

Cost-Benefit Analysis of Sesame Production under Improved and Traditional/ Farmer's Practice/ in Kafta-humera, Tigray Region, Ethiopia

Abstract

This study aimed to investigate the cost-benefit of sesame production per hectare under improved and (traditional sesame production) farmer's practice. The primary data for the study were generated from the sesame farmers who cultivate both improved and traditional sesame production (plot with improved sesame agronomic technologies on one side and farmers practice on the other side) were selected randomly from the participants of households on the cluster-based large scale demonstration of sesame production during 2019 in kafta-humera district, Western Zone of Tigray, Ethiopia. The study found that farmers were able to generate an average gross income of ETB 28997 per hectare from the improved sesame production, whereas, ETB 19215.21 per hectare from their practice, respectively. The average cost of cultivation for improved sesame production was ETB 11857.89 hectares and ETB 9259.63 per hectare under (traditional sesame production) farmers practice. Therefore, the net profit of sesame production under improved and traditional sesame production was ETB 17139.69 and ETB 9955.58 respectively. This implied that farmers could earn an additional net income of 7184.11 /ha through practicing the recommended sesame technologies. This shows that although the net profit under the improved production system was higher than traditional/farmers practice, higher costs of production were also recorded in improved sesame production than traditional /farmers practice as farmers spend a lot of money for sesame cultivation especially weeding and harvesting. Hence, the government and private sectors should give more emphasis to introduce mechanized captivators and combined harvester machines to reduce labor costs especially when the cost of labor is high. Moreover, the price of sesame seed was lower than the previous three-four years. Hence, agricultural economists should consider on setting up a sesame price policy to help farmers to gain more profit from selling sesame.

Keywords: Sesame, Profitability, Cost, Benefit, Production, Traditional, improved

Introduction

Agriculture plays a major role in economic growth and development of the world in general and in developing countries in particular [1]. In Ethiopia, agriculture has played and continues to play a vital role in the national economic development of the country, contributing 41.4% of the country's gross domestic product (GDP) and 83.9% of the total exports [2]. Among the agriculture sectors practiced in Ethiopia, oilseeds are the backbone of the rural and national economy of the country in earning foreign currency. Among the different oil crops in Ethiopia, sesame is one of the major economically important oil crops in Ethiopia which is the second most important agricultural commodity next to coffee [3, 4] with an attractive domestic and international market. Sesame is grown primarily for its oil-rich seeds and used as a cash crop, export commodity, raw materials for industries and pharmaceutical [5], and a source of employment opportunity that supports the livelihoods of thousands of small farmers, hundreds of medium-to-large-scale private farms along with thousands of other actors [6,7].

Having all these importance, sesame production continues to face several problems and challenges. The major ones are weather uncertainties, limited use of improved agricultural technologies, pest outbreaks, and absence of a business-oriented production system, resulting in lower crop productivity and then limited or no profitability [8,9].

To overcome the problems, the government of Ethiopia has been promoting the new extension program as an effective mechanism to bring about the desired growth in the agricultural sector. The intervention is composed of packages of improved technological inputs such as chemical fertilizers, improved seeds, better cultural practices (for example land preparation, row planting, time and frequency of weeding), pest management, and expert support. Its success will depend upon the effectiveness of the technological packages and the extent to which a significant number of peasant households are willing and able to adopt the package and employ it continuously and sustainably [10]. On the other hand, adoption by smallholder farmers for improved agricultural technologies can provide the basis for increasing their production and income. A decision to adopt or reject agricultural technologies depends on smallholder farmer's objectives, their constraints as well as the cost and benefits of the technology [11]

When considering farming practices, the main practices are traditional and improved sesame production system. The traditional sesame production system is the cultivation of sesame through farmer's practice, whereas, improved sesame production system is producing sesame by adopting the improved sesame technologies which are recommended by different researches and studies in different times. So far, many improved sesame technologies were recommended by national and regional research institutions. Improved sesame varieties, land preparation, method of planting (row planting), time and frequency of weeding, seed and fertilizer rate, time and method of fertilizer application, pest and diseases management measures, harvesting, removing/minimization of post-harvest loss, and other technologies were suggested by different researches and studies in different period. In other words, in Sesame cultivation, there are essential inputs namely land, labor, management, as well as new inputs such as seeds, fertilizers, pesticides, and various machinery. These factors, when properly allocated, can help increase productivity.

Sesame productivity is different as its production costs are different from one producer to the other as they differ among the production methods. Determining the costs of sesame production is, therefore, a delicate matter and should be done on a case-by-case basis. Therefore, a study of economic analysis between the tradition and improved sesame production is very important for agricultural economists and policymakers in the study area. This study can also be informative for lowland farmers on the main cost components of sesame production. Also of interest is data on which method between the tradition and improved condition was more profitable. Thus, this study was carried out to assess the costs and benefits to farmers from the improved and traditional sesame production practices in Western Tigray, Ethiopia

2. Methodology

2.1. The Study area

The study was conducted within the kafta-humera district of Western Tigray, Ethiopia during 2020. The district was selected based on the information large sesame production area, many sesame growers, the potential for sesame production, accessibility, and representativeness of the farming system. Once the district was selected, an equivalent procedure and selection criteria were went to select the study Kebeles, namely Adebay and Rawyan. The population for this

study comprised of all sesame farmers who participate in cluster-based large scale sesame technologies demonstration within the selected kebeles.

