Research Article

Emerging Business: Cut-Rose and Gladiolus Production by Small-Scale Florists in Pakistan

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Abstract | The article measures the respective benefit-cost ratio and estimates cut-rose and gladiolus production prospects using technical efficiency. Primary data were obtained from a well-tailored questionnaire administered to 50 cut rose and 50 gladiolus small-scale farmers as respondents selected randomly from Gehlan Hithar in district Kasuther. The results from benefit-cost ratio analyses revealed that the benefit-cost ratio of cut rose (2.07) farming is expected to deliver more positively than gladiolus (1.35) production. The maximum likelihood estimates found that cut rose florists produce efficiently regarding the total area cultivated, irrigation cost, and harvest cost as measured against gladiolus farmers. Since flower cultivation seems profitable, the government and other stakeholders should provide training facilities and appropriate planting materials for florists to produce effectively and efficiently. In addition, infrastructural facilities like good roads leading to the farms and storage facilities are made available to the florists for suitable marketing.

Received | April 05, 2023; **Accepted** | January 15, 2024; **Published** | June 05, 2024
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Citation | Hashmi M., B.P. Komba, M.W.A. Chattha, A. Fatima, M.F. Hyder. 2024. Emerging business: Cut-rose and gladiolus production by small-scale florists in Pakistan. *Sarhad Journal of Agriculture,* 40(2): 570-577.
DOI | https://dx.doi.org/10.17582/journal.sja/2024/40.2.570.577
Keywords | Emerging business, Florists, Gladiolus and cut rose production in Pakistan

Introduction

Modern businesses are interested in investing in floriculture because of the aesthetic value of flowers and decorative plants, their use in social gatherings, how satisfying it is to work with them, and how much money they may generate (Shuang and Yan, 2015). Flowers are a universal means of communication used to show affection, celebrate special occasions, and express a wide range of feelings (Usman *et al*., 2014). Flowers varied aesthetics, textures, colours, and scents make them essential to human existence (Ikram *et al*., 2012). Most social, political, and historical events, as well as more personal ones like weddings, birthdays, and anniversaries, often include flowers. The widespread popularity of flowers has given rise to a commercial flower-growing industry that is expanding to fulfil the rising demand (Haque *et al*., 2013).

The rise in the commercial growing of flowers in many nations is due to the emergence of floriculture

as a rapidly competitive business (Taj *et al*., 2013). It has increased global demand for cut flowers, increasing their economic viability (Chandravanshi *et al*., 2018). The current market leaders in the floral industry need help to keep up with the 8-10% annual growth in worldwide flower demand (Ghule and Shreekumar, 2013). Approximately US$13 billion is spent annually on flowers worldwide (Farooq and Kamal, 2020). Opportunities to serve high-income markets in Europe, the United States, and Asia have been significant drivers of the explosive expansion in cut flower production.

Numerous nations devote substantial resources to flower farming due to the industry's massive global economic impact. However, Pakistan's global market share is less than 3 per cent. At the same time, India, Pakistan's neighbour, ranks 25 per cent in international commerce with exports and sees export growth of 12-15 per cent in the floriculture industry (Haque *et al*., 2013).

According to academic documents, horticulture and floriculture account for 6 per cent and 4 to 5 per cent of Pakistan's agricultural sector, respectively (Ahmad, 2009). As people's appreciation for beauty grows and their incomes rise, they are more likely to purchase expensive flowers like roses and gladiolus as cut flowers. But it wasn't until much later those the social and economic benefits of flower farming were fully appreciated. Recent years have seen floriculture rise to the level of a serious commercial enterprise, thanks to the rising disposable income of the urban middle class and the general improvement of people's standard of living (Kumar *et al*., 2020). Due to its higher profit potential than any other horticultural endeavour, floriculture has emerged as a viable business option in recent decades (Sudhagar, 2013). The industrial cultivation of flowers and their use in social occasions have been identified as a promising new market in Pakistan (Usman *et al*., 2016).

