

**EMERGING HORTICULTURAL CROPS OF NORTH-EASTERN STATES OF INDIA
SUITABLE FOR PRECISION FARMING TO IMPROVE LIVELIHOODS OF FARMING
COMMUNITY - WITH SPECIAL REFERENCE TO KIWI FRUIT**

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Abstract: Kiwifruit or Chinese gooseberry (*Actinidia chinensis* Patch) originated in china and commercialized first in New Zealand. Kiwi introduced in Himachal Pradesh, India in 1963, is now fairly introduced in North East Indian states viz. Arunachal Pradesh, Sikkim, Meghalaya and Mizoram and has wide scope in expanding its production. Arunachal Pradesh is leading producer of Kiwifruit, though other states have also priorities the fruit for area expansion. Despite congenial climate and soil, the lack of quality planting material, package of practices, modern technology and trained manpower are the major constraints in enhancing the productivity of temperate fruits in general and stone fruits and kiwi in particular. Keeping in view the constraints, ICAR Roving team for temperate fruits have recommended the road maps for cultivation of temperate fruits in NE hill region. The paper elucidate the major technologies developed for increased productivity in kiwifruits. Priority area, economic estimate and organic production of to be studied for precision farming of Kiwifruit has also been discussed.

Introduction: North Eastern Hills of India have rich resources of soil and agro-climate making them an ideal region for horticulture industry. North East is sixth mega-centre of rich plant-biodiversity in the world and therefore a natural home of origin of many important horticulture crops. The wild relatives of apple, kiwi, temperate fruits and nuts are found

growing in natural form in NE forests, reflecting scope of wide adaptability of various temperate fruit crops. Fruits namely apple, pear, plum, peach are grown semi commercially in the NE-Hill states particularly in Arunachal Pradesh, Sikkim, Nagaland and Meghalaya. Walnut, Pecan nut, Strawberry and Kiwi fruit are also experienced under area expansion.

Suitable Zone	Horticulture Crop
ZONE-I Foothills and valley [170-915m]	Citrus, Guava, Banana, Litchi, Mango Pineapple, Papaya, Seasonal vegetables
ZONE-II Mid hills [915-1830m]	Peach, Plum Apricot, Pears, Almond, Pomegranate, Low chilling apple, Seasonal vegetables, Floriculture
ZONE- III High hills [>1830 m]	Apple, Cherry, Walnut, Chestnut, Kiwi, Persimmon, Off season vegetables, Seed production of vegetables n and flowers
ZONE- IV Rainshadow areas [with chilling Off season vegetables Requirements]	Apple, Pear, Plum, Peach, Apricot, Almond,

Commercial Temperate Fruits of North-East States: Among the temperate fruits, cultivation of apple, pear, kiwi, peach and plum is done on commercial scale. The best suited tract for apple and kiwi cultivation is in Arunachal Pradesh. Cultivation of pear is promising in Sikkim, while stone fruits like peaches and plums are mostly concentrated around Maram and Ukhrul area of Manipur and around Shillong in Meghalaya which constitute sub-temperate areas. In the sub-tropical hills low chilling varieties of apple, peach, plum, apricot and pear are getting popularity as crop diversification (Jindal and Singh, 2015).

The lack of quality planting material, package of practices, modern technology and trained manpower are the major constraints in enhancing the

productivity of temperate fruits in general and stone fruits and kiwi in particular. The technologies generated in Dr Y S Parmar University of Horticulture and Forestry, Solan have been transferred with the co-operation of scientists, State Departments of Horticulture and farmer to farmer interaction facilitated by national agencies like National Horticulture Board and APEDA. The technologies available for the farming communities in NE, particularly in high hills of Arunachal Pradesh and Sikkim for low chilling fruits such as Kiwi Fruit are discussed here in.

