



# Varietal Preferences in Large Cardamom with Respect to Yield and Profitability in the Hill Region of West Bengal


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## ABSTRACT

The study was conducted during the year 2017–18 in Block II of Kalimpong District in West Bengal. The state, district and the block were selected purposively whereas the respondents were selected randomly. Data were collected randomly from 60 farmers from three different villages of Block II of Kalimpong district with the help of structured interview schedule. The four different varieties namely Ramsey, Golsey, Varlangey and Seremna were presented to the farmers in pairs, in 6 possible combinations. The farmers were requested to identify one variety over the other from each six pairs which they consider more profitable and high yielding. For analysis of the data, Method of Paired Comparisons was followed. It was found from the study that the majority of farmers preferred Varlangey cultivar more in terms of yield (Scale value 2.1) and profitability (scale value 2.0) because of its higher yield, early maturity, bigger capsule size, making it easy to harvest and higher productivity. Ramsay variety occupied the second position in terms of yield (Scale value 1.6) and profitability (Scale Value 1.2). Whereas, Golsey variety occupied the third position in case of yield (Scale Value 1.0) and profitability (Scale value 0.16) followed by the variety Seremna whose scale value have been brought down to arbitrary zero. According to the respondents there is no significant difference between Golsey and Seremna with respect to their yield and profitability.

**KEYWORDS:** Large cardamom varietal preferences, paired comparisons, yield, profitability

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**Data Availability Statement:** Legal restrictions are imposed on the public sharing of raw data. However, authors have full right to transfer or share the data in raw form upon request subject to either meeting the conditions of the original consents and the original research study. Further, access of data needs to meet whether the user complies with the ethical and legal obligations as data controllers to allow for secondary use of the data outside of the original study.

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## 1. INTRODUCTION

Large cardamom (*Amomum subulatum* Roxb.), known as 'badi elaichi' in Hindi, and often referred to as the "Queen of Spices" because of its very pleasant aroma and taste. It is the principal perennial cash crop from the prospect of income in the Eastern Himalayan region of India (Sikkim and the Darjeeling hills), eastern part of Nepal and Southern Bhutan (Sharma et al., 2016). It is perhaps among the oldest spice known to the mankind. In India it was used in Ayurvedic preparations as mentioned by Susruta as early as 600 BC. The spice was known to Greeks and Romans as "Amomum" and recorded by Theophrastus, the Greek philosopher during the 400 BC. Its capsule (fruit) is used as spice and condiment, and contains about 3% essential oil (cineole) (Gupta, 1984). It is native of Sikkim Himalayas, perennial, low volume, high value, cash crop grown under the forest cover. Its cultivation is a unique example of ecological and economic viability of a traditional farming system based on indigenous agro forestry practices.

India is the largest producer of large cardamom with 54% share in world production (Sharma et al., 2016). Kalimpong and Darjeeling district of West Bengal is the 2<sup>nd</sup> leading producer of large cardamom in India after Sikkim. During the year 2015–16, the area of large cardamom was 3305 ha, yield area was 2829 ha, production was 848.84 metric tonnes and the average productivity was 300.5 kg ha<sup>-1</sup>. It is a major agricultural commodity for export and prioritizes in National Trade Integration Strategy. In the recent times, the area of large cardamom has spread to other North Eastern Indian states like Nagaland (6308 ha), Arunachal Pradesh (9901 ha), Mizoram (400 ha), Meghalaya (250 ha), Manipur (250 ha) and Uttarakhand (41 ha). It is used in different forms as spice or condiment flavoring agent, preventive and curative agent for sore throat, lung congestion, digestive disorders, and pulmonary tuberculosis Unani and Ayurvedic medicine.

Sikkim is the largest producer and contributes a large share of Indian and world market. It not only contributes to the economy of these places but also play important role in the ecosystem and contribute to the human health. Several indigenous technical/traditional knowledge (ITKs) in large cardamom have been reported in Sikkim (Gopi et al., 2016, Laxuman et al., 2017, Pradhan et al., 2017). As per the estimation of Spice Board, approximately 9893 families are engaged in this activity. Most of the family in the hill blocks of Darjeeling and Kalimpong are engaged in the cultivation of large cardamom due to its economic returns and its suitability to agro climatic condition of the region. Kalimpong contributes 80% of the total area under large cardamom. There are mainly six popular cultivars of large cardamom viz., Ramsey, Ramla, Sawney, Varlangey, Seremna, Dzongu and Golsey. There are two

high yielding varieties released by Indian Cardamom Research Institute, Regional Station in the year 2004 for cultivation in Sikkim are ICRI Sikkim 1 and ICRI Sikkim 2. According to survey by a group of scientists of Regional Research Station, UBKV, Kalimpong. 90% area grown by Varlangey cultivar in Darjeeling and Kalimpong district. In this backdrop a study was conducted in Kalimpong district with the objective of studying the varietal preferences of large cardamom with respect to its profitability and yield as perceived by the farmers.

