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*Research note*

## Kiwi value chain in Arunachal Pradesh: issues and prospects

Gyanendra Mani<sup>a</sup>, Ashish Kundra<sup>b</sup> and Azimul Haque<sup>c</sup>

<sup>a</sup>National Bank for Agriculture and Rural Development (NABARD), Itanagar, Arunachal Pradesh, India

<sup>b,c</sup>Government of Arunachal Pradesh, Itanagar, Arunachal Pradesh, India

**Abstract** This paper examines some issues related to the production and marketing of kiwi in Arunachal Pradesh, the largest producer of kiwis in India. It contributes 56.5% of the total 8.5 thousand tons of kiwis produced in the country. India imports 75% of its domestic demand for fresh kiwis and, therefore, there is huge scope to upscale kiwi production in north-eastern states in general and Arunachal Pradesh in particular. However, developing an efficient value chain is a challenge because of several infrastructural and institutional constraints like the non-availability of reliable data on production, lack of research and extension support, lack of organized marketing and post-harvest infrastructure, poor credit support, etc. A few solutions suggested for upscaling the kiwi production are : the formation of ‘Kiwi Producers Groups (KPGs)’, a dedicated research centre for kiwi, and sufficient credit flow to farmers .

**Keywords** Kiwi production, Value chain, Arunachal Pradesh, India

**JEL classification** Q11, Q12, Q13, Q14, Q15

### 1 Introduction

Agricultural sector in Arunachal Pradesh employs 60% of its workforce and contributes 30% to the gross domestic product (GDP). Amongst north-eastern states, Arunachal Pradesh has largest geographical spread - 8.37 million ha. But only 2.2% of the geographical area is arable. Average size of landholding is 3.52 ha, more than thrice of the all-India average. In other words, 109 thousand farm households in the state cultivate 384 thousand ha of land, of which only 30% is cultivated more than once. Small landholdings, measuring less than or equal to 2 ha comprise 37.32% of the total holdings and share 9.84% of the total area.

The state has huge unexploited potential in agriculture. Its strength lies in its natural endowments of diverse agro-climates (tropical, sub-tropical, and temperate) suitable for cultivation of different types of high-value crops, including fruits, vegetables, floriculture, medicinal & aromatic plants and spices. Horticulture contributes 40% to the total value of agricultural value

output. It, however, faces several, geographical, institutional and infrastructural constraints, which if addressed, may significantly enhance agricultural growth and welfare of the farming communities.

Land holdings are scattered, and are used mainly for subsistence production with little marketable surplus, except in the case of some horticultural crops like orange, apple, kiwi, pineapple and banana; and spices like large cardamom, ginger and turmeric. The small surpluses along with difficult geographical terrain make the aggregation of surplus difficult. Also innovations do not reach farmers due to poor extension networks. Food processing remains a non-starter.

In Arunachal Pradesh, computerisation and digitization of land records has not started so far. No cadastral survey has been done and no formal ‘ownership rights’ to land have been issued to farmers. Recently, the land law has been amended to recognise ‘Land Possession Certificate’ as deemed ownership, but the process is yet to take off. Farmers have customary rights on the land they cultivate, including *jhum* land and the land used for other purposes.

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\*Corresponding author: gyanendramani.sir@gmail.com

Farmers face a number of challenges, more prominently poor access to markets and finances, in their efforts in transiting towards market-oriented agriculture. Agricultural marketing system is under-developed, characterized by non-availability of sufficient marketing, storage, grading and standardization facilities, poor processing infrastructure and non-existence of aggregators. Farmer's limited access to institutional finance restricts them to adopt productivity-enhancing technologies and inputs, and to invest in land improvements, irrigation, mechanization and farm storage. Their financial requirements are not large, yet the commercial banks and other financial institutions are reluctant to provide credit to them because of the high cost of lending relative to size of the loan and higher lending risks. In the past few years, the state has experienced a decline in the crop loans and a near-stagnation in overall institutional credit support.