Due to its high market value, it is widely cultivated in Pakistan, especially in Hyderabad and Chakwal districts (Khan, 2005). Punjab's floriculture industry is thriving in comparison to that of other provinces. Faisalabad, Karachi, Multan, Rawalpindi, Islamabad, Lahore, and Quetta are significant centres for Pakistan's rose and ornamental crop-producing sector. Pattoki, a town near Lahore; Sahiwal, in the Sargodha district; and places close to Hyderabad are also significant since they have large acreages devoted to these crops. The southern region of Pakistan is a well-established centre for producing dried rose petals. Dried rose petal production thrives in the region because of the favourable weather conditions. Because of the limited variety of rose petals, marigolds, roses, jasmine, tuberose, gladioli, daylilies, and narcissus available during the growing season, the domestic market for cut flowers is relatively tiny (Farooq and Kamal, 2020). Producing cut flowers in Pakistan might be a lucrative venture credited to the country's favourable weather conditions and relatively inexpensive and easily accessible people resources. Growers can only cultivate the standard rose, gladiolus, marigold, and tuberose varieties if they have assistance with the planting materials (Ahmad *et al*., 2017). If done commercially, flower cultivation in Pakistan can yield significant profits. Due to increasing demand, the wholesale of cut flowers is becoming increasingly competitive in the Punjab district. Florists in rural areas of this district must secure their trade benefits to the fullest because agricultural holdings are typically relatively tiny. There has hardly been a better time for farmers to try new methods of earning more money in flower cultivation (Usman *et al*., 2013).

Since marginal or small farmers are essential to Pakistani agriculture, their prosperity is necessary to improve the country's agricultural sector (Adil *et al*., 2004). For marginal or small farmers, the floriculture sector offers appealing options for self-employment (Sridevi, 2014). If done correctly and on a commercial basis, cultivating cut flowers can be a very profitable enterprise in Pakistan. Due to the increased demand, the rose and gladiolus cut flowers marketing industry is becoming more and more well-known. Due to the tiny size of farm holdings, a farmer barely makes ends meet with this business. It's about time farmers started using creative strategies to boost their profits (Usman *et al*., 2014).

Among the few studies on these flowers conducted thus far are those evaluating gladiolus cultivars under Multan's agro-climatic conditions for sustainable cut flower production on a commercial scale (Ahmad *et al*., 2023) and calculating the costs and returns of rose producers and marketing intermediaries (Rasheed *et al*., 2016).

Therefore, regarding the high value of floral products and the increasing demand for them at social occasions

and in industrial settings in Pakistan, floriculture has been identified as a promising industry; the current study aimed to quantify the benefit-cost ratio and technical efficiency of producing cut roses and gladiolus flowers of small-scale growers.

Materials and Methods

The research is based on an empirical study conducted in a village named Gehlan Hithar District Kasur Tehsil Chunian in Punjab district, Pakistan. This village has numerous small-scale flower growers and is one of Pakistan's leading flower suppliers. The flowers commonly grown in this area are mainly Grojen, Cut roses, Tuberose, Gladiolus, etc. Mostly, the farmers in this study area are small-scale farmers.

With the known population of flower growers (approximately 150) in the study area, Yamane's formula, n = N/ (1 +Ne^2) for the sample size determination (Chaokromthong and Sintao, 2021), was employed. Using clustered sampling, the population was divided into two subgroups, known as clusters, which fifty (50) respondents from each cluster were randomly selected to be included in the study.

Fifty respondents from each cut rose, and gladiolus flower grower (100 farmers) as the two clusters were selected randomly to get the primary data for this study using a well-tailored questionnaire.

Analytical framework

Following data analysis techniques in Microsoft Excel, the total variable cost, total fixed cost, total cost, total revenue, and benefit-cost ratio were measured to analyze the economic production of cut-roses and gladiolus from the information obtained from the respondents.

Calculation of expenditures and receipts

Net values of the produce and cost involved were estimated. Cost of variables inputs such as labor, Seed, irrigation, fertilizers, pesticides, transportation and miscellaneous cost were included.

To calculate gross income, value of product (price of flower) during the year was considered as given below:

$$Gross\ Margin\ (GM) = TR - VC$$

Where; TR= Total revenue and VC= Variable cost.

$$Net\ income\ (NI) = TR - TC$$

Where; TR= Total revenue and TC= Total cost.

Benefit-cost ratio (BCR) was calculated using the formula:

$$BCR = \frac{\sum PV\ of\ Expected\ Benefits}{\sum PV\ of\ Expected\ Costs}$$

$$PV = \text{Present Value factor} = [1/(1+r)n$$

Where: r = real interest rate; n = number of periods the florists made payments.

Maximum likelihood estimates of stochastic frontier production (SFP)

It was found that Cobb-Douglas production function is an adequate representation of the data, given the specifications of the corresponding Trans log frontier model 4.1. The outcome variable is total revenue, while the explanatory variables are age, education, total acre land cultivated, experience of the florists, seed rate/acre, land preparation cost/acre, seed cost/acre, sow cost/acre, irrigation cost/acre, pesticides cost/acre and harvest cost/acre.

