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Knowledge Level of Kewda Cultivation Farmers in Southern Odisha

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HIGHLIGHTS

- Respondents exhibited significant knowledge regarding climatic requirement, soil suitability, flowering behaviour, harvesting methods and planting material.
- Significant knowledge deficiencies were observed in nutrient management, spacing, manuring practices, intercultural operations and desuckering.
- Correlation and regression analysis revealed that education, family size, occupation, information sources, and annual income significantly influenced knowledge levels of respondents.

ARTICLE INFO

Keywords: Education, Extension services, Kewda growers, Knowledge, Women empowerment.

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ABSTRACT

The study was conducted in 2024 in Ganjam district of Odisha to assess the knowledge level of farmers regarding recommended Kewda cultivation practices using an ex post facto research design. Data were collected from 83 Kewda flower growers through a structured interview schedule, employing purposive and simple random sampling techniques. The results revealed that respondents demonstrated relatively higher knowledge of ecological conditions and traditional field-based practices. The findings further indicated that farmers were actively involved in planning, decision-making and adoption of innovative cultivation practices, while facing constraints in value addition and distillation activities. Correlation and regression analysis indicated that variables such as education, innovativeness, planning ability, and decision-making capacity had a positive and significant relationship with the knowledge level of respondents. The study concludes that although Kewda cultivation provides substantial livelihood opportunities in coastal Odisha, there is a need for targeted extension interventions, capacity-building programmes, and skill-oriented training, particularly in post-harvest and value addition practices, to enhance farmers' knowledge and adoption of improved technologies.

INTRODUCTION

Kewda (*Pandanus odorifer*), or kia locally, is a globally significant fragrant plant that is used in the production of perfume, traditional medicine, and religious rituals due to its fragrant flowers and leaves (Singh and Parle, 2016). In India, the cultivation of kewda has significant economic and cultural significance, particularly in

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the Odisha state. Ganjam district alone produces 85-90 percent of the total production of kewda flowers in the country (Senapati, 2023). Pandanus odorifer is a small, gregarious, perennial evergreen with a flexible trunk, and with the help of brace roots, it grows in the form of a dense grove in damp areas, regardless of the amount of flooding (Solomon et al., 2020). The cultivation of Kewda is primarily associated with small farming and local knowledge regimes. In some villages, including Kirtipur of Ganjam district, most of the households rely on kewda flowers as a leading source of income (Gaonconnection.com, 2022). Small and marginal farmers are dependent on the crop, as it is a source of regular income, and women are essential in gathering male flowers in harsh conditions (Acharya, 2025).

The cultivation of Kewda helps to empower rural livelihoods as it offers the small and marginal farmers income. Plants become mature in 4-5 years and live up to 40-45 years, blooming every month in the first flowering stage with four flowers (Padhy et al., 2016). Kewda plants begin flowering 5–7 years after planting, with male plants blooming three times a year and peak flowering during July–September (Panda et al., 2012). Despite its production potential, the kewda industry in Ganjam district is declining due to reduced profitability and policy constraints, leading to fewer collectors and about 50 distillation units (Panigrahi, 2019). Women play a crucial role in agricultural livelihoods, and their participation in farm-based enterprises reflects growing entrepreneurial potential driven by knowledge, innovation, and planning ability (Kumari et al., 2025). A more market- and business-oriented strategy is gradually replacing subsistence-based methods in the agriculture sector. Recognising the importance of fostering agripreneurship, various organisations are actively promoting entrepreneurial development among farmers through capacity-building initiatives and institutional support (Kademani et al., 2024). Intercropping *Pandanus* with arecanut has been reported to improve soil microbial diversity and maintain ecological balance in tropical plantation systems (Zhong et al., 2022). Pandanus leaves are typically harvested twice a year, during April–May and December–January, using sickles or long-handled tools to cut leaves from taller plants (Naseer, 2015). Non-governmental organisations (NGOs) should collaborate with Krishi Vigyan Kendras, agricultural colleges, and research institutions to strengthen scientific capacity-building initiatives for farmers (Padhy et al., 2026).