Some of the constraints related to product and financial markets that farmers face can be mitigated using value chain approach that brings chain actors including farmers, aggregators, traders, processors and financial institutions together to gain control over the processes of production, marketing, processing and distribution (Meyer 2007; Trienekens 2011). In this paper, we examine some of the issues related to production and marketing of kiwi, and prospects for value chain development. Rest of the paper is organized as follows. In the next section we examine status of kiwi production in Arunachal Pradesh, followed by a section on global trend in kiwi production. Section 4 presents a value chain framework for agricultural commodities. Prospects for developing value chain for kiwi in

Arunachal Pradesh are discussed in section 5. Some viable solutions suggested to address the challenges for upscaling of kiwi production are provided in section 6. Concluding remarks are made in the final section.

## 2 Kiwi production in India

The state has immense potential for development of horticulture, a high-value high-growth segment of its agricultural economy. Approximately, 56.5% of the total 8.5 thousand tons of the kiwis produced in the country come from Arunachal Pradesh. Note that, India imports 75% of its domestic demand for fresh kiwis. Thus, there is huge scope to upscale kiwi production in north-eastern states in general, and Arunachal Pradesh in particular.

No reliable estimates of area under kiwi cultivation are available. The Economic Survey of Arunachal Pradesh 2016-17 reports 3379 ha of land under kiwi producing 6047 tons of fresh kiwi fruits. According to the National Horticulture Board (NHB) that provides state-wise information on Kiwi production (table 1), Arunachal Pradesh contributes more than 50% to the total kiwi production. Nagaland is the second most important kiwi producing state.

India produces about 8500 tons of kiwi, just one fourth of its total demand. In 2016, it imported 24,481 tons of fresh kiwifruits by spending US\$ 32 million (table 2).

## 3 Global trends in kiwi production

The cultivation of kiwi (*Actinidia deliciosa* and *Actinidia chinensis*) or Chinese gooseberry spread from China in the early twentieth century. Though native to China, until recently kiwi was not produced much there

**Table 1. Production of kiwi fruit in India**

States	Production (000t)				% share in all-India			
	2011-12	2012-13	2013-14	2014-15	2011-12	2012-13	2013-14	2014-15
Arunachal Pradesh	4.54	4.72	4.06	4.80	80.30	65.86	49.27	56.48
Nagaland	-	0.42	2.40	2.40	-	5.86	29.12	28.24
Mizoram	0.24	0.69	0.88	1.03	4.24	9.63	10.68	12.12
Sikkim	0.72	0.78	0.79	-	12.74	10.88	9.59	-
Himachal Pradesh	0.15	0.56	0.11	0.26	2.65	7.81	1.33	3.06
Jammu & Kashmir	-	-	0.01	0.01	-	-	0.12	0.12
Total Production	5.65	7.17	8.25	8.50	100.00	100.00	100.00	100.00

Source: National Horticulture Board (NHB) <http://nhb.gov.in>.

**Table 2. Imports of kiwifruit, 2012-2016**

Year	Quantity (t)	Value (000 US\$)	Import price (US\$/t)
2012	5,460	9,138	1674
2013	5,492	9,405	1712
2014	6,575	12,973	1973
2015	12,389	22,154	1788
2016	24,481	32,161	1314

Source: [http://apeda.in/agriexchange/ProductSearch/Product\\_Detail.aspx?hscode=081050](http://apeda.in/agriexchange/ProductSearch/Product_Detail.aspx?hscode=081050).

on a large scale because traditionally it has been considered as a wild fruit. New Zealand was the first country to exploit its commercial production. In 1962, New Zealand growers began calling it “kiwifruit” to provide it a market orientation, and subsequently a California-based importer Frieda Caplan used this name while introducing it to the American market (Wikipedia – ‘Kiwifruit’ accessed on 22 Nov 2017).

