



Analysis of Benefit Cost Ratio of Sesame Production under Demonstration in Low Lands of Western Zone, Tigray, Ethiopia

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Authors' contributions

This work was carried out in collaboration among all authors. Author TM designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors DGT and GZ managed the analyses of the study. Author GZ managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/SAJSSE/2021/v11i330283

Editor(s):

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Complete Peer review History: <http://www.sdiarticle4.com/review-history/62760>

Original Research Article

Received 01 October 2020
Accepted 07 December 2020
Published 24 June 2021

ABSTRACT

This study aimed to investigate the cost-benefit of sesame production per hectare under (farmers practice, partial package and full package) practice were farmers performed side by side in their plot. Benefit cost ratio analyses of sesame was conducted in western low lands of Tigray. It includes the production year of 2016/17 E.C and bounded of two woredas with six production sites. In the present study 40 respondents of sesame producers were incorporated. Producers were categorized in to full package (row planting, fertilizer and improved seed users), partial package (broadcast, fertilizer and improved seed users) and non package (broad cast and improved seed). Data was analyzed using SPSS version 16 in terms of percentage, mean, model and others. On the other hand, per hectare yield, return, production cost, and benefit cost ratio of each package were statistically different. The mean productivity per hectare for full package, partial package and non package was 6.55, 5.26 and 3.85 quintal sequentially. The mean return per hectare of full package, partial package, and non package was 26243.75, 21746.25 and 13178.91 birr sequentially. The production cost per hectare of full package, partial package, and non package

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was 13826.74, 12561.35 and 8681.46 birr respectively. The mean benefit cost ratio was 1.90, 1.74 and 1.50 birr respectively for full package, partial package and non package.

Keywords: Farmers practice; partial package; sesame production; Ethiopia.

1. INTRODUCTION

1.1 Back Ground of the Study

Improving the productivity, profitability, and sustainability of the agricultural sector is the main pathway out of poverty for the country [1,2], Dawson et al., 2016). Ethiopia is one of the centers of biodiversity for several oilseeds (sesame seed, Niger seed, mustard seed, pumpkin seed, sunflower, rape seed, castor seeds, ground nuts) which can be considered as specialty high value seeds on the international market [3] and [4]. Ethiopia is one of the major sesame producing countries in the world, which was ranked number 5 in production after Myanmar, India, China, and Sudan 2010 [5] and it is the third world exporter of sesame seed after India and Sudan [6].

Sesame is one of the main important oil seed crop semi ared of Ethopia [7]. Oil seed sector is one of Ethiopia fastest growing and importer sector, in terms of foreign exchanng earnings as a main source of income for over three million Ethiopians; It is the second export crop next to the coffee [4],[8],[9] and [5]. Most farmer produce sesame mainly for market, Sesame plays a significant role in the livelihood of sesame growing farmers in Ethiopia particularly in the western part of Tigray (Humara, Welkayit, Tshegdi and the Tahtay adiabo (FAO, 2012 and [5]. About 30% of the country's total sesame production comes from Humera districts of Ethiopia [10].

In wastern zone of Tigray sesame dominatly produced by farmers with low production and productivity due to different production problems like lack of improved sesame varitie supplier, lack of extension services and poor integration of Agricultural office with research institutions, due to this farmers incur larege amount cost of production with low proadctivity. Today producing sesame is not as easy as the past. In modern farming system, competition of resources and inputs is very complex, it needs high investment and effort, frequently monitoring and evaluation of the farm activities and using of modern technologies. Because our grandfathers hold large farm size, and produced high production regardless of the productivity of the farm land. At

this time, the farm size of today is not as large as last times and its fertility is decreasing by many factors and its productivity is depends on its fertility, consuming of modern farm inputs. It is an alternative to our government forced farmers to use these technologies in order to increase the production and productivity to secure food supply. In western zone of Tigray region so many improved inputs are introducing to farmer such as fertilizer, improved seed, row planting, pesticides and insecticides in order to increase the productivity and production of the farm land. In western zone of Tigray sesame produced mostly with traditional method of farmers with low production and productivity from existed hectare this is too much low when we compare with existed research foundation, one of the major constraints is low production and productivity. The farming system depends on traditional rainfall.

In western zone of Tigray especially the low land's rainfall is unpredictable. There is huge shortage of rainfall at this area but have large arable land compared to the other zone of this region. It needs high farm managing system and experience to produce agricultural products in the low lands of Tigray also the farmer must compare its expenditure and gains from the improved farm technologies at modern century, farmer need not only producing more but also need to analysis the cost benefit of the their work. Cost benefit analysis (CBA) is an assessing and comparison of the costs and gains of an investment. In this area, cost benefit analysis is not introduced as main activity of any farm work. But most of farmers are not register their cost of farm activities and benefit, because some of costs and benefits are tangible but many of the costs and gains are none tangible.

