

Annexure- 2

Statement of Case

Arunachal Orange

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1. Background

1.1. Introduction

Arunachal Pradesh - the "Land of the dawn-lit mountains", is situated in the north east of India. In Arunachal Pradesh, out of the total geographical area of 83,743 Sq. Km, the recorded forest area is 51540 Sq. Km covering about 62% of the total geographical area.¹ Total area suitable for Horticulture in the state is 18 Lakh Ha out of which on 0.88 Lakh Ha is currently covered under Horticulture.¹⁰

| S. No. | Particulars of uses | Approximate %age of geographical area |
|--------|--|---|
| 1 | Cultivable Land under Agri / Horticulture | 3.40(Agriculture) 5.20(Horticulture) |
| 2 | Land under forest | 56.50 |
| 3 | Land under other uses including inhabitation and Administrative centres. | 2.00 |
| 4 | Barren and un cultivable waste land | 10.00 |
| 5 | River stream, water courses and water area including lakes, and marshes | 10.00 |
| 6 | Snow clad pastoral alpine lands | 12.00 |
| Total | | 100.00 |

Source:⁵

The State, with a population of only 10.91 lakhs as per 2001 Census inhabiting over an area of 83,743 sq. km., largest amongst NE States, has a very low density of 13 people per sq. km. According to 2001 Census, the total working population of the state is 4, 82,206 (male-2, 93,549 and female-1,88,657), the number of cultivators is 2, 81,822 and that of agricultural labourers is 18,569. About 80% of population living in rural area is dependent on agriculture and 62.29% of total working populations are engaged in agriculture. Therefore, agriculture will have to play the most important role in the economic development in the State. During FY 2008-09 Agriculture sector contributed about 28.5% of state GDP.¹

Topography

Arunachal Pradesh is generally a hilly region. The elevation of the hills ranges from 60 meters to over 7300 meters (GORICHEN peak in West Kameng). The territory falls in the outer Himalayas and Patkoi Ranges. It is endowed with wide topographical variations, vegetations and wild life along the greater part of the length of the territory the characteristics Siwalik type formation of Himalayan

Mountains is native. Because of these hill ridges and the valleys, the surface of Arunachal Pradesh is found variegated almost everywhere which also results into numerous geographical isolated places caused by various rivers and streams traversing the region and depositing the flowing detritus enroute in valley and again at the foothills.⁵

| Sl. No | Area Percentage | Types of Slopes |
|--------|-----------------|------------------------------------|
| 1 | 0.7 | Level to near Level |
| 2 | 5 | Very gently sloping |
| 3 | 1 | Very gently to gently sloping |
| 4 | 1.4 | Gently to moderately steep sloping |
| 5 | 7.9 | Moderately steep sloping |
| 6 | 6.8 | Moderately to steep sloping |
| 7 | 13.4 | Steep sloping |
| 8 | 14.3 | Steep to steeply sloping |
| 9 | 10.1 | Steeply sloping |
| 10 | 9.6 | Steeply to very steeply sloping |
| 11 | 19.9 | Very steeply sloping |

Soil

In vast varied terrain with numerous rivers it is difficult to provide any generalization about the type of soils. However, considering the sand stone rocks the granite and genesis formation interspersed with calcareous limestone and slate and other minerals tempered largely by swift flowing hilly rivers the broad group could possibly be⁵

- Soils of the hills,
- Soils in the valleys and mid hills and
- Soils in the foot –hills.

