



RESEARCH ARTICLE

Unveiling the economic potential of Glory Lily (*Gloriosa superba*) cultivation in Tamil Nadu (Dindigul district)

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Abstract

The cultivation of medicinal plants is gaining significant momentum, with the promotion of their commercial cultivation becoming crucial to meet the rising demands for their medicinal properties in both domestic and export markets. Glory Lily (*Gloriosa superba*), the official floral emblem (state flower) of Tamil Nadu, contains medicinal alkaloids such as colchicine in its seeds (the economic part), which are beneficial in treating cancer, diabetes, arthritis, and gout. Research conducted to evaluate the financial viability of Glory Lily cultivation revealed that it is feasible for farmers to cultivate alongside traditional crops. The study was conducted in the Dindigul district, which was selected purposively for its extensive cultivation of Glory Lily. Data was collected from 90 growers using random sampling and structured questionnaires. From 2011 to 2021, the compound annual growth rates for the area, production, and productivity of Glory lily cultivation in the Dindigul district were 4.18 %, 4.54 %, and 0.34 %, respectively. The overall expenses per acre for Glory Lily cultivation amounted to ₹ 13.7 lakhs, while the profit per acre was ₹15.8 lakhs. Farmers used three primary marketing channels for Marketing Glory Lily, each with varying costs and margins. Channel I (Producer to Promoter to Processing company) was identified as the most efficient, followed by channel II (Producer to Village Commission agents to Promoter to Processing company) and channel III (Producer to Pre-harvest contractor to Promoter to Processing company). Farmers faced several challenges in cultivation and marketing, including continuous rainfall, fog, and price fluctuations. Despite the high initial capital investment required to establish Glory Lily cultivation, the projected returns over multiple harvest cycles make it an attractive and lucrative business opportunity for farmers in Tamil Nadu.

Keywords

constraints; cost; cultivation; glory lily; margin; marketing

Introduction

Glory Lily, locally known as "Kanvali Kizhangu," holds a special place as both a native medicinal plant and the state flower of Tamil Nadu (1). Belonging to the Colchicaceae family, it is primarily cultivated for its seeds and has a lifespan of four years (2). In 2021, the cultivation of Glory Lily in Tamil Nadu spanned approximately 6,377 hectares, producing around 2,550 tonnes with a productivity rate of 0.40 tonnes per hectare (Department of Horticulture and Plantation Crops, 2021).

The plant derives its medicinal significance from alkaloids, particularly colchicine, which are effective in treating gout, arthritis, and diabetes (3). Glory Lily seeds, containing 0.5-0.7 % colchicine, also exhibit notable anti-inflammatory and anti-cancer properties (4). Due to these valuable medicinal alkaloids, Glory Lily has emerged as a lucrative cash crop, comparable to traditional crops like cotton and sugarcane, with increasing demand in both domestic and international markets (5). Its ability to adapt to various soil types and climatic conditions across Tamil Nadu, combined with moderate input requirements, makes it an attractive option for small and marginal farmers, allowing cultivation alongside their traditional crops. This study was undertaken with the following objectives: to analyze the trends in the area, production aspects, and economic viability in Glory Lily cultivation. This study also determines the value chain associated with the crop and the significant challenges faced by farmers in Glory Lily cultivation.

Methodology

Dindigul district was chosen as the focus area for this study due to its prominence as a significant breeding ground for Glory Lily and its emergence as a major seed-producing region in Tamil Nadu. A total of 3,383 hectares is dedicated to Glory Lily cultivation, underscoring its importance as a key producer. Three villages, Kariyampatti, Kallimandayam, and Kappalpatti, were randomly selected from the Thoppampatti block, a key area for Glory Lily cultivation. The study also included information about intermediaries involved in the marketing of Glory Lily.

