P-ISSN 2322 - 0678 & E-ISSN 3048 - 9946
https://doi.org/10.56572/gjoee.2026.41.2.0003 Gujarat Journal of Extension Education Vol. 41 : Issue 2 : June - 2026

ASSESSMENT OF FARMERS' INCOME AND PRODUCTION COSTS ON STRAWBERRY CULTIVATION: EVIDENCE FROM NOWIN-E OLYA VILLAGE, INJIL DISTRICT, HERAT PROVINCE, AFGHANISTAN

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ABSTRACT

Strawberry production has emerged as an important source of income for smallholder farmers in Afghanistan; however, its economic performance is influenced by production costs, market access, and institutional conditions. This study aimed to assess farmers' income and production costs associated with strawberry cultivation in Nowin-e Olya village, Injil District, Herat Province, Afghanistan in 2025. A survey research design was applied, and primary data were collected from 60 randomly selected strawberry growers using a structured questionnaire. The collected data were analyzed using Microsoft Excel and SPSS software. The findings indicate that 21.67% of respondents earned a moderate net income ranging from AFN 122,760 to AFN 206,089, while 31.67% achieved a higher income exceeding AFN 206,089. In addition, 45% of farmers reported relatively low production costs below AFN 39,237. Regarding socio-economic characteristics, 40% of respondents were over 50 years old, 21.67% were illiterate, and 33.33% belonged to large households of more than eight members. Furthermore, 71.67% of farmers participated in agricultural training and extension programs. Among the major constraints, lack of an appropriate market (98.3%) was identified as the most significant challenge, while farmers emphasized government support, irrigation development, and market regulation as the most important recommendations for improving production efficiency and income levels. The study concludes that although strawberry production has strong potential to improve rural livelihoods, its sustainability depends on improved market systems, reduced production constraints, and stronger institutional support.

Keywords: *agricultural profitability, farm income, market constraints, net income, production costs, strawberry production.*

INTRODUCTION

Strawberry (*Fragaria × ananassa* .L) is a perennial herbaceous plant belonging to the family Rosaceae. It was first developed as a cultivated crop in the Brittany region of western France through the hybridization of two wild strawberry species and was subsequently introduced to other parts of the world (Ahmadi, 2022).

Strawberry is one of the most economically valuable horticultural crops and has attracted increasing attention from Afghan farmers in recent years. Owing to its high value-added potential, employment generation, investment opportunities, and contribution to farm income, strawberry production plays an important role in agricultural and rural economic development. The growing demand for strawberries in both domestic and international markets has created significant opportunities for export expansion, foreign exchange earnings, and income improvement for producers. Moreover, its high commercial value, desirable quality, processing potential, and relatively easy transportation have made strawberry one of the most promising horticultural commodities.

Strawberry cultivation is practiced across different regions of the world under diverse climatic and geographical conditions. Expanding global markets, increasing consumer demand, and the crop's high economic returns have intensified competition among major strawberry-producing and exporting countries. The United States, Spain, France, Germany, Iran, Türkiye, and Afghanistan are among the leading producers of this crop. Nevertheless, strawberry production in many parts of Afghanistan is still predominantly based on traditional farming practices. The adoption of modern production technologies, greenhouse cultivation, improved farm management, and advanced production techniques could substantially enhance productivity, improve fruit quality, and increase farmers' income (Ahmadi, 2022).

Previous studies have demonstrated that strawberry cultivation generates considerable economic and social benefits for rural households. Increased household income, employment creation, expansion of activities related to production, packaging, processing, marketing, and value chain development are among the major positive outcomes associated with strawberry production. Consequently, the expansion of strawberry cultivation can contribute significantly to improving rural livelihoods, enhancing economic resilience, and strengthening the welfare of farming communities.

Despite the economic importance of strawberry production, limited research has simultaneously examined farmers' income and production costs in Afghanistan, particularly in Herat Province. The lack of empirical evidence in this area constrains effective planning and evidence-based policymaking aimed at improving farm profitability and production efficiency. Therefore, the present study was conducted to assess farmers' income and production costs associated with strawberry cultivation in Nowin-e Olya Village, Injil District, Herat Province, Afghanistan. The findings are expected to provide useful insights for improving farm income, reducing production costs, and promoting the sustainable development of strawberry cultivation in the study area.

Previous studies have extensively examined the economic, production, educational, and marketing dimensions of strawberry cultivation and other agricultural commodities. Salehi and Kalantari (2007) investigated the economic status of strawberry producers in Sanandaj Province and reported that crop yield per unit area declined as farm size increased. They also found that variable production costs per unit area decreased with increasing farm size, while smaller farms were more profitable than larger ones.

