

# Insighting the Decisiveness of the Large Cardamom Growers under Changing Climate in Sikkim

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**Abstract**—In the changing climate situation, an agro-based enterprise essentially requires appropriate decision at any point of time to combat climate change discourses with agglomeration of climate change mitigational practices for sustaining its productivity and profitability. In this backdrop, the present study was conducted with the aim to explore the decisiveness of the farmers of Sikkim engaged in large cardamom farming as this crop enterprise provides for sustainable livelihood option in that region. The study was conducted at six gram panchayat wards under Regu block of East Sikkim district in Sikkim. Purposive, multi-stage and simple random sampling procedures were followed in the present study. Hundred (100) large cardamom growers were selected as respondents for the present study. In the present study, decisiveness of the farmers has been conceptualised and operationalised in terms of their decision making ability which has been considered as the dependent variable and eighteen socio-economic, socio-psychological, socio-personal and communication related attributes of the respondents were considered as the independent variables. The data were collected with the help of the structured schedule coupled with personal interview method. The collected data were analyzed using descriptive statistics such as frequency, percentage, mean, dispersion measurement, coefficient of variance and inferential statistics such as Pearson correlation and multiple regressions. Majority of the respondents falls under medium level of decision making ability group. From the correlation coefficient, it is evident that the variables namely education, management orientation, risk orientation and innovativeness are positively and significantly associated and the variable livestock possession is significantly but negatively associated with the dependent variable, decision making ability of the large cardamom growers. Furthermore, multiple regression analysis showed that the variable risk orientation has contributed significantly and positively while other three variables namely family education status, livestock possession and social participation have contributed significantly but negatively in case of characterizing the predicted variable, decision making ability of the large cardamom growers and the entire explicability is 40.40 percent.

**Keywords:** Climate change, decisiveness, decision making ability, large cardamom, sustainable livelihood.

## 1. INTRODUCTION

In the present context, the scientific production and management of any agricultural and horticultural crops need a

concerted effort to understand the trend of changing climate. Mostly the grower has to depend on the whims and fancies of weather to get profitable margin from their land. In this perspective, it is worth mentioning that the maintenance of livelihood in a sustainable manner requires a strong perception about the climate change issues as the growers are primarily depends on agricultural field crops. The spices are very much vulnerable to the climate change scenario and consequently, appropriate strategies are needed to address the challenges associated with the spice crop production under changing climate to ensure its contribution to livelihoods in sustainable manner.

Spice crops constitute a major component of the overall cash crops of our country. Among several cash crops, large cardamom (*Amomum subulatum*) is a major one that provides an opportunity for sustainable livelihood option for farmers in many parts of the country particularly in the north-eastern Himalayas. India is the largest producer of large cardamom in the world with 54% share in the world production while Sikkim is the highest producing state with 88% of the total large cardamom production of the country [1]. About 3863 MT of large cardamom are being produced annually from 26,459 ha in Sikkim emerging as India's large cardamom hub [2]. In fact, large cardamom is the main cash crop in Sikkim and it provides for an important livelihood option for people of Sikkim. The possible reasons behind its greater acceptability among the farmers may be that the cultivation is cost-effective compared to other farming systems and has high international market potential. Besides these, large cardamom farming has strong social acceptance for its greater economic viability and ecological sustainability. This is an inventive self reliant system and an example of harnessing mountain niche that also provides basic support services of resources. Soil and nutrient loss are negligible; the system maintains live fence of trees and other associate biodiversity. Altogether, it is a comparatively advantageous crop for the region [3].

But, in recent times, like other crops, large cardamom farming is also experiencing climate change impacts leading to decline in both plantation area and production. In general, the

symptoms of climate change are manifested through rapid spread of diseases at higher altitudes, irregularity of seasonal rainfall and the drying up of high altitude springs [4]. These changes in climatic factors have resulted in a decreased number of pollinator species, including honeybees and bumblebees. Consequently, the actual area of large cardamom cultivation has decreased from 22,714 ha in 2003 to 12,500 ha by 2007/08 with a decline of 45% [5]. Such changes have had a devastating impact on both the socioeconomic security of mountain farmers and the ecological resilience of the system itself.

