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A study on entrepreneurial behaviour of Assam lemon (*Citrus limon* L. Burm.) growers in Tinsukia district of Assam

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Abstract
Assam lemon, locally known as *'Kaji Nemu'* is one of the most widely grown high valued crops grown in Assam, particularly in the district of Tinsukia. In order to conduct the investigation, a total of 120 respondents were selected with the help of multi-staged sampling technique. A total of eight villages which were selected from two sub-divisions of the district. It was found that 66.70 per cent of the sampled Assam lemon growers had medium entrepreneurial behaviour, 17.50% of them were found to possess high and 15.83% of the growers had low entrepreneurial behaviour. The entrepreneurial behaviour was measured using seven dimensions. The investigation disclosed that the Assam lemon growers, out of the seven dimensions, respondents possessed high 'Decision making ability' (Rank I). Following statistical analysis namely, frequency, percentage, Entrepreneurial Behaviour Index, Entrepreneurial Behaviour Score and Weighted Mean Score was used to study the entrepreneurial behaviour of the Assam lemon growers.

Keywords: Assam lemon, entrepreneurial behaviour, Tinsukia, Assam

Introduction
Citrus is one of the most important fruit crops planted worldwide. As of 2022, globally, total area under to citrus was approximately 9.8 million hectares and total production was approximately 158.8 million metric tonnes (FAOSTAT,2023) [3]. The average global productivity for citrus is about 16.2 tonnes per hectare, however, productivity varies from country to country depending on climate, farm practices, and input usage (FAO,2023) [4]. World's average productivity for citrus is around 16.2 tonnes per hectare. The productivity varies from country to country depending on various factors such as weather, climate pattern, farm practices, and input usages (FAO,2023) [4].

Citrus fruit crops are an integral part of Indian horticultural sector. During 2022-23 the annual citrus production per hectare of the country was found to be 10.30 MT/Ha (MoAFW, 2023) [5]. In 2023–24, India exported fresh fruits and vegetables worth USD 1.814 billion, and citrus fruits, such as oranges, were one of the leading products (APEDA, 2024) [7]. The major citrus-growing states are Andhra Pradesh, Maharashtra, Madhya Pradesh, Rajasthan, Karnataka, Assam, and Arunachal Pradesh.

Assam has been native to many indigenous species of citrus. Among all these species Assam Lemon (*Citrus limon* L. Burm) which is locally known as 'Kaji Nemu' is of great significance (Gogoi,2023) [13]. The fruit crop is well known for its unique aroma, high juice content, thin skin and elongated shape. The characteristics of its being seedless makes it more distinct from other lemon varieties of India. During 2021 around 1200 kgs of Assam lemons have been exported to the wholesale international market in London and UK from the district of Chirang and during 2022 around 600 kgs of Assam lemon was dispatched from Baksa (G Plus, 2021) [1]. In the year 2023, around 5000 pieces of Assam lemon were exported to London from Tinsukia district (The sentinel, 2024) [2]. According to the statistical handbook of Assam, in the year 2015-16 the area, production and productivity of Assam lemon was found to be 13173Hectare, 108492M.T and 8236 Kg/hectare respectively which significantly increased to 18036 Ha, 178872 MT and 9841

Kg/Ha respectively during 2023-24 (Directorate of Horticulture and Food processing, 2023-24) [6]. This progression reflects the growing economic significance of Assam lemon within the horticultural sector of the state.

Assam lemon has been declared to be the state fruit, *'Jatiya Phal'* of Assam on 13th of February 2024 by the Govt of Assam. The fruit crop was granted the tag of the Geographical Indication (GI) in the year 2019 under 'Geographical Indication of Goods (Registration and Protection) Act, 1999' and this has uplifted its market identity and potentiality, this in turns helps to boost the economic condition of the region. The climatic condition of Assam is well suited for growing Assam lemon. Assam lemon requires a subtropical humid climate for providing good yield per unit area.

Assam lemon has gained a significant importance due to its growing demand in market. Cultivation of this crop is a key to the life of rural people of Assam as it serves as an excellent source of livelihood for them. The economic potentiality of the crop has encouraged many small, marginal and large farmers to cultivate this crop as it serves as an outstanding opportunity to increase their income. Although many locals of Assam practice subsistence farming but there are also locals found to be emerging as energetic entrepreneur in Assam lemon farming.

