Scope for Sustainable Development of Fruit Crop Growers in Arunachal Pradesh and their Relationship with Entrepreneurial Behaviour

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Abstract:

The North Eastern Region (NER) has a vast potential for the development of horticultural sector. The horticultural sector in Arunachal Pradesh has emerged as an economically rewarding and most viable option in diversification of agriculture. It offers a wide variety of crops suitable for cultivation under different agro-climatic conditions and terrain with possibility of multitier cropping system, thus enhancing the returns per unit of land area, generating employment and providing food and nutritional security. The shift in dietary patterns with preference for vegetarian food has led to increase focus on the horticultural crops. With a significant volume of crops cultivated in the Arunachal Pradesh, shifting pattern of consumers' demand for agro produce and changing mode of cultivation through use of modern technologies and efficient use of irrigated water , the region has emerged as a front runner in the production of agro based commodities. The region has the potential of becoming a major Agro and Food processing hub.

Fruit crops can be used for various post-harvest and processing activities, which are huge entrepreneurial opportunities. Studying the socio-economic conditions of fruit crop growers is indeed crucial for effective policy design and successful implementation of governmental developmental programs in the horticultural sector. The study identified that variables such as education, land holding, annual income, occupation, experience in fruit crop cultivation, self-reliance, urbanisation, deferred gratification, extension participation and mass media exposure had a significant association with the entrepreneurial behaviour of fruit crop growers.

Key words: Arunachal Pradesh, Growers, entrepreneurship, Horticulture, Fruit crops

A. Introduction

The augmentation of the rural economy in Arunachal Pradesh is largely dependent upon agricultural development. Arunachal Pradesh has recorded poor economic growth since independence despite the existing vast scope for development of the agriculture, forestry sector especially horticulture through an integrated approach accommodating cultivation, marketing and processing together which can also play an important role in the production scenario. Development of horticulture calls for the establishment of appropriate post-harvest infrastructure like PPC etc. The relative position of horticulture compared to other agricultural activities is very poor. Although in hill states it is comparatively better, it is still far below the expected level. Specialised production of horticultural crops is lacking. A wide range of products with small inventories makes it difficult for planning appropriate post-harvest infrastructure. A definite reorientation in the primary Agri-horticultural production is strongly recommended. The agricultural marketing system is very unorganised and its infrastructure underdeveloped. The marketing system is fully dominated by private traders and a large chain of middlemen. Crop specific establishment of PPC is an utmost necessityin the production centres.

Any crop based enterprise has to look comprehensively at both the aspects of production and marketing of the produce. Based on the analysis of the current situation of horticultural production and marketing, it is recommended that an Integrated Horticulture Development Plan (IAHP) for Arunachal Pradesh is put in place. True benefits from such an approach will be harvested only if we have improved the availability quality fruits for marketing. The perishable produce like fruit (particularly apple) with seasonal production, the aspects of marketing assume greater importance. Accordingly, the departmental interventations are recommended to address the problem/ constraints in two areas of production and marketing. The Integrated Horticulturre Development Plan proposed to address the various issues in order to ultimately help us in restructuring the post harvest management and marketing of horticulture products will consist of three major components.i)Production enhancement, ii)Post harvest production management, iii) Value addition

The scenario of horticulture marketing in the Arunachal Pradesh is unorganised and underdeveloped. The salient features of the apple marketing scenario in the Arunachal Pradesh is as follows:

a) Poorly developed market infrastructure. Most of the markets do not have adequate facility for display, auction and seller-buyer interactions. Storage facility for non-perishable commodities although available to some extent, the same for perishable items is almost nil.
b) A major portion of the commodities do not flow through the market yards. Farmer's participation in market operation is seldom found even at the primary rural markets. Traders have their own established channel for procuring and disposal of the commodity.
c) Backward and forward linkage is formed by a long chain of middlemen spread right up to the village level. Middlemen at backward link very often change their role in market management, as agricultural trading is not the primary occupation of 79% of such middlemen surveyed. Often,they disassociate themselves from the marketing chain depending upon the ups and downs of the market.
d) The entire marketing system has been created and managed by private traders and middlemen. Institutional market functionaries are not seen at any stage of marketing.
e) Buyer dominance at the primary stage of marketing is very evident. This has been possible for the existence of area and commodity-specific monopoly of large traders, who operate through their own established channels. Farmers receive a throw-away price which is 16-28% of a depending upon the area and commodity
f) Pre-harvest sales and credit-linked marketing are witnessed with respect to cash crops like ginger, areca nut etc.
g) The extent of post-harvest loss of horticultural produces is very high. It is estimated that the same ranges between 18-32% during marketing and transport depending upon the commodity and their production sites. Nevertheless, around 30-40% of the perishable produces especially vegetables and certain types of fruits perish at the field itself before they could be harvested.