Although kewda cultivation is recognized for its livelihood potential, there is limited empirical evidence on farmers' knowledge of recommended practices. This gap restricts targeted extension and capacity-building efforts. Assessing farmers' knowledge is essential to identify gaps between existing practices and scientific recommendations, helping design interventions to enhance productivity, income, and sustainability. The present study aims to analyse the knowledge level of farmers regarding Kewda cultivation practices.

METHODOLOGY

The study was conducted in 2024 in Ganjam district of Odisha. The district was purposively selected as it is the major Kewda-growing region of the state, contributing nearly 85–90 per cent of the country's production (Senapati, 2023). It also has a high concentration of farmers engaged in kewda cultivation and flower collection, making it suitable for assessing farmers' knowledge of cultivation practices. Two blocks, namely Chatrapur and Rangeilunda, were selected randomly from the district. From each block, four Gram Panchayats were selected through simple random sampling. A comprehensive list of kewda growers in the selected Gram Panchayats was obtained from the District Horticulture Department, Ganjam and around 15% respondents were selected from each Gram Panchayat. Based on this list, a total of 83 respondents were selected. The respondents comprised active kewda growers in the study area. Regarding the sample size (n = 83), it is justified as it ensured proportional representation of kewda growers across selected Gram Panchayats and was adequate for conducting meaningful statistical analysis within the constraints of time and field accessibility.

The term knowledge level in the current study is used to refer to the range and depth of knowledge that the farmers possess concerning the suggested practices of the Kewda cultivation and this includes aspects such as, how to plant the plants, how to manage the nutrients, intercultural operations, flowering, and harvesting practices. The present study employed a structured interview schedule that was elaborated based on a literature review and the consultation of the experts in the subject matter in analyzing the level of knowledge of respondents concerning the recommended practices in cultivating Kewda. The answers were taken on a three-point basis (strongly agree, agree and disagree) giving 3, 2 and 1, respectively. Even though the three-point scale (strongly agree, agree and disagree) is a simplified measure of knowledge, it was adopted so that it would be easy to comprehend by respondents of different educational backgrounds, as well as to get the respondents to respond accurately during personal interviews. The knowledge gap was assessed by comparing the maximum obtainable score with the mean score obtained for each practice and expressing the difference as a percentage. The collected data were analysed using descriptive statistics such as frequency, percentage, mean and standard deviation, while correlation and multiple regression analysis were used to examine the relationship between selected socio-economic variables and the knowledge level of respondents.

RESULTS

Table 1 indicates that the respondents are categorised as poor/high based on the mean score. The findings reveal a clear dichotomy between farmer's operational knowledge of ecological and operational practices and their limited understanding of cultural practices.

Table 1 presents the mean knowledge scores of respondents regarding recommended Kewda cultivation practices. The results reveal considerable variation in the knowledge level of farmers across different practices. Knowledge was measured using a three-point scale (Fully known = 3, Partially known = 2, Not known = 1). Based on the scoring procedure, knowledge levels were categorized as low (mean score < 2.00), and high (mean score ≥ 2.00). The findings indicate a clear variation in farmers' knowledge across different components of kewda cultivation.

Practices related to nutrient management and certain cultural operations recorded relatively low mean scores. These included

Table 1. Knowledge of Recommended Kewda Cultivation Practices

Practices	Mean Score	Low/ High
Nitrogen application of 12 kg/acre	1.181	Low
Manure of 1-2 basket per plant applied before planting	1.217	Low
Phosphorus application of 6 kg/acre	1.277	Low
Applying 60 g N, 30 g P & 30 g K per plant	1.446	Low
Seed also used as planting material	1.530	Low
Legumes grown initially as intercrop	1.578	Low
Main season of flowering in July – August	2.976	High
Flower collected in early morning	2.964	High
Comparatively high rainfall	2.940	High
Well drained sandy soil	2.928	High
Cuttings to be scattered in ground for 2-3 days	2.855	High
Selling collected flowers same day to distillers/ traders	2.831	High
Providing water during summer to sustain vegetative growth	2.771	High
Fertilizer to be applied in June	2.747	High
Low night temperature not desirable	2.651	High
Weeding not required due to salinity	2.518	High
Spacing at 8-10 meters distance	2.361	High
Desuckering after 3 years of planting	2.024	High

recommended nitrogen application (Mean = 1.181), application of manure before planting (Mean = 1.217), phosphorus application (Mean = 1.277), recommended fertilizer dose per plant (Mean = 1.446), use of seed as planting material (Mean = 1.530) and growing legumes as intercrop (Mean = 1.578). Since these mean values were less than the midpoint of the scale (2.0), they indicate a relatively low level of knowledge among farmers regarding these scientific cultivation practices.

