Cost benefits Analysis of Sage (*Salvia officinalis*) variety: SAGE-1 for herbal production

*Melkamu Tilaye*, Tamirat Girma, Muluken Philipose

INTRODUCTION

*Sage* (*Salvia officinalis*) belongs to Lamiaceae family is a perennial woody sub-shrub native to the Mediterranean region. It is cultivated mainly to obtain dried leaves to be used as raw material in medicine, perfumery, and food industry (Santos-Gomes, *et al*., 2002). Sage is one of the oldest medicinal plants, and the etymology of its name suggests its healing properties. The name *Salvia* derived from the Latin verb *salvare* = to save or to cure, and *officinalis* also means medicinal (Abu-Darwish, *et al*., 2013). It has been used for a long time in folk medicine as medication against fever, rheumatism, perspiration, sexual debility, and in the treatment of chronic bronchitis, as well as mental and nervous diseases (Said-Al Ahl, *et al*., 2015).

Sage has a wide range of biological activities, such as antibacterial, fungistatic, virustatic, astringent, eupptic and anti-hydrotic effects. The leaves of sage are well known for their anti-oxidative properties and anti-inflammatory effect (Baricevic, *et al*., 2001). Leaves and essential oils of Sage are stated to possess carminative, antispasmodic, antiseptic and astringent properties (Aziz, *et al*., 2013). Its leaves and essential oils are used commonly in the food, drug and perfumery industries (Raal *et al*., 2007).

Sage has many different uses especially; it has been used as herbal remedy for a wide range of disorders and illnesses by applying it either internally or externally. It is employed as diuretic, tonic, menstruation's promoter; local styptic, antiseptic, anti-inflammatory, antifungal and spasmodic pain relief (Khail and Li, 2011).

Although Sage used as herbal remedy for a wide range of disorders and illnesses and as industrial inputs; Production and utilization of this plant is at infant Stage in Ethiopia. Besides this, information regarding production and financial feasibility of Sage production is limited. Thus, the study aimed to assess the financial feasibility of Sage variety: SAGE-1 production for its herbal production. The study was conducted at Wondogenet Agricultural Research Center experimental field from January 2015 to December 2017. For this study SAGE-1 was planted on 100m² area of land with an intra and inters row spacing of 60cm. All cost and benefit data were collected throughout the production period. The study employed financial analysis methods such as Net Present Value (NPV) and Benefit Cost Ratio (BCR) to analyze feasibility of production. The result revealed that; the herbal production SAGE-1 required a total cost of 68,571.82 birr/ha, and provided total revenue of 431,500 birr/ha, resulted net return of 362,928.18 birr/ha in three years of production. Moreover, net present value and benefit cost ratio was found 305,602.13 and 6.03 birr/ha respectively showed that production of SAGE-1 is financially feasible. Sensitivity analysis in changed scenarios revealed that production is still financially feasible.
It has herbal medicines with antibacterial, free radical scavenging, and antitumor activities have been found to be very effective in the development of novel natural drugs to prevent, control, and treat many minor health problems as well as more serious and complicated diseases such as diabetes, Alzheimer’s, and cancer. In a study drinking of sage tea (300 ml, twice a day) showed increase in antioxidant defenses and improved the lipid profile, without causing any hepatotoxicity or inducing any adverse effects such as, changes in blood pressure, heart rate and body weight, which may indirectly improve diabetic condition. Sage provides valuable alternative for the treatment of menopausal hot flashes and climacteric complaints (Hamidpour et al., 2014).

The essential oil of Sage can be extracted by hydro distillation using Clevenger apparatus for small amounts of essential oil production or using steam distillation for mass production of essential oils. To extract its essential oil first Sage fresh herb is harvested from the field and then its leaf and stem are separated. Finally, extraction of its essential oil can be done using either its fresh or dry leaf by using hydro distillation or steam distillation according to the purpose of production.