Until the mid-1980s, New Zealand dominated global kiwi production and accounted for about three-fourths of the total global kiwi area (table 3). Its share declined gradually to about 25% because of its increasing cultivation in Europe and Asia. In 1990, 39% of the total kiwi area was concentrated in Europe, mainly in

Italy, France, Greece, and Spain. However, with growing global demand, China has emerged as the largest producer, consolidating its share to 66% in 2014 from 6% in 1990. A similar picture emerges from an analysis of production trends as well.

The trends in yield of kiwi in major producing regions of the world presented in table 4 show that, except in Oceania that has experienced substantial yield growth, it has either remained stagnant or increased on the margin.

Kiwi is one of the most traded fresh fruits with 104 exporting and 118 importing countries. Table 5 presents information on the top 10 exporting and importing countries. New Zealand is the largest exporter, in quantity as well as value terms, followed by Italy and Chile. While, kiwi exports are concentrated among a few countries, imports have a larger regional spread. It is interesting to note that China is the largest importer, followed by Japan, Belgium and Germany.

#### 4 Value chain frameworks for agricultural commodities

A value chain can be described as the ‘organized links among groups of producers, traders, processors, and service providers, including non-governmental organizations (NGOs), that join together to improve

**Table 3. Global distribution of kiwi area and production**

Year		Europe	North America	South America	Asia	Oceania
	Area (ha)	% share in area				
1990	70674	38.7	4.2	17.3	14.4	25.3
2000	127358	21.9	1.7	6.1	60.5	9.9
2005	151921	21.6	1.2	4.3	65.2	7.7
2010	172763	22.0	1.0	6.3	63.0	7.7
2014	219134	18.4	0.8	4.9	70.4	5.6
	Production (t)	% share in production				
1990	843011	48.4	4.2	4.4	9.6	33.4
1993	901691	50.4	4.9	10.4	8.0	26.3
1997	867886	40.4	3.3	14.6	15.6	26.0
2000	1869658	28.2	1.7	6.2	49.7	14.3
2005	2278836	25.7	1.5	6.6	52.1	14.1
2010	2728776	24.0	1.1	8.8	50.1	16.1
2014	3447604	22.7	0.8	7.7	56.8	12.0

Source: [www.fao.org/faostat](http://www.fao.org/faostat).

Note: Data on China prior to 2000 was taken from Huang & Ferguson (2001).

**Table 4. Yield of fresh kiwi fruits (t/ha)**

Year	World	Europe	North America	South America	Asia	Oceania	China
1990	12.00	15.01	12.07	3.04	7.96	15.82	1.25
2000	14.68	18.92	14.43	14.86	12.07	21.19	12.14
2005	15.00	17.85	18.49	22.73	12.00	27.55	12.94
2010	15.79	17.19	17.43	21.93	12.57	33.03	12.76
2014	15.73	19.37	15.56	25.02	12.70	33.84	12.69

Source: [www.fao.org/faostat](http://www.fao.org/faostat).

**Table 5. Top 10 kiwi exporting and importing countries in 2016**

Exporters				Importers			
Rank	Country	Qty (t)	Value (US\$ 000)	Rank	Country	Qty (US\$ 000)	Value
1	New Zealand	574,282	1,291,993	1	China P RP	125,988	343,098
2	Italy	393,902	488,533	2	Japan	93,192	286,854
3	Chile	201,508	273,959	3	Belgium	153,155	207,777
4	Belgium	79,808	124,201	4	Germany	123,757	190,230
5	Greece	110,816	91,893	5	Spain	161,794	167,001
6	Iran	51,960	57,100	6	U S A	82,742	154,468
7	Germany	28,992	43,681	7	Other Asia	48,109	133,249
8	France	25,358	36,173	8	Netherlands	60,865	109,953
9	Netherlands	21,649	27,185	9	France	67,146	109,695
10	Spain	14,312	22,295	10	Russia	63,949	66,670
16	China P RP	2,035	3,228	18	India	24,481	32,161

Source: [http://apeda.in/agriexchange/ProductSearch/Product\\_Detail.aspx?hscode=081050](http://apeda.in/agriexchange/ProductSearch/Product_Detail.aspx?hscode=081050).

productivity and value addition' (ADB, 2013). Thus, a modern value chain differs from the traditional supply chain in its integration of back-end and front-end activities, and governance structure.