Data on the cost of cultivation for the crop during 2023–2024 were collected from 90 farmers using a pre-structured interview questionnaire. Primary data were gathered through surveys and personal interviews with the farmers to achieve the research objectives, which were subsequently tabulated. Secondary data on Glory Lily's area, production, and productivity from 2011 to 2022 in the Dindigul district were obtained from the Joint Director of Horticulture Office and used in this study. Fig. 1 and Fig. 2 present the map of the selected district in Tamil Nadu and the sampling distribution of the study area, respectively.



Fig. 1. Map of Selected District in Tamil Nadu.

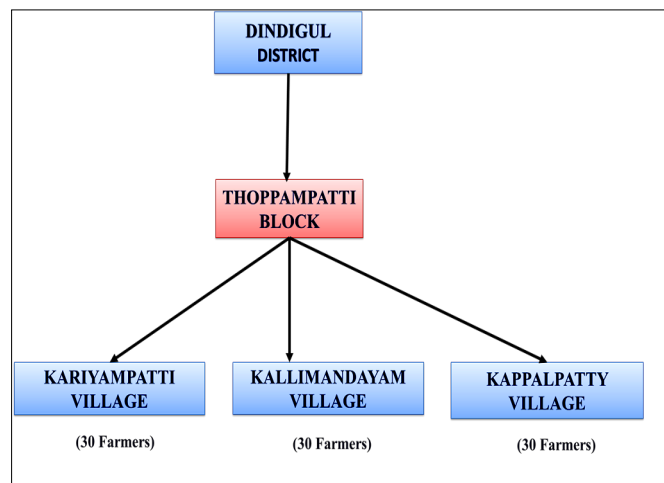


Fig. 2. Sampling Design of Study District.

Compound Annual Growth Rate (CAGR)

CAGR for the area, production and productivity of Glory Lily in Dindigul District, Tamil Nadu, were calculated by fitting an exponential function of the following form (6).

$$Y = \alpha\beta^t \dots (1) \quad \dots\dots(1)$$

$$\text{Log } Y = \log \alpha + t \log \beta \dots (2) \quad \dots\dots(2)$$

Where, Y= Area, production & productivity of Glory Lily in Dindigul District, α = Constant, β = Regression coefficient and t= time in a year

Economics of Production

The main economic value of cultivating glory lily lies in its seeds (7). To understand the production economics of this crop, the costs of cultivation, yields per acre, and returns were calculated. Estimating these aspects is crucial for aiding farmers, researchers, policymakers, lenders, and bankers in making informed decisions(8).

The study examined cultivation costs under four categories: Cost of Establishment (A), Variable Cost (B), Fixed Cost (C), and Total Cost (D). The following cost components were assessed in detail as part of this analysis.

Cost of Establishment (A)

Includes expenses related to land preparation, procurement of planting materials, installation of support systems, and other initial investments required to commence Glory Lily cultivation.

Variable Costs (B)

Inputs such as tubers, fertilizers, pesticides, labour (for activities like land preparation, hand pollination, weeding, and harvesting), irrigation, machinery usage, and other variable inputs per unit area.

Fixed Costs (C)

Includes the rental value of the owned land, interest on fixed capital assets, and depreciation on permanent assets like farm buildings, irrigation systems, support systems, etc.

Total Cost (D)

Includes total establishment (A), variable (B), and fixed costs (C).

The study also evaluated marketing efficiency to

assess the effectiveness of the marketing system for Glory Lily seeds.

$$\text{Marketing Efficiency} = \text{FP} / (\text{MM} + \text{MC})$$

Where, FP = Farmer's Price or Net Price Received by the Farmer, MM = Marketing Margin, MC = Total Marketing Costs

Garrett's ranking technique

Garrett's ranking technique was used to rank the constraints faced by farmers. Respondents were asked to assign the rank for all factors, and the outcome of such ranking was converted into score value using the following formula (9).

$$\text{Relative position} = 100 (O_{ij} - 0.5) / M_j \quad \dots\dots(4)$$

Where, O_{ij} = Order given for the i th variable by 90 respondents, M_j = number of variables ordered by 90 respondents

Using Garrett's Table, the relative positions were converted into scores. The scores for each factor were then summed across respondents, and the total and mean scores were calculated (10).