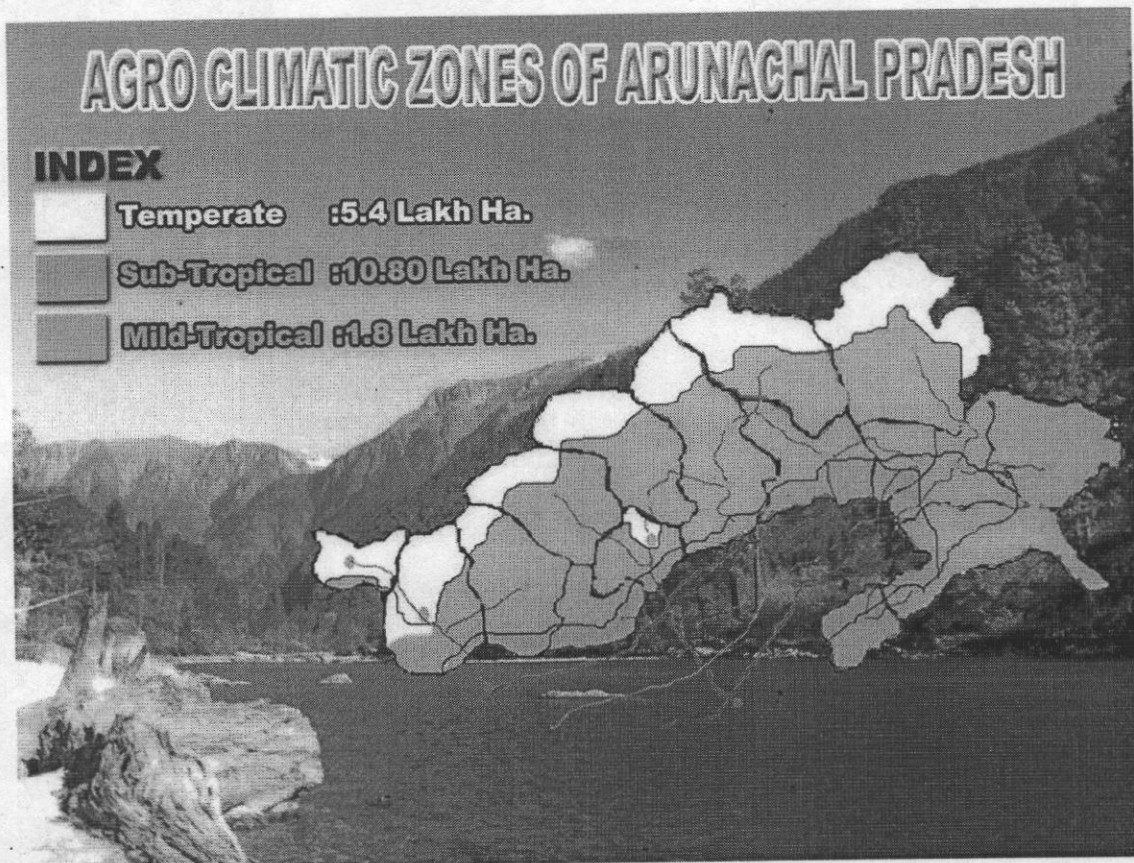
The soils in the valleys are rich in organic content and clayey-aluminous. Soils in Arunachal Pradesh are high acidity which may be ascribed to the high rainfall and heavy run of soils. As regards the colour, the soils look red, black and white (Pure sand).

Climate

The seasons and rainfall in India are so important that the whole year is divided into four seasons (1) Winter (2) Spring (3) Summer and (4) Rainy. In Arunachal Pradesh rainfall provides wide ranging blessing of monsoon. Arunachal Pradesh receives a very high average annual rainfall of about 2,782 mm per year distributed well over 7-9 month.

1.2. Horticulture Zone of Arunachal Pradesh crops grown in the area⁴

| Sl. No. | Horticulture Zone | Suggestive crops suitable for cultivation | Potential area in Hectare |
|---------|---|--|---------------------------|
| 1 | Foothills and Valleys (170-915 Mtr. Altitudes) | Citrus, Guava, Banana, Mango. Litchi, Pine apple, Sapota, Jackfruit, Papaya, Plum, Pear, etc. seasonal vegetables. | 1,45,000 |
| 2 | Mid Hills (915-1803 Mtr.) | Apples, Plum, Apricot, Pear, Almond, Low Chilling apple, Pomegranate, Olive, Grapes, etc. seasonal vegetables for seed, and truck gardening. | 1,40,000 |
| 3 | High Hills (above 1830 Mtr.) | Apples, Cherry, Walnut, Chestnut, Peanut, Pomegranate, etc. off season vegetables and production of temperate vegetable seeds. | 1,15,000 |
| 4 | Rain sown area below 40" annual rainfall (with wide range of chilling requirement and temperature). | Apple, Pear, Plum, Peach, Apricot, Almond, Walnut, Pomegranate, etc. off season vegetables. | 31,300 |

1.4. Agro-Climatic Zones Map of Arunachal Pradesh¹⁰1.5. Arunachal Orange

Arunachal Orange or Wakro Orange is a crop well adapted to the sub tropical agro climatic zone of Arunachal Pradesh. Spread over 7 districts of the states, the crop not only covers the largest area under cultivation but also have the highest production among all horticultural crops. During year 2009-10 the state produced about 41621 MT of Citrus fruits from about 30381 Ha of cultivated area.