Sage essential oil contains a mixture of many compounds. Around 88% the compounds distributed in three terpene groups: oxygen containing monoterpenes (47.7%), sesquiterpene hydrocarbons (24.5%), and monoterpenic hydrocarbons (15.9%). The major components of Sage essential though out different studies are 1,8 cineole, camphor, borneol, bornyl acetate, camphene, α and β-thujone, linalool, α and β-caryophyllene, α-humulene, α and β-pinene, viridiflorol, pimaradiene, salvianolic acid, rosmarinic acid, camoseric acid, and ursolic acid (Lima et al., 2004; Hamidpour et al., 2014). The study on assessment of antioxidant activity of sage showed that rosmarinic acid derivatives were potent antioxidants, while the flavonoids, luteolin and apigenin glycosides, possessed comparatively weak to moderate activities (Lu and Foo, 2001). The oil of Sage inhibited the growth of B. cereus, B. megatherium, B. subtilis, A. hydrophila, A. sobria, and K. oxytoca (Delamare, et al., 2007). Rosmarinic acid (RA), and luteolin-7-glucoside (L-7-G) are protecting cells against oxidative DNA damage and stimulating DNA repair (Ramos et al., 2010). According to the study β-ursolic acid of Sage essential oil significantly decreased the number of B16 colonies in the lungs of mice at the dose of 50 mg/kg (Jedinak et al., 2006).

Although sage has many different uses as herbal medicinal and industrial inputs, the production and utilization of this plant is in infant stage in Ethiopia. Primarily because of low awareness among farming community, regarding on its potential and returns on the production this plant and limitation on market linkage. On the other hand there is no published information on feasibility of Sage production. This study aimed to study feasibility of SAGE-1 for herbal production and to provide information regarding feasibility of its production. This information will help in encouraging farmers and investors to cultivate Sage plant. In this study the discounted measure financial analysis methods such as net present value (NPV) and benefit cost ratio (BCR) was applied. Net present value is the net benefit or worth of an investment at the time of initiation of the investment by converting cash flow streams into present value. Benefit cost ratio shows the ratio of present worth of benefit streams to the present worth of cost streams. It shows the ratio of benefits to the costs at the initial time of investment. Net present value is calculated by subtracting the sum of discounted cost from the sum of discounted benefits; whereas benefit cost ratio is calculated by dividing the discounted sum all benefit streams to the discounted sum all cost streams.

**METHODOLOGY**

The study was conducted at Wondogenet Agricultural Research Center, Southern Nations Nationalities, and people’s region of Ethiopia. This study was performed in experimental field of Wondogenet Agricultural Research Center from January 2015 to December 2017. Geographical location of the study area ranges from 38° 37'13"-38° 38'20" East and 7° 52'23"-7° 55'2" North with an altitude range of 1760-1920 masl. Planting material used in the study was seedlings of sage (Salvia officinalis) variety: SAGE-1. Then planting material was planted on the experimental field area of 100m² and with inter and intra row spacing of 60cm. To study the costs of SAGE-1 production: the amount labor in terms of man-days for land preparation, planting, watering, weeding and hoeing and harvesting operations were recorded accordingly by preparing data collection sheets. The total amount of labor cost was calculated by using wage rates that were fixed by Wondogenet Agricultural Research Center. In addition to this, planting material and initial plowing costs was recorded. At the end, the total cost of production was obtained through addition of all these costs. On the other hand, in order to calculate the total revenue obtained per each year, total annual yields were recorded and multiplied by its price. All data on the cost and benefit were recorded in Ethiopian Birr. Finally, all the information was converted to a per hectare basis for the final analysis. All the necessary data for the study were collected from experimental field during economic life of the plant. The price of SAGE-1 herb was the farm gate price which was used to purchase its fresh herb of Sage from farmers. Finally, to examine the feasibility SAGE-1 production for its fresh herbal production financial analysis methods were followed. For this study the two discounted measures, net present value (NPV) and benefit cost ratio (BCR) methods was employed for analyzing financial feasibility. To calculate total revenue (TR), total cost (TC), net present value (NPV), and Benefit cost ratio (BCR) the following formulas were used:
Total revenue (TR)

\[ TR = Q \times P \]  \hspace{1cm} (1)

Where:
- TR: Total Revenue
- Q: Total quantity of fresh herb in kg
- P: Selling price per kg of fresh herb

Total cost (TC)

\[ TC = PC + MC + CP + LC \]  \hspace{1cm} (2)

Where:
- TC: Total cost
- PC: Plowing cost/first cost of plowing and harrowing
- MC: Planting material cost
- CP: Land cleaning and leveling, and cost of planting
- LC: Labor costs (labor cost of operation: watering, weeding and hoeing and harvesting)