In India, rapidly growing market for high-value food products (Joshi and Kumar 2016) is creating an opportunity for downstream chain actors to expand their businesses integrating the 'front-end' activities of wholesaling, processing, logistics and retailing to the 'back-end' activities of production through institutional arrangements such as contract farming and informal or formal producers' associations. In fact, in the last few decades, India's agricultural marketing system has undergone a transformation on account of (i) rapid growth in horticultural production, and (ii) rise of organized supply or value chains, especially for horticultural commodities. These changes have been triggered by the rising demand for high-value food

commodities, in addition to increasing consumer's awareness about quality and safety aspects. Consequently, the production, processing and distribution systems are adapting to these changes in demand.

For financial institutions, value chains can facilitate their outreach to chain actors, mainly small-scale producers and entrepreneurs, and to reduce transaction costs and risks associated with small loans. Further, value chain approach with its product market orientation can serve as a guarantee or collateral for funding. According to Miller and Jones (2010), 'if the financial institutions can tailor their products and services along the value chain, these can reduce transaction costs, enhance their outreach to small-scale producers and entrepreneurs and improve their repayments'.

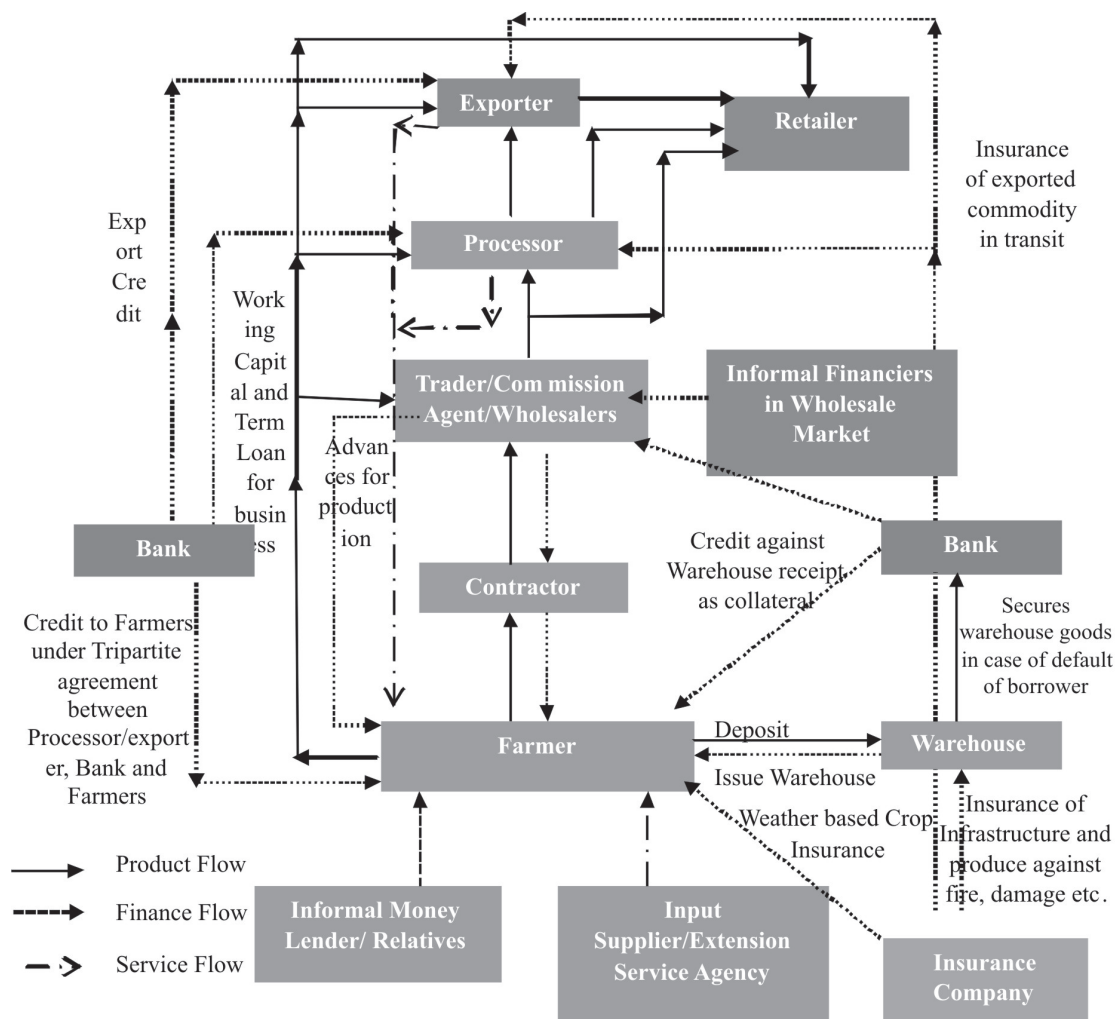
Figure 1 shows a comprehensive value chain model involving the flow of funds amongst various stakeholders (Birthal et al. 2014).