The model is defined by:

$$Ln(Yi) = \beta_0 + \beta_1 LnAGE + \beta_2 LnEDU + \beta_3 LnTA + \beta_4 LnEXP + \beta_5 LnSR + \beta_6 LnLP + \beta_7 LnSC + \beta_8 LnSoC + \beta_9 LnIC + \beta_{10} LnFC + \beta_{11} LnPC + \beta_{12} LnHC + Vi - Ui$$

Where; *Ln(Yi)* = Total revenue; *LnAGE*= Age of respondents; *LnEDU* = Formal educational level of respondents; *LnTA*= Total acre cultivated; *LnEXP*= Experience of the florists; *LnSR*= Seed rate/acre; *LnLP*= Land preparation cost/acre; *LnSC*= Seed cost/acre; *LnSoC*= Sow cost/acre; *LnIC*= Irrigation cost/acre; *LnPC* = Pesticides cost/acre and *LnHC* = Harvest cost/acre. Vi = random error related with measured errors in flower production reported. Ui = non-negative random variables, related to technical inefficiency effect for the ith farmer.

In short the model is defined by:

$$Lny_i = \beta_0 + \sum_n^i \beta_n\ LnX_{ni} + V_i - U_i$$

Results and Discussion

This section presents the results of the investigation along with discussions of salient findings in context

with the prevailing conditions.

Gross margins and net income of cut rose production

As depicted in Figure 1 below, the gross margins and net income are calculated from total variable cost and total income. Total variable cost includes all the inputs used to produce an acre of cut rose flowers. The net income was calculated from total revenue and total fixed cost. The fixed cost is the land rent or opportunity cost of land rent, which includes the family labour working in the farm activities. The gross margins of cut rose per acre were 518,540 rupees, while the average net income generated from the cultivation per acre was 462,944 rupees. A small-scale florist of 1 or 2 acres earns a handsome amount annually; which other crops can hardly give a profit sum to such an amount on a small piece of land. Manzoor *et al.* (2001) found that compared to conventional crops like wheat in Pakistan, the returns per rupee spent on producing various flowers were higher. They went on to say that as long as the limitations imposed by market intermediaries are promptly removed, the floriculture industry has great potential to generate cash and jobs for the nation.

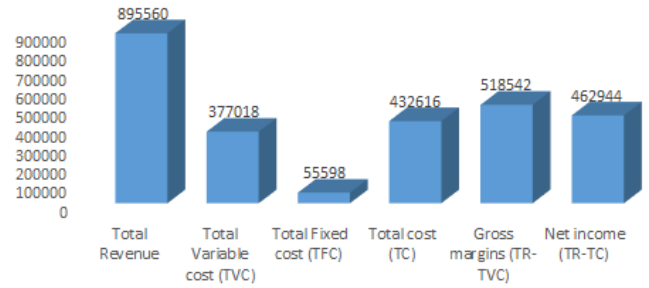

Figure 1: *Gross margin and net income generated from Cut rose production per acre (rupees).*

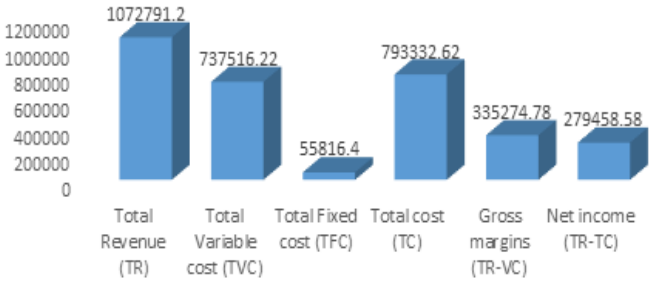

Figure 2: *Gross margin and net income generated from Gladiolus production per acre (rupees).*

Gross margins and net income of gladiolus production per acre

Figure 2 shows the gross margins and net income estimated on average for gladiolus production per acre. The gross margin of gladiolus flower per acre was estimated to be 335,274.78 rupees, while the net income generated from the cultivation was 279,458.58 rupees. This is a good profit margin, as the extant literature indicates that flower cultivation is an essential profitable farming enterprise (Riaz *et al.*, 2007).

Benefit-cost ratio of cut rose and gladiolus flower

From Figure 3 below, the benefit-cost ratio (BCR) of cut rose was estimated to be 2.07, which is derived from the total present value of receipts (895560 Pakistan rupees) divided by the total present value of all input cost (432616 Pakistan rupees) per acre. If a cut rose flower grower invests one rupee in inputs per acre, the total benefits generated from that rupee are estimated as the BCR (Usman *et al.*, 2015).