## 2. MATERIALS AND METHODS

Three villages of Pedong (Block II) of Kalimpong district of West Bengal were selected purposively and a total sixty farmers were selected randomly, twenty from each village. The Data was collected randomly from 60 farmers from three different villages of Block II of Kalimpong district with the help of structured interview schedule during the month of May 2017. In Pedong, the four varieties of large cardamom namely Ramsey, Golsey, Varlangey and Seremna are cultivated by the growers. It was intended to find out the hierarchy of four cultivars according to the yield and profitability. For this purpose, the four cultivars were presented to the large cardamom growers in pairs in six possible combinations. The Large cardamom growers were requested to mark one cultivar over the other from each pair separately which they consider as more profitable as well as mark one cultivar over the other from each pair separately, which gives more yield. The six pairs thus made were Ramsey-Golsey, Ramsey-Seremna, Varlangey-Seremna, Golsey-Seremna, Golsey-Varlangey and Ramsey-Varlangey

For analysis of the data, Method of Paired Comparisons (Edward, 1969) was followed.

### 2.1. The method of paired comparisons

Thurstone developed the law of comparative judgment, which provides a rationale for ordering of stimuli along a psychological continuum. It is a psychological scaling method that makes the quantitative investigation of all kinds of values and subjective experiences (Edwards, 1969). In this method, the stimuli (items, statements or variables) are presented in pairs, in all possible combinations and the respondents are asked to select one stimulus over the other from each pair separately which is judged more favorable. This method of psychological scaling also provides an estimate of the distances between each of the stimuli, in comparison to the stimulus with least preference, whose scale value is (arbitrarily) brought down to 'zero'. If there are 'n' stimuli, the number of pairs which may be obtained are  $n(n-1)/2$ . The stimuli or items for judgment should be distinct from each other and easily understandable.



To eliminate bias, both the stimuli in each pair and the pairs themselves, are randomly arranged. The stimuli are then presented to the respondents, who are asked to select one stimulus over the other from each pair, which they considered as more favorable.

### 3. RESULTS AND DISCUSSION

A comparative study on consumer perception towards packaged spices among rural and urban women done by Chandila and Puri, 2019 indicated that the knowledge about spice adulteration is limited among rural women. In comparison to rural women, urban women possessed positive attitude towards spice adulteration. Another comparative study for yield and economics of seed spices-based cropping system with fruit and vegetable crops was conducted by Meena et al., 2017. The study revealed that the cropping sequences intercropped with Ber showed higher coriander equivalent yield, net returns and BCR over the cropping sequence intercropped with Aonla. Further, the cropping sequence of Fenugreek- Okra with Ber was recommended for realizing higher system productivity, net returns and BCR. Similarly, A review paper titled comparative profitability analysis of spices production in Bangladesh done by Prity, 2018 showed that spices production in Bangladesh is influenced by the average price in the market and it was seen from BCR analysis that out of all the spices studied turmeric (5) was the most profitable, followed by BCR (3.12) for ginger, BCR (2.19) for chili and BCR (2.13) for onion.

#### 3.1. The F-matrix

The table for F-matrix consists of frequencies corresponding to the number of times, each stimulus is judged more favorable than the other. The cell entries correspond to the frequency with which the column stimulus is judged more favorable than the row stimulus.

#### 3.2. The P-matrix

The table for P-matrix gives the proportion of times the column stimulus is judged more favorable than the row stimulus. This is obtained by dividing each of the cell entries in the F-matrix by N i.e., total number of respondents or this may be obtained conveniently by multiplying the cell entries of F-matrix by the reciprocal of N i.e.,  $1/N$ . A rearranged P-matrix is then made with the stimulus having the smallest column sum at left and that with the highest at the right.

#### 3.3. The Z-matrix

The table with Z-matrix gives the normal deviates corresponding to the proportions in the table of P-matrix. Those are obtained from the table of normal deviates (Edward, 1969). In the analysis of paired comparisons, the method of 'complete data' was used as there was no  $P_{ij}$  value

equal to or greater than 0.99 or equal to or less than 0.01.