Factors with the highest mean scores were considered the most significant. The constraints faced by Glory Lily farmers in the study area and the number of farmers affected by each issue were ultimately compiled and presented.

Results and Discussion

Compound Annual Growth Rate (CAGR) of Area, Production and Productivity

Glory Lily cultivation in Dindigul district from 2011 to 2021 revealed higher growth in area, production, and productivity. The cultivated area of glory lily increased by 4.18 % annually, as presented in Fig. 3. In comparison, overall production increased by 4.54 % yearly, as presented in Fig. 4. However, productivity grew at a comparatively modest rate of 0.34 % annually, as depicted in Fig. 5.

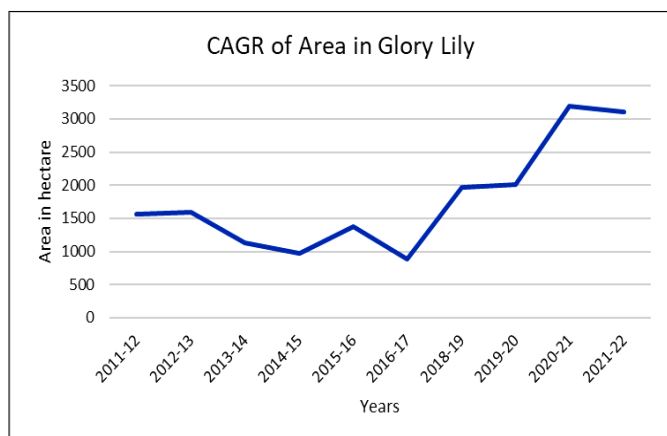


Fig. 3. CAGR Area of Glory Lily.

The higher profitability associated with glory lily cultivation motivated farmers to expand their cultivation

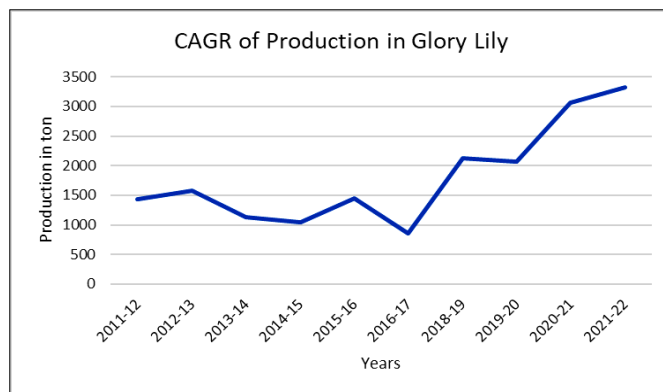


Fig. 4. CAGR Production of Glory Lily.

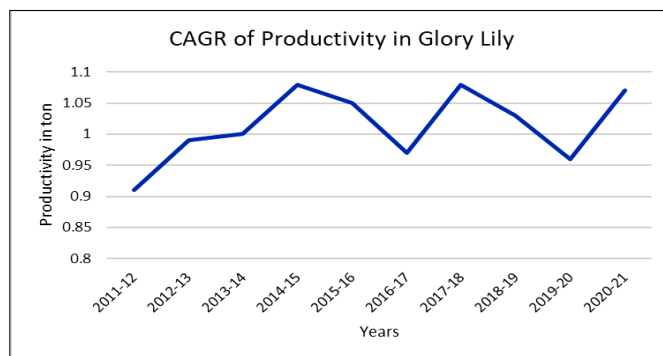


Fig. 5. CAGR Productivity of Glory Lily.

area, increasing production. Additionally, greater awareness among farmers about using fertilizers and improved agricultural practices contributed to the rise in productivity in recent years.

