International Journal of Agricultural Economics
2025, Vol. 10, No. 1, pp. 1-4
https://doi.org/10.11648/j.ijae.20251001.11

Research Article

Cost-Benefit Analysis of Early Generation Seed Production of Bread Wheat (*Triticum aestivum L.*)

Hassen Seid Awoke[1, *], Karta Kaske[2], Megersa Bayisa[1], Debele Debela[1], Girma Debeli[1], Astawus Esatu[1]

[1]Kulumsa Agricultural Research Center, Asela, Ethiopia

[2]Ethiopian Institute of Agricultural Research (EIAR), Addis Ababa, Ethiopia

Abstract

Bread wheat (Triticum aestivum L.) is one of the major crops predominantly grown by small-scale farmers under rain-fed and irrigation conditions in Ethiopia. Understanding the cost of bread wheat source seed production can help for better understand the need for greater specialization in terms of the crop type and the seed class. This study assesses the financial feasibility and risk bearing ability of bread wheat seed production. A two yeasr (2020/21-2021/22), cost and return data was collected from Kulumsa Agricultural research center, bread wheat sources seed multiplication farm. The economic performance measures such as, gross revenue, profit and benefit cost ratio were used for data analysis. Results of economic performance indicators revealed that bread wheat pre-basic seed production requested an average total cost of production about 82,120.33 ETB to operate a hectare of farm, to fetch total average revenue 184,031.92 ETB and profit 101,911.47 ETB per hectare. The study revealed that input and weeding operations expense were the most critical factors to escalate cost of production, and thereby to decrease its profitability. Therefore, it can be concluded that, bread wheat source seed production was a profitable business besides supplying quality sources seed to farming community to encourage food security in the country.

Keywords

Profitability, Revenue, Profit, Seed Production, *Benefit Cost Ratio*

1. Introduction

Bread wheat (*Triticum aestivum* L.) is one of the major crops predominantly grown by small-scale farmers under rain-fed and irrigation conditions in Ethiopia. It is the most important cereal crop grown from lowland to highland areas of Ethiopia. In Ethiopia wheat was the third and the second in area coverage and production covering about 1,897,405 ha of land, with average productivity of 3.05 ton ha^{-1} [1-3].

Development of improved varieties is not an end by itself unless those varieties are multiplied, marketed to farmers efficiently, timely and make an impact on the livelihoods of farmers [4]. Availability, access, and use of quality seeds of adaptable crop varieties are essential in increasing crop productivity and ensuring food security [5, 6].

Released and registration of superior varieties should be followed by ensuring the supply of good quality early generation seed at the required quantity and time. In this regard,

*Corresponding author: hassenseid49@yahoo.com (Hassen Seid)

Received: 3 January 2024; **Accepted:** 25 October 2024; **Published:** 17 January 2025

multiplication and dissemination of improved technologies are integral components of research for development efforts. But estimation of seed production cost and economic benefit derived from bread wheat seed production operation was not clearly understood and also the verification of the economic benefits of the varieties to reduce the economic risks farmers not well understood. Therefore, this study was conducted to assess the costs and benefits of bread wheat seed production at Kulumsa Agricultural Research Center, Ethiopia.

2. Materials and Method

2.1. Description of Study Area

The study was conducted at Kulumsa Agricultural Research Center (KARC) from 2020/21 to 2021/22 cropping season under field and laboratory conditions. The site is located at 8 ̊00' N and 39 ̊07' E at an elevation of 2210 m above sea level in Arsi Administrative Zone of Oromia Regional State, 159 km South East of Addis Ababa. The agro-climatic condition of the area is wet and receives a unimodal mean annual rainfall of 809.15 mm from March to September; however, the peak season is from July to August. The maximum and minimum mean temperature is 23.08 and 9.9 ℃, respectively.

2.2. Sampling Design and Size

Relevant physical and cost related data were collected from the primary sources. Primary data were collected on seed yield, straw, labor, machinery used and application rates and used of inputs such as seed, fertilizer and agro chemicals were based on the 22.4 (ha) of land allocated for bread wheat (king bird variety) seed multiplication farm basis.

2.3. Data Analysis

All plot level data were converted to per hectare basis for ease of computation. The widely known financial evaluation tools such as, net present value (NPV), benefit cost ratio (BCR) and internal rate of return (IRR) were used for the analysis, Gross margin was calculated as the difference between gross revenue and variable costs [7, 8]. Gross revenue is the product of the total grain and straw produced and the price per unit of product. Profit was estimated for ha^{-1} of seed multiplication farm level and refers to the difference between total revenue and total costs that included both variable and fixed costs. Performance indicator is the ratio between the total output and the total input in terms of market value and the benefit cost ratio in cost-benefit analysis to determine the viability of cash flows generated from an asset were done.