Entrepreneurs who choose Assam lemon as enterprise has great scope to generate a good economy specially in a region like Assam where all the conditions to grow the crop holds good, making it comparatively easier to cultivate as compared to other region. The local growers can take strategic advantage and produce high quality lemon with low cost of input. Besides this, the fruit crop's high demand in domestic and international market increases the enterprise's economic viability.

The district of Tinsukia is one of the leading districts of Assam with respect to Assam lemon cultivation. The district solely covers 1241 ha area under Assam lemon cultivation. During 2022-23, the production and productivity of the crop was reported to be 6144 MT and 6235kg/hectare respectively which significantly increased to 11510 MT and 9275 kg/hectare during 2023-24. Despite being one of the leading districts with high area under Assam lemon cultivation, the productivity as per reports from Directorate of Horticulture, Khanapara was seen to be comparatively lower than that of other Assam lemon-growing districts in the state. This may be attributed due to various reasons. Entrepreneurial behaviour serves as one of the promising factors to boost the region's productivity, hence it is important to undertake a systematic study of the entrepreneurial behaviour of Assam lemon growers in the district for better understanding various behavioural dimensions that offer deeper insight into the reasons behind comparative low productivity in the region and help framing strategies for capacity building and commercialization of lemon cultivation in the region. The study also intends to support the shift from subsistence to commercial farming of Assam lemon. Many farmers still grow Assam lemon for home use or local markets without thinking of it as a business. However, with the right mindset and training, these growers could turn their orchards into profitable ventures.

In view of the above, the present study entitled "A Study on Entrepreneurial Behaviour of Assam Lemon (*Citrus limon* L. Burm) Growers in Tinsukia District of Assam" was conducted with the following objective.

Objective

To study the Entrepreneurial Behaviour of Assam Lemon growers.

Research Methodology

Tinsukia district consisted of three sub-division namely Tinsukia, Margherita and Doomdooma. The Tinsukia subdivision was selected purposively as it has the highest numbers of Assam Lemon growers. The district consisted of eleven ADO circles out of which two ADO circles namely Kakapather and Dholla. Four villages from each ADO circle were selected and from each village 15 numbers of Assam lemon growers were taken. Thus, a total of 120 Assam lemon growers from the district of Tinsukia, Assam were selected with a multi staged sampling procedure from eight sampled villages. Data was collected with the help of a one-to-one interview method. For collecting data, a scale developed by 'R.R.Chaudhari (2007); modified by E. Yogesh Sudam (2016); retested by the researcher' was used. Data analysis was done using statistical tool such as frequency, percentage, mean, standard deviation, Entrepreneurial Behaviour Index and Weighted Mean Score.

EBI (Entrepreneurial Behaviour Index)

$$EBI = \frac{Entrepreneurial\ behaviour\ score\ obtained}{Max.obtainable\ entrepreneurial\ behaviour\ score} \times 100$$

WMS (Weighted Mean Score)

$$WMS = \frac{Sum\ of\ product\ of\ frequency\ and\ score\ assigned}{Total\ no.of\ respondents}$$

Results and Discussion

As depicted in the table 1 majority (66.67%) of the sampled assam lemon growers were seen to possess medium level of entrepreneurial behaviour, 17.50 per cent with high and 15.83 per cent possessed low entrepreneurial behaviour level. The findings are in line with studies conducted by Doddamani (2014) [11], Ekhande (2016) [12], Goswami (2021) [14], Bharadwaj (2023) [8], Bhutia (2023) [9] and Chikkalaki (2024) [10].

This may be due to limited exposure to entrepreneurial training and business-oriented education, which restricts their ability to fully capitalize on innovative practices or explore market-driven opportunities. Additionally, the prevalence of traditional farming approaches, coupled with moderate access to agricultural information, credit facilities, and market linkages, may contribute to a cautious and risk-averse mindset. The medium-level dominance reflects both potential and constraints—indicating a need for targeted interventions to foster higher levels of entrepreneurial behaviour among Assam lemon cultivators. Therefore, if focus is given to the respondents by extension department or other institutions, in the medium and high category, then there is high chance that there will be transition of growers in the medium level category towards high category and the growers who are already in the high category, will serve as a role model for young rural youth.