Economics of Production

Cost of Cultivation

The establishment cost of Glory Lily cultivation includes planting materials, field preparation, and support systems, representing the initial investment required in the first year. Critical agricultural practices in Glory Lily cultivation involve the application of fertilizers, plant protection chemicals, and various intercultural operations such as ridge and furrow preparation, irrigation, hand pollination, weeding, and harvesting. All 90 sample farmers planted Glory Lily during June and July.

Table 1 presents the annual establishment cost for glory lily cultivation per acre. It includes the costs of planting material (77.70 %), field preparation (1.92%), and support system (20.32 %). The total cost of establishment amounts to Rs. 4,54,856, with planting material being the highest contributor at Rs. 3,53,659. The details of variable

Table 1. Cost of establishment in cultivation of glory lily during the life span of first year.

S. no	Particulars	Input value (in INR)	Labour Cost (in INR)	Total (INR /ac/ yr.)
1.	Planting Material	3,44,604	9,055	3,53,659 (77.70)
2.	Field Preparation	0	8,747	8,747 (1.92)
3.	Support System	82,918	9,532	92,450 (20.32)
	Cost of Establishment (A) (in INR)	4,27,522	27,334	4,54,856 (100.00)

Figures indicate percentage to total .Input value, Labour cost & total are calculated from the average of 90 sample farmers.

costs in glory lily cultivation are included in Table 2. Table 2 presents the total variable cost (TVC) for glory lily cultivation over four years, including expenses for staking (3.87 %), manures and fertilizers (7.14 %), plant protection chemicals (21.87 %), intercultural operations like ridge preparation (4.80 %), irrigation (0.56 %), weeding (8.99 %), hand pollination (36.82 %), and harvesting (9.36%). The total cost over four years amounts to Rs. 7,41,443, with hand pollination being the highest contributor at 36.82 %. Fixed costs utilized in glory lily cultivation are summarized in Fig. 3. Table 3 shows the total fixed cost (TFC) for glory lily cultivation over four years, which includes the rental

value of owned land (22.32 %), depreciation (66.96 %), and interest on fixed investment (10.72 %). The total fixed cost amounts to Rs. 1,78,784 per acre per year, with depreciation being the highest contributor at 66.96 %. Table 4 shows the cost and returns of glory lily cultivation.

Table 4 presents a comprehensive breakdown of the cost of cultivation, yield, price, gross income, and net income for glory lily cultivation. The total cost of cultivation is Rs. 13,75,086, with variable cost contributing 53.80 %, fixed cost 13.05 %, and annual share of establishment cost 33.13 %. The annual share of the establishment cost for the lifespan of Glory Lily cultivation is calculated by evenly

Table 2. Variable cost during the life span of Glory Lily cultivation.

S.No	Particulars	Total (INR/ac/yr.)				Total
		Life span of the first year	Life span of the Second year	Life span of the third year	Life span of fourth year	
1.	Staking	9,891	8,391	8,035	7,339	33,656 (3.87)
2.	Manures and Fertilizers	13,150	13,102	13,220	13,271	52,743 (7.14)
3.	Plant Protection chemicals	40,150	40,024	40,024	41,374	1,61,572 (21.87)
4.	Intercultural Operations					
	Arrangement of Ridge and furrows	9,000	8,835	8,532	7,656	34,023 (4.80)
	Irrigation	1050	1000	1100	950	4100 (0.56)
	Weeding	17,500	16,300	16,200	16,070	66070 (8.99)
	Hand Pollination	69,000	67,676	67,660	67,600	2,71,936 (36.82)
5.	Harvesting Cost	17,274	17,290	17,250	17,210	69,024 (9.36)
	Total Variable TVC	1,77,015	1,72,618	1,72,021	1,71,470	6,93,124
	Interest on working capital@7%	12,391	12,088	11,720	12,120	48,319 (6.54)
	Total Variable Cost (B) (in INR)	1,89,406	1,84,706	1,83,741	1,83,590	7,41,443 (100.00)

Figures in parentheses indicate percentage to total. Staking, Manures & Fertilizers, Plant protection chemicals, Intercultural operations, and harvesting costs are

Table 3. Fixed cost for during the life span of Glory Lily cultivation.