3. Results and Discussion

The material input cost, operational cost, storage rent, interest and risk allowance cost of bread wheat pre-basic seed production were work out on (Table 1). The study showed that, the two consecutive years (2020/21 and 2021/22) estimated total variable costs were incurred about 66,105.67 ETB and 77,015.05 ETB. Similarly, the total fixed costs of the same years were recorded about 9,794.08 ETB and 11,325.86 ETB to produce 2.71 ton ha^{-1} and 2.82 ton ha^{-1} of bread wheat pre-basic seed, respectively, (Table 1). The total variable costs were included labor, farm machinery, Fuel and lubricant, seed testing charge, Administration cost (salary), material inputs (fertilizer, seeds, chemicals and packaging materials) and also fixed cost included interest on working capital, risk allowance and storage rent, (Table 1).

The observations showed that about 47.41% and 52.59% of total variable costs were allocated to material inputs in 2020/21 and 2021/22 cropping seasons, respectively, (Table 1). The other cost of production of the two consecutive years (2020/21 and 2021/22) cropping seasons were the operational cost which incurred about 52.59% and 47.52%, respectively. The other cost of production of the two consecutive years was the fixed cost which incurred about 9,794.08 ETB and 11,325.86 ETB, respectively. Generally, the total cost of bread wheat pre basic seed production at Kulumsa Agricultural Research Center of the two consecutive production years (2020/21 and 2021/22) were recorded about 75,899.75 ETB and 88,340.91 ETB per hectare, respectively, (Table 1).

Seed production involves on some specific cultural operations, fertilizer application and chemical spray, rouging, harvesting and threshing and post-harvest processing were the main parts of seed management. To perform all these special operations for maintaining genetic purity standards of a seed produced, requires additional cost or labor and material inputs, thus the portion of these two costs among other variable costs makes high. Further, the seed lots were to be certified for minimum quality standards. In case of seed produced, the risk of rejection due to low quality standards would be added to cost of production. These findings are in agreement with the reports of [9], in case of sorghum and wheat seed production.

Table 1. *Estimation of total costs (ETB) involved bread wheat seed production (ha^{-1}).*

No	Cost item	Cropping seasons		
		2020/21	2021/22	Total cost
1	Material cost = (a+b+c+d)	31,337.99	40,414.58	71,752.57
a	Seed	10,087.50	12,609.00	22,696.50
b	Fertilizer	13,687.20	13,687.20	27,374.40
c	Chemical	6,699.00	12,892.93	19,591.93
d	Packaging materials	864.29	1,225.45	2,089.74
2	Operational Costs = (e+f+g+h+i)	34,767.69	36,600.47	71,368.16
e	Labor (wage) cost	10,077.88	10,095.91	20,173.79
f	Fuel and lubricant costs	2,311.15	4,109.25	6,420.40
g	Farm machinery cost	6,704.46	6,704.46	13,408.92
h	Seed Testing charge	92.95	109.60	202.55
i	Administration cost (salary)	15,581.25	15,581.25	31,162.50
3	Total Variable Costs = (TVC)= (1+2)	66,105.67	77,015.05	143,120.72
4	Storage rent	539.29	543.75	1,083.04
5	Risk allowance (5% of TVC)	5,949.51	6,931.35	12,880.86
6	Interest on working capital (9% TVC)	3,305.28	3,850.75	7,156.03
7	Total Fixed Costs (TFC)= (4+5+6)	9,794.08	11,325.86	21,119.94
8	Total Cost = (3+7)	75,899.75	88,340.91	164240.66

Profitability of bread wheat seed production at KARC was analyzed and presented in (Table 2). The revenue mainly obtained from bread wheat seed yield and straw sold. The total aggregated revenue generated from bread wheat seed production in 2020/21 and 2021/22 cropping seasons were about 171,842.20 ETB ha^{-1} and 196,221.40 ETB ha^{-1}, respectively. Seed production return at 2021/22 was highest due to the seed price were increased. The total aggregated profits of the two consecutive cropping seasons were recorded about 95,942.45 ETB and 107,880.49 ETB, respectively. Finally, the benefit-cost ratios of the two consecutive bread wheat seed production were recorded about 1.26 and 1.22.