The Horticulture sector has emerged as an economically rewarding and most viable option in diversification of agriculture. It offers a wide variety of crops suitable for cultivation under different agro-climatic conditions and terrain with possibility of multiple cropping system, thus enhancing the returns per unit of land area, generating employment and providing food and nutritional security. The shift in dietary pattern with preference for vegetarian food has led to increased focus on the horticultural crops.

The state of Arunachal Pradesh lies between the North latitude of 26028 to 29030 and East longitude of 90030 to 97030. Horticulture is an important sector of Arunachal Pradesh. In the middle and broad valley, each crop like spices, vegetables and fruits have been developed for the last one decade along motor able road network. This ribbon type of development is being further supplemented in interiors through low volume and high value crops for supporting the economy of the villagers in less communicated and isolated areas. On the higher altitude with steep gradient and narrow valleys, flat open sloppy land becomes very limited and scattered. In these areas, food production turns into a need based farming and horticultural assumes priority. The Government of Arunachal Pradesh has recognised the potential of horticulture for alleviating poverty level through generation of sustained levels of income and employment opportunities. Horticultural farming with provision of effective post harvest management (including marketing) is emerging as the prime sectoral policy in Government programmes.

A. On the basis of prevailing Agro- climatic conditions and topography , the state has been divided into four horticultural zones. (Table 1.01)

Table 1.01:**Horticultural Zones and Potential area**

Sl No	Horticultural Zones	Crops suitable for cultivation	Potential area (ha)
1	Foot Hills & Valley (170-915 M altitude)	Citrus, Banana, Litchi, Pineapple, Papaya, Seasonal Vegetables.	6,05,147
2	Mid Hills (915 -1830 M altitude)	Peach, Plum, Apricot, Almond, Low chilling apple, Pomegranate, Flowers, Seasonal Vegetables	5,84,280
3	High Hills	Apple, Cherry, Walnut, Pomegranate, Kiwi, Off seasonal Vegetables, seed production of temperate vegetables.	4,79, 944
4	Rain shadow area with	Apple, Pear, Plum, Peach,	1,30,629

	rainfall(with less than 40" rainfall	Areca nut, Almond, Walnut, Off seasonal Vegetables.)	
5	Total		18,00,000

Source; Directorate of Horticulture, Govt. Of Arunachal Pradesh.

Depending on the potential of different areas and micro-climatic, some selected fruit crops and spices have been identified as follows(Table 1.02)

Table 1.02: Identification of crops based on Micro-climatic variation

Sl No	Area	Climate	Crops
1	Tawang, West Kameng, Lower Subansiri, Mechuka, Anini, Hawai, walong	Temperate	Apple, Walnut, Kiwi, Pear, Plum
2	Middle foot hill areas of all the districts	Sub-tropical	Citrus, Pineapple, Guava, Litchi

The state produces a wide range of fruits, vegetables, spices, orchids and medicinal plants in temperate and sub-tropical climate with reported area of 69,500 ha as per 2020 data. . Among the horticultural crops, fruit occupy an area of 45,091 hectare and generate a production of 1,17,950MT (2020). The next group of crops under horticulture which are important for revenue generation arethe spices which occupy 11,612 ha and their production is around 61,050 MT. Details of area and production under major fruits and spices are given in Table 1.03. Besides the crops mentioned in the Table 1.03, the other major ones of some important are Guava, Plum, Papaya, litchi, Jack Fruit and Peach among fruits and Ginger and Large Cardamom under spices

Table 1.03: Area and Production of Fruits and Spices (2023)

Sl No	Name of the fruits	Area (ha)	Production (MT)
A.	**Temperate**		
1.	Apple	4664	6557
2	Walnut	1000	630
3	Pear	1164	2956
4	Kiwi	320	450
	Sub-Total	**6,901**	**10,901**
B.	**Tropical & Sub-**		

	Tropical		
1.	Mandarin	32730	69740
2.	Pine apple	3090	23110
3.	Banana	2210	14080
4.	Lime/Lemon	160	111
	Sub-Total	**38,190**	**1,07,041**
C	Spices		
1.	Large Cardamom	2342	512
2.	Black Pepper	820	118
3.	Ginger	7650	56580
4.	Turmeric	800	3840
	Sub-Total	**11,612**	**61,050**
	Total	**56,703**	**1,79,002**

B. Apple Production in Arunachal Pradesh-Present status:

Arunachal Pradesh is the only major apple producing state outside the north-western hill region in the country. Though apple orchards are found in three of the four horticultural zones of Arunachal Pradesh namely Mid Hills, High Hills and Rain Shadow, not all of them are accounted and it is the West Kameng, Tawang and Lower Subansiri where most of orchards are located. Fruit growers in the higher hill region of the state, particularly in the West Kameng district have been producing apple which are known for the good quality. The area under apple crop has not changed much over a period of time. There was slight improvement in production/productivity (1.3 MT/ha) which is observed much lower than the other apple growing states.