S.No	Particulars	Total (INR /ac/yr.)				Total
		Life span of the first-year	Life span of the second year	Life span of the third year	Life span of the fourth year	
1.	Rental value of owned land	10,000	10,124	10,210	10,250	40,584 (22.32)
2.	Depreciation	30,000	30,000	30,000	30,000	1,20,000 (66.96)
3.	Interest on Fixed investment (12%)	4,800	4,800	4,800	4,800	19,200 (10.72)
	Total Fixed Cost ©	44,800	44,924	45,010	44,050	1,78,784 (100.00)

Figures in parentheses indicate percentage to total.

Table 4. Cost and returns during the life span in glory lily cultivation

S.No	Particulars	Life span of the first-year	Life span of the second year	Life span of the third year	Life span of the fourth year	Total
1	Variable Cost (in Rs)	189406 (54.43)	1,84,706 (53.82)	1,83,741 (53.05)	1,83,590 (53.88)	7,41,443 (53.80)
2	Fixed Cost (in Rs)	44,800 (12.87)	44,924 (13.05)	45,010 (13.26)	44,050 (13.03)	1,78,784 (13.05)
3	Annual Share of Establishment Cost	1,13,714 (32.68)	1,13,714 (33.12)	1,13,714 (33.67)	1,13,714 (33.07)	4,54,856 (33.13)
4	Total cost of cultivation (D) (in INR)	3,47,920 (100.00)	3,43,344 (100.00)	3,42,465 (100.00)	3,41,357 (100.00)	13,75,086 (100.00)
5	Yield (in kg)	220	250	255	220	945
6	Price (in INR)	3150	3200	3100	3000	12,450
7	Gross Income (in INR)	6,93,000	8,00,000	7,90,500	6,60,000	29,43,500
8	Net Income (in INR)	3,45,080	4,56,656	4,48,035	3,18,643	15,68,414

Figures in parentheses indicate percentage to total. All costs and income are calculated from the average of 90 sample farmers.

distributing the total cost of the establishment (A) over the lifespan of this crop. The yield ranges from 220 kg to 255 kg, with prices varying from Rs. 3,000 to Rs. 3,200 per kg. The gross income totals Rs. 29,43,500, while the net income over four years amounts to Rs. 15,68,414. Variable costs and annual share of establishment costs together contribute the highest percentages to the total cost of cultivation.

Value Chain Actors

Glory lily is an essential medicinal crop cultivated primarily for its seeds. The production and marketing process begins with the producer and involves several intermediaries before reaching the processing company. The producer, serving as the starting point, procures essential materials from input suppliers. The roles and interactions of the key stakeholders in this value chain, including input suppliers, producers, commission agents, promoters and processing companies, are illustrated in Fig. 4 and Fig. 6.

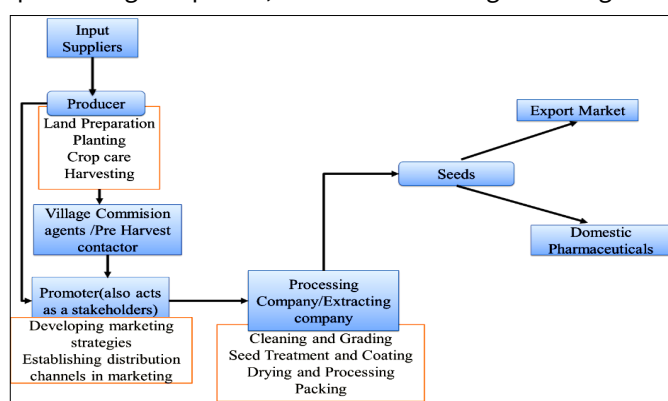


Fig. 6. Value chain actors involved in glory lily marketing based on the field survey.