The production of horticultural crops in India, estimated at 283.4 million tons in 2015-16, has exceeded the production of foodgrains, yet the value chains for these have not developed. Value chains for horticultural crops range from the preliminary 'producer to consumer' links to 'grower – pre-harvest contractor/local middlemen – commission agent/trader – wholesaler – retailer – consumer' (sale through *mandis*), to even longer chains leading to export markets, depending upon the nature of the final output.

In the traditional chains, commission agents (CAs) are the dominant actors, serving as an indispensable link between the farmers and the traders, and performing

the task of grading, sorting, and weighing the fruits bought from the farmers, finally auctioning the product in the same or other markets. Most farmers prefer to sell their produce to some known CAs as they are used to transacting with them, and many of them avail credit from them.

A number of localized value chain models for marketing of fruits and vegetables have been working successfully in different parts of the country. The cooperative retail chains HOPCOMS in Karnataka and SAFAL (now MDFVL) in Delhi source their requirements from producers' association. SAFAL, promoted by the National Dairy Development Board, procures its requirements through informal producers' associations promoted by it. Many export-oriented agribusiness firms have promoted producers'



**Figure 1. Value chain and flow of funds across chain actors**

Source: Birthal et al. (2014).

associations to control over the production process to enable the farmers to comply with safety standards of the importing countries. For example, the Agrocet Industries secure their requirement of organic cotton and Basmati rice through producers' associations (Chen et al. 2015); and Mahagrapes (an apex organization of grape growers) sources grapes through cooperatives (Roy and Thorat 2008).

## 5 Kiwi marketing and value chains in Arunachal Pradesh

There are several types of kiwis grown in the world; purple kiwi, silver vine, green Hayward (most common), red kiwi, golden kiwi, hardy kiwi (mini kiwis), etc. Green kiwis and golden kiwis are common in India. Most of the golden varieties are imported, although these are grown on a limited scale in India because of their higher prices. In India, the commercially grown cultivar are Abbot and Allison (early maturing with sweet, oblong, medium sized fruits covered with dense hairs, and low ascorbic acid). Bruno is a heavy bearing with long, dark brown bristly hair, and is high in ascorbic acid and titratable acidity. Hayward is the most popular biennial bearing cultivar, with broad and fruit flat, superior in flavour and sugar and ascorbic acid). Monty resembles to Abbot and Allison, and is prolific bearer with high acidity and medium sugar content (<https://en.wikipedia.org/wiki/Kiwifruit>).

In Arunachal Pradesh, two kiwi wineries have been established at Ziro in Lower Subansiri district and Dirang in West Kameng district. Once these are fully operational would create more demand for kiwifruit. In fact, with present level of kiwi production in the state, these are unable to utilize their established capacity.