Table 1: Distribution of respondents according to their entrepreneurial behaviour **n=120**

Sl. No.	Category	*f*	(%)	Mean	SD
1	Low (<77.19)	19	15.83	91.08	13.88
2	Medium (77.19-104.97)	80	66.67		
3	High (>104.99)	21	17.50		
	Total	120	100		

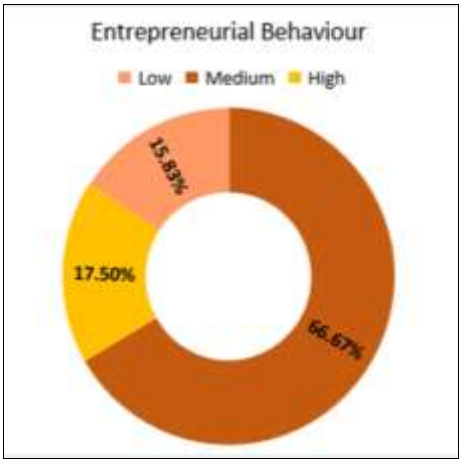

Fig 1: Distribution of respondents according to their entrepreneurial behaviour

Table 2: Distribution of respondents according to Entrepreneurial Behaviour Score, Entrepreneurial Behaviour Index and Weighted Mean Score. (n=120)

Sl no	Items	EBS	EBI	WMS	Rank
A	**Innovativeness**				
1 (a)	I stay informed about new seasonal cropping techniques of Assam lemon, but I don't use every new technique.	239	66.38	1.99	VII
1 (b)	I've heard new information on seasonal cultivation practices of Assam lemon, but I don't implement it.	244	67.77	2.03	V
1 (c)	It is important to know how the new method of cultivation for Assam lemon is better than the old method.	360	100	3.00	I
2 (a)	I've heard a lot about new cropping methods of Assam lemon, but I've been using the same methods since many years	238	66.11	1.98	VIII
2(b)	I often use new crop methods of Assam lemon from which my neighbouring farmers have been benefited	266	73.88	2.21	III
2(c)	I believe that traditional farming of Assam lemon is best and holds good value	234	65.00	1.95	IX
3 (a)	I am aware of the use of new cultivation methods of Assam lemon.	246	68.33	2.05	IV
3(b)	the seasonal crop methods of my four generations of Assam lemon are well, so I don't change them	240	66.66	2.00	VI
3(c)	If new seasonal cultivation methods show promise, I would be willing to use those methods	341	94.72	2.84	II
B	**Decision making ability**				
1	Deciding when to grow Assam lemon in the field	328	91.11	2.73	II
2	Decision on the source of Assam lemon planting materials	291	80.83	2.425	III
3	Deciding how much fertilizer to use for Assam Lemon cultivation	242	67.22	2.01	IV
4	Deciding on various crop protection measures for Assam lemon	239	66.38	1.99	V
5	Decision to sell your Assam lemon produce	338	93.88	2.81	I
6	Keeping farm record on Assam lemon orchard	239	66.67	2.00	VI
C	**Achievement motivation**				
1	After achieving a goal, one should prioritize work over rest	305	84.72	2.54	II
2	Focusing on small achievement is always better than achieving something big.	159	44.16	1.32	VI
3	I always want to do something big and different in Assam lemon farming	334	92.77	2.78	I
4	I would like to do something difficult that is very challenging and seems impossible to others in Assam lemon farming	295	81.94	2.45	III
5	Losing the enthusiasm to do a difficult task is my current mindset	226	62.77	1.88	V
6	Even if the family neglects, one should achieve success in their business in Assam lemon.	259	71.94	2.15	IV
D	**Risk orientation**				
1	Instead of continuing traditional practices, Assam lemon growers should experiment with improved cultivation techniques	251	69.72	2.09	IV
2	Assam lemon growers should take big risks in farming to maximize profit rather than making small changes and taking low risks	244	67.78	2.03	V
3	Those Assam lemon growers who take more risks usually have a better financial condition than those who avoid risks.	253	70.28	2.11	III
4	it's good to take risks in Assam lemon farming if there's more certainty of profit.	343	95.28	2.86	I
5	If successful Assam lemon farmers are not using a new method, then I should also not adopt that particular method	241	66.94	2.03	VI
6	Although, using completely new methods in Assam lemon farming is risky, it is sometimes more beneficial	321	89.17	2.68	II
E	**Information seeking behaviour**				
1	Family member	360	100	3.00	I
2	Relatives	318	88.33	2.65	II
3	Friends / Neighbours	316	87.78	2.63	III
4	progressive farmer	256	71.11	2.13	IX
5	Gram Panchayat Member	245	68.06	2.04	XI
6	Agriculture Development Officer	310	86.11	2.45	IV
7	Agricultural Extension Officer	264	73.33	2.40	VII
8	Subject Matter Specialist	294	81.67	2.45	VI
9	Newspapers	250	69.44	208	X
10	radio	196	54.44	1.75	XIII