Under this complex situation induced by climate change, appropriate decision-making becomes an important means to select the best among alternative courses of action for profit maximization from any enterprise, particularly in agro-enterprises. Here, in the present study, large cardamom farming has been selected as a viable enterprise which could help the farmers gain a lucrative profit and thereby, improve their livelihoods. But, climate change is often creating major obstacles in this process affecting various aspects of large cardamom farming like production, harvesting, processing or marketing which ultimately poses serious challenges in the way of harnessing the maximum benefits from large cardamom enterprise. On the other hand, from entrepreneurial point of view, decision making power plays a vital role in case of deciding on whether or not to exploit opportunity, how to enter a market, how to react to competitors, or whether or not to terminate the business [6]. Thus, a strong decision making power within the large cardamom farmers to make the right decision at the right time to tackle these climate change discourses is very much needed. And, decisiveness, in this direction, is the most important element of human psyche which directly affects the decision-making power within an individual. Therefore, the level of decisiveness within the large cardamom growers will certainly influence the effectiveness and efficiency of their decision-making towards acquisition of knowledge and adoption of appropriate technologies to mitigate the climate change impacts on their large cardamom farming.

Under such a research niche, the present study has been undertaken to assess and analyse the decisiveness of the large cardamom growers and thereby explore different attributes that affect the decisiveness of the large cardamom growers in East Sikkim Himalayas in the changed climate scenario.

**2. METHODOLOGY**

The study was conducted in Regu block of East Sikkim District in Sikkim. Regu block was purposively selected and both the Gram Panchayat Units and Gram Panchayats were randomly selected. Multistage and random sampling procedures were followed for the selection of final respondents. From an exhaustive list of the heads of the large cardamom growing families, a total hundred number of large cardamom growers were selected randomly as respondents in

the study area. In the present study, decisiveness of the large cardamom growers has been conceptualized and operationalised in terms of their decision making ability which has been considered as the dependent variable and eighteen socio-economic, socio-psychological, socio-personal and communication related attributes of the respondents were considered as the independent, antecedent and predictor variables. The data were collected with the help of the structured schedule constructed for the study through personal interview method. The important statistical measures used to analyze the survey or research data were frequency, percentage, range, mean, standard deviation, coefficient of variation, coefficient of correlation, multiple regression.

**3. RESULTS AND DISCUSSION**

**Table 1: Distribution of the respondents according to their decision making ability (Y)**

Category	Score	Frequency	Percentage	Statistics
Low	14.00-19.66	7	7	Range = 14.00-31.00 Mean = 22.90 SD=2.73 CV= 11.92%
Medium	19.67-25.33	78	78	
High	25.34-31.00	15	15	

Table 1 presents the distribution of the large cardamom growers in Sikkim according to their decision making ability. The results show that majority of the respondents are under the medium level of decision making ability with score of 19.67-25.33 (78%) followed by high decision making ability group with score 25.34-31.00 (15%) and low decision making ability group of 14.00-19.66 (7%) respectively. The mean score of total distribution is 22.90 and standard deviation of the distribution is 2.73. The coefficient of variation value within the distribution 11.92% signifies the very high consistency level of the distribution for the variable 'decision making ability'. The result is indicative of the fact that most of the large cardamom growers in the study area possess medium level of decision making ability.

**Table 2: Correlation Coefficient of Decision making ability (Y) of farmers in large cardamom Farming with 18 causal variables:**

Variables	Correlation Coefficient (r)
Age (X <sub>1</sub> )	-0.187
Caste (X <sub>2</sub> )	-0.029
Family size(X <sub>3</sub> )	-0.084
Education (X <sub>4</sub> )	0.250*
Family Education Status (X <sub>5</sub> )	0.058
Family Annual Income (X <sub>6</sub> )	-0.011
Annual expenditure(X <sub>7</sub> )	-0.053
Land Holding (X <sub>8</sub> )	-0.104
Farm power (X <sub>9</sub> )	-0.134
Asset Possession (X <sub>10</sub> )	-0.081
Livestock possession (X <sub>11</sub> )	-0.225*