Net Present Value (NPV)

Net present value is computed by finding the difference between the present worth of benefit stream less the present worth of cost stream. Or it is simply the present worth of the cash flow stream.

\[ NPV = \text{Present worth of Benefit Stream} - \text{Present Worth of Cost Stream} \]

Mathematically, it can be shown as:

\[ NPV = \sum_{t=0}^{n} \frac{(B_n - C_n)}{(1+r)^n} \]  \hspace{1cm} (4)

Where:
- NPV: Net Present Value
- Bn: Benefits in each year
- Cn: Costs in each year
- n: number of years
- r: discount rate.

Then, after having the value of NPV, the decision is; if NPV is positive indicates that investing on SAGE-1 for herbal production is feasible; if NPV is negative indicates that it is not feasible.

Benefit Cost Ratio (BCR)

It is the ratio of present worth of benefit stream to present worth of cost stream, that is:

\[ BCR = \frac{\text{Sum of the present worth of benefit}}{\text{Sum of the present worth of costs}} \]

Mathematically, it can be shown as:

\[ BCR = \frac{\sum_{t=0}^{n} B_n (1+r)^{-t}}{\sum_{t=0}^{n} C_n (1+r)^{-t}} \]  \hspace{1cm} (5)

Where:
- BCR: Benefit cost ratio
- Bn: Benefit in each year
- Cn: Cost in each year
- n: number of years
- r: discount rate.

According to BCR, herbal production of SAGE-1 is feasible; if BCR is greater than 1. If it is less than one, it indicates that the production of SAGE-1 is not feasible.

RESULTS AND DISCUSSION

In this section results on yield, costs and returns associated with herbal production of SAGE-1 variety of Sage and its financial feasibility analyses is presented.

Yield of SAGE-1 production.

The fresh herb yield of SAGE-1 which is converted into a per hectare basis, was 33,000 Kilogram per hectare (kg/ha) in the first year of cultivation, 35,050 kilogram per hectare (kg/ha) in the second year and 18,250 kilogram per hectare (kg/ha) in the third years of cultivation. In terms of percentage the first years herbal yield was 38.24%, the second year herbal yield was 40.61% and the third year herbal yield was 21.15% of the overall herbal yield in the three years of production. This showed the yields of SAGE-1 had reached maximum in the second year of cultivation then it diminished in the third years of cultivation because of the plant SAGE-1 plants died due to ageing from time to time. It showed the herbal yield in the second year increased by 6.21% from the first year, and the herbal yield in the third year decreased by 47.93% and 44.7% from the second and first year of cultivation respectively. In three years of Cultivation SAGE-1, yielded a total fresh herb of 86,300 kilogram per hectare (kg/ha), and an average of 28,766.67 kilogram per hectare (kg/ha) per year in its production life as it is presented in table: 1 and chart 1 below.

Table 1: Herbal production of SAGE-1 in kilogram per hectare (kg/ha).

<table>
<thead>
<tr>
<th>Plant name</th>
<th>Years of cultivation</th>
<th>Fresh herb yield (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sage(SAGE-1)</td>
<td>I</td>
<td>33,000</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>35,050</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>18,250</td>
</tr>
<tr>
<td>Total production (kg/ha)</td>
<td></td>
<td>86,300.00</td>
</tr>
<tr>
<td>Average yield per Year (kg/ha)</td>
<td></td>
<td>28,766.67</td>
</tr>
</tbody>
</table>

Source: field data, 2015-2017
Costs and Returns of SAGE-1 production

The annual costs of SAGE-1 were calculated based on specified wage rate for labor, and their input prices for other inputs of production. On the other hand, revenue is calculated based of fresh herb price of Sage. The costs, returns and their share of costs per year are presented in table 2, and the trends of returns in chart 2 below.