The recently launched kiwi wine "NAARA-AABA" brand brewed by M/s Lambu Subu Food & Beverages at Hong village (Ziro) in Lower Subansiri district claims to be the first Indian pure organic kiwi winery and the second in the world. The unit has processing capacity of 40,000 litres and can accommodate all the kiwis produced in the state in a single batch. The second organic winery unit established at Dirang of West Kameng district is also expected to be operational soon with 'Blue Sheep' brand.

The production of wine using the kiwifruit from Arunachal Pradesh is not the maiden attempt in India.

A pilot project to produce kiwi wine with brand name of 'Arun Kiwi' was attempted by the Pune-based Hill Crest Foods & Beverages Pvt Ltd in December 2013. The winery entered into a MoU with Arunachal Pradesh Horticultural Produce Marketing & Processing Board (APHPM&PB) for sourcing raw material. Rhythm Winery, a part of the Hill Crest Foods & Beverages Pvt Ltd, procured about 2.0-2.5 tons of kiwi fruits from Arunachal in 2014, however, afterwards it did not procure any raw material from the state.

The kiwifruit of Arunachal Pradesh reaches consumer through (i) grower – commission agent – wholesaler – retailer, and (ii) grower - commission agent – wine processing unit – wholesaler – retailer. The second channel accounts for a small share of the total marketed surplus. In the first channel, value addition, in terms of sorting, grading and packaging, is rare at the first two levels, i.e. at farm and commission agent level. The value addition takes place at wholesale level before transferring the produce to retailers.

Developing an efficient value chain in the state is a challenge on account of several factors as described below:

**No reliable statistics on area and production:** Kiwi though is an important horticultural crop in Arunachal Pradesh; hardly any reliable estimates on various aspects of its production and marketing are available, making it difficult for entrepreneurs to assess prospects for investment in value chains.

**Low yield:** Yield of kiwifruit is low due to lack of package of cultivation practices and poor maintenance of orchards. Training and pruning of undesired branches during off-season are considered important agronomic practices for good yield. Kiwi vine normally grows 2-4 m every year and becomes overcrowded and unmanageable if not controlled through pruning. Similarly, thinning is also important to reduce number of fruits in a bunch so that fruits grow to a normal size.

**Lack of research and extension:** Since the cultivation of kiwi is limited to a few north-eastern states; it has not received any attention in agricultural research. Extension support remains poor because of scattered cultivation in difficult terrains.

**Lack of quality nurseries:** Availability of good planting material that too of a known variety, is also an important constraint probably because of poor research and extension support.

**No variety specific orchards:** Most of the orchards in the state have a mixture of varieties, and these when sold without grading fetch lower prices. This is because of non-availability of variety specific nurseries.

**Lack of organized marketing and post-harvest infrastructure:** Recently, efforts have been made to attract organized retailers like 'Big Basket' to procure kiwis from the state. Yet, this system is to be established and stabilised. Farmers often sell entire orchards to commission agents/wholesalers mostly from Guwahati, Assam. Most farmers do not grade their produce, resulting in low offer price from buyers. Lack of primary processing, logistics and post-harvest infrastructure often cause deterioration in quantity as well as quality. Farmers often bring fruit bags on their heads to the nearest pick point, from there these are transported through small vehicles to the local markets, and through trucks to Guwahati market.

**Lack of processing industries:** Kiwi from Arunachal Pradesh is marketed for consumption as fresh fruit. There are only two wineries, that too were established recently. But, their viability is a concern as kiwis are available only for 3-4 months, which is not sufficient to run both the wineries.

**Poor credit support from financial institutions:** Establishing an orchard is capital intensive. The initial cost to establish an orchard is around Rs. 5 lakh per ha. Farmers are capital constrained and lack access to credit from commercial banks and other such financial institutions. In 2016-17, total institutional credit to plantation and horticulture was 1.09 crores, but it is difficult to estimate how much of it was allocated for kiwi plantation. The absence of clear land title makes it difficult for banks to use land as collateral.