Marketing channel and Marketing of Glory Lily Cultivation

The marketing channel comprises producers, village commission agents, pre-harvest contractors, promoters, extracting companies, and exporters. Among these, the promoter acts as a commission agent, maintaining constant contact with seed-extracting companies. The processing company determines the purchase price based on demand in both domestic and international markets.

The marketing channels identified for Glory Lily seeds based on field surveys are as follows:

- Channel I (Producer to Promoter to Processing company)
- Channel II (Producer to Village Commission agents to Promoter to Processing company)
- Channel III (Producer to Pre-harvest contractor to Promoter to Processing company)

Table 5 outlines the marketing cost associated with Glory Lily Seeds through three different channels, detailing the net price received by the producer and expenses for activities such as drying, cleaning, packing, transport, commission fees, and promoter's margin. The purchase price paid by the processing company is highest in Channel I (Rs. 3600/kg), followed by Channel III (Rs. 3613/kg) and Channel II (Rs. 3494/kg). Marketing costs and intermediary commissions vary significantly across these channels.

Table 6 presents the marketing efficiency index for these channels. Channel I demonstrates the highest

Table 5. Marketing cost and marketing margin of three channels in Glory Lily marketing.

S.No.	Particulars	Marketing Cost (INR/Kg)		
		Channel I	Channel II	Channel III
I	Net Price received by the producer	3200 (88.88)	3000 (85.86)	3150 (87.18)
	Marketing Cost of Producer -			
2	Drying and cleaning	8	8	8
3	Packing	0	0	0
4	Transport	0	0	0
5	Sub Total	8 (0.22)	8 (0.22)	8 (0.22)
6	Purchase Price of VCA or Pre-Harvest Contractor	3208	3008	3158
	Village Commission Agents (VCA)	-	-	-
II	Commission Fees	-	40	-
	Sub Total	0	40 (1.14)	0
	Pre-Harvest Contractor	-	-	-
III	Commission Fees	-	-	50
	Sub Total	-	-	50 (1.38)
IV	Marketing Cost of Promoter			
1	Drying and cleaning	0	4	0
2	Packing	12	17	15
3	Transport	35	50	40
4	Subtotal	47 (1.30)	71 (2.03)	55 (1.52)
5	Promoters Margin	345 (9.60)	375 (10.75)	350 (9.70)
6	Purchase Price of Processing Company	3600 (100.00)	3494 (100.00)	3613 (100.00)

Figures in parentheses indicate percentage to total. Marketing channel I-Producer to the promoter to Processing company. Marketing channel II-Producer to Village Commission agents to the promoter to Processing company. Marketing channel III-Producer to Pre-harvest contractor to promoter to Processing company.

Table 6. Marketing efficiency among three channels in Glory Lily marketing.

S. No.	Particulars	MC I	MC II	MC III
1.	Total Marketing Cost	55	119	113
2.	Total Marketing Margin	345	375	350
3.	Price received by Farmers	3200	3000	3150
4.	Marketing Efficiency=FP/MM+MC	8.00	6.07	6.80

Marketing channel I-Producer to the promoter to Processing company. Marketing channel II-Producer to Village Commission agents to the promoter to Processing company. Marketing channel III-Producer to Pre-harvest contractor to promoter to Processing company.

efficiency index of 8.00, Channel III with 6.80, and Marketing Channel II with the lowest efficiency of 6.07. From that table, we conclude that a higher efficiency index in Channel I indicates a more efficient marketing system with lower costs and margins in glory lily cultivation.

Constraints Faced by Glory Lily Farmers

The field study found that most glory lily farmers experienced both production and marketing constraints, which negatively impacted yields and led to unfair pricing in producing the produce.