As it is presented in the table 2, the first-year cost of cultivation of SAGE-1 for herbal production was 52,570.56 birr/ha, this accounts 76.66% of the total cost. The second-year cost of cultivation was 7,560.65 birr/ha, accounts 11.03% of the total cost of cultivation. The third-year cost of cultivation was 8,440.61 birr/ha, accounts 12.31% of the total cost of cultivation. This shows that the cost of production of SAGE-1 was maximum in the first year and it diminishes in the second and third years of production; even though the third-year cost of cultivation is higher than second year by 1.28%. In the third year this cost increment is occurred due to frequency of harvesting fresh yield increase to small extent which causes to increase labor cost of harvesting and in turn increases total cost of cultivation in the year. The per hectare cost of cultivation of SAGE-1 was maximum during the initial year, because of the presence of initial costs such as cost of plowing, planting material, land preparation and labor cost for planting; but declined substantially in the second and third years of production due to the absence of those initial costs. This result is comparable with the study, Mittal and Singh (2007) reported that per hectare cost of cultivation has been found maximum in the initial year but declined substantially in subsequent years due to the absence of cost of planting material. In the three years life of its cultivation the maximum cost of production was planting material cost which was estimated to Birr 33,235 accounts 48.47% of the overall total cost and the minimum cost was land leveling and cleaning cost which was Birr 327.36 accounts 0.48% of the overall cost of production. Moreover, the total cost of herbal production SAGE-1 over three years of production life was 68,571.82 birr/ha.

As presented in table 2 and chart 2, the first-year total revenue of SAGE-1 was Birr 165,000 which accounts 38.24% of the overall total revenue. In the second-year total revenue was Birr 175,250 accounts 40.61% of the overall total revenue. In the third-year total revenue was Birr 91,250 this account 21.15% the overall total revenue. The second-year total revenue was increased by 6.21% from the first-year total revenue. The third-year total revenue decreased by 47.93% and 44.70% from the second and first year total revenues of SAGE-1 production respectively. The revenue decrease in third year of production due to herbal yield of SAGE-1 diminished. The total revenue of SAGE-1 in its three years of the production was Birr 431,500. The net return in the production of SAGE-1 was 112,429.44 birr/ha for the first year 167,689.35 birr/ha in its second year, and 82,809.39 birr/ha in the third years of production. In addition to this, the overall net return obtained from production of SAGE-1 was 362,928.18 birr/ha indicating that investing in production of SAGE-1 generates a positive net return. This showed that the production the plant was highly profitable. This result is in agreement to the current study of Suresh and et.al. (2012) reported that production medicinal plants (menthol mint, tulsi, and vetiver) are highly remunerative.

### Table 2: costs and returns of SAGE-1 production.

<table>
<thead>
<tr>
<th>Particulars</th>
<th>years</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I. Fixed cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tractor rent for plowing (birr/ha)</td>
<td>2,480 (4.72)</td>
<td>2,480 (3.62)</td>
</tr>
<tr>
<td>II. Variable cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planting material/seedling cost</td>
<td>33,235 (63.22)</td>
<td>33,235 (48.47)</td>
</tr>
<tr>
<td>land labeling and cleaning</td>
<td>327.36 (0.62)</td>
<td>327.36 (0.48)</td>
</tr>
<tr>
<td>Planting seedlings (birr/ha)</td>
<td>1,099.47 (2.09)</td>
<td>1,099.47 (1.60)</td>
</tr>
<tr>
<td>Labor cost of Watering (birr/ha)</td>
<td>1,307.79 (2.49)</td>
<td>1,299.06 (15.39)</td>
</tr>
<tr>
<td>Weeding and hoeing (birr/ha)</td>
<td>5,418.80 (10.31)</td>
<td>3,583.60 (34.43)</td>
</tr>
<tr>
<td>Harvesting (birr/ha)</td>
<td>1,845.12 (3.51)</td>
<td>1,488.00 (19.68)</td>
</tr>
<tr>
<td>Miscellaneous expense 15%</td>
<td>6,869.55 (13.07)</td>
<td>996.26 (13.18)</td>
</tr>
<tr>
<td>Total costs (birr/ha)</td>
<td>52,570.56 (100)</td>
<td>7,560.65 (100)</td>
</tr>
<tr>
<td>Herbal Yield (Kg/ha)</td>
<td>33,000</td>
<td>35,050</td>
</tr>
<tr>
<td>Gross return at (5birr/kg)</td>
<td>165,000</td>
<td>175,250</td>
</tr>
<tr>
<td>Net return (birr/ha)</td>
<td>112,429.44</td>
<td>167,689.35</td>
</tr>
</tbody>
</table>