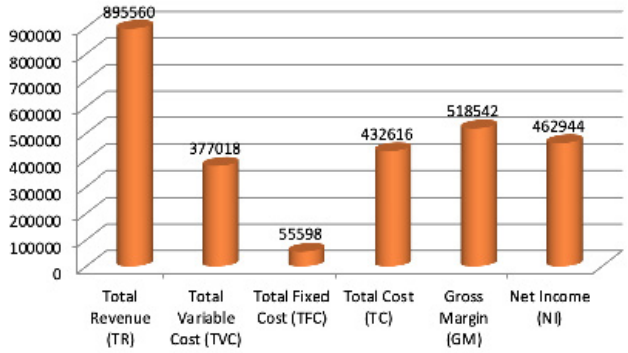

Figure 3: *Gross margin and net income generated from cut-rose per acre (Pk Rupees)*

On the other hand, the benefit-cost ratio of gladiolus was calculated to be 1.35. The total present value of receipts is 1,072,791.2 Pakistan rupees, and the total present value of all input cost is 793,332.62 Pakistan rupees per acre. It implies that if a gladiolus farmer invests one rupee, the total benefits will be around 1.35 ceteris paribus.

Maximum likelihood estimates of stochastic production frontier of cut rose and gladiolus production

As shown above, in Table 1, the age of cut rose growers is very significant at a 5 per cent level. Any 25 percent increase in the similar age of cut rose growers will lead to 0.4598 rupees in total revenue per acre of cut-rose production. The total acre of land cultivated for cut rose is significant at 1 per cent, implying that any 26.4 per cent increase in land area per acre will increase the total revenue by 0.2229 rupees on average. Land preparation cost per acre is high at 10 per cent; an average 16.4 per cent decrease in land preparation cost per acre will increase the total revenue to 0.6189 rupees. Irrigation cost per acre is significant at 1

percent. The 34.3 per cent reduction in irrigation cost will increase the total revenue by 0.6222 rupees per acre. Harvest cost per acre is high at 10 per cent, implying that a 16.7 per cent decrease in harvest cost per acre will bring additional gain to the total revenue of 0.2401 rupees on average. The potential stands in flower production can be found using three leading economic performance indicators: Net income, gross margin, and profit margin. This suggests that producers may have varying profitability levels based on their production knowledge. This helps producers choose and modify patterns to optimize prospective revenues and lower expenses in particular places (Wei *et al*., 2020).

Table 1: *The parameters of stochastic frontier production function for cut rose farmers.*

Variables and parameters		Maximum likelihood estimate		
		Coefficient	Standard-error	T-ratio
Constant	β_0	9.433**	3.799	2.482
Age	β_1	0.4598**	0.1830	2.51
Education	β_2	-0.1415	0.1618	-0.2468
Total acre cultivated	β_3	0.2229***	0.0844	2.641
Experience	β_4	-0.0283	0.1267	-0.2238
Seed rate/acre	β_5	0.2063	0.3183	0.6480
Land preparation cost/acre	β_6	0.6189*	0.3760	1.641
Seed cost/acre	β_7	-0.3164	0.0796	-3.975
Sow cost/acre	β_8	-0.2009	0.1956	-1.026
Irrigation cost/acre	β_9	0.6222***	0.1815	3.427
Fertilizer cost/acre	β_{10}	0.8215	0.1198	0.6856
Pesticides cost/acre	β_{11}	-0.01721	0.3801	-4.529
Harvest cost/acre	β_{12}	0.2401*	0.1440	1.667
Sigma squared	σ^2	0.4060***	0.0328	12.36
Gamma	γ	0.9999***	0.0000	24479784
LR-test		-13.73		
Log likelihood function		14.42		

*Statistically significant at: *** = 1%; **= 5% and *=10%*

Sigma squared (σ^2) (is significant at 1 per cent, which implies a technical efficiency of 41 per cent, while 59 per cent of the inefficiency of cut-rose production in the study area. Gamma (γ) is also statistically significant at 1 per cent, and therefore, the null hypothesis (H_O) of technical inefficiency is rejected (Majumder *et al*., 2016). The findings disclosed that the average technical efficiency of cut rose production is 0.6905, the maximum efficiency of a cut rose farmer is 0.9998, and the minimum efficiency was 0.2420 among the 50 cut rose farmers contacted for this research purpose. Flower growers must adapt to a different, economically viable production method to save expenses and boost profitability. Growers will find it easier to decide which crops are generally profitable to plant using this knowledge. By using sensitivity analysis, which offers applications to risk scenarios related to price and input costs, growers can assess how efficient their operations are. They can then make the required adjustments to reflect their unique circumstances and assess whether adopting alternative management practices is financially viable. Growers should look at the future and be ready to address these problems. Growers must be proactive and equipped to handle the problems of consumer demand for sustainable products and environmental concerns about challenges (Khachatryan and Wei, 2021).