It is pertinent to mention that recently kiwifruit has caught imagination of producers in Arunachal, Sikkim, Nagaland, Manipur and Meghalaya. However productivity of temperate fruits is low. Causes of low

productivity visualized are selection of areas for expansion in high hills and valleys having spring frost and temperature fluctuations during flowering time adversely affected fruits yield. Trees hardly receive desired training and pruning resulting in poor fruiting. Pollinizing varieties are insufficient and disproportionate resulting in the lack of pollination and fruit set. Lack of quality planting material and technical knowhow have added serious dimensions to productivity problems (Jindal, 2016a). ICAR Roving Team of experts has suggested priority activities and Research and Development plans and Roadmap for

expansion of kiwi, apple and walnut.

Present Scenario of Temperate Fruits In North East: In North East Region, large parts of Arunachal Pradesh, Sikkim and some part of Nagaland and Meghalaya fall under sub-temperate zone. Whereas, low hills of Assam, Meghalaya, lower hills of Arunachal Pradesh and Sikkim fall under sub-tropical zone, while part of Tripura and Mizoram under coastal/tropical zone. Areas suitable for temperate fruit growing in N.E. Region states are presented in Table 1 and area and production in Table 2.

Table 1. Areas suitable for temperate fruits in different states of north eastern India.

Name of the State	Locations	Approximate range of elevation (amls)	Fruit crops that can be successfully tried
Arunachal Pradesh	Kameng, Tawang, Siang, Trirap and Lohit District	900-4000 m	Apple, Peach, Plum, Pear, Apricot, Walnut, Chestnut, Cherry.
Meghalaya	Central plateau-Khasi and Jaintia hills districts.	950-1900 m	Plum, Pear, Peach, Apricot, Persimmon.
Manipur	Sekmai, Maram, Tadubi, Mao, Ukhrul, Tengnoupal.	900-2000 m	Peach, Plum. Pear, Apricot, Persimmon.
Nagaland	Mokokchung, Wokha, Tuensang, Kohima. Phek districts.	1000-3000 m	Peach, Plum, Pear, Apricot.

Table 2: Area and Production of temperate fruits in North East states of India

Fruits	Arunachal Pradesh	Manipur	Meghalaya	Mizoram	Nagaland	Sikkim
Apple	A 12,800 P 10,000	- -	- -	- -	A 750 P 150	A 50 P <50
Pear	A 125 P 681	A 160 P 1000	A 30 P 185	A 60 P 210	-	
Kiwi Fruit	A 4,052* P 4,956*	A 20*			A 2000* P – NA	A 93** P 780
Low Chill Plum, Peach & Other	A 430 P 961	- -	- -	A 36 P 99	A 327 P 592	

Based on ICAR Roving Team 2012-13 [A - Area in hectares and P- Production in tonnes] Arunachal and Manipur Kiwi data from MIDH Database 2014-15 * Nagaland Feb2016 – Personal Communications

** Sikkim Organic Mission'2013

ICAR's Roving Team for Suggesting Road Map for Temperate Horticulture In The North East Hills:

- 1) Asses the present status and future scopes of temperate horticultural crops, fruits and nuts in particular, in the high hills and mountains of North Eastern States.
- 2) Analyze climate change parameters and suggest R & D intervention areas for successful commercial cultivation of apple, nut crops, kiwi and wine grapes in suitable pockets.

- 3) Suggest immediate actions under MM I and MM II of Horticulture Technology Mission for hill states.

Abstract of Report & Recommendations of Roving Team of ICAR: Temperate fruits, namely, apple, pear, plum, peach are grown semi-commercially in the NE Hills states, particularly in Arunachal Pradesh, Sikkim, Nagaland & Meghalaya. Walnut, Strawberry and Kiwi also experienced area expansion. Apple in rain shadow belts in Arunachal Pradesh with high density planting system has been

reported to enhance productivity in a big way. Similarly, Kiwi has caught imagination of producers in Arunachal Pradesh, where not only productivity is good, but also the quality of the produce is reported to compare favorably with Australian kiwi fruits that are in good demand in the international market. The road map for the establishment of a sound temperate fruit industry in Arunachal Pradesh and Sikkim suggested below:

A) Arunachal Pradesh: Arunachal Pradesh is the only leading state in the NEH suitable for apple production. In more recent times Kiwi and Walnut are showing promise in the temperate- alpine zone, particularly in the rain shadow belts. High hills of West Kameng, Tawang, Ziro, Anini, Upper reaches of Anjaw, Upper Subansiri and upper Siang are suitable areas for apple.