Sayar et al. (2020) examined the role of agricultural sector development in Afghanistan's economy and found that 42.9% of the respondents had very low income, 39.9% had low income, and only 15% earned a moderate income. Their findings highlighted the significant contribution of the agricultural sector to improving the economic conditions and livelihoods of rural households in Afghanistan.

Ahmadi (2022) assessed the economic status of farmers engaged in strawberry cultivation and reported that 36.66% of the respondents incurred moderate production costs ranging from AFN 10,000 to AFN 25,000, while 33.33% earned a net income exceeding AFN 180,000. The study concluded that strawberry cultivation represents an economically profitable agricultural enterprise with considerable potential to improve farmers' income.

Seddighi and Pourkakhk (2005) investigated farmers' attitudes toward saffron production and expansion and found that the surveyed farmers owned an average of 3.39 hectares of agricultural land, of which approximately 1.4 hectares were allocated to saffron cultivation. Their findings suggested that farm size and land allocation significantly influence agricultural production and farm income.

Ghanbari et al. (2017) evaluated the effects of drought on rural livelihoods and reported that 55% of the respondents owned less than 20 jeribs of agricultural land, whereas only 2.4% possessed more than 100 jeribs. Their study demonstrated that drought had substantial adverse effects on the economic conditions and livelihoods of rural households.

Azizi Khalkhali and Haddadi-Nejad (2016) investigated the educational needs of strawberry growers in Mazandaran Province and identified fruit firmness during transportation as the highest-priority training need among the 55 educational topics evaluated. They recommended that extension and training programs should prioritize the identified educational needs to improve strawberry production and post-harvest management.

Miri, Mirzadeh, and colleagues (2018) analyzed the strawberry supply chain in Golestan Province and recommended promoting high-yielding and market-preferred cultivars, encouraging investment in strawberry processing industries, establishing farmers' cooperatives, and expanding value-added industries to improve production efficiency and marketing performance.

Overall, previous studies have addressed various economic, production, educational, and marketing aspects of strawberry cultivation and other agricultural enterprises. However, empirical evidence regarding farmers' income and production costs associated with strawberry cultivation in Afghanistan, particularly in Nowin-e Olya Village of Injil District, Herat Province, remains limited. This research aims to fill this gap by assessing the income and production costs of strawberry growers in the study area, thereby providing evidence to support agricultural planning, rural development initiatives, and policies aimed at improving farmers' livelihoods.

OBJECTIVES

(1) To assess farmers' income and production costs associated with strawberry cultivation.

(2) To examine the socio-economic profile of the respondents

(3) To assess the problems and suggestions of the respondents.

METHODOLOGY

This study employed an Ex-post facto research design, which examines phenomena that have already occurred without manipulating the study variables. Data were collected using a pre-designed questionnaire from a randomly selected sample of 60 strawberry farmers in Nowin-e-Ulya Village, Injil District, Herat Province, Afghanistan.

The questionnaire used in this study consisted of four main sections:

(1) respondents' demographic characteristics,

(2) socio-economic profile of the farmers, including age, educational level, household size, landholding size, farming experience, annual income, participation in agricultural extension programs, economic incentives, and motivational factors,

(3) farmers' income and expenditure related to strawberry cultivation, and

(4) the major constraints faced by the farmers and their suggestions.

This research was conducted in Nowin-e-Ulya Village, Injil District, Herat Province, Afghanistan. The collected data were coded and entered into Microsoft Excel 2024 before being analyzed using descriptive statistical methods, including frequency, percentage, mean, standard deviation, and ranking. Finally, the data were analyzed using the Statistical Package for the Social Sciences (SPSS) to obtain the research findings.

RESULTS AND DISCUSSION

Farmers' income

Table 1 presents the distribution of thesurveyed farmers according to their income levels. The findings indicate that the largest proportion of the respondents (40.00%) belonged to the low-income category (less than AFN 168,791), while 36.67% were classified as high-income farmers (more than AFN 216,015). These results suggest that although strawberry cultivation can generate considerable income for some producers, income levels vary substantially among farmers. This finding is consistent with Ahmadi (2022), who also reported that strawberry cultivation has significant economic potential for improving farmers' livelihoods.

Table 1 : Distribution of the Surveyed Farmers by Income Level (n = 60)

Sr. No.	Income Level	Frequency	Percentage
1	**Low income** (less than AFN 168,791)	24	40.00
2	**Moderate income** (AFN 168,791–216,015)	14	23.33
3	**High income** (more than AFN 216,015)	22	36.67

Production costs

Table 2 presents the distribution of the surveyed farmers according to their production costs. The findings indicate that the largest proportion of the respondents (45.00%) incurred low production costs (less than AFN 39,237), whereas 38.33% reported high production costs (more than AFN 60,127). These findings suggest that a considerable proportion of strawberry growers were able to maintain relatively low production costs, which may positively influence farm profitability. The results are generally consistent with those reported by Ahmadi (2022), who found that a substantial proportion of strawberry farmers also fell within the moderate production cost category, highlighting the variability of production costs among strawberry producers.