The table 1 shows the preference made by the respondents, for large cardamom varieties among the four varieties taken into consideration or the study namely Ramsey, Golsey, Varlangey and Seremna on the basis of their profitability. It has been found that the Variety Ramsey was preferred by majority when compared to Golsey and Seremna. However, the variety Varlangey was preferred more when compared to Ramsey in terms of profitability. In case of Golsey variety, though it has been preferred over Seremna but didn't get chosen over Ramsey and Varlangey as both of them are believed to be more profitability. The variety Varlangey was preferred by majority among all the varieties considered in the study because of its higher profitability. The variety Seremna was preferred over Golsey but the variety Ramsey and Varlangey were preferred more than Seremna.

Table 1: F-Matrix for four varieties of large cardamom according to the profitability

Varieties	Ramsey (A)	Golsey (B)	Varlangey (C)	Seremna (D)
Ramsey (A)	-	4	56	3
Golsey (B)	56	-	55	27
Varlangay (C)	4	5	-	3
Seremna (D)	57	33	57	-

The table 2 presents the sum of P-matrix for the large cardamom varieties taken into consideration in the study. It shows the overall preference for a variety over others, among the four varieties in respect of their profitability. It has been seen that the variety Varlangey with P-Matrix value 3.29 was preferred by majority when compared to other three varieties considered against Varlangey. The variety Varlangey was followed by varieties Ramsey, Golsey and Seremna respectively in terms of profitability with P-Matrix value of 2.44, 1.19 and 1.05, respectively.

Table 2: P-Matrix corresponding to the F-Matrix

Varieties	Ramsey (A)	Golsey (B)	Varlangey (C)	Seremna (D)
Ramsey (A)	0.500	0.066	0.933	0.050
Golsey (B)	0.933	0.500	0.916	0.450
Varlangay (C)	0.066	0.083	0.500	0.050
Seremna (D)	0.950	0.550	0.950	0.500
Sum of P-Matrix	2.44	1.19	3.29	1.05

The table 3 shows the preferability of the large cardamom varieties in ascending order starting from Seremna (P-Matrix value=1.05) the least preferred to Varlangey (P-matrix value=3.29) the most preferred.



Table 3: Re-arranged P-Matrix; lowest to highest column sum

Varieties	Seremna (D)	Golsey (B)	Ramsey (A)	Varlangey (C)
Seremna (D)	0.500	0.550	0.950	0.950
Golsey (B)	0.450	0.500	0.933	0.916
Ramsey (A)	0.050	0.066	0.500	0.933
Varlangay (C)	0.050	0.083	0.066	0.500
Sum of P-Matrix	1.05	1.19	2.44	3.29

Table 4 reveals that Varlangey cultivar was preferred more in terms of profitability by majority of the the farmers (scale value 2.0). Varlangey yields higher profitability and its capsule size is larger in size which make its harvesting easier compared to other varieties. Ramsay variety occupied the second position (scale value of 1.2). Likewise, Golsey variety occupied third position (scale value of 0.16) followed by the variety Seremna. Its scale value has been brought down to arbitrary zero. As per the respondents there is no significant difference between the varieties Golsey and Seremna in terms of profitability.

Table 4: Z-Matrix Hierarchy of four varieties according to their profitability

Varieties	Seremna (D)	Golsey (B)	Ramsey (A)	Varlangey (C)
Seremna (D)	0.000	0.126	1.645	1.645
Golsey (B)	-0.126	0.000	1.499	1.379
Ramsey (A)	-1.645	-1.506	0.000	1.499
Varlangay (C)	-1.645	-1.385	-1.506	0.000
Sum of Z-Matrix=	-3.416	-2.765	1.638	4.523
Mean of Z-Matrix=	-0.854	-0.691	0.409	1.130
Add largest negative deviation=	+0.854	+0.854	+0.854	+0.854
Scale value	0.000	0.163 (0.16)	1.263 (1.2)	1.984 (2.0)
Rank	4 <sup>th</sup>	3 <sup>rd</sup>	2 <sup>nd</sup>	1 <sup>st</sup>

The table 5 shows the preferences made by the respondents for large cardamom varieties on the basis of their yield. Similar type of preferences has been found in terms of yield of the varieties also. Hence, the varieties preferred for their profitability were also preferred equally for their yield. The variety Ramsey was preferred by majority when compared