B) Sikkim: Sikkim had a meager area of 200 ha in apple with limited potential for expansion. The existing orchards were sick, infected with scab and cankers and had no systematic training and pruning of trees. They needed rejuvenation, proper training and technological interventions for management of pests and diseases. The other temperate crops which have potential are kiwi fruit, pear and walnut. Apple has not been included as a focused crop under Horticulture Technology Mission and State Govt. to come forward with specific programme for temperate fruits, Asiatic Pear and Kiwi in particular.

Thrust Areas in Kiwi Fruit Production:

1) Arunachal: The Kiwi fruit is a berry, oblong in shape with brown skin similar to Sapota (Chikoo). The fruit has a refreshing, delicate flavour, pleasing aroma and high nutritive and medicinal values with low calories. The centre of origin of Kiwifruit lies in China and hence is crown as Chinese gooseberry. It is grown well in the mid hills under moderate to high rainfall conditions with a wide range of adaptability having no serious pests and diseases. The fruit ripens during October/ November which is a lean period for other fruits in the market. During this period rains stop and temperature slides down providing less chance of road blockade and spoilage thereby ensuring possibility of supply for long periods without creating glut and fetching high prices (Jindal, 2016b).

Kiwi fruit was first introduced in India in 1963 (Rathore, 2001) in Shimla and later spread to other part of the country. Introduction of Kiwi in Arunachal Pradesh is of recent and has assumed tremendous popularity and preference among the growers as well as consumers due to its favourable properties for easy maintenance and marketing besides having high nutritional and medicinal values. The Kiwifruit of the state has already attained commercial identity not only in the local markets but

also in the national as well as international markets. As the Kiwifruit originated in China on the northern front of the eastern Sub Himalayan ranges, the inherent potentiality for its commercial cultivation on the southern Sub Himalaya ranges is obviously evident. This is the future crop of the state which could provide sustenance to the economy of the rural masses and the state.

Diversification in any farming system provides sustainability to the major occupation. Cultivation of minor temperate fruit crops can impart sustainability to the promotion of temperate horticulture venture.

2) Sikkim: West Sikkim is taking lead in kiwi fruit production. More and more farmers in Richenpong, Deythang and Soreng areas are growing the fruit with support from State Department of Horticulture under Horticulture Technology Mission guidance. There are now many progressive kiwi fruit growers of Darap, Singyang, Nambu, Yuksom, Nessa, Kaluk, Uttaray, Yangsum area of west Sikkim. It is interesting to note that wherever Kiwi is grown, large cardamom is there. This means that large cardamom can be inter-planted in new kiwi orchard. It is grown in 93 hectare with production of 780 tonnes (Sikkim Organic Mission, 2013).

Precision Farming (Advanced Horticulture Production Systems) In Kiwi Fruit: In general the precision farming of Kiwi fruit in Arunachal and Sikkim require scientific manual of training and pruning, quality improvement of fruits besides proper post-harvest management practices as major attributes to sustain its cultivation to meet the international standards.

Training and Pruning of Kiwi Plants For Quality Production: The exotic kiwifruit has shown tremendous potential in the recent years and has been assessed as a model fruit for diversification of mid hill horticulture in West Sikkim with scope in Upper Gyathang, Dzongu areas of North Sikkim Ranipul, Rhenock, Pakheyang in East and Kewzing and Zaubari in South under Horticulture Technology Mission. The transfer of technology on the improved cultivation in production with main emphasis on training and pruning will further enhance the scope of kiwifruit in mid hills of other districts of Sikkim where stone fruits have shown declining trend in the recent past due to their perishable nature and poor marketability. In order to have high yield of quality fruit of Kiwi a training manual is required for proper training and pruning of Kiwi fruit plants to boost the productivity of quality fruits with international marketing standards and grades.