The following Table 1.04 provides information in the reported area, production and productivity of apple in the state of Arunachal Pradesh.

Table 1.04: Reported area, production and productivity of Apple since 1991-92

Sl No	Year	Area (ha)	Production (MT)	Productivity (MT/ ha)
1	1991-92	5100	9300	1.82
2	1996-97	6186	14500	2.34
3	2001-02	6812	8588	1.25
4	2006-07	6545	8432	1.29

5	2008-09	6342	8345	1.32
6	2012-13	5765	8123	1.41
7	2017-18	4660	7350	1.58
8	2020-21	4664	6987	1.50
9	2021-22	4664	6557	1.41

Source; Directorate of Horticulture, Govt. Of Arunachal Pradesh

Though the above table presents a fairly good status of apple production in the state, in reality it is not so. In fact in most of the areas reported apple orchards are very old. and apple product in those orchards cannotbe used for human consumption. Hence, growers are gradually felling the old plants and replanting new plants in those areas. The following table is provided realistic information about the major apple growing district in the state as presented in the Table 1.05.

Table 1.05: District wise area and production of Apple in Arunachal Pradesh

Sl No	District	Area (Ha)	Production (MT)
1	West Kameng	575.00	131.10
2	Tawang	84.12	43.66
3	Lower Subansiri	16.67	19.50
4	Upper Dibang Valley	10.00	Negligible

C. Block wise present and Potential area:

The following Tables 1.05 gives an indication of the present area under apple cultivation and area that could be termed as potential for future.

Table 1.05: Present potential for apple cultivation in Arunachal Pradesh

District	Block	Present Area (ha)	Present Production (MT)	Potential area (ha)
Tawang	Tawang	62.57	32.47	24202
	Mukto	16.73	8.69	6474
	Lumla	4.82	2.50	1850
	Sub-Total	84.12	43.66	32,526
West Kameng	Bomdila	150.00	45.00	2,000

	Kalakteng	177.00	53.40	2,02,000
	Dirang	178.00	31.00	1,50,000
	Nafra	60.00	1.00	60,000
	Therizino	-	0.60	4,700
	Sub-Total	575.00	131.00	4,18,700
Lower Subansiri	Ziro	16.67	19.50	1722
	Sub-Total	16.67	19.50	1722
Upper Dibang Valley	Anini	10	Negligible	170
	Sub-Total	10	Negligible	170
	Grand Total	685.79	194.16	453118

It is reported that the productivity of apple in West Kameng district in the order of about 4.00 MT/ha whereas , it is about 3.00 MT/Ha. Productivity in Lower Subansiri is much lower in comparison to other district. In the Tawang district, in the last couple of years , there have been new plantation(under high density plantation) coming up with Red Chif, Organ Spur, Star Krinson etc. The area in the districts of West Kameng andTawang are considered as the climate is more suitable for apple cultivation. Most of the apple varieties require about 1000-1500 hrs of chilling below seven degree centigrade during winter to complete the dormancy. By and large, the average summer temperature in the area is about 17—24 degree centigrade during active growth period of the tree with frost free springs and adequate sunshine during summer without wide fluctuation in temperature. Well distribution rainfall of 1400-1420 mm throughout the growing season is the most favourable. Based on discussion with farmers and other officials and previous reports, the gap in apple production can be attributed.

a. Jhuming cultivation
b. Low yielding variety
c. Heterogeneous population of apple trees in old orchards showing considerable variation in yield and quality.
d. Poor orchard efficiency
e. Weather vagaries
f. Multiplication of plant materials from unknown pedigree

g. Insufficient package of practices especially for pruning and plant protection measures.
h. Lack of improved technology and trained man power.