**Source:** field data: 2015-2017

**NOTE:** In this table, numbers in brackets shows the share of each cost.
Financial Feasibility

The financial feasibility of SAGE-1 was investigated by using of investment analysis criteria. The Net present value (NPV) and benefit cost ratio (BCR) was applied to analyze the feasibility of SAGE-1 for its herbal production. Market interest rate which is 9.5% was used to calculate the discount factor. Based on this, as presented in Table 3, the NPV was 305,602.13 indicating that investing in herbal production of SAGE-1 is financially feasible. Similarly, the BCR was 6.03 which indicate that a 1 birr investment in SAGE-1 production yielded a net benefit of Birr 5.03. The result revealed that in both measures investing in SAGE-1 cultivation for herbal production is financially feasible.

Table 3: Results of financial feasibility analysis

<table>
<thead>
<tr>
<th>Items</th>
<th>Years</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Total revenue</td>
<td>165,000</td>
<td>175,250</td>
</tr>
<tr>
<td>Total costs</td>
<td>52,570.56</td>
<td>7,560.65</td>
</tr>
<tr>
<td>Discounted total revenue</td>
<td>150,684.93</td>
<td>146,160.42</td>
</tr>
<tr>
<td>Discounted total costs</td>
<td>48,009.65</td>
<td>6,305.67</td>
</tr>
<tr>
<td>NPV</td>
<td>305,602.13</td>
<td></td>
</tr>
<tr>
<td>BCR</td>
<td>6.03</td>
<td></td>
</tr>
</tbody>
</table>

Source: field data 2015-2017

Sensitivity Analysis

In this section the sensitivity of SAGE-1 production is presented. Sensitivity is done to examine how sensitive is the production to the fluctuations in the values of the variables. The sensitivity of production is tested in the following scenarios SAGE-1 production.

Assuming other things/variables keeps constant
1. When herbal yield of SAGE-1 decreased by 10%.
2. When the price of SAGE-1 decreased 10%
3. When costs of production of SAGE-1 increased 10%.
4. When costs of production of increased by 10% and herbal yield of SAGE-1 decreased by 10%.
5. When costs of production increased by 10% and price of SAGE-1 decreased by 10%.
6. When both herbal yield and price of SAGE-1 decrease by 10%.
7. When herbal yield and price of SAGE-1 decreased by 10%, and costs increased by 10%.

Based on the above listed scenarios, the effect the variables to net return, net present value (NPV), and benefit cost ratio (BCR) of SAGE-1 production were examined as presented in the table: 4 below.

Table 4: Sensitivity Analysis of SAGE-1 Cultivation

<table>
<thead>
<tr>
<th>S/N</th>
<th>Scenario change</th>
<th>Net return (birr/ha)</th>
<th>Net present value (NPV)</th>
<th>Benefit Cost ratio (BCR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yield decreased by 10%</td>
<td>319,778.18</td>
<td>268,967.50</td>
<td>5.43</td>
</tr>
<tr>
<td>2</td>
<td>Price decreased by 10%</td>
<td>319,778.18</td>
<td>268,967.50</td>
<td>5.43</td>
</tr>
<tr>
<td>3</td>
<td>Costs of increased by 10%</td>
<td>356,070.99</td>
<td>299,527.72</td>
<td>5.48</td>
</tr>
<tr>
<td>4</td>
<td>Costs increased by 10% and yield decreased by 10%</td>
<td>312,920.99</td>
<td>262,893.09</td>
<td>4.93</td>
</tr>
<tr>
<td>5</td>
<td>Costs increased by 10% and price decreased by 10%</td>
<td>312,920.99</td>
<td>262,893.09</td>
<td>4.93</td>
</tr>
<tr>
<td>6</td>
<td>When price and Yield decreased by 10%</td>
<td>280,943.18</td>
<td>235,996.34</td>
<td>4.89</td>
</tr>
<tr>
<td>7</td>
<td>Yield and price decreased by 10%, and costs increased by 10%</td>
<td>274,085.99</td>
<td>229,921.93</td>
<td>4.44</td>
</tr>
</tbody>
</table>