The result indicates that bread wheat seed production was a profitable enterprise, which is consistent with findings from the study conducted by [10-12] on the community based seed production of the open pollinated maize in western Kenya. This is expected given that profit is a function of price and yield and a change in any of the two could influence the crop profitability [13-15].

Table 2. *Profitability analysis of bread wheat seed production at KARC (ETB).*

Cost items	cropping seasons	
	2020/21	2021/22
Total variable costs	66,105.67	77,015.05
Total fixed costs	9,794.08	11,325.86
Total costs	75,899.75	88,340.91
Benefits (birr ha^{-1})		

Cost items	cropping seasons	
	2020/21	2021/22
Seed yield	170640.00	195019.20
Straw yield	1202.16	1202.16
Total revenue	171842.2	196221.4
Profit (birr ha-1)	95,942.45	107,880.49
Benefit-cost ratio	1.26	1.22

4. Conclusion

This study examines the financial feasibility and risk bearing ability of bread wheat source seed production in Kulumsa Agricultural Research Center. The result indicates that bread wheat seed production was a profitable business besides supplying quality sources seed to farming community to encourage food security in the country. Moreover, the profitability analysis showed that, a hectare of bread wheat pre-basic seed multiplication farm requested an average total cost of two consecutive production years (2020/21 and 2021/22) was about 82,115.33 ETB per hectare with an average profit 101,911.47 ETB.

Abbreviations

ETB	Ethiopian Birr
CSA	Central Stastical Agency
KARC	Kulumsa Agricultural Research Center
NPV	Net Present Value
BCR	Benefit Cost Ratio

Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] CSA. (2021). The Federal Democratic Republic of Ethiopia Central Statistical Agency. Report on Area and Production of Major Crops.

[2] Kalsa, K. K., Tadesse, T., Kassa, S., Geleti, D., 2021. Early Generation Seed Production in Ethiopia: Trends and Way Forward. Ethiopian Institute of Agricultural Research, Addis Ababa, Ethiopia.

[3] Tadesse, W., Zewude B., and Assefa, S. (2018). Wheat production and breeding in Sub-Saharan Africa: Challenges and opportunities in the face of climate change. Int. J. Clim. Chang. Strategy. Manag. 11: 696–715.

[4] Kifle, T., Tolossa, D., Shibru, A., Alemu, D., 2022. Analysis of Seed System Actors: Roles, Responsibilities, and Linkages in Central Ethiopia. J. Agric. Sci 32, 71–97.

[5] Abebe, A., Dawit, A., Bishaw Z., Kifle, T., and Kalsa, K. (2017). Early Generation Seed Production and Supply in Ethiopia: Status, Challenges and Opportunities Framework of early generation seed production. Ethiop. J. Agric. Sci. 27: 99–119.

[6] Jenkins, Kuo, and Harberger. (2011). Cost-Benefit Analysis for Investment Decision, August 2012 Edition.

[7] New Market Lab, 2020. Case Study on KALRO Model Plant Varieties Licensing Agreement. Nairobi, Kenya.

[8] Lion, K. D., Boef, W. S. de, Huisenga, M., Atwood, D., 2015. Convening Report: Multiple Pathways for Promoting the Commercial and Sustainable Production and Delivery of Early Generation Seed for Food Crops in Sub-Saharan Africa.

[9] Chivatsi, W., Kamau, M., Wekesa, N., Diallo, O., and Hugo, D. (2002). Communitybased maize seed production in Coastal Lowland Kenya. pp. 446-451.

[10] Assefa, A., and Heidhues, A. (1996). Estimation of output and input technical efficiency using a flexible functional forms and panel data. International Economics Review 35: 245-255.

[11] Coelli, T., Rao, D., and Battese, G. (1998). An introduction to efficiency and productivity analysis. Boston: Kluwer Academic Publishers.

[12] Hassena, M., Alemu, D., Dey, B., 2023. Quality Declared Seed Mechanism in Ethiopia. A Feed the Future Global Supporting Seed Systems for Development activity report.

[13] Hassena, M., Ruediger, A., Sisay, D. T., 2022. Pricing of Early Generation Seed in Ethiopia. Addis Ababa, Ethiopia.

[14] ATA, 2016. Early Generation Seed Study Interim Report for the EGS National Workshop. Addis Ababa, Ethiopia.

[15] Bishaw, Z., Atilaw, A., 2016. Enhancing Agricultural Sector Development in Ethiopia: the Role of Research and Seed Sector. Ethiop. J. Agric. Sci. Special Is, 101–130.