A. Provision of Support Structures for Training: There are generally two recognized support structure for kiwi fruit, the T-bar system and overhead pergola. These are illustrated in Fig 1. T-bar

system is simple and cheaper to establish under Sikkim conditions. Overall yield may be lower, but this may be compensated by easier management manually and earlier attainment of full cropping potential. On the contrary pergola system though gives complete cover with leaves and fruit, but little light penetration lower side and reduction in cultural operations. Wind damage is also less of problem with this system. However it is more expensive to construct and needs more labour to maintain. It may also reduce access for bees and rot may be more of problem. Some of the pergola system observed in present studies are not properly laid out for want of more inputs. Under Sikkim conditions, hence, T-bar system is more efficient and workable.

B. Provision of End Posts: Since, the weight of the kiwifruit vines and fully grown fruiting area is greater every year, stronger end and structures are needed. Two major strainer assemblies area followed all over are shown in Fig. 2 and 3 for either the T-bar or pergola. In India Tie back end assembly is more common.

C. Layout of the T-bar System: The standard T-bar is 1.8 m tall and 1.5 m wide (Fig. 4) one wire slanting on pole as end post and 5 straight wires at distance of 45 cm between lines are provided. The T-bar posts are kept at 6 m distance. The initial training of kiwifruit vine in both the T-bar system and the pergola is essentially the same. As shown in Fig. 5 vines are planted midway between 2 iron posts of 6.0 m apart. A light stake of bamboo is placed next to vine and attached to the central wire. The strongest shoot is selected and lightly but securely tied to the stake at regular interval with thread or sutli until it reaches the top. The main shoot must not be allowed to twist tightly around the stake. When the main leader branch is more than 2 meters, it is then tied with wire. In order to encourage side shoots permanent leader shoots is cut near the wire (Fig. 6) for producing two side shoots on opposite direction. From this permanent shoot, two non-permanent shoots 25-30 cm apart are selected with right angle from main leader shoot. These shoots are tied to outside wires which bear fruit in first year, while in the second year fruiting will take place from laterals. After 3-4 years, T-bar will be furnished with 2 strong leaders in opposite directions and fruiting arms as shown in fig 7.

Pruning practice of kiwi plants: As stated above the objective of pruning is to strike a balance between vegetative growth and reproductive fruiting growth so as to get fruit every year with better quality. In kiwi fruit plants, the fruits are borne on current season growth coming out of one year old shoots. Normally 4 to 12 buds from the base will bear fruiting.

More vigorous shoots later on will twin disrupting air and light sometime. These inter twining shoots need to be cut back or pinched off during summer little away for the fruiting nodes.

Precautions during pruning required:

1. Fruiting occurs on current season shoots coming out of last year growth.
2. Only 4-12 buds producing shoots from the base will bear fruits.
3. Annual growth of shoots is normally left upto 3 meters, while excessive shoot growth will produce twinning shoots which are required to be removed in summer and winter pruning.
4. Heading back of old shoots will not yield fruit in the current season.
5. The buds on basal end are smaller initially but get developed in fruiting buds/flowers where as such buds do not exist in upper side of the shoots.

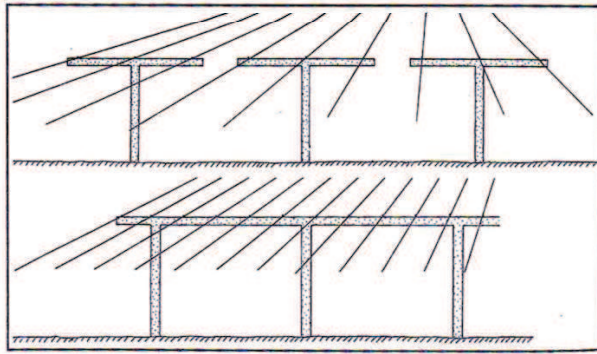
Keeping in view all above points, pruning is done in such a way that fruiting shoots are encouraged every year. For ensuring this, after 3-4 years lateral replacement system is followed where in basal shoots coming out of main branch need to be headed back so that these produce 4-5 fruiting shoots with 4-5 buds/internodes. The fast growing vegetative shoots which are sometimes criss-crossing should be removed in summer. The fruiting shoots need to be tripped off in summer.