In western zone of Tigray region so many improved inputs are introducing to farmer such as fertilizer, improved seed, row planting, pesticides and insecticides in order to increase the production and productivity of the farm land. The farmer must compare its expenditure and gains from the improved farm technologies activities. At modern century, farmer need not only producing more but also need to analysis the cost benefit of their work. Cost benefit analysis (CBA) is an assessing and comparison

of the costs and gains of an investment. In this area, cost benefit analysis is not introduced as main activity of any farm work. But most of farmers are not register their cost of farm activities and benefit, because some of costs and benefits are tangible but many of the costs and gains are non tangible.

1.2 General Objective of the Study

To assess the cost benefit of sesame production in the low land area western zone of Tigray.

1.2.1 Specific objective of the study

- ✓ To identify the production cost of sesame each packages.
- ✓ To identify the productivity of sesame each packages.
- ✓ To identify the return of sesame each packages.
- ✓ To identify the cost benefit of sesame each packages.

1.3 Resarch Questions

Does the packages have different return, yield, production cost, and benefit cost ratio per hectare.

1.4 Significance of the Study

Increasing sesame production and productivity is primary concern of the policy makers and development agencies for many years. By now some sort of agreement exists about how increased production and productivity can be achieved. Improved farming technologies which are the results of scientific research, must be available to farmers, along with full information on how to use the new technologies. If researchers lack understanding of farmers' problems and the conditions under which they are operating, it may result in development of inappropriate technologies and fail to accelerate the process. In this respect, all development partners like extension educators, technical assistants, NGOs and other development agents involved in agricultural development must be aware and understand the financial profitability of the technology, farmers' perception on technology the adoption of new technologies in order to target and extend appropriate technologies to farmers. It is also important for policymakers to know the benefit of new technologies and the critical factors that could accelerate their use. This could facilitate efficient allocation of major resources for research, extension and development programs.

1.5 Scope and Limitation of the Research

This study is only a piece of a massive effort to open up realities concerning farm technologies consequences. Therefore, its scope is limited in terms of coverage and production packages depth owing to financial and time resources available. It is limited to only sesame varieties production and also limited to western zone of Tigray district in terms of area coverage. On the other hand, the result of this study can be used as a reference for other similar areas.

2. METHODOLOGY

2.1 Location

Western Tigray zone is one of the 6 zones in national regional state of Tigray bordered on the South by Amhara, on West by Sudan and on the North by Eritrea, and on the East by TahitayAdyabo, Asegede Tsimbila, and Tselmitiworedas of North West zone of Tigray. It is distant about 545 kilometers to the North West of Mekelle (the regional capital) at an altitude ranging from 500 to about 3000 meter above sea level. The administration center of this zone is found in Setit-Humera town.

2.2 Sampling Techniques and Sample Size

First from the western zone of Tigray three weredas were selected. Then six production site were selected based on accessibility and availability of transport, farmers responsibility, development agent supports, widely use of technologies. The total sample size from producer's sesame was 40. This data collection used 40 farmers from each package of producers.

2.3 Data Collection Method

Both primary and secondary data were used for this study. Primary data on sesame production was associated with production cost like cost of input, area of sesame in hectare, yield obtained per hectare and, price of output were collected. Secondary data for this study obtained from book, journals and other published and unpublished documents from internet.

2.4 Data Analysis Method

The coding of data collected for the analysis was performed after collection and before entering the data in to the computer. The data were analyzed using software SPSS version 16. And

appropriate techniques and procedures were used in the analysis to identify the production and productivity of each package (full package, partial package and non package) farmer users. Descriptive statistics such as mean, standard deviation (SD), frequencies, percentages and linear regression model were used to have a clear picture of the characteristics of sample units. And an independent sample t-test and anova test were used to identify variables that vary significantly among packages was conducted to compare some quantitative characteristics of the sesame production.

3. RESULTS AND DISCUSSION

3.1 Households Character of Categorical Variables

The sample composed of both male and female household heads. From the total household 20% of them were female and 80% were male included, the majority of households in the sample were headed by males. Additionally the result reveals that out of the total participants (25%) of the house hold heads were illiterate, 40% of them were junior school, 25% were primary school and 10% of the attended secondary school level. Based on the marital status out of the total household heads single, married, widows and divorced comprise of 7.5%, 75%, 12.5% and 5% respectively. The majority of household heads in the in the sample are headed by married couples (Table 1).

Table 1. Households character of categorical variables

Variables		Frequency	Percentage
Education	Illiterate	10	25%
	From 1 up to 4	16	40%
	From 5 up to 8	10	25%
	From 9 up to 10	4	10%
Marital status	Single	3	7.5%
	Married	30	75%
	Widowed	5	12.5%
	Divorced	2	5%
Sex	Female	8	20%
	Male	32	80%

Table 2. Households character of continuous variables

Variables	Mean	Std.dev	Minimum	Maximum
Age	44.83	6.18	29	54
Experience	18.68	7.05	10	30
Family size	5.65	1.05	3	7

3.2 Households Character of Continuous Variables

The Table 2 illustrate average age of the sample household head was 44.83 years with standard deviation of 6.18. The minimum and maximum age of the respondent was 29 and 54 respectively. Additionally average household size was 5.65 with standard deviation of 1.05. The minimum and maximum household size per household was 3 and 7 respectively. The mean experience sesame production of the sample was 18.68 with standard deviation of 7.05 the minimum and maximum experience of the respondent was 10 and 30 correspondingly.