In contrast, respondents demonstrated relatively higher knowledge of ecological conditions and traditional field based practices. The highest mean score was observed for knowledge about the main flowering season (Mean = 2.976), followed by collection of flowers in early morning hours (Mean = 2.964), requirement of comparatively high rainfall (Mean = 2.940), and suitability of well-drained sandy soil (Mean = 2.928). Similarly, practices such as post-harvest handling of cuttings, same-day marketing of flowers, providing irrigation during summer, and timely fertilizer application also recorded higher knowledge levels.

The findings indicate that farmers have stronger experiential knowledge of climatic conditions, harvesting, and marketing practices, while their knowledge of nutrient management and improved agronomic practices is comparatively low.

The mean score of each variable was computed to compare the different domains of knowledge related to Kewda cultivation practices. The results are presented in Table 2.

Table 2 presents the knowledge gap in recommended Kewda cultivation practices among the respondents. The knowledge gap was determined by comparing the maximum obtainable score with the mean score obtained for each practice, indicating the extent of deviation from the recommended level of knowledge.

The analysis revealed that relatively higher knowledge gaps were observed in practices related to nutrient management and

Table 2. Comparative Analysis of Knowledge Gap (n=83)

Knowledge	Average Mean Score	Gap (%)
Soil suitability	2.71	9.66
Favourable climate	2.78	7.33
Planting material use	2.43	19.00
Planting	2.70	10.00
Nutrient management	2.00	33.33
Cultural management	2.27	24.33
Flowering	2.91	3.00
Harvesting	2.90	3.33

intercultural operations, indicating limited awareness of recommended scientific practices. In contrast, lower knowledge gaps were observed for ecological conditions, flowering behaviour, harvesting and marketing practices, which farmers commonly experience in their day-to-day cultivation activities.

This pattern suggested that while farmers have good practical knowledge derived from experience, there remains a considerable gap in scientific crop management practices, particularly nutrient application and improved cultural operations. Therefore, extension interventions, farmer training programmes and demonstrations should focus on these areas to improve the adoption of recommended Kewda cultivation practices.

The results obtained from the co efficient of co relation analysis of the collected data have been indicated in Table 3.

Table 3. Association between Socio-economic Attributes and Knowledge Level (Correlation) (n=83)

Attribute	'r' value	't' value
Age	-0.191	-1.75
Caste	-0.121	-1.097
Education	0.372**	3.607
Farm holding size	-0.007	-0.0630
Family type	-0.059	-0.532
Family size	0.487**	5.020
House type	-0.077	-0.695
Occupation	-0.285*	-2.677
Extension contact	-0.089	-0.804
Information sources use	-0.355**	-3.417
Cosmopolite behaviour	0.133	1.207
Social aptitude	0.135	1.227
Economic aptitude	0.422**	4.192
Annual Income	-0.351**	-3.375

** Significant at the 0.01 level; * Significant at the 0.05 level

The correlation analysis revealed that the attributes economic aptitude, family size and education had a positive and significant impact in enhancing the knowledge level of the respondents.

Education (r = 0.372**) showed a positive and highly significant relationship with the knowledge level indicating that farmers with higher educational attainment tended to possess better knowledge regarding recommended kewda cultivation practices. Education appeared to enhance farmers' ability to understand technical information and adopt improved agricultural practices. Family size (r = 0.487**) also exhibited a positive and significant relationship with knowledge level. This may be attributed to the fact that larger families often have more members involved in agricultural activities, there by facilitating exchange of information and shared learning related to cultivation practices.