D. Post Harvest Management:

The actual gains of good quality production are when the produce is marketed at a rewarding price. This would be possible only if due attention is paid at each step of post production till the produce reach the consumers. Following care is utmost necessary for a good post harvest management.

a. Maturity standard: Most of the farmers are unaware the current maturity standard of apples. Very often they harvest the fruit at different stages of maturity. Most farmers in order to exploit the market advantage often harvest up ripe fruits.

b. Grading: Discussion with the farmer respondents as well as with the market functionaries in all apple growing belts indicate that all the fruits are packed for marketing without any reference of grade specification to suit the particular market. Producers generally grade the products into two broad grades A and B or good or poor.

c. Packaging: A related aspect to grading is the appropriate packing of the produce. Since most produce from the Arunachal Pradesh is sold within the state , not such attention or investment is made on proper packaging . Farmers, themselves or the marketing agents, as the case may be bring the produce to the market in a plastic creates or gunny bags. Once they are being sent to Guwahati/ Tezpur or other parts of neighbouring state of Assam, they are being packed in old cartoon boxes which are mostly old egg boxes.

The potential locations for setting up of post harvest management facilities including cold storage/cold chambers in the state of Arunachal Pradesh are Rupa and Dirang

d. Market Analysis: While ranging discussion with growers, fruit merchants, horticulture development agencies and other players indicate that limited production necessitated local sales. That was the reason given for no or little investment on the post harvest management. As per information provided by state Directorate of Horticulture, Naharlagun, it is only 40% of the total produce that is consumed locally and balance 60% goes outside the state. The local sales refers to sale within the state. The outside market refers to the adjoining state of Assam.

The produce has been going to Guwahati and other parts of Assam through Tezpur.

In specific, there is no marketing system for apple in the state. Various channels for marketing are in use. In most cases, growers take their produce to the nearby markets and sell them on their own. In some places , a few agents collect the produce from the growers and organise their sale in the local or nearby markets. Most of the agents from Assam who usually negotiate pre-harvest sales. There is no operational public sector undertaking for marketing and distribution of Apple and their by-products. As such the entire marketing and distribution system is un-intervened and managed by the private traders.

e. **Wastage:** Needless to mention that there is a sizeable percentage of wastage of apple associate with the farmers, retailers and wholesalers. It is observed that the percentage of wastage is much higher in respect of retailers as compared to wholesale traders. The estimated loss of produce is around 30%. The loss in farmer's field mainly confine with pre-harvest drop, poor quality in view of under developed colour, reduced size etc. These fruits have little or no market as fresh fruit either within the state or outside the state. With the present level production of 6557 MT of fruit, the marketed surplus would be 2,500 MT.

f. **Value addition:**

The development of agriculture sector, more particularly that of perishable products like fruits is incomplete without attention to all aspects of the utilisation of the produce. Thus, we have to integrate increased production with effective marketing strategy and plan for reducing the losses as well as improve marketability of produce through value addition by means of processing them into formwhich are less or non perishable.

3. The Strategy:

Any crop based enterprise has to look comprehensively at both the aspects of production and marketing of the produce. Based on the analysis of the current situation of apple production and marketing, it is recommended that an Integrated Apple Development Plan (IADP) for Arunachal Pradesh is put in place. True benefits from such an approach will be harvested only if we have improved the availability quality fruits for marketing. The perishable produce like fruit

(particularly apple) with seasonal production, the aspects of marketing assume greater importance. Accordingly, the departmental interventations are recommended to address the problem/ constraints in two areas of production and marketing.

The Integrated Apple Development Plan proposed to address the various issues in order to ultimately help us in restructuring the post harvest management and marketing of apples will consist of three major components.

i) Production enhancement
ii) Post harvest production management
iii) Value addition

While the second component will be the thrust area receiving maximum focus , the other two areas, due to their linkage with the second one, should also receive attention.

Association of personal, socio-economic and psychological characteristics of apple, large cardamom, orange growers with their entrepreneurial behaviour

The variables such as education, occupation, land holding, annual income, experience in fruit cultivation, social participation, self-reliance, cosmopoliteness and deferred gratification were found to have significant association with the entrepreneurial behaviour of apple, large cardamom and orange growers at five per cent level of significance. Whereas, extension participation and mass media exposure were found to be significant at one per cent level of significance with entrepreneurial behaviour of apple, large cardamom and orange growers. The remaining variables such as age, family size and value orientation had non-significant association with entrepreneurial behaviour of grape, lime and pomegranate growers.