Table 7 shows the production constraints of glory lily cultivation, ranked using Garrett's ranking method. Primary constraints faced by farmers were Continuous rainfall and fog with a mean score of 59.50, followed by pest attacks with a mean score of 51.08, high production costs with a mean score of 45.60, labour shortages with a mean score of 40.05, higher wages with a mean score of 34.65, lower yield with a mean score of 30.33, inadequate funds with a mean score of 31.15, and irrigation issues with a mean score of 30.04.

Table 7. Production constraints faced by farmers in Glory Lily cultivation.

S.No	Production constraints	Mean Score	Rank
1.	Continuous Rainfall and Fog	59.50	I
2.	Attack of Pests and Diseases	51.08	II
3.	High Cost of Production	45.60	III
4.	Shortage of Labour	40.05	IV
5.	High Wage	34.65	V
6.	Low Yield	30.33	VI
7.	Inadequate Fund	31.15	VII
8.	Lack of adequate irrigation Facility	30.04	VIII

Table 8 shows the marketing constraints of glory lily cultivation using Garrett's ranking method. The primary marketing constraints identified were price fluctuation,

Table 8. Marketing constraints faced by farmers in Glory Lily marketing.

S.No	Marketing constraints	Mean Score	Rank
1	Price Fluctuation	60.45	I
2	Lack of Fair Price	51.55	II
3	No Alternate Buyers	45.15	III
4	Lack of Finance	41.12	IV
5	Lack of Coordination among Producers	38.87	V
6	High Cost of Transport	34.35	VI

with a mean score of 60.45, followed by a lack of fair price, with a mean score of 51.55. No alternate buyers with a mean score of 45.15, lack of finance with a mean score of 41.12, lack of coordination among the producers with a mean score of 38.87, and high transport costs with a mean score of 34.35.

Conclusion

Glory Lily is emerging as a commercial crop, similar to traditional cash crops. The crop requires low rainfall during its flowering period but involves high establishment costs and is labour-intensive. Over its life span, the average net income from Glory Lily cultivation per acre is approximately Rs. 15.7 lakhs. In the study region, three marketing channels were identified, with Channel I (Producer to Promoter to Processing company) demonstrating the highest marketing efficiency compared to Channel II and Channel III. However, farmers faced several production challenges, including continuous rainfall and fog, which reduced the yields. Farmers faced problems in marketing, marking price fluctuations as a significant issue that reduced producers' profits. Despite these challenges, Glory Lily cultivation offers substantial profit potential through collective marketing through Farmer Producer Organizations (FPOs) and direct sales to processors. Contract farming with processing companies can help market stability and fair pricing for producers. Glory Lily can potentially improve farmers' livelihoods as a valuable medicinal crop. With the proper policy support and the adoption of best practices, Glory Lily cultivation can significantly contribute to the agricultural economy.

Policy Suggestions

Glory lily cultivation can be highly profitable for farmers, but collective marketing through farmer-producer organizations and direct selling to processing companies will enhance their profitability. Providing subsidies and incentives to farmers will increase their interest in cultivating glory lilies. Facilitating contract farming between farmers and processing companies will ensure a stable market and fair pricing for the farmers. Creating awareness among the glory lily farmers about the insurance schemes will help mitigate the impact of challenges such as continuous rainfall and fog. Utilizing MGNREGA workers while cultivating glory lily can alleviate the stress caused by high wages and labour shortages. As a high-value medicinal crop, Glory Lily has the potential to improve the livelihoods of farmers significantly.

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Authors' contributions

Author SL and VK was responsible for designing the study, conducting the statistical analysis, developing the proto-

col, and drafting the initial manuscript and remaining all authors are contributed and revised the manuscript

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interests to declare.

Ethical issues: None.

AI Declaration

While preparing this work, the author(s) did not use any generative AI or AI-assisted technologies. The content is entirely the result of the author(s) original work, and they take full responsibility for the publication's content.

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