Economic aptitude (r = 0.422**) had a positive and significant association with knowledge level. Farmers with higher economic orientation are generally more motivated to seek information, adopt improved practices and manage their farming activities in a more efficient manner.

Occupation (r = –0.285*) showed a negative but significant relationship with knowledge level suggesting that respondents engaged in non-farm occupations or multiple livelihood activities had less time and involvement in kewda cultivation, resulting in comparatively lower knowledge regarding recommended practices.

Information sources use (r = –0.355**) also showed a negative significant relationship indicating that the respondents relied more on traditional or informal knowledge sources rather than formal extension channels. Limited access to reliable information sources may have influenced their knowledge level regarding scientific cultivation practices.

Annual income (r = –0.351**) showed a negative significant relationship with knowledge level. This may be because some farmers with higher income derived their earnings from non-agricultural sources and were less dependent on kewda cultivation, leading to relatively lower attention to technical knowledge of the crop.

To assess the influence of selected socio-economic attributes on the knowledge level of Kewda growers, a multiple regression analysis was carried out. The results are presented in Table 4.

A multiple regression analysis was carried out to determine the influence of selected socio-economic attributes on the knowledge level of kewda growers. The results are presented in Table 4. The coefficient of determination (R^2 = 0.651) indicated that 65.1 per cent of the variation in the knowledge level of respondents was explained by the selected socio-economic variables included in the model. The adjusted R^2 value (0.580) suggests that the model explains a substantial proportion of variation in the dependent variable, indicating a reasonably good fit of the regression model. Education showed a positive and significant influence on knowledge level (β = 3.812, p < 0.01), indicating that respondents with higher education possessed better knowledge regarding recommended kewda cultivation practices, as education enhanced their ability to access and understand technical agricultural information. Family size also had a positive and highly significant effect on knowledge level (β = 6.232, p < 0.01). Larger family size facilitated sharing of agricultural information and collective involvement in farming activities, thereby improving knowledge acquisition.

There was a statistically significant negative effect on family type (0.05 = -10.824, p < 0.05). This shows that the respondents in some types of families were more likely to be less knowledgeable in terms of recommended practices of Kewda cultivation, perhaps because of variations in decision-making processes and participation in farming activities. Occupation was a significant (negatively) and highly significant (= -7.248, p < 0.01) factor that indicated that a respondent who had non-farm or multiple occupations that involve livelihood was more likely to possess lower knowledge perhaps because of the reduced time and attention that would be paid to Kewda cultivation. The use of information sources also indicated negative significance (2 = -2.661, p = 0.01) indicating that informal or traditional sources of information were a greater source of information in comparison with formal extension channels.

The economic aptitude had a negative and statistically significant regression coefficient (2 = -2.134, p = 0.00) which meant that economic aptitude was negatively related to the level of knowledge of respondents on the recommended practices of Kewda cultivation. This was an implication that farmers possessing greater economic potential were more likely to have a comparatively low-level of knowledge in the current study. The results implied that economically inclined farmers may have diversified their livelihoods activities and given relatively lesser concerns to the acquisition of technical knowledge specific to the Kewda production. Annual income also showed a negative and significant influence (β = –6.186,

Table 4. Contribution of Socio-economic Attributes to Knowledge Level (Regression) (n=83)

Attribute	Unstandardized Coefficients		Standardized Coefficients	't' value	Probability
	Beta	Std. Error	Beta		
(Constant)	158.785	13.133		12.091	.000
Age	-3.410	2.058	-.183	-1.657	.102
Caste	-.452	2.084	-.026	-.217	.829
Education	3.812	1.135	.095	3.358	.003**
Farm holding size	-.901	1.636	-.095	-.551	.584
Family type	-10.824	4.259	-.518	-2.541	.013
Family size	6.232	2.005	.638	3.108	.003**
House type	-.314	1.789	-.022	-.176	.861
Occupation	-7.248	1.879	-.081	-3.857	.000**
Extension contact	-.798	.846	-.133	-.943	.349
Information sources	-2.661	.603	-.161	-3.749	0.000**
Cosmopolite behaviour	.997	.812	.182	1.227	.224
Social aptitude	.543	.591	.114	.919	.361
Economic aptitude	-2.134	.443	-.044	-4.817	.000**
Annual Income	-6.186	1.986	-.017	-3.114	.004*

a. Dependent Variable: Knowledge; R^2=0.651, Adj R^2=0.580, Std. error= 6.751

$p < 0.05$). This implied that respondents with higher income levels, possibly derived from multiple sources, were less dependent on Kewda cultivation and therefore less inclined to acquire in-depth technical knowledge of the crop.