Table 3: Association of personal, socio-economic and psychological characteristics of fruit crop growers with their entrepreneurial behavior

Sl. No.	Independent variables	Apple (n_1=40)		Large cardamom (n_2=40)		Orange (n_3=40)	
		χ^2value	C	χ^2value	C	χ^2value	C
1	Age	06.46 ^{NS}	0.38	05.32 ^{NS}	0.34	07.41 ^{NS}	0.40
2	Education	12.86*	0.48	12.62*	0.46	12.51*	0.44
3	Family size	06.86 ^{NS}	0.38	07.11 ^{NS}	0.39	08.49 ^{NS}	0.42
4	Occupation	11.43*	0.47	09.79*	0.44	09.72*	0.44
5	Land holding	12.17*	0.48	10.83*	0.46	11.59*	0.47
6	Experience in fruit crop cultivation	12.87*	0.49	11.92*	0.48	10.14*	0.45
7	Annual income	09.65*	0.44	12.31*	0.49	10.76*	0.46
8	Mass media exposure	22.94**	0.60	20.13**	0.58	19.86**	0.58
9	Extension participation	23.18**	0.61	24.17**	0.61	22.21**	0.60
10	Social participation	11.39*	0.47	12.62*	0.49	11.65*	0.47
11	Value orientation	5.58^{NS}	0.35	4.08*	0.29	5.85*	0.32
12	Self-reliance	11.31*	0.47	12.38*	0.49	10.51*	0.46
13	Cosmopoliteness	09.85*	0.44	11.85*	0.48	12.77*	0.49
14	Deferred gratification	11.73*	0.48	10.85*	0.46	13.11*	0.50

NS- Non Significant, *- Significant at 5 per cent level, **- Significant at 1 per cent level, χ^2 – Chi square, C- Contingency coefficient

Education of the apple, large cardamom and orange growers was found to be significantly associated with their entrepreneurial behavior. The probable reason might be the literate respondents have the ability to gather, interpret, critically evaluate and use information in an appropriate manner. Education helps an individual in proper planning, precise decision making and managing the production, post-harvest and marketing activities. The results are in conformity with the results of Sofegar (2017) and Sumana (2017). Land holding had positive and significant association with entrepreneurial behaviour. The probable

reason might be because of the fact that larger size of the land holding creates an economic base for the respondents to adopt, practice innovative technologies for deriving maximum benefit and also improves their risk bearing ability. Similar results were identified by Ekhande (2016) and Wanole et al. (2018).

Occupation and experience in fruit cultivation were found to be significantly associated with entrepreneurial behaviour. The probable reason could be that, the respondents who were involved in fruit cultivation as major occupation for many years, would have got higher yield, income and recognition than others. They will be having good management orientation, ability to coordinate farm activities which they got through experience. The findings were supported by Wanole et al. (2018). Annual income was found to have significant association with their entrepreneurial behaviour. The fruit growers having higher annual income have higher risk bearing ability and good management orientation. Similar results were identified by Naveen Kumar (2012) and Sumana (2017).

Both social participation and urbanization were found to have positive and significant association with entrepreneurial behavior of the apple, large cardamom and orange growers. Higher cosmopoliteness and social participation of the fruit growers ensures a lot of scope for the exchange of thoughts, feelings and facts with the outside society which enhances their mental horizon. The results are in conformity with the results of Sumana (2017) and Wanole et al. (2018). Self-reliance and deferred gratification were also significantly associated with the entrepreneurial behavior of grape, lime and pomegranate growers. Self-reliance helps to take better decisions in the farm and increases the responsibility of grower. Deferred gratification helps the growers to save for future uncertainties which helps in better management of farm and increases risk bearing ability of grower. The observations are in conformity with the observations of Rajendra Prasad (2016).

Mass media exposure of apple, large cardamom and orange growers was observed to be significantly associated with their entrepreneurial behavior at one percent level. The possible reason could be that, mass media play an important role in creating awareness about innovative practices. Growers with higher mass media exposure are able to get acquainted with knowledge of improved technologies and marketing aspects which help them for proper planning and decision making in taking up of farm operations. The observations are in conformity with the observations of Sofegar (2017) and Sumana (2017). The study also indicated that extension participation was significantly associated with the entrepreneurial behaviour of apple, large cardamom and orange growers at one percent level. Because, greater participation in extension activities helps the fruit growers to gather information from

different sources. Extension activities conducted in the area directly influence the awareness and knowledge among the fruit growers about improved practices and be the earliest to adopt new technologies than others in the community. The results are in consonance with that of Naveen Kumar (2012) and Sumana (2017).

4. CONCLUSION

Fruit crops can be used for various post-harvest and processing activities, which are huge entrepreneurial opportunities. Studying the socio-economic conditions of fruit crop growers is indeed crucial for effective policy design and successful implementation of governmental developmental programs in the horticultural sector. The study identified that variables such as education, land holding, annual income, occupation, experience in fruit crop cultivation, self-reliance, urbanisation, deferred gratification, extension participation and mass media exposure had a significant association with the entrepreneurial behaviour of fruit crop growers. Hence, the government and other concerned agencies should strive to manipulate these variables to their advantage for improvement in entrepreneurial behaviour of fruit crop growers

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