The orange of the state is unique in taste with its high TSS % along with medium acidity. This combination gives a sweet sour taste to the fruit which is unique to this geographical area. This quality and demand of Arunachal Orange provides a huge potential for GI registration. Acquiring of GI for Arunachal Orange is bound to start a positive chain of events which can eventually bring prosperity to the farmers of the state.

2. **Applicant organization**

North Eastern Regional Agricultural Marketing Corporation Ltd (NERAMAC) has been assigned the responsibility of registration and supervision of GI by North East Council, Ministry of Development

of North Eastern Region (DoNER) in consultation with the Department of Horticulture, Government of Arunachal Pradesh.

North Eastern Regional Agricultural Marketing Corporation Ltd (NERAMAC) was incorporated at 31st March 1982 to support farmers/producers of north east getting remunerative prices for their produce and thereby bridge the gap between the farmers and the market and also to enhance the agricultural, procurement, processing and marketing infrastructure of the North eastern Region of India.

The Authorised Capital of the Corporation is Rs.10.00 Cr and the Paid-up Capital is Rupees Rs 7.62 Cr. Presently it is under the administrative control of the Ministry of Development of North Eastern Region (DoNER), Government of India, New Delhi, with its registered office at 9 Rajbari Path, Ganeshguri, Guwahati.

2.1. The Objectives of NERAMAC

- To undertake development and marketing of horticultural products within and outside the north eastern region and the supply of inputs, tools, equipment etc. required for the development of horticulture and agro-based industries whether own or run by the Government, statutory body, company, firm, co-operative or individual.
- To undertake, establish, acquire, purchase, sell and manage the projects for the development of horticultural products such as establishment of nurseries and commercial orchards, seed stations etc. and function as agent for the distribution of seeds, plants, processed food and other such products connected with the development of horticultural products.
- To manage, promote, aid and expedite the export of raw and finished horticultural produce and equipment and also to import raw and finished horticultural produce and equipment in furtherance of the company's business

Following is the constitution and list of directors of NERAMAC

| Name of Individual | Designations at NERAMAC and other govt. organizations |
|-------------------------------|---|
| Shri Arvind Madhav Singh, IFS | Joint Secretary, Ministry of Development of North Eastern Region & Chairman, NERAMAC Ltd. |
| Shri Vinod H Kalbande | Managing Director, NERAMAC Ltd. |
| Prof. Charu Lata Mahanta | Professor Department of Food Processing Technology, Tezpur University & Director NERAMAC Ltd. |
| Shri Rohtash Singh | Director, Ministry of Development of North Eastern Region & Director NERAMAC Ltd. |
| Dr. Bidyut Chandra Deka | Joint Director, ICAR, Jharnapani (Nagaland) & Director NERAMAC Ltd. |
| Shri Rajen Lohia | Businessman, Dibrugarh (Assam) & Director NERAMAC Ltd. |
| Shri R. P. Gurug | CEO, Ecotourism & Conservation Society of Sikkim Gangtok (Sikkim) & Director NERAMAC Ltd. |
| Shri Hage Kojeen | Commissioner (Agriculture) Government of Arunachal Pradesh & Director NERAMAC Ltd. |
| Shri I. Meitei | Advisor (Horticulture), North Eastern Council & Director NERAMAC Ltd. |
| Shri Samuel Rosanglura | Director (Horticulture), Dept. of Agriculture, Govt. of Mizoram & Director NERAMAC Ltd. |

NERAMAC is offering helping hand in sourcing and procuring cash crops of the producers by intervening in the market and provide them remunerative prices. It also helps processing units by providing raw materials and arranging packaging materials. NERAMAC has a few retail outlets within the North East region which directly sell various processed and value added products produced locally in the region. GI registration is a historical initiative to preserve and promote the bio diversity of region and one more step to help the farmers of geographical location to secure better remuneration.

In line with the set organizational objective, NERAMAC established a branch office at **Arunachal Pradesh** located at **Krishi Bhawan Annexe, Sector-D, Basement, Naharlagun, Papum Pare, Arunachal Pradesh - 791 110** and has been working for the betterment of local farming community.