Table 2: Distribution of the Surveyed Farmers by Production Cost Level (n = 60)

Production Cost Level	Frequency	Percentage
Low production cost (less than AFN 39,237)	27	45.00
Moderate production cost (AFN 39,237–60,127)	10	16.67
High production cost (more than AFN 60,127)	23	38.33

Net income

Table 4 summarizes the distribution of the surveyed farmers according to their net income levels. Nearly half of the respondents (46.67%) were classified in the low net income category (less than AFN 122,760), whereas approximately one-third (31.67%) earned more than AFN 206,089 annually. This distribution demonstrates considerable variability in the economic returns from strawberry cultivation among the surveyed farmers. Such variation may be attributed to differences in production efficiency, input utilization, and marketing performance. A comparable trend was reported by Ahmadi (2022), who also observed that strawberry cultivation provides substantial economic benefits for a considerable proportion of farmers, although income levels differ across

producers.

Table 3 : Distribution of the Surveyed Farmers by Net Income Level (n = 60)

Net Income Level	Frequency	Percentage
Low net income (less than AFN 122,760)	28	46.67
Moderate net income (AFN 122,760–206,089)	13	21.67
High net income (more than AFN 206,089)	19	31.67

Socio-economic profile of the respondents

Table 4 summarizes the socio-economic characteristics of the surveyed farmers. The results indicate that the respondents were predominantly middle-aged and older farmers, with 40.00% belonging to the 31–50-year age group and an equal proportion aged over 50 years. Regarding educational attainment, the largest proportion of respondents (35.00%) had completed primary education, while 21.67% were illiterate, suggesting that strawberry cultivation in the study area is largely practiced by farmers with relatively low levels of formal education. This observation is consistent with the findings of Zarafshani et al. (2021), who emphasized that farmers' educational background plays an important role in shaping their access to agricultural knowledge and extension services.

Household size was dominated by medium-sized families (61.67%), indicating that family labor remains an important component of agricultural production. A similar household structure was reported by Qanbari et al. (2017), who found that rural households engaged in agricultural activities generally consisted of medium-sized families. Likewise, the predominance of small- and medium-sized irrigated farms observed in the present study is broadly comparable with the findings of Sedighi and Pourkakhk (2005), who reported that farmers typically allocated relatively limited areas of land to high-value crops.

The respondents were also relatively experienced, with more than 85% reporting at least five years of farming experience. Such experience is expected to enhance production management and decision-making. Comparable observations were reported by Ahmadi (2022), who found that strawberry growers generally possessed considerable farming experience. In terms of annual income, although nearly half of the respondents belonged to the low-income category, a substantial proportion (30.00%) reported high annual income, indicating noticeable variation in the economic performance of strawberry production. This finding partially agrees with the results of Sayar et al. (2020), who likewise reported considerable variation in farmers' income levels across agricultural households.

Table 4 : presents the general socio-economic profile of the individuals under study (n = 60)

Sr. No.	Variables	Category	Number	Percentage
1	**Age**	Young (18-30 years)	12	20.00
		Middle-aged (31-50 years)	24	40.00
		Elderly (over 50 years)	24	40.00
2	**Family size**	Small (1-3 members)	03	05.00
		Medium (4-8 members)	37	61.67
		Large (more than 8 members)	20	33.33
3	**Education level**	Illiterate	13	21.67
		Primary School (grades 1-6)	21	35.00
		Secondary School (grades 7-9)	14	23.00
		High School (grades 10-12)	09	15.00
		14th Grade (Seventeenth and Fourteenth)	0	00.00
		Bachelor's Degree	03	05.00
4	**Farming experience**	Low (1-5 years)	09	15.00
		Medium (6-10 years)	26	43.33
		High (more than 10 years)	25	41.67

Sr. No.	Variables	Category	Number	Percentage
	Land Ownership	Irrigated land	Small Farmers (1-3 jeribs)	50.00
			Medium Farmers (4-10 jeribs)	50.00
			Large Farmers (more than 10 jeribs)	00.00
		Rainfed land	Small Farmers (1-3 jeribs)	00.00
			Medium Farmers (4-10 jeribs)	00.00
			Large Farmers (more than 10 jeribs)	00.00
		Orchards	Small Farmers (1-3 jeribs)	06.67
			Medium Farmers (4-10 jeribs)	00.00
			Large Farmers (more than 10 jeribs)	00.00
	Annual Income	Low (less than 486,413.33 AFN)	29	48.33
		Medium (486,413.33–792,986.66 AFN)	13	21.67
		High (more than 792,986.66AFN)	18	30.00

Problem reported by respondents

Table 5 presents the major constraints reported by the surveyed farmers based on multiple-response analysis. The lack of an appropriate market was identified as the most critical challenge (98.3%), followed by the lack of modern cold storage facilities (91.6%) and water scarcity with limited access to reliable irrigation water (85.0%). These findings suggest that the sustainability of strawberry production is constrained more by post-harvest, marketing, and infrastructure limitations than by on-farm production factors alone.