House type (X <sub>12</sub> )	-0.016
Social participation(X <sub>13</sub> )	-0.031
Extension contact(X <sub>14</sub> )	0.095
Mass media exposure(X <sub>15</sub> )	0.155
Management orientation(X <sub>16</sub> )	0.354**
Risk orientation (X <sub>17</sub> )	0.434**
Innovativeness(X <sub>18</sub> )	0.355**

\* 5% level of significance, \*\* 1% level of significance

Table 2 reflects the Pearson's coefficient of correlation among the dependent variable, decision making ability of large cardamom growers with the eighteen casual variables. The result shows that the variable education (X<sub>4</sub>), management orientation (X<sub>16</sub>), risk orientation (X<sub>17</sub>), innovative (X<sub>18</sub>) are positively and significantly associated with the dependent variable decision making ability of the large cardamom growers in case of livelihood contributions in changing climate. The variable livestock possession (X<sub>11</sub>) of the large cardamom growers is negatively and significantly associated with the decision making ability (Y<sub>1</sub>) of the large cardamom growers in case of livelihood contribution in changing climate.

#### 4. EDUCATION AND DECISION MAKING ABILITY OF THE LARGE CARDAMOM GROWERS:

Education is a continuous process for gaining the knowledge, experience and developing cognitive attributes of an individual through manifestation of the creative natural entity within an individual without inhibiting the perception regarding a situation. The facilitation of the process through which an individual can solve their own problems with the help of their own recourses and experience may be viewed as education. Education also helps in developing the analytical mindset of the human being for critically evaluating and taking decision in a better way to gain a profitable outcome. In the present study, the emphasis is given on the perception, knowledge and scientific approaches of large cardamom growers in relation to mitigating the climate change discourses on the farming practices, productivity and marketing of large cardamom. Large cardamom is basically a cash crop in the region which contributes highly in the livelihoods of the people, according to some researcher of eminence. This spice is one of the primary spice crops which contribute a visible amount of cash in the annual income of the family. So, the need is to make a decision in favour of mitigating the climate change impact on large cardamom farming. Without education it cannot be achieved, it is to say that education plays a pivotal role in case of developing the decision making ability of large cardamom growers in the changed climate after critically analyzing the pros and cons of the strategies. That is why the variable 'education' is positively and significantly associated with the decision making ability of the large cardamom growers.

#### 5. MANAGEMENT ORIENTATION AND DECISION MAKING ABILITY OF LARGE CARDAMOM GROWERS IN THE CHANGED CLIMATE:

Management orientation is considered as one of the psychological variables in the present study. Management orientation can be viewed as orientation of an individual in case of planning, production and marketing of the products. This orientation reflects the managerial capacity of an individual to run the enterprise smoothly and in an effective manner. As it has a strong impact on human psyche, it creates a psychic environment towards making a decision in favour of any object after critically evaluating them on the basis of their resources endowment. Orientation towards managing an enterprise paves the way to develop, nurture and equip with the ability to take the decision in an effective manner. Consequently, the enhanced rate of management orientation within an individual can help in increasing the decision making ability. That is why the variable 'management orientation' is positively and significantly associated with the decision making ability of large cardamom growers.

#### 6. RISK ORIENTATION AND DECISION MAKING ABILITY OF LARGE CARDAMOM GROWERS IN THE CHANGED CLIMATE:

For taking any new venture, there is a need to mobilize the mind set by risk taking ability. One individual can take a positive and profitable decision after understanding and perceiving the risk or uncertainty associated with the intervention. Primarily, the risk taking ability as well as the risk orientation make an individual much more capable to restrict the unwanted loss due to uncertain phenomenon occurs within the system. It also helps in making the contingency plan for averting unusual happenings within any enterprise. So, decision making in any sense can be more authenticated, if the decision maker has a high degree of risk orientation. In the present study, the large cardamom growers in changed climate can make a positive and profitable decision regarding production and marketing or mitigating the climate change aberrations within the cultivation practices and production, if, they have the ability to take risk in case of their preferences. This may be possible reason for positive and significant association of the variable 'risk orientation' with the decision making ability of the large cardamom growers.