NERAMAC has been actively involved in the procurement and marketing of the oranges in the state of Arunachal Pradesh. The intervention by NERAMAC has provided remunerative prices to the farmers of the state. The sales figure of the oranges of the three financial years in terms of value is given below:

| | |
|----------------|------------------|
| 1. 2008 – 2009 | Rs. 6,55,532.00 |
| 2. 2009 – 2010 | Rs. 13,45,138.00 |
| 3. 2010 – 2011 | Rs. 15,44,052.00 |

NERAMAC at a glance

| | |
|--|---|
| Incorporation: 31st March 1982 Promoter: North Eastern Council, Govt. of India, Shillong-793 001 | Administrative Ministry: Ministry of Development of North Eastern Region (DoNER), Govt. Of India, Vigyan Bhavan Annexe Maulana Azad Road, New Delhi – 110 011 |
| Registered/Head Office: 9 Rajbari Path, Ganeshguri G S Road, Guwahati – 781 005 Phone: (0361) 2341427/28 Fax: (0361) 2341428 Email: neramac@gmail.com ; info@neramac.com | Zonal Offices: <ul style="list-style-type: none"> • Arunachal Pradesh • Assam • Manipur • Meghalaya • Mizoram • Nagaland |

2. Specification

Arunachal Orange is specially known for its sweet – sour taste, and high juice content. It grows well in the climatic conditions of Arunachal Pradesh and has high demand within and outside the state.

The basic characteristics of Arunachal Orange has been given below based on its performance at ICAR,

Basar, Arunachal Pradesh

| | |
|---|----------|
| a. Average Yield/tree (No. of fruits) - | 282 Nos. |
| b. Average Yield / tree - | 37.51 Kg |

| | |
|--------------------------------|------------------------|
| c. Average Fruit wt - | 133 g |
| d. Average Fruit Size - | 6.25 x 6.56 (cm x cm) |
| e. Average Peel thickness – | 3.65 mm |
| f. Average Juice/fruit – | 65.5 ml |
| g. Average Juice Content (%) – | 49.2 % |
| h. Average TSS (%) – | 10.11 % |
| i. Average Acidity (%) – | 1.01 % |
| j. Average Ascorbic acid– | 26.1 (mg/100 ml juice) |

3. Description of Goods

Family: Rutaceae, **Genus:** Citrus, **Botanical name:** *Citrus reticulata* Blanco

Arunachal Orange or Wakro Orange (sometimes referred as Khasi Mandarin) is a type of orange fruit with some distinctive qualities generated because of specific agro climatic conditions of the geographical area, grown in various parts of Arunchal Pradesh. The fruit is round shaped with sweet taste. It has a medium thick peel over it which attains orange colour at full ripening.

It is easily peeled with the fingers, starting at the thick rind covering the depression at the top of the fruit, and can be easily split into even segments without squirting juice. This makes it convenient to eat, as utensils are not required to peel or cut the fruit. It is usually eaten plain or in fruit salads. The fruits have high vitamin C and refreshing juice. It has high content of TSS and a medium acidity which gives it a special taste. The tress grows between 3 to 6 m high, and has a wide range of climate tolerance. On an average a tree on full production bears 200 to 300 fruits per year, with a big size and average fruit weight of 100 to 150 gm. The fruits are good at juice content (about 50%) with a TSS of about 10% and acidity percentage of about 1%.

4. Origin and Historical References

Citrus fruits are believed to be originated in the tropical and sub tropical regions of South East Asia, particularly India.

There are practically no records relating to the history of this area, except some oral literature and a number of historical ruins found mainly in the foothills. Subsequent explorations and excavations have identified the ruins as dating approximately from the early Christian era.³

North East India is the native place of many citrus species and it is being cultivated in Arunachal Pradesh since times immemorial, however the commercial cultivation got a boom after 1970's when the government launched the Jhum Control Scheme. In order to reduce the practice of shifting cultivation government wanted to encourage the permanent set up fruit orchards of a crop indigenous and well adopted to the local climate and that is when commercial cultivation of Arunachal Orange developed as an option to Jhum cultivation.¹²

Following that the cultivation of Arunachal Orange was also promoted under Technology Mission and National Horticulture Mission.¹²