Table 2: *The parameters of stochastic frontier production function for gladiolus farmers.*

Variables and parameters		Maximum likelihood estimate		
		coefficient	Standard-error	t-ratio
Constant	β_0	19.33***	1.000	19.17
Age	β_1	-0.0001	1.106	-0.0001
Education	β_2	-0.0432	1.258	-0.034
Total acre cultivated	β_3	-0.1292	0.5988	-0.2158
Experience	β_4	-662.6	1.640	-404.0
Seed rate/acre	β_5	-662.7	2.260	-291.9
Land preparation cost/acre	β_6	0.4192	1.383	0.3030
Seed cost/acre	β_7	662.6***	0.8366	747.3
Sow cost/acre	β_8	0.0309	0.8597	0.0360
Irrigation cost/acre	β_9	-0.4675	0.6461	-0.7236
Fertilizer cost/acre	β_{10}	-0.3076	1.138	-0.2679
Pesticides cost/acre	β_{11}	-0.2749	1.913	-0.1436
Harvest cost/acre	β_{12}	0.1443	1.293	0.1115
Sigma squared	σ^2	407.1***	3.817	106.6
Gamma	γ	0.9999***	0.0000	1176398.4
LR-test		73.01		
Log likelihood function		-161.5		

*Note: *** Statistically significant at 1%.*

Table 2 indicates that the seed cost per acre of gladiolus production is statistically high at 1%. Any 75 per cent decrease in the seed cost per acre will

result in an average increase in total revenue of 0.6626 rupees. The sigma squared is statistically significant at 1 per cent, which is 40.7 per cent with technical efficiency, while 49.3 per cent is technically inefficient in gladiolus production. Gamma is statistically significant; therefore, the null hypothesis of technical inefficiency is rejected for gladiolus production. The mean technical efficiency of gladiolus production is 0.7116, the maximum efficiency of a gladiolus farmer is 0.9868, and the minimum efficiency is 0.4021 from the 50 respondents. When gladiolus products are produced at relatively low-cost inputs, the value of marketing efficiency in gladiolus production is higher than when produced at relatively high costs. It can save time, money, and labour; hence, producers prefer when these inputs are reasonable (Khan *et al*., 2017).

Conclusions and Recommendations

The study intended to assess the benefit-cost ratio and technical efficiency of randomly selected small farm households in floricultural cultivation using data collected from cut rose and gladiolus florists. According to the results, the benefit-cost ratio for homes growing cut-roses is 2.07, while the ratio for households growing gladiolus is 1.35. It was determined by considering each floricultural production category's total present value receipts and costs. The stochastic production frontier 41 calculations show that the maximum likelihood estimates for input costs and cultivated land area exhibited more significant values in cut-rose production than in gladiolus flower production. It was also found that among farm households, cut rose cultivation is more efficient and profitable than gladiolus floricultural production, even though the mean technical efficiency in gladiolus flower production is more significant than in cut rose cultivation greater in gladiolus flower production (0.7116) than the cut rose (0.6905).

Based on these findings, the study recommends that government and non-government institutions make a concerted effort to supply the florists with enough training and planting materials especially in the area of cut-rose production. Additionally, land and irrigation policies should be formulated so as flower production in Pakistan will positively compete with the international commercial market. Furthermore, small and medium-sized enterprise (SME) establishments that are entrepreneur-friendly are needed among florists to ensure a steady expansion of the floriculture industry in Pakistan.

Acknowledgement

The authors would like to express their profound gratitude to the seniors and colleagues of the Institute of Agricultural Resource Economics (IARE)-University of Agriculture Faisalabad (UAF) and the officials of Agriculture Knowledge Centre and Local government for their cooperation and support to carry out this study.

Novelty Statement

The benefit-cost of cut rose farming is more positive than gladiolus production. The maximum likelihood estimates of cut rose florists produce efficiently regarding the total area cultivated, irrigation cost, and harvest cost as measured against gladiolus farmers.

Author's Contribution

Almazea Fatima: Conceptualization, funding acquisition, methodology, resources, software, supervision, validation, visualization, project administration.
Muhammad Farooq Hyder: Data curation, investigation
Muhammad Waqas Alam Chattha: Funding acquisition, resources, visualization
Muazzam Hashmi: Conceptualization, data curation, investigation, writing original draft
Braima Pascal Komba: Formal analysis, software.

Conflict of interest
The authors have declared no conflict of interest.

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