#### 7. INNOVATIVENESS AND DECISION MAKING ABILITY OF LARGE CARDAMOM GROWERS IN THE CHANGED CLIMATE:

The creativity is the basic motivating force for development and growth. Always creation makes the difference in case of developing the society in a better way through appropriate decision making and its implementation in the rural situation. Innovativeness is the inherent characteristics of an individual to make invention much more in the field of agricultural development. Innovativeness prepares the mentality to go

along with the new scientific practices for its fullest use in the rural areas. Decision making ability is also influenced by the risk taking ability, scientific orientation, managerial ability and creativity. Without its attributes, one individual cannot take an appropriate decision on a particular challenges or issue. In the present study, large cardamom grower are taking the decision in favour of scientific cultivation practices of averting ill effect of climate change with the help of their brain and heart. So, in this situation, there is a need of innovativeness which one be utilized as motivating force for taking appropriate decision. That is why the variable 'innovativeness' is positively and significantly associated with the dependent variable, decision making ability of large cardamom growers in the changed climate.

**8. LIVESTOCK POSSESSION AND DECISION MAKING ABILITY OF LARGE CARDAMOM GROWERS IN THE CHANGED CLIMATE:**

Livestock possession can be an indicator of economic aspects in the society. But in the present study, it is not at all related with the economic aspects. It may be another alternative vocation of the farming community in the research area. The vocation livestock farming can be stabilized with the large cardamom farming. It is discernible that if one farmer can invest his time and money in livestock farming, than he cannot utilize his resources in other vocation like large cardamom farming. Sometimes, during the data collection phase the loss of large cardamom cultivation due to climate change aberration like different natural calamities is compensated by livestock farming. So, it may be considered as the compensatory vocation of large cardamom farming as in last year the productivity of large cardamom was decrease due to natural calamity. So, it is from that decision making in favour of livestock possession replace the decision making in favour of large cardamom cultivation in the changed climate scenario. That is why the variable 'livestock possession' is negatively and significantly associated with the decision making ability of large cardamom growers in the changed climate.

**Table 3: Multiple regression analysis of decision making ability (Y) with eighteen predictor variables:**

Variables	Standardize d regression coefficient (β)	Unstandardise d regression coefficient (B)	S.E of 'B'	t-value
Age (X <sub>1</sub> )	-0.125	-0.033	0.029	-1.158
Caste (X <sub>2</sub> )	-0.131	-0.559	0.390	-1.434
Family size(X <sub>3</sub> )	0.063	0.155	0.256	0.606
Education (X <sub>4</sub> )	0.287	0.469	0.260	1.801
Family Education Status (X <sub>5</sub> )	-0.256	-0.798	0.391	-2.038*

Family Annual Income (X <sub>6</sub> )	0.061	0.006	0.023	0.263
Annual expenditure(X <sub>7</sub> )	-0.014	-0.002	0.037	-0.059
Land Holding (X <sub>8</sub> )	-0.113	-0.109	0.132	-0.824
Farm power (X <sub>9</sub> )	-0.118	-0.407	0.386	-1.053
Asset Possession (X <sub>10</sub> )	0.152	0.280	0.222	1-265
Livestock possession (X <sub>11</sub> )	-0.252	-0.993	0.403	-2.466*
House type (X <sub>12</sub> )	0.085	-0.465	0.589	0.790
Social participation(X <sub>13</sub> )	-0.433	-2.138	0.611	-3.500*
Extension contact(X <sub>14</sub> )	0.088	0.120	0.181	0.662
Mass media exposure(X <sub>15</sub> )	-0.076	-0.100	0.191	-0.524
Management orientation(X <sub>16</sub> )	0.076	0.042	0.067	0.626
Risk orientation (X <sub>17</sub> )	0.415	0.380	0.120	3.173*
Innovativeness(X <sub>18</sub> )	0.107	0.099	0.124	0.792

R<sup>2</sup>= 0.404

\* 5% level of significance, \*\* 1% level of significance

Table 6.25 delineated the multiple regression analysis of large cardamom grower's decision making ability with eighteen predictor variables. The result shows that family education status (X<sub>5</sub>), livestock possession(X<sub>11</sub>) and social participation(X<sub>13</sub>) are the indicative variables that negatively and significantly contribute in case of characterizing the large cardamom growers' decision making ability (Y<sub>1</sub>). Another variable risk orientation(X<sub>17</sub>) in presence of other predictor variables is contributing positively and significantly for characterizing the large cardamom growers' decision making ability (Y<sub>1</sub>).