Modern history of Arunachal Pradesh, begins with the inception of British rule in Assam after the treaty of Yandaboo concluded on 24 February 1826. Before 1962 the area was popularly known as the North East Frontier Agency (NEFA), and was constitutionally a part of Assam. Because of its strategic importance, however, it was administered by the Ministry of External Affairs until 1965 and subsequently by the Ministry of Home Affairs, through the Governor of Assam. In 1972 it was constituted as a Union Territory and renamed Arunachal Pradesh. On 20 February 1987, it became the 24th state of the Indian Union.³

5. Geographical Area of Production

5.1. *Production*

Citrus is largest grown horticultural crop in Arunachal Pradesh both in terms of area under cultivation as well as total production. During year 2009 – 10 it covered 30,381 Ha of area under cultivation out of the total area of 83,402 Ha under all horticultural crops and the production was 41,621 MT.⁵ The citrus group includes fruits like lemon, orange and mandarin but in Arunachal Pradesh the only major fruit of citrus variety is Arunachal Orange, which accounts to almost 90% of the total citrus production.^{12, 13}

Year-Wise Area and Production for Citrus Fruits in Arunachal Pradesh⁵

| Year | Area (Ha) | Production (MT) | Productivity (MT/Ha) |
|-----------|-----------|-----------------|----------------------|
| 2000-2001 | 19147 | 24000 | 1.25 |
| 2001-2002 | 19800 | 24500 | 1.24 |
| 2002-2003 | 20790 | 25725 | 1.24 |
| 2003-2004 | 21829 | 27011 | 1.24 |
| 2004-2005 | 22920 | 28361 | 1.24 |

| | | | |
|-----------|-------|-------|------|
| 2005-2006 | 24066 | 30629 | 1.27 |
| 2006-2007 | 25509 | 33079 | 1.30 |
| 2007-2008 | 27040 | 35725 | 1.32 |
| 2008-2009 | 28662 | 38538 | 1.34 |
| 2009-2010 | 30381 | 41621 | 1.37 |

Source - <http://arunachalpradesh.nic.in/nnap.htm> and research team analysis

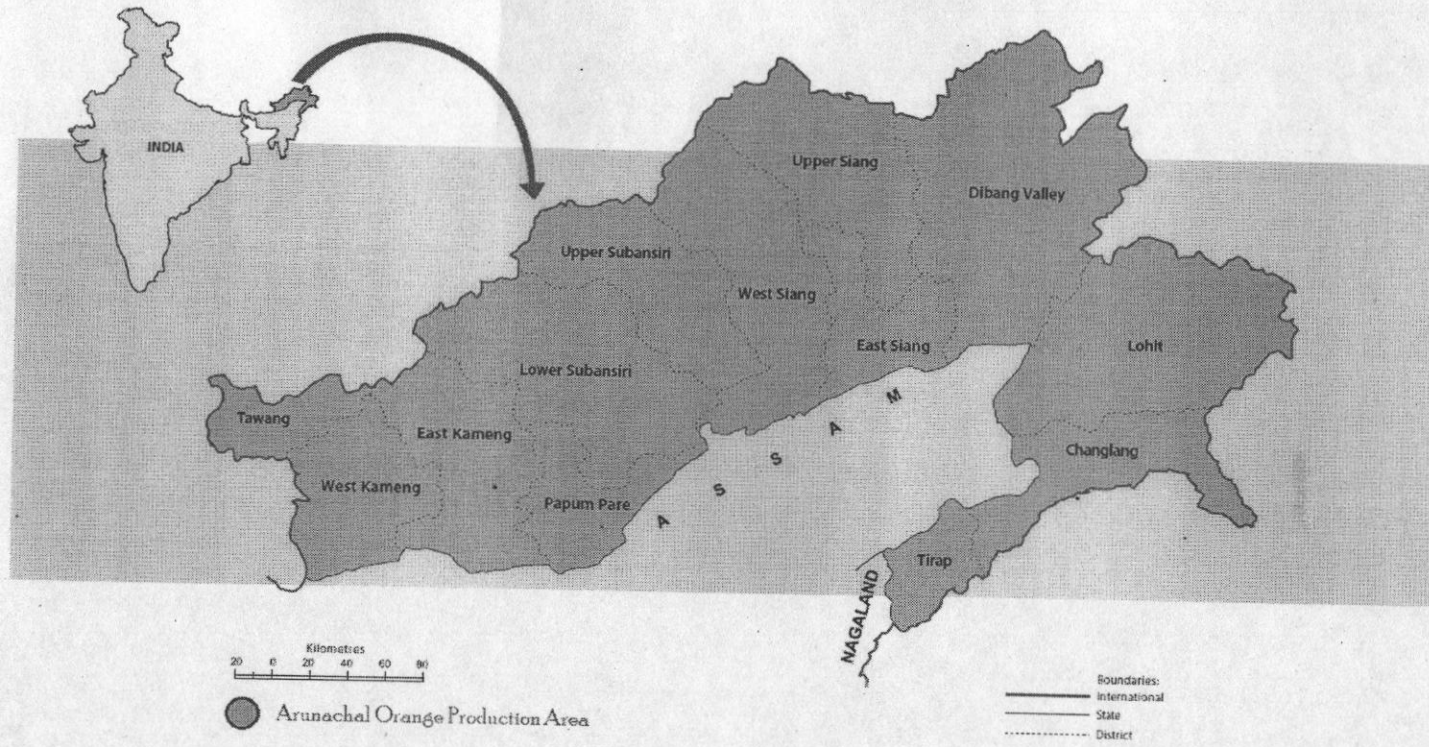
According to ICAR, Basar also, Arunachal Orange is the premier crop, cultivated in over 23,360 ha area with a production of 27,251 MT with the productivity of modest 1.75 MT per ha. ¹¹