Therefore, it was suggested that extension functionaries should consider these significant socio-economic attributes while designing and implementing educational programmes, training, and extension strategies to enhance the knowledge level of farmers regarding recommended Kewda cultivation practices.

DISCUSSION

The findings revealed that farmers possessed relatively poor knowledge and adoption of practices related to nutrient management and scientific crop inputs in Kewda cultivation. This suggested limited awareness among respondents regarding recommended nutrient management practices which might be attributed to inadequate access to formal extension services and soil testing facilities. In addition, there is also a prevailing perception among farmers that Kewda can grow successfully under low-input conditions, which might have discouraged them from adopting recommended fertilizer and nutrient management practices. The observed imbalance indicated that farmers largely relied on indigenous knowledge systems rather than formal extension recommendations. Therefore, to address this knowledge gap, it was necessary to strengthen extension interventions. Priority should be given to capacity-building programmes emphasizing balanced nutrient management and scientifically-based crop-management practices. Extension approaches such as on-farm demonstrations, farmer field schools, skills-based training programmes, and advisory services were found to be effective in enhancing the knowledge level of farmers and promoting the adoption of improved cultivation practices. This finding correlates with the studies conducted in different setting revealing farmers' significantly higher adoption of improved technologies highlighting the positive impact of extension interventions on technology uptake (Nain and Bhagat, 2005; Nain and Chandel, 2013; Raina et al., 2014; Kumar et al., 2020; Kumar et al., 2022). In addition, soil health card programmes and location-specific advisory services supported farmers in understanding balanced nutrient application. The integration of indigenous knowledge with scientific recommendations through participatory and context-specific extension strategies enhanced farmers' acceptance and adoption of improved practices, which ultimately contributed to increased productivity and sustainability in Kewda cultivation.

Correlation analysis revealed a positive and significant relationship between the education level of the respondents and their knowledge level. This indicated that farmers with higher educational attainment possessed greater knowledge regarding recommended Kewda cultivation practices. Education enhanced farmers' ability to understand technical information, interpret extension messages and adopt improved agricultural practices. Additionally, family size was found to have a strong positive relationship with the level of knowledge. Large families facilitated the sharing of agricultural skills, increased the availability of labour and promoted the exchange of information among members, thereby contributing to higher knowledge levels. The regression model further provided insight that the combined effect of the selected socio-economic variables explained variations in the knowledge level of the respondents, although the strength and statistical significance of individual factors differed.

CONCLUSION

This study examined how particular socioeconomic variables affected the knowledge of the farmers concerning the Kewda cultivation practices in the Ganjam district of Odisha. The discussion of the personal activities presented that growers had a relatively higher level of knowledge of climatic appropriateness, flowering period, harvesting time, irrigation during summer, spacing among plants and post harvesting practices. These competencies are largely derived from native indigenous knowledge gained in the course of long-term farming experience. Contrary to that, women who had knowledge about science based, input intensive practices, such as nutrient management, the rates of recommended fertilizer application, manure use, intercropping with legumes, and the use of better planting material, had significantly lower scores. The socioeconomic analysis showed that the overall knowledge of farmers had a statistically significant positive impact of education level and family size. As a result, the findings indicate that extension services should be improved through capacity-building programmes, on-farm demonstrations, and geographically-designed advisory services to align the indigenous knowledge of people with scientific principles, and hence improve productivity and sustainability of Kewda cultivation.

DECLARATIONS

Ethics approval and informed consent: Informed consent was sought from the respondents and their organisations regarding the study during the course of the data collection.

Conflict of interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest. The authors declare that during the preparation of this work, they thoroughly reviewed, revised, and edited the content as needed. The authors take full responsibility for the final content of this publication.

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