Source: field data 2015-2017

As presented in the table: 4 keeping other things constant:
1. When yield decreased by 10% and
2. When Price decreased by 10% separately, the production of SAGE-1, in three years of production provides a net return of 319,778.18 birr/ha. These showed that, in the two cases, that is: when yield decreased by 10% and price decreased by 10% investing in SAGE-1 production is still profitable. Net present value (NPV) is 268,967.5 which is a positive number. It indicates that investing in SAGE-1 production is financially feasible regardless the changes. Similarly benefit cost ratio (BCR) is 5.43. This indicates that production of SAGE-1 is financially feasible as BCR was greater than one. It shows that if 1 birr is invested in the production of SAGE-1 it yields a net benefit of birr 4.43 in this scenario. The result also showed that, if the price decreased by 10% and yield decreased by 10% independently, they were provided the same results in net returns, NPV and BCR in its Cultivation.
3. When costs of production of Sage increased by 10%, net returns of production is 356,070.99 birr/ha. This shows that even though all costs of production increased by 10%, production of SAGE-1 is still profitable. The Net present value (NPV) is 299,527.72 which is a positive number. It indicates that with this change investing in SAGE-1 production is financially feasible. Similarly benefit cost ratio (BCR) is 5.48. This indicates that production of SAGE-1 is financially feasible as BCR was greater than one. It shows that if 1 birr is invested in production of SAGE-1 it yields a net benefit of birr 4.48 birr within this change.

4. When Costs increased by 10% and yield decreased by 10% and
5. When Costs increased by 10% and price decreased by 10% keeping other variables constant, the production of SAGE-1 have net return 312,920.99 birr/ha. It indicates that although those changes occur, the production of SAGE-1 is still profitable. Net present value (NPV) is 262,893.09 which is a positive number. It indicates investing in SAGE-1 production is financially feasible. Similarly benefit cost ratio (BCR) is 4.93. This indicates that production of sage is financially feasible as BCR was greater than one. It shows that if 1 birr is invested in the cultivation of sage it yields a net benefit of birr 3.93.

6. When price and Yield decreased by 10%, keeping other things constant, the production of SAGE-1 has a net return 280,943.18 birr/ha. It indicates that even though yield and price of SAGE-1 production decreased by 10% production of the plant is still profitable. Net present value (NPV) is 235,996.34 which is a positive number. It shows that even though this change occurs, investing in SAGE-1 production is financially feasible. Similarly benefit cost ratio (BCR) is 4.89. This indicates that production of SAGE-1 is financially feasible as BCR was greater than one. It shows that if 1 birr is invested in its production it yields a net benefit of birr 3.89.

7. When yield and price decreased by 10%, and costs of production increased by 10% keeping other things constant the production of SAGE-1 has a net return 274,085.99 birr/ha. It indicates that, even though yield and price of SAGE-1 production decreased by 10% and cost of production increased by 10%, the production is still profitable. Net present value (NPV) is 229,921.93 which is a positive number. It indicates that even though the change in scenario occurs, SAGE-1 production is financially feasible. Similarly benefit cost ratio (BCR) is 4.44. This also indicates that production of SAGE-1 is financially feasible as BCR was greater than one. It shows that if 1 birr is invested in the production of SAGE-1 it yields a net benefit of birr 1.44. The result showed that, even though the selected scenarios changed together the production is still financially feasible.

CONCLUSION AND RECOMMENDATION

The feasibility SAGE-1 has been conducted at Wondogenet Agricultural Research Center for three years. During the life of the experiment data were collected accordingly from the experimental site. Based on this the costs benefits and financial feasibility of its production is examined. The study revealed that cultivation of SAGE-1 for herbal production is financially feasible. So this plant can be taken as means of generating additional income for farmers and other stake holders without affecting their production on other crops.

Although SAGE-1 has different uses as herbal remedies and inputs to industry in Ethiopia awareness about this plant, the market and market linkage is poor and are not sustainable. So, it needs to create awareness about the plant for farming community and stake holders to engage on the investment of this plant. For these who are existed in production and processing of the plant; market linkage between producer and processors of the plant should be strengthened.

ACKNOWLEDGEMENT

We would like to Acknowledge Wondogenet Agricultural Research Center Aromatic and Medicinal Plants Research Program for its financial support. Next our special thanks go to Sofonias Admasu and Gezahegn Erkeno for their help in the field data collection and recording on the life time of the experiment.

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Accepted 6 June 2018


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