Table 5: F-Matrix for four varieties of large cardamom according to the yield

Varieties	Ramsey (A)	Golsey (B)	Varlangey (C)	Seremna (D)
Ramsey (A)	-	1	54	3
Golsey (B)	59	-	53	26
Varlangay (C)	6	7	-	1
Seremna (D)	57	34	59	-

to Golsey and Seremna however, the variety Varlangey was preferred over Ramsey in terms of yield. In case of Golsey variety, it has been observed the variety was preferred more than Seremna but was not chosen over Ramsey and Varlangey varieties. The variety Varlangey was preferred by majority among all other varieties considered in the study. The variety Seremna was preferred over the variety Golsey whereas the variety Ramsey and Varlangey were preferred more compared to Seremna. So, it can be concluded from the table that higher yield resulted in higher preference.

The table 6 presents the sum of P-matrix for the large cardamom varieties considered in the study. It shows the overall preference for varieties in respect of their yield. It has been seen that the variety Varlangey has the highest P-Matrix value of 3.26 compared to other three varieties considered against Varlangey. This indicates, that it was preferred more due to its higher yield. The preference for variety Varlangey was followed by Ramsey, Golsey and Seremna with P-Matrix value of 2.53, 1.19, and 0.99, respectively in terms of the yield.

Table 6: P-Matrix corresponding to the F-matrix

Varieties	Ramsey (A)	Golsey (B)	Varlangey (C)	Seremna (D)
Ramsey (A)	0.500	0.016	0.900	0.050
Golsey (B)	0.983	0.500	0.883	0.433
Varlangay (C)	0.100	0.116	0.500	0.016
Seremna (D)	0.950	0.566	0.983	0.500
Sum of P-Matrix=	2.53	1.19	3.26	0.99

The above table 7 shows the preferability of the large cardamom varieties in terms of yield in ascending order starting from Seremna (P-Matrix value= 0.99) with lowest preference to Varlangey (P-matrix value= 3.26) with highest preference obtained.

The table 8 reveals that Varlangey cultivar is preferred more in terms of yield by majority of the respondents (Scale Value 2.1) because of its higher yield, early maturity, bigger capsule size and higher productivity. However, it has been

Table 7: Re-arranged P-Matrix; lowest to the highest column sum

Varieties	Seremna (D)	Golsey (B)	Ramsay (A)	Varlangay (C)
Seremna (D)	0.500	0.566	0.950	0.983
Golsey (B)	0.433	0.500	0.983	0.883
Ramsay (A)	0.050	0.016	0.500	0.900
Varlangay (C)	0.016	0.116	0.100	0.500
Sum of P-Matrix=	0.99	1.19	2.53	3.26

Table 8: Z-Matrix; Hierarchy of four varieties according to the yield

Varieties	Seremna (D)	Golsey (B)	Ramsay (A)	Varlangay (C)
Seremna (D)	0.000	0.166	1.645	2.120
Golsey (B)	-.169	0.000	2.120	1.190
Ramsay (A)	-1.645	-2.144	0.000	1.282
Varlangay (C)	2.144	-1.195	-1.282	0.000
Sum of Z-Matrix=	-3.958	-3.173	2.483	4.592
Mean of Z-Matrix	-0.989	-0.793	0.620	1.148
Add largest -tive deviation=	+.989	+.989	+.989	+.989
Scale value	0.000	0.196 (1.0)	1.609 (1.6)	2.137 (2.1)
rank	4 <sup>th</sup>	3 <sup>rd</sup>	2 <sup>nd</sup>	1 <sup>st</sup>

reported that the variety Seremna has got popularity among the farmers of West Sikkim and other parts of the state for its high yielding capacity and a big capsule with a very thin cover which makes curing procedure easier (Anonymous, 2021). Ramsay variety occupied the second position (Scale Value 1.6). Whereas, Golsey variety occupied the third position (Scale Value 1.0) followed by the variety Seremna. Its scale value has been brought down to arbitrary zero. According to the respondents there is no significant difference between Golsey and Seremna with respect to their yield.

#### 4. CONCLUSION

There was no significant difference in choosing large cardamom cultivars with respect to profitability and yield by the farmers. The perception of farmers was, the more yield of the variety, the more it was profitable. The first priority of variety with respect to profitability and yield as perceived by the farmers was Varlangay followed

by Ramsay, Golsey and Seremna.

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