Time of Pruning:

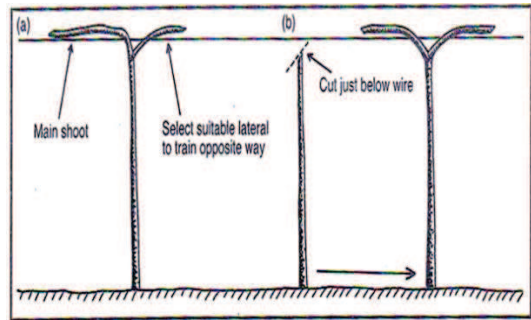
(a) **Winter Pruning:** In dormant winter pruning, the fruiting laterals are cut back to vegetative lands beyond the last fruit. In the second year these vegetative lands produce the fruiting shoots, which is pruned again. The arms on lateral shoots are pruned and allowed to fruit for 3-4 years. After this the lateral is removed from the main branch and other laterals are selected and pruned accordingly so that balance between vegetative and reproductive growth is maintained for the continuity in the fruit production.

In Hayward variety, buds are kept more during pruning so as to have more fruiting shoots as this variety is shy bearer. In first year the shoots do not bear fruits but later on 4-6 buds are maintained to have more sustainable fruiting.

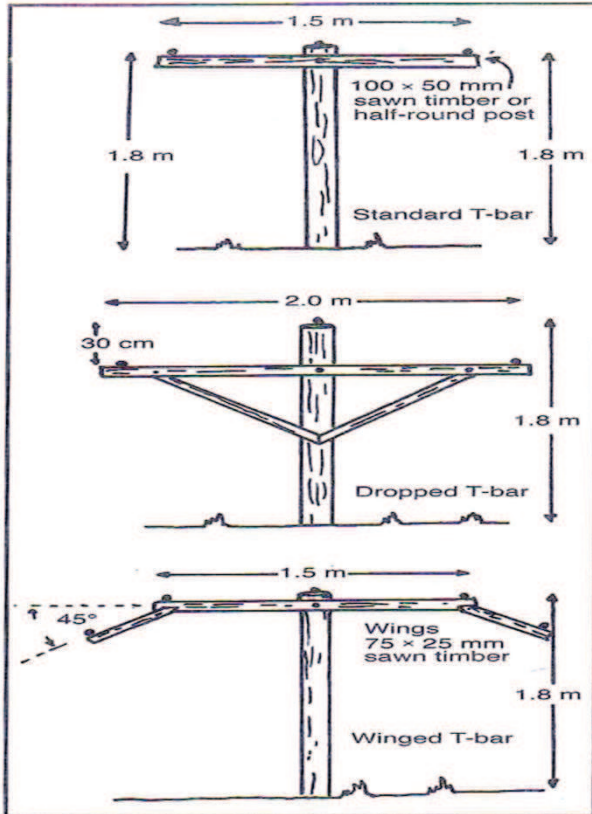
(b) **Summer Pruning:** It is generally practiced only to maintain proper food supply to growing fruits and allow proper aeration and light, so as to encourage heavy fruiting on shoots. In summer pruning, shoots with 6-8 buds beyond fruiting area are headed back. The main purpose is check shading, removal of twining and crossing branches. The pruning wood is used for preparation of semi-soft wood cuttings for propagation.