**9. FAMILY EDUCATION STATUS AND DECISION MAKING ABILITY OF LARGE CARDAMOM GROWERS IN CHANGED CLIMATE:**

Family education status indicates the formal education of the family members which makes them more critical and analytical for taking any decision in favour of or against of any new practices. In the present context, the large cardamom growers are trying to decide upon the new scientific practices for growing large cardamom profitably in the changed climate situation. The high level of family education status compels the grower to think upon the matter repeatedly and conflict may arise in case of taking decisions towards the practices which can mitigate the climate change discourses. So, it may create hindrance in case of taking any decision in favour of the

new technology. Sometimes, it is observable in the study area that different natural calamities reduce the large cardamom yield in a high degree. In such a background, the high level of family education status of large cardamom growers creates a confusing state of mind to take decision in favour of the strategic large cardamom cultivation. That is why the variable “family education status” is negatively and significantly contributing in case of characterizing the predicted variable, decision making ability of the large cardamom growers in the changed climate.

The variable family education status is directly contributing 39.10% in case of characterizing the decision making ability of the large cardamom growers in the changed climate. One unit change of the variable family education status is delineating the 0.798 unit change in the predicted variable, decision making ability of large cardamom cultivation.

#### **10. LIVESTOCK POSSESSION AND DECISION MAKING ABILITY OF THE LARGE CARDAMOM GROWERS IN THE CHANGED CLIMATE:**

Livestock possession implies the economic affluence of people within the society. In the present study, attempts have been made to analyse the decision making ability of the large cardamom growers in their real life situation. In reality, almost all the large cardamom growers manage their livestock along with their large cardamom enterprise. In this way, they can also get an alternative source of income from livestock farming besides their large cardamom cultivation. It is also discernible that in time of loss from large cardamom enterprise due to certain climate change adversity, they can compensate the loss with the help of their livestock enterprise. But, when an individual utilizes his resources (time, money, labour) in livestock farming, he/she cannot utilize his/her resources in some other vocation like large cardamom cultivation. Therefore, utilizing the livestock possession as a safe guard mechanism during declining large cardamom production due to climate change aberrations has prevented the large cardamom growers from being involved themselves in decision making process related to the large cardamom enterprise. That is why the variable “livestock possession” is negatively and significantly contributing in case of characterizing the predicted variable, decision making ability of the large cardamom growers in the changed climate.

The variable livestock possession is directly contributing 25.20% in case of characterizing the decision making ability of the large cardamom growers. One unit change of the variable livestock possession is delineating the 0.993 unit change in the predicted variable, decision making ability of large cardamom growers.

#### **11. SOCIAL PARTICIPATION AND DECISION MAKING ABILITY OF THE LARGE CARDAMOM GROWERS IN THE CHANGED CLIMATE:**

Social participation measures the participation of the local people as member or office bearer in grass root level organizations. This variable somewhat reflects the cosmopolitan nature of the people. But the grass root level organizations are mostly led by the age old persons. They are very much traditional in nature and they avoid taking any risk prone decision in favour of new innovation to combat climate change. In the present study, it is found that the large cardamom growers who are associated with grass root level organization as member or office bearer are mostly old aged without risk taking ability, innovativeness and cosmopolitanism. As a result, they are feeling threat in case of taking any new decision favouring the mitigation technology of climate change in large cardamom. That is why the variable “social participation” is negatively and significantly contributing in case of characterizing the predicted variable, decision making ability of the large cardamom growers in the changed climate.

The variable social participation is directly contributing 43.30% in case of characterizing the decision making ability of the large cardamom growers. One unit change of the variable social participation is delineating the 2.138 unit change in the predicted variable, decision making ability of large cardamom growers.