The data for this research were collected from both primary and secondary data sources. The first data for the study were generated from the sesame farmers who cultivate both improved and traditional sesame production (plot with improved sesame technologies on one side and farmers practice on the other side were selected randomly from the participants of households on the cluster-based large scale demonstration of sesame production during 2019).

2.2 Data analysis

Descriptive tools like mean, standard deviation, minimum, and maximum were used to analyze the data. Economic analysis was performed using the prevailing average market prices for all cost of production and sesame grain yield (output). The net benefit (NB) was calculated as the difference between the gross benefit (GB) and the production cost. The difference of mean yield, crop income, production cost, and financial profitability was tested using paired t-test inferential statistics as the data were subjected to t-test for significance test.

3. Result and Discussion

Table 1: Average Sesame Grain yield across the two production systems

	Mean	Std. Dev.	Min.	Max.	t-value
Full-package	7.07	2.03	3.5	10	t= 10.4760
Farmers practice	4.69	1.29	2.75	8	P= 0.0000
Difference	2.38				

The productivity of sesame under improved production technology ranged between 3.5 and 10 qt/ha with a mean yield of 7.07 qt/ha as against a yield range between 2.75 and 8 qt/ha with a mean of 4.69 qt/ha under farmer's practices (traditional sesame production practice). The result also revealed a significant difference ($t = 10.4760$; $P < 0.0001$) between sesame productivity under improved production technology and farmer's practices.

Table 2: Cost of Sesame production

Variable	Improved sesame production system				Farmers practice			
	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.	Min.	Max.
Cost of land preparation/ha	374.64	132.54	145.45	500	348.80	185.17	125	833.33
Cost of 1 st plowing /ha	402.98	92.61	300	600	412.51	74.67	300	500
Cost of 2 nd plowing /ha	419.85	95.98	300	600	345.66	192.72	0	600
Cost of 3 rd plowing /ha	1200.00	0	1200	1200	0.00	0.00	0	0
Cost of seed/ha	231.53	34.74	198	297	269.85	11.70	231	297
Cost of fertilizer /ha	1833.45	84.89	1595	1875	494.24	678.78	0	1875
Cost of fertilizer transportation /ha	39.60	9.96	20	50	12.58	15.05	0	30
Cost of labor for fertilizer application /ha	45.05	31.18	20	100	32.90	49.54	0	200
Cost of 1 st weeding /ha	1226.774	265.1966	600	1500	1595.04	407.291	1250	2250
Cost of 2 nd weeding/ha	1071.667	394.2574	500	1650	1175	255.542	750	2000
Cost of 3 rd weeding/ha	921.697	380.9571	109.0909	1500	1790.149	347.3579	1111.111	2571.428
Cost of chemical /ha	66.61	63.76	45	300	4.35	13.52	0	45
Cost of chemical spraying /ha	26.29	37.33	15	200	2.90	9.02	0	30
Cost of harvesting /ha	2489.28	986.33	1000	4000	2529.73	1125.58	700	4857.14
Cost of threshing /ha	790.91	274.47	300	1200	447.73	97.33	400	825
Cost of transportation /ha	154.26	86.74	50	300	115.68	77.73	0	240
Cost of foods and related /ha	588.39	241.04	500	1280	557.07	247.44	0	1305
Cost of others/ha	153.29	87.92	120	378	23.23	48.19	0	120
Total cost of production/ha	11857.89	1564.93	9167	14673.5	9259.631	2418.145	4160.5	14426.86

The higher cost of cultivation of 11857.89 birrs/ha is involved in the case of improved sesame production as compared to 9259.63 birrs under Farmer's practice (Table 3).

Table 3: Cost-Benefit Analysis

Variable	Improved production system				Farmers practices				t-test
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	
Gross income	28997	8315.33	14350	41000	19215.21	5292.23	11275	32800	t = 10.4760 P= 0.0000
Total cost	11857.89	1564.93	9167	14673.5	9259.631	2418.145	4160.5	14426.86	t = 5.1683 P=0.0000
Net income	17139.69	7875.942	3776.5	30367	9955.576	4841.906	3009.5	25419	t = 7.0824 P=0.0000
BCR	2.448578	.6693	1.257369	3.85592	2.171543	.7061618	1.291745	4.443842	t = 1.9394 P= 0.0310

Beneficiary farmers were able to generate an average gross income of 28997 birrs per ha from the improved sesame production, whereas, 19215.21Birr/ha from their practice, respectively (Table 3). After deducting all the cost of production, the average net income was 17139.69 birr/ha in the case of improved sesame production system, whereas, 9955.58 Birr/ha, in a similar field with farmers practice. This implied that farmers could earn an additional net income of 7184.11 /ha by practicing the technologies.

Conclusions and recommendation

This study can conclude that the average sesame yield under improved sesame production system was higher (7.07 quintal/ha) than the yield of sesame under farmers practice 4.69 quintals/ha. Although both the sesame yield and net profit under the improved production system were higher than traditional/farmers practice, the costs of production were also higher in improved sesame production than traditional /farmers practice as farmers spend a lot of money for sesame cultivation especially weeding and harvesting so the government and private sectors should give more emphasis to introduce mechanized captivator and combined harvester machine to reduce the labor cost especially when the cost of labor is high. Moreover, the price of sesame seed was lower than the previous three-four years. Hence, agricultural economists should consider setting up a sesame price policy to help farmers to gain more profit from selling sesame.

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