5.2. *Distribution Area and Map*

The crop is being grown almost in every part of the state, wherein the main producing places and districts are: - ¹¹

- I. Wakro – Lohit district
- II. Roing and Dambuk sub division – Lower Dibang valley district
- III. Panging, Mebo – East Siang district
- IV. Boleng – Upper Siang district
- V. Basar – West Siang district
- VI. Boha, Bragon – West Kameng district
- VII. Bana – East Kameng district

5.3 Arunachal Orange Production Area Map



Arunachal Orange production area lies between 26° 30' North to 29° 30' North Latitude and 91° 30' East to 97° 30' East Longitude

6. Methods of Production

6.1. Climate and Soil

The successful establishment of an orchard and satisfactory production is dependent on the favorable combination of certain natural factors and management factors. The climate include basic environmental elements like temperature, rainfall, atmospheric humidity

A reasonably deep and fertile uniform soil having good drainage and adequate supply of water for irrigation is the basic for successful establishment of mandarin orchard. Soil depth of one meter is necessary. The temperature range for growing citrus is 14 – 40° C, however, the best growth and performance occur between 29 to 34° C.³

6.2. Propagation

Arunachal Orange plants are propagated by seed as well as vegetative means. Vegetative propagation is preferred because it ensures true to type plants, uniform quality, regular and early bearing. In Arunachal Pradesh mandarin cultivation has been followed through planting seedlings raised locally by the farmer or in private nurseries.

6.3. Planning of orchard establishment

If the site is new one and uncultivated previously, it has to be cured before planting. The site must be cleared of all trees and shrubs. After removing all the roots and shrubs up to the depth of 60 cm, the ground is ploughed and harrowed until it presents smooth surface. On the hill slopes, terraces should be made along the contours. If terracing is not possible on steep slope at least half moon terrace should be made at the time of planting. Raising some cover crops before planting may enrich the soil nutrients. In hills, in order to get sufficient sunlight, planting should preferably be done in southward directions. In plains, orchards can be established in square system by keeping row to row and plant to plant distance of 6 x 6 m.³

On hills contour system is followed and the trees are planted in rows along lines of equal elevation or contour made at a distance of 5.5 to 6 m. The trees in this type of topography are not at equidistance and the no. of trees per unit area is generally less than plain land orchards.³

6.4. Spacing and Planting

On rich fertile soils with crumbly soil structure wider spacing of 7 x 7 is required while in unfertile soil closer spacing is recommended (5 x 5 m) in view of their less prolific growth. At ICAR Basar, high density plantation (HDP) has performed well at a spacing of 3 x 3 m and 4 x 4 m.³

Planting is done in pit with 60x60x60 cm. The pit is filled with FYM or pig manure and sand in a 1:1:1 ratio with subsurface soil. Due to heavy rainfall, the planting should be done after the end of rainy season i.e. Sept – Oct. Planting should be avoided in hot weather.³

6.5. Soil Management

It is mostly observed that soils in Arunachal Pradesh are acidic and hence liming with limestone or dolomite is used to alleviate this problem. Application of dolomite lime @ 3 kg/ tree once in three years in Jan – Feb improves soil reaction.³