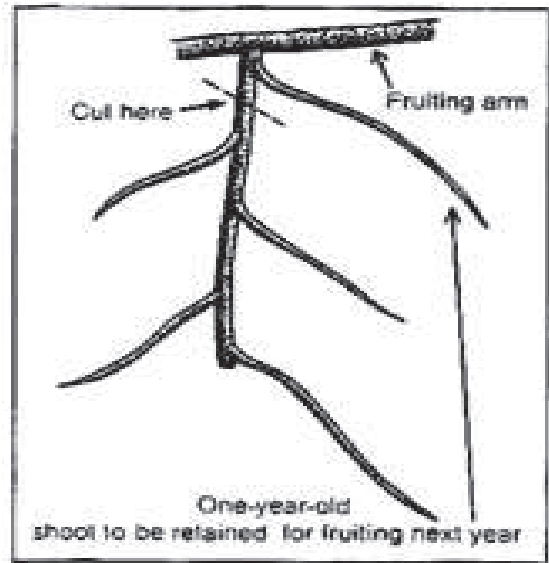
T-bar and overhead percola.



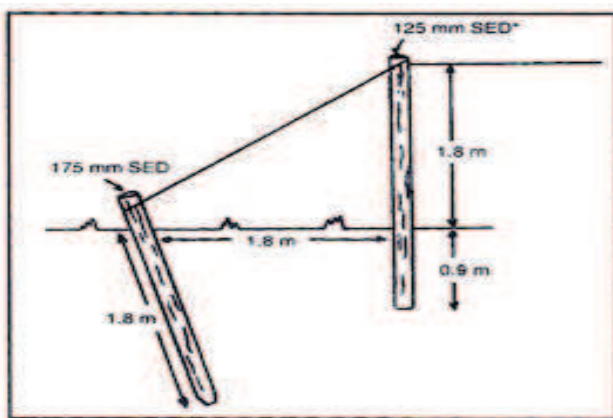
Two methods of selecting the main leader.



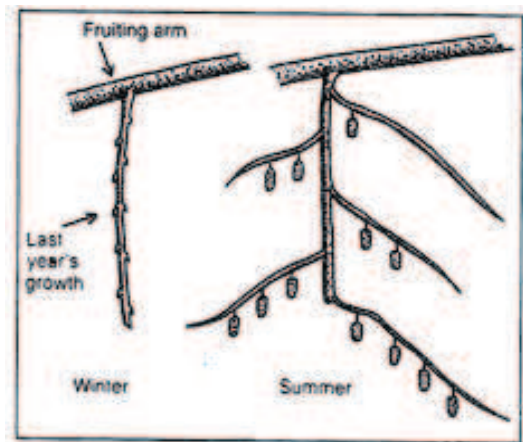
Standard T-bar and its modifications.



Winter pruning of lateral



Tie back end assembly.



Fruit formation on kiwifruit vine.

General Guidelines for Canopy Management in Kiwi:

Kiwifruit is a vine like grape, thus require similar training structure but stronger than grape. In Tar trellis system, the pillars of iron or concrete about 1.8 m in height above the ground level are erected at a distance of 6 m from each other in a row in straight line. A cross arm (1.5 m) is used on each pole, which carries 5 outrigger wires at a distance of 45 cm each. Vine is trained up to the wire as single stem, than two leaders in opposite direction along the center wire are selected or developed. From these permanent leaders, temporary fruiting arms 25.30 cm apart are selected at right angle along both sides of each leader. Training of vine on pergola system is similar to that of T-bar. A flat topped network of criss-cross wires is prepared on the erected pillar. This system is costly to prepare but gives higher yield. The fruit is developed on current season's growth arising from one year old shoot. Only the basal buds of nodes 4 to 12 on current season's growth are productive. Vine grows 2-3 m every year, which become over-crowded if not controlled by both summer and winter pruning. The shoots developed on older wood by heading back will not fruit normally in the first season. Vine pruning is carried out in such a way that the fruiting areas are available every year requiring the wood to be young. This is achieved by 3 to 4 years lateral replacement system. In dormant pruning, the fruiting lateral is cutback to 2 vegetative buds beyond the last fruit. In the second year these vegetative buds produce the fruiting shoots, which is pruned again. The arm on lateral shoots are pruned and allowed to fruit for 3 to 4 years. After this the lateral is removed from the main branch and other laterals are selected and pruned accordingly see that the balance between vegetative and reproductive growth is maintained for the continuity in the fruit production. In summer pruning, a fruiting shoot is headed back beyond 6-8 buds from the last fruiting bud during June-July.