These findings are generally consistent with those of Miri et al. (2018), who emphasized that weak marketing systems, inadequate processing facilities, and limited investment in the strawberry value chain constitute major barriers to the development of strawberry production. Similarly, Sedighi and Pourkakhk (2005) highlighted the importance of institutional support and production infrastructure in improving farmers' productivity and economic performance.

Table (5) problems reported by respondents (n = 60)

Sr. No.	Reported Problems	Frequency	Percentage (%)	Rank
1	Lack of an appropriate market	59	98.3	I
2	Lack of modern cold storage facilities	55	91.6	II
3	Water scarcity and limited access to reliable irrigation water	51	85	III
4	Market price fluctuations	47	78.3	IV
5	Climate variability and farmers' limited adaptation capacity	44	73.3	V
6	Declining market prices due to imported strawberries entering domestic markets	41	68.3	VI
7	Limited access to modern agricultural machinery and equipment	33	55	VII
8	Poor rural transportation infrastructure	29	48.3	VIII
9	High prices of chemical fertilizers	28	46.6	IX

Multiple Respondents Analysis

Suggestions provided by the respondents

Table 6 summarizes the recommendations proposed by the surveyed farmers. The most frequently suggested recommendation was greater government support for farmers and agricultural producers (91.6%), followed by the construction of deep wells for agricultural lands (86.6%) and improved market regulation through controlling imports of foreign agricultural products (81.6%). These findings indicate that farmers consider institutional support, improved

water resource management, and market protection as the most important measures for enhancing the profitability and sustainability of strawberry production.

These findings are generally consistent with those of Miri et al. (2018), who emphasized the importance of strengthening marketing systems and promoting investment in the strawberry value chain. Likewise, Azizikhalkhili and Hadadinejad (2016) highlighted the need for extension and training programs to improve farmers' knowledge and productivity, which is consistent with the respondents' recommendation for expanding agricultural extension courses.

Table (6) : Suggestions provided by respondents (n = 60)

Sr. No.	Suggestions Provided	Frequency	Percentage (%)	Rank
1	Greater government support for farmers and agricultural producers	55	91.6	I
2	Construction of deep wells for agricultural lands	52	86.6	II
3	Better market regulation and control of imported agricultural products	49	81.6	III
4	Reducing the prices of chemical fertilizers	44	73.3	IV
5	Organizing agricultural extension training courses to improve farmers' income	42	70.0	V
6	Developing domestic and international markets	38	63.3	VI
7	Improving rural road infrastructure	27	45.0	VII
8	Promoting the export of agricultural products, particularly strawberries	21	36.0	VIII
9	Providing modern agricultural machinery and equipment	16	26.6	IX

Multiple respondents analysis

CONCLUSION

This study revealed that strawberry cultivation in Nowin Olya village, Injil District, Herat Province, despite its economic potential, remains a moderate and limited source of income for most farmers. Socio-economic factors such as education level, access to resources, and participation in extension services significantly influence farmers' income and expenditure.

The findings further indicate that the main constraints include the lack of proper markets, insufficient cold storage facilities, water scarcity, and price fluctuations, all of which negatively affect profitability. Limited access to modern inputs and machinery also reduces production efficiency.

Overall, sustainable development of strawberry production requires an integrated approach involving improved marketing infrastructure, better water resource management, strengthened extension services, and institutional support. Without such interventions, the economic sustainability of farmers in this sector will remain vulnerable.

RECOMMENDATIONS

(1) Develop transparent and well-structured markets for strawberry sales to reduce farmers' dependence on intermediaries and increase their share of the final product price.

(2) Strengthen the strawberry value chain by establishing collection centers, packaging facilities, and facilitating access to domestic and international markets.

(3) Improve irrigation infrastructure through the expansion of modern irrigation systems and sustainable water resource management.

(4) Implement extension and training programs on farm management, marketing, and productivity enhancement for farmers.

(5) Strengthen governmental institutional support through price stabilization policies, reduction of input costs, and development of agricultural infrastructure.

(6) Facilitate farmers' access to financial and credit services through agricultural loans and targeted support programs.

CONFLICT OF INTEREST

All authors express no conflict of interest in any part of the research.

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Received : April2026 : Accepted : June 2026