6.6. Manure and fertilization schedule as recommended by ICAR Basar, Arunachal Pradesh

| Manure / Fertilizer | Time of application | Age of plant | | | | | | | |
|---------------------|--|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|------------------------------|
| | | 1 st year | 2 nd year | 3 rd year | 4 th year | 5 th year | 6 th year | 7 th year | 8 th year onwards |
| FYM (Kg / Plant) | Feb | 5 | 10 | 15 | 20 | 25 | 30 | 30 | 30 |
| Urea (g / Plant) | Mar | 70 | 135 | 200 | 270 | 285 | 335 | 400 | 400 |
| | Jun | 70 | 135 | 200 | 270 | 285 | 335 | 400 | 400 |
| | Sep | 70 | 135 | 200 | 270 | 285 | 335 | 400 | 400 |
| SSP (g / Plant) | Mar | 200 | 300 | 400 | 500 | 600 | 800 | 900 | 1000 |
| | Jun | 200 | 300 | 400 | 500 | 600 | 800 | 900 | 1000 |
| | Sep | 200 | 300 | 400 | 500 | 600 | 800 | 900 | 1000 |
| MOP (g / Plant) | Mar | 70 | 135 | 170 | 200 | 200 | 300 | 370 | 400 |
| | Jun | 70 | 135 | 170 | 200 | 200 | 300 | 370 | 400 |
| | Sep | 70 | 135 | 170 | 200 | 200 | 300 | 370 | 400 |
| Micronutrients | A mix of 100 g each of zinc sulphate, magnesium sulphate and manganese sulphate, 80 g copper sulphate, 20 g borax along with 100 g lime dissolved in 20 liter of water should be sprayed twice in Mar – Apr and Sep – Oct. | | | | | | | | |

This schedule is based on research at ICAR, however in actual cultivation farmers do not use any chemical fertilizer or pesticides for their crops, and in some exceptional conditions even if they use chemical fertilizer or pesticides the usage is very limited.

6.7. Irrigation

Arunachal received very high rainfall spread over a period of 7 – 9 months and therefore farmers hardly following the practice of giving additional water to the plant. However, continuous dry spell in Oct – Nov, which is a critical period for fruit growth and development, can affect the quality of

produce; hence watering is required at an interval of 10 – 15 days during winter. Manual watering to plants in water scarce upland areas is practiced by the farmers which requires huge amount of labor.

6.8. Weeding

Weeds are the major problem in orchard plantation in Arunachal, the area receives abundant rainfall. Most of the weeds are controlled either by hand pulling, hoeing, burning and tillage. Spraying of pre – emergence herbicides like Diuron 5 Kg / Ha or post emergence herbicides like Atazine 5 – 6 Kg / Ha can also help but mostly farmers are not using them. Manual weeding is more advisable if as far as possible. ³

6.9. Training and pruning

Train the trees to a single stem up to a height of 40 – 50 cm from the ground level and there after allow 4 -6 well shaped branches to grow. The bearing tree requires only little pruning. Pruning of non – bearing trees can be done any time in the year but for bearing trees best time is just after harvest.

6.10. Major Pests

Arunachal Orange has been found relatively tolerant to pest and disease in comparison of other orange varieties because of its better adoption to agro climatic condition of the state, still a list of possible pest and disease has been furnished below. ³

- Trunk borer (*Anoplophora varsteegi*)
- Leaf minor (*Phyllocnistis citrella*)
- Aphides (*Toxoptera aurantii*, *T. dorsalis*, *T. citricidus*)
- Fruit fly (*Bactrocera* sp)
- Fruit sucking moth (*Othreis fullonia* L)
- Citrus psylla (*Diaphorina citri*)
- Lemon butterflies (*Papilio demoleus* L and *P. polytes* L)

6.11. Major Diseases

- Anthracnose / Wither tip/ Die back (*Collectotichum gloeosporidies*, *Diplodia netalensis*, *Coryularia tuberculata*)
- Felt disease (*Septobasidium pseudopendicillatum*)
- Powdery mildew (*Oidium tingitaninum*)
- Pink disease (*Pellicularia salmonicolor*)
- Blue & Green mould (*Phenicillium digitatum*)

- Fruit rot (*Alternaria citri*)
- Canker and bark eruption (*Xanthomonas citri*)
- Greening (*Mycoplasma* like organisms)
- Tristeza or Quick decline (Viral disease)
- Exocortis or Scaly butt
- Lichens & Mosses