Strategies & Priority Areas for Kiwi Fruit In North East: In the North East kiwi fruit is experiencing expansion among the temperate fruits. However it has specific production problems which need to be addressed.

In kiwi fruit major production constrains are:

- Lack of genetically superior planting material.
- High cost of plantation whole establishment.
- Lack of standardized techniques of cultivation like pruning cum training.
- Since Sikkim is an organic state, package of practice of organic cultivation is adhoc
- Lack of use of proper proportion of pollinizers, practice of hand pollination
- Concept of hand thinning and use of biostimulants to increase fruit size is non-

existent.

The priority areas and activities suggested for precision farming in Kiwi aimed at crop improvement and improved agro techniques:

A. Introduction, evaluation and mass multiplication of suitable varieties which can bear biotic and abiotic stress: The orchards in West Sikkim has mainly, Monty Allison and Bruno. Hayward variety which is very less. This variety is now being introduced widely under Technology mission.

B. Training and pruning in kiwi is very crucial in regulating the vegetative growth and fruiting: The technique of trellis on T-bar is very scientific and needs precise practice to be performed by farmers so as to have maximum fruiting wood. The farmers are to be educated practically.

C. Crop and Quality regulation of kiwi fruits: All cultivars of kiwi fruit except Hayward bear heavy crop every year. The heavy crop creates a severe competition between fruits for nutrients and water which leads to production of small size fruits. Poor management practices, improper ratio of pollinizers, their placement in plantations and lack of hand pollination also contribute to small fruits. Therefore to increase quality kiwi crop of good size hand thinning is essential. The studies conducted in thinning of fruits to 4-6 fruits per bunch immediately after fruits set and treatment with CPPU biostimulant/plant growth promoter standardized by Dr. Y.S. Parmar University of Horticulture & Forestry Nauni, Solan need to be replicated in kiwi orchards of Sikkim.

D. Improvement for propagation and quality work in Kiwi using biotechnological tools: Quality production of planting material of Kiwifruit through improved propagation technologies and improvement of fruit growth by plant hormones.

E. Guidelines for Crop and Quality Regulation (Hand Thinning): All the cultivars of kiwi fruit except Hayward bear heavily every year. This heavy crop creates a severe competition between the fruits for water and nutrient material which leads to production of small sized fruits. Therefore to harvest quality fruits hand thinning of small fruits is essential to the extent of retaining 5-6 fruits per bunch or flowering shoot will produce more 'A' grade fruits without having any adverse effect on total quality yield.

F. Maturity Harvesting and Storage: In Kiwifruits determination of optimum harvest maturity is difficult as there is no perceptible change in colour of skin of flesh of fruit at the time of maturity. A maturity index of 65°Brix TSS to 8.0°Brix is considered satisfactory for fruit harvest. The

harvesting period varies from area to area and varieties. The fruits mature earlier at low altitudes and later at higher attributes. The fruits are harvested when they are still hand. In mid hills (1200-1500

meter) the fruits mature in first week of November while at lower elevation mature in mid October to last week of October.

Time of Harvesting of Kiwi in Mid Hill (1200-1500 m) of different varieties :

Sr. No.	Variety	Days from flowering to fruiting (days)	Time of Harvest
1.	Allison	188-195	4-6 Nov.
2.	Abbot	192-200	7-12 Nov.
3.	Bruno	190-199	1-3 Nov.
4.	Monty	189-197	6-10 Nov.
5.	Hayward	194-202	15-20 Nov.

G. Grading: As per Indian standards we need to grade fruit on the basis of fruit weight to ensure better national and international market:

Grade	Weight of Fruit
A	More than 100 gms
B	60-100 gm
C	Less than 60 gms

For international markets minimum size should be 100 gms under North East conditions were rainfall is plenty during growth can have added advantage.