#### **12. RISK ORIENTATION AND DECISION MAKING ABILITY OF THE LARGE CARDAMOM GROWERS IN THE CHANGED CLIMATE:**

Risk orientation prepares one individual for critically analyzing a situation and thereby identifying the potential risk and uncertainty associated with the situation. Similarly, in case of developing and managing an enterprise profitably, the entrepreneurs need to make appropriate decision in several aspects of planning, production and marketing of the products. In the present climate change scenario, it is inevitable for anyone involved in any vocation to be up-to-date regarding the possible impact of the changed climate on his/her vocation. In the present study, the large cardamom growers have also found their large cardamom cultivation practices being exposed to several unseen risks and uncertainties associated with the climate change impacts. Therefore, their competency to take an appropriate decision regarding any aspect of large cardamom farming largely depends on their degree of risk orientation. The increment of the degree in risk orientation contributes to the positive decision making ability of large cardamom growers in the changing climate. That is why the variable “risk orientation” is positively and significantly contributing in case of characterizing the predicted variable, decision making ability of the large cardamom growers in the changed climate.

The variable risk orientation is directly contributing 41.50% in case of characterizing the decision making ability of the large cardamom growers in the changed climate. One unit change of the variable risk orientation is delineating the 0.380 unit change in the predicted variable decision making ability of large cardamom cultivation.

The  $R^2$  value being 0.404, it is to infer that the eighteen predictor variables put together have explained 40.40% variation embedded with the predicted variable, decision making ability of the large cardamom growers. Still 59.60% variable embedded with predicted one remains unexplained. Thus, it would be suggested that inclusion of some more contextual variables possessing direct bearing on the decision making ability of the large cardamom growers could have increased the level of explicability.

### 13. CONCLUSION

In the realm of globalization and free trade liberalization, the impactful pathway for uplifting the rural poor with the help of their locally available resources is to revive the locally existing enterprises developed through the cash crops grown in that area. The rural Indian economy is largely based on agriculture and allied activities. The only way to promote and strengthen the rural economy is through establishing and managing the rural agro-enterprises in an effective manner. In this direction, spice crops can serve the purpose fruitfully because these crops have huge potential to link with the national as well as international markets and generate a lucrative profit. Large cardamom is an important spice as well as cash crop in the East Sikkim Himalayas. Therefore, large cardamom cultivation can be considered as a viable and profitable enterprise for the farmers of this region. But in recent times, climate change has taken place with much of its adverse impacts on several agri-based enterprises in every parts of our country. Sikkim is also experiencing the effects of climate change on its flora and fauna. Similarly, large cardamom cultivation in Sikkim is passing through several changes in its various aspects like plantation, production, pests and disease, marketing etc. due to changes in climate. Consequently, large cardamom growers are often thrust into the clutches of the uncertainty arisen due to the climate change aberrations. Hence, the livelihood security of large cardamom growers in East Sikkim Himalayas has become at stake. To overcome this problem and make the situation better, there is a need to choose appropriate technologies which are eco-

friendly and climate resilient for mitigating the climate change adversities on large cardamom cultivation. Now, selecting effective technologies out of several alternatives requires a sound decisiveness characteristic within the large cardamom growers so that they can make the right decision at the right time regarding adopting appropriate technology. Sometimes, climate change is also manifested into sudden but unavoidable phenomena like natural calamities, pest and disease attacks etc. which requires the farmers to take prompt as well as correct decisions regarding effective strategies to avert the risk and minimize the impacts. Therefore, the decisiveness of large cardamom growers would play a pivotal role in running their large cardamom enterprise profitably and sustainably in the present climate change scenario. The present study also witnessed that education, management orientation, risk orientation and innovativeness are some of the important attributes of the large cardamom growers that enhance their decision making ability. Therefore, any strategic intervention in this direction should analyze the decisiveness of the large cardamom growers and consider those attributes influencing their decisiveness in order to ensure their livelihood security through scientific cultivation of large cardamom under the changed climate in East Sikkim Himalayas.

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