## 6 Viable solutions

**Form 'Kiwi producer/ farmers' groups and their digitization:** There is an urgent need to promote 'Kiwi Producers Groups (KPGs)'. Creating digital records on area, production and varieties grown should be attempted at the time of enrolling growers as member of KPGs. This will help stakeholders to develop strategies in their respective areas of strength to take advantage of enhanced kiwi production in the state.

**Establish a research centre or cell on kiwi:** The state government with support from the union government

may consider establishing a dedicated research centre or cell at Horticulture College, Pasighat for research on varietal improvement and development of agronomic practices.

**Strengthen extension services:** The state horticulture department in coordination with Krishi Vigyan Kendras (KVKs) should develop a suitable strategy for putting in place an effective extension network in the kiwi growing areas. KVKs should consider putting demonstration plots and organising on-farm training camps. Some financial support should be provided by the state government in addition to what is already available under Horticulture Mission for North East and Himalayan States (HMNEH).

**Develop good nurseries:** The horticulture department should identify suitable locations for developing specialised kiwi nurseries. The state government may also consider providing financial support to Horticulture College, Pasighat, and KVKs to develop nurseries on scientific lines.

**Develop organized marketing systems and post-harvest infrastructure:** The 'State Marketing Board' should assess critical gaps in marketing of kiwi, in terms of requirement of cold storages and packaging infrastructure, etc. The Board may also consider creating its own brand, and sell through its own retail outlets, and also tie-up with organized retailers.

Alternatively, the possibility of having a state level tie-up with 'Zespri International Limited', New Zealand for marketing of kiwi produced in the state.

**Develop integrated pack houses:** There is a need to establish integrated pack houses at kiwi production centres to reduce post-harvest losses. The state horticulture department in collaboration with the state Marketing Board should identify suitable locations to establish pack houses and develop suitable arrangements for transporting the fruits safely from orchards to these pack houses.

**Certification of organic orchards:** Arunachal Pradesh has already been declared as 'organic state' and the wineries coming up in the state have also been targeting to produce organic wine. Hence, there is need for certification of kiwi orchards in order to establish credibility of the brand Arunachal.

**Ensuring viability of processing units:** The best support to upcoming wineries in the state would be to

ensure uninterrupted supply of raw material to run these throughout the year. However, given a limited window for kiwi production it appears that the processing of kiwi fruit alone will not make these wineries viable. These wineries should also explore possibility of utilizing their processing capacity using alternative fruits such as apple and orange.

**Rejuvenation of old/ unorganized orchards:** Many of the orchards are old and unorganized, leading to decline in their productivity. The efforts are needed to rejuvenate the old orchards providing farmers credit, and maintenance support.

**Modernize markets:** The amendment of the Agricultural Produce Market Committee Act has given a boost to contract farming in the state and created enabling conditions for electronic National Agricultural Market (e-NAM).

**Financial support:** There is a need to upscale the credit flow to kiwi growers by the financial institutions. Contract farming arrangements with farmers, winery units and commercial banks under tripartite arrangement for financing of the entire value chain of kiwi crop would help all the stakeholders.

## 7 Conclusions

The state of Arunachal Pradesh must respond to the signal from quantum growth in imports of kiwifruit in India. Kiwi produced in Arunachal Pradesh has a unique selling proposition in a market where demand outstrips supply. The challenge lies in taking the first mover advantage and firmly establishing the state as the market leader at least in high value markets. This will entail a much focussed approach that addresses the various challenges of the entire value chain, targeting the farmers who are already engaged in cultivation and encouraging more farmers to venture into kiwi cultivation. Equally, the entrepreneurs who have taken the investment risk in establishing processing facility must be provided hand holding support by the state to ensure that these ventures become successful and encourage other entrepreneurs to venture in this field. Two wineries have already been set up in the state that further necessitates that the state government must rise to the occasion to ensure the viability of these units. However, till the time the production of kiwi in the state reaches to the desired level, a suitable strategy for area expansion and yield

enhancement of other important horticultural crops like orange, apple or any other vegetable which can be processed in these units to make these viable. Investment in research and marketing structures is prerequisite to harvest the benefits of investments in other components.

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