H. Storage: Since the fruits are harvested hard, can be kept in cool place without refrigeration upto 6-8 weeks. It can be stored for about 4 months in a cold storage at 0°C with 80-90% RH, provided sugar percentage at harvest in less than 8 per cent, the best being 6.5 per cent.

Emphasis on Organic Farming: Organic farming is a sustainable crop and soil management practice,

especially for the small and marginal hill farmers. The farmers of the region are generally the locally available organic materials in their cropping system. Therefore there is a need for standardization of doses different organic fertilizers. The emphasis should be given on the use of locally available organic materials upto the maximum extent. Although Kiwi Fruit production does not involve major diseases and pests, the use of botanicals to control insect pest and diseases should be encouraged. Although, North East region is termed as organic by default, yet some farmers in the West Sikkim district have been striving hard to produce organic Kiwi Fruit. One such example is quality Kiwi production winning first prize in the recently held Agri Expo exhibition in CAU Pasighat in January 2016.

Estimated Economics of Kiwi Cultivation:

A.) Estimated cost of establishment of 100 plant Kiwi block including iron T-bar supporting structure, cost of plants and plantation, say Rs 3.5 Lakh. Detailed below:

S. No	Farm operation	Amount (Rs.)
Orchard Establishment		
1	Cost of leveling of the land: 10 Hours – JCB @ Rs. 800 per hour + Fuel	10,000.00
2	Digging of pits: 20 man days X Rs. 300 per man day	6000.00
3	Training structure and erection : Rs. 3000 X 100	300000.00
4	Planting Material: Rs. 50 X 100	5000.00
5	Bamboo staking for support: to young plants:	5000.00
6.	Miscellaneous expenses	20000.00
	Total (A)	3,46,000.00 Say 3, 50,000.00
B.	Fertigation unit and installation	1,50,000.00
	GRAND TOTAL (A+B)	4,91, 000.00

Annual maintenance expenditure including FYM, fertilizer, labour [60 man days @ 300] = **Rs. 1,00,000.00 (One Lakh)**

Therefore, cost of plant shall be around 1000 rupees initially, with annual maintenance @20%.

B. Yearly Production and gross income per plant

C.

Age	Production (Kg/plant)	Return (Amount @Rs. 60/Kg)
1 st and 2 nd Year	Nil	Nil
3 rd Year	1	60
4 th Year	3	180
5 th Year	20	1200
6 th Year	30	1800
7 th Year	40	2400
8 th Year	50	4000
9 th Year	60	3600
10 th Year	70-80	4200 - 4800
11 th – 25 th Year	60-70	3600-4200
25 th – 30 th Year	50-60 (mostly B & C Grade)	2500- 3000
35 th - 40 th Year	Decline in productivity	<2000
After 40 th Year	Need total replacement	unproductive

Note: Currently in Himachal Pradesh, A grade fruit >80 gm rate per Kg is Rs 100, B grade 60-80 gm is Rs 80, C grade < 60 gm is Rs 60 Processing grade <40 gm is Rs 30

Conclusion: Arunachal Pradesh and Sikkim located in the eastern Sub-Himalayan ranges, while Nagaland, Manipur, Meghalaya Mikir Region in Purvanchal Region having huge unexplored land under temperate climate, has tremendous potentiality for promotion of temperate fruits namely apple, kiwi, walnut, pecan-nut, Asiatic pear, low chill stone fruits.

It is strongly recommended that Kiwi fruit production be taken up in commercial scale in all the states of North East except Assam and Tripura, if the basic requirements of development like appropriate self-reliant technology, infrastructure and techno-physical marketing facilities are addressed in a

mission mode with long term vision with the active participation of North East Horticulture Technology Mission of different states supported by Department of Agriculture, Cooperation and Farmers Welfare Ministry of Agriculture Govt. of India, Central Institute of Horticulture Dimapur, and Assam Agriculture University.

The temperate fruits of the North Eastern Hill states, particularly Kiwi Fruit, could be developed into a vital industry for sustainable economy of hilly region rural people in particular and North East region in general for their livelihoods and export to neighboring countries.

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