3.3 Cost and Production Analysis

3.3.1 Cost of cultivation

Productivity each package of technology was different. The mean yield of full, partial and none packaged in puts was 6.55, 5.26 and 3.85 quintal per hectare respectively The one way ANOVA test statistics reveals, there is a significant difference in mean productivity among the production practices at ($\chi^2=30.57$, $P=0.000$) significance level. The mean difference between full and partial and full non package were 1.29, 2.71 quintal in the same way and also the mean difference between parietal and none package was 1.42 quintal. Farmer producing at parietal and non package technology instead of full package were incurred an opportunity cost of 1.29 and 2.71 quintal sequentially. Producing at none package farmer incurred opportunity of 1.42 comparing with partial package.

Table 3. Cost and production analysis

Variables	None package		Partial package		Full package		Combined		F-test
	Mean	Std.er	Mean	Std.er	Mean	Std.er	Mean	Std.er	
Productivity	3.85	1.39	5.26	1.29	6.55	1.90	5.22	1.89	30.57
Return per her	13178.91	3913.82	21746.25	4083.53	26243.75	5574.62	20389.63	7091.21	83.82
Cost cultivation	8681.46	1938.19	12561.35	2004.49	13826.74	1761.45	11689.85	2897.78	79.3
Cost production	2471.10	392.12	2191.01	290.97	2030.03	340.33	2230.71	386.76	16.87
BCR	1.50	0.18	1.74	0.24	1.90	0.33	1.71	0.30	24.26

Table 4. Benefit cost and partial budget analyses

Variables	Sowing method		
	None package	Partial package	Full package
Average yield per/hectare in kg	384.58	526.2	655.55
Gorse filed benefit	13178.91	21746.25	26243.75
mean difference of TVC	0	3879.89	5145.28
net benefit	13178.91	17866.36	21098.47
MRR		120.81%	255.42%
Benefit cost ratio	1.50	1.74	1.90

3.3.2 Return per hectare

Farmers' return was varied with input used technologies (packages). A producer with full, parietal and none package return were 26243.75, 21746.25 and 13178.91 Birr correspondingly. The mean difference of return between full and partial was 4497.5. Additionally the mean difference between full and none packages was 13064.84 Birr. And also 8567.34 birr between partial and non package producers. Farmer producing at parietal and non package technology instead of full package incurred an opportunity cost of 4497.5 and 13064.84 birr respectively. Producing at none package farmer incurred opportunity cost of 8567.34 birr compared with partial package. The one way ANOVA test statistics indicates, there is a significant difference in production practices among the farmers at ($\chi^2=83.82$ $P=0.000$) significance level.

3.3.3 Cost of production

Mean production costs of full, partial and none packages were 13826.74, 11689.85 and 8681.46 birr respectively in the production year of 2016/17. The mean difference production cost between full and partial, full and none package inputs were 5145.27, 1265.39 birr sequentially and also the mean difference of production cost of partial and none package was 3879.89 birr. The one way ANOVA test statistics indicates, there is a significant difference in production practices among the farmers at ($\chi^2=79.3$ $P=0.000$) significance level.

3.4 Benefit Cost and Partial Budget Analyses

This result showed the partial analyses of the packages as the farmer changes input from none package to partial package the return change by 120.81% and also as the farmer change the technology from none package to full package the return increased by 255.42%. And also the benefit cost ratio of the respondents with each technology a producer of full package when he spent 1Birr he can get a benefit of 1.90 Birr, a men which uses parietal package he can get 1.74 Birr when he spent 1 Birr and also a person who can produce with none package he can get 1.5 Birr when he spent 1 Birr.

4. CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

Sesame producing at full package was excellent status than the other packages according the benefit cost ratio. Adopting at full, partial and none package producer's produces 6.55, 5.26 and 3.85 quintal respectively. Farmers produced full package were gained return of 26243.75 Birr. The partial package and non-package producers gain 21746.25 Birr and 13178.91 Birr sequentially. The production cost of full, partial and non-package producers were 13826.74, 12561.35 and 8681.46 Birr sequentially and benefit cost ratio of full, partial and non-package producers were 120.81% and 255.42% sequentially. According our results, it was possible to conclude that the full packaged producer's were more profitable or beneficiary than the partial package and non-package users. The full packaged input users are beneficiary as compared to the partial and non-package input users.

4.2 Recommendations

Based on the results, wide and extended extension service is needed in order to expand and popularize the technologies, and to aware the people about the benefit of the improved inputs. Utilizing improved farm inputs must not be the only technology applied, but continuous follow up of the farm condition is very basic task because monitoring and evaluation of farm activity daily tells us the status of the farm condition. Beside to using improved technology and follow up of farm condition, farmers have to register their day to day costs and gains in order to know their farming financial activities. Comprehensive financial analysis provides that the basic data needed for economic evaluation of the task. Costs are expenditures, but revenues are financial benefits from the activity.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:

The peer review history for this paper can be accessed here:

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