11	Television	296	82.22	2.47	V
12	Leaflet	210	58.33	1.75	XII
13	Internet	266	73.89	2.22	VIII
F	**Leadership Ability**				
1	Do you participate in group discussions related to new farming methods of Assam Lemon?	247	68.61	2.058	III
2	Whenever you hear or see a new farming method related to Assam lemon do you discuss it with your fellow farmers?	337	93.61	2.808	I
3	Do village people regard you as a good source of information on Assam lemon cultivation practices?	245	68.06	2.042	IV
4	Do you assign the work of Assam lemon orchard to your family members?	261	72.50	2.175	II
5	Do you adopt new approaches to overcome problems in Assam lemon farming?	244	67.78	2.033	V
G	**Cosmopoliteness**				
1	It is not necessary to collect and use information from outside the village for successful Assam lemon farming.	171	47.50	1.42	V
2	Assam lemon growers should try to gather information about farming and management practices from outside the village and use mass media for this purpose	301	83.61	2.50	II
3	Assam lemon growers should learn from events and experiences in their village only.	237	65.83	1.97	IV
4	It is important to have complete information on Assam lemon cultivation from different sources and networks for successful Assam lemon business.	350	97.22	2.97	I
5	Visiting the subject matter specialist is a waste of time for Assam lemon growers.	139	38.61	1.15	VI
6	Extension workers help in gathering accurate information related to Assam lemon farming.	278	77.82	2.31	III

Innovativeness

The highest score was obtained by the statement 'It is important to know how the new method of cultivation for Assam lemon is better than the old method'' with EBI of 100 and WMS of 3 with rank I. It reflects the curiousness of the growers in order to understand how the new innovative methods will help them to grow their business venture of Assam lemon. It also portrays a cautious perspective of respondents that bounds them not to adopt any innovation in a random manner but to carefully understand each aspect before adopting it rationally and carefully.

Lowest score was obtained by the statement "I believe that traditional farming of Assam lemon is best and holds good value'' with EBI score of 65.00, WMS of 1.95 (rank IX). This infers that the farmers are not really stuck with past traditional practices but in the same time they also respect the old traditional methods to some extent.

Decision making ability

The highest score was received on 'Decision to sell your Assam lemon produce' with EBS of 338, EBI of 93.88 and WMS of 2.81 (Rank I). This shows that respondents took decision very carefully and rationally to sell their Assam lemon produce. Growers show strong decision- making behaviour in selling their produce.

The lowest score was received on 'Keeping farm record on Assam lemon orchard' with EBS of 239, EBI of 66.67 and WMS of 2.00 (Rank VI). This indicated that respondents show interest in farm record keeping related decision making. While interaction with the respondents the researcher found that most of the respondents hardly maintained any farm record with discipline and consistency.

Achievement motivation

Highest score was received by the statement 'I always want to do something big and different in Assam lemon farming' with EBS of 334, EBI of 92.22 and WMS of 2.78 (Rank I). The score reflects respondents' high motivation and strong desire for big achievements in Assam lemon farming business.

Lowest score was received by the statement **'**Focusing on small achievement is always better than achieving something big' with EBS of 159 and WMS of 1.32. The score indicates that farmers do not agree with the idea of achieving small but always wanted to achieve something big. Both the highest and lowest scored statements depicted high achievement motivation of the growers.

Risk orientation

The highest score was obtained by the statement 'it's good to take risks in Assam lemon farming if there's more certainty of profit' with EBS of 343 and EBI 95.28 and WMS of 2.86. This indicates that the respondents like to take risk only when the profit is certain, signifying a characteristic calculative risk taking strategy to avoid loss. The like to carefully evaluate the risk reward ratio before making any decision.

The lowest scored statement was 'If successful Assam lemon farmers are not using a new method, then I should also not adopt that particular method' with EBI of 241 and WMS of 2.03. The score infers that the respondents have independent risk-taking strategy rather than following actions of successful peer farmer.

Information seeking behaviour

The highest score was received by 'Family member' with EBI of 100%, WMS of 3.00 and EBS of 360 (Highest Possible Score). This signifies that respondents' highest utilised source of information is 'Family member'. This indicates that respondents mostly rely on interpersonal and informal source. This score indicates high level of trust and integrity among family members.

The lowest score was received by 'Radio' with WMS of 1.75, EBI of 54.44 and EBS 196. The score indicates that radio is the least used source of information for the respondents. Probable result may include preference of audio-visual aid like TV, Smart phone etc over only audio aids.

Leadership ability

While measuring leadership ability of the respondents it was found that the highest score was achieved by the question 'Whenever you hear or see a new farming method related to Assam lemon do you discuss it with your fellow farmers?' with EBS of 377, WMS of 2.808 and EBI 93.61. This infers that the respondents or the growers always discussed any new farming method that they get to know with their fellow mates. This signifies that the farmers are highly proactive in knowledge sharing, which shows that they have the ability to influence their peer farmers hence being informal leader within their farming community. This shows a collaborative and participative nature of the Assam lemon growers in the region.

Lowest score was received by the question 'Do you adopt new approaches to overcome problems in Assam lemon farming' with EBS of 244, WMS of 2.033 and EBI of 67.78 per cent. This infers that the growers have very low level of leadership ability in adopting new approaches in problem solving related to Assam

lemon. This indicates that the farmers mostly follow a characteristic risk aversion strategy in order to avoid loss.

Cosmopoliteness

The highest score was obtained by the statement 'It is important to have complete information on Assam lemon cultivation from different sources and networks for successful Assam lemon business' with EBS score of 350. This discloses that the respondents are open to seek information from other network rather than limiting only to their village area.

The lowest score was received by the statement 'Visiting the subject matter specialist is a waste of time for Assam lemon growers' with EBS of 139 (Rank VI). The statement was a negative but most off the respondent disagreed to the statement which is actually positive in context. They believe that visiting the subject matter specialist is not a waste of time. Rather they believe seeking advice and information from specialist can help them to grow their business venture.

Table 3: Distribution of respondents according to component wise ranking of Entrepreneurial behaviour of Assam Lemon growers

Sl No	Category	Mean score	Rank
A	Innovativeness	2.23	IV
B	Decision making ability	2.32	I
C	Achievement motivation	2.18	VI
D	Risk orientation	2.30	III
E	Information seeking behaviour	2.31	II
F	Leadership ability	2.22	V
G	Cosmopoliteness	2.05	VII

The highest scored (Mean=2.32) component with rank I was decision making ability. This suggests that respondents are good at evaluation of alternatives and taking rational and timely decision for betterment of their Assam lemon orchard. The high score reflects a strong practical thinking before taking any decision related to their farm.

Decision making ability was closely followed by information seeking behaviour with mean score of 2.31 (Rank II) and risk orientation with mean score 2.30(Rank III), indicating that respondents are open to learn and seek information from diverse sources and like to take very rational and calculative risk in order to avoid any loss.

With a mean score of 2.23 innovativeness was ranked forth and this suggest that farmers are having slightly moderate level of innovativeness and there is room for improvement. Innovativeness was closely followed by leadership ability with mean score 2.22, indicating that while some of the farmers are capable of influencing their peer farmers but all of them are not dominantly having leadership ability.

On the lower end, Achievement motivation (mean=2.18) was ranked sixth. This reflects that respondents had a low level of behavioural traits related to achievement motivation as compared to other components.

The lowest ranked component was found to cosmopoliteness with rank VII and mean score of 2.05. the score revels that respondents do not frequently seek information beyond their village. A low level of cosmopoliteness can hamper overall production and productivity of the area for Assam lemon.

Conclusion

Considering all the components it can be said that Assam lemon growers in the district of Tinsukia demonstrates high decision-making ability and proactive information seeking behaviour, moderate risk orientation, innovativeness and achievement motivation and low cosmopoliteness characteristics. Encouragement of wide exposure and improvement in access to extension services will help Assam lemon growers to widen their perspective and outlook which in turn will enhance and strengthen their entrepreneurial behaviour.

Policy implication

With growing scope and opportunities for Assam Lemon cultivation, there rises importance in improving the entrepreneurial behaviour of the Assam lemon growers. The research findings of the present study disclose that organising regular skill focused and skill-oriented training on moder cultivation techniques, access to proper market information and Assam lemon value addition training will facilitate a shift from medium entrepreneurial behaviour category to high entrepreneurial behaviour category.

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Conflict of Interest

There do not exist any conflict of interest as declared by the authors.

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