6.12. Harvesting

Orange is harvested immediately after maturity to avoid fruit drop, fruit fly infestation, shrinkage and loss of weight. Peel color is the most common method to judge maturity. The peak season for harvesting falls between Nov – Feb in Arunachal Pradesh mid hill conditions.³

7. Specialties of Arunachal Orange

Arunachal Pradesh is considered as one of the 12 mega diversity (Hot Spots) in the World. The State has 20% species of country's fauna, 4500 species of flowering plants, 400 species of pteridophytes, 23 species of conifers, 35 species of bamboos, 20 species of canes, 52 rhododendron species and more than 500 species of orchids.¹

During evolution, a remarkable diversity in citrus has developed due to natural hybridization and cultivation since time immemorial. There was a long period of progressive evolution of citrus. There is huge diversity in citrus in NR region and is also considered as one of the major center of crop diversity, having 17 species, 52 varieties and 7 natural hybrids.³

A subtropical to sub temperate climate and evenly distributed rainfall of about 2000 – 3000 mm throughout the year prevailing in the state favors for successful cultivation of Mandarin.

7.1. Taste and flavor

The table below shows that Arunachal Orange has a relatively good size of fruit with high amount of Juice content. The fruit also have a high TSS % and medium acidity which provides it a unique sweet sour taste. The thickness of peel is quite less which is preferred by consumers because this makes it easy to peel off the fruit and less weight of fruit goes waste because of peeling.

7.2. Organic Production

The orchards are mostly organically grown because of the unavailability of chemical fertilizers. The consumption of chemical fertilizers in the state is just 3.42 Kg/Ha, whereas the usage of agro –

chemicals is limited to about 0.08 kg/ha. The produce is by default organic however Organic certification needs to be formally obtained.¹⁰

Performance of some improved varieties of Mandarin under Basar condition are listed in Table³

7.3. *Comparison of Yield & Physio – chemical Characteristic of Different Citrus Varieties*

| Varieties | Yield /tree | | Fruit wt (G) | Fruit Size (cm x cm) | Peel thickness (mm) | Juice /fruit (ml) | Juice Content (%) | TSS (%) | Acidity (%) | Ascorbic acid (mg /100 ml juice) |
|------------------|-----------------|-------|--------------|----------------------|---------------------|-------------------|-------------------|---------|-------------|----------------------------------|
| | (No. of fruits) | (Kg) | | | | | | | | |
| Arunachal Orange | 282 | 37.51 | 133 | 6.25 x 6.56 | 3.65 | 65.5 | 49.20% | 10.11 | 1.01 | 26.1 |
| Nagpur Santra | 227 | 32.69 | 144 | 5.9 x 6.5 | 4.2 | 63 | 43.80% | 9.4 | 0.8 | 28.21 |
| Hill Mandarin | 164 | 16.07 | 98 | 5.6 x 6.2 | 3.8 | 49.5 | 50.50% | 9.5 | 1.07 | 25 |
| Sikkim Orange | 168 | 16.03 | 95.4 | 5.8 x 6.3 | 3.87 | 57.2 | 60.00% | 10 | 1.06 | 23.3 |
| Wilking Orange | 144 | 8.44 | 58.6 | 4.3 x 5.6 | 2 | 24.3 | 41.50% | 9.9 | 1.11 | 26.4 |
| Citrus Zigardio | 76 | 10.18 | 134 | 6.2 x 6.98 | 8.06 | 62.9 | 46.90% | 7.7 | 1.16 | 24.63 |

8. Impact of Climatic conditions and Human Skills

Arunachal Orange is a crop well adapted to the sub tropical agro climatic zone of Arunachal Pradesh. Spread over the states, the crop not only covers the largest area under cultivation but also have the highest production among all horticultural crops. During year 2009-10 the state produced about 41621 MT of Citrus fruits from about 30381 Ha of cultivated area.

The successful establishment of an orchard and satisfactory production is dependent on the favorable combination of certain natural factors and management factors. The climate include basic environmental elements like temperature, rainfall, atmospheric humidity

A reasonably deep and fertile uniform soil having good drainage and adequate supply of water for irrigation is the basic for successful establishment of mandarin orchard. Soil depth of one meter is necessary. The temperature range for growing citrus is 14 – 40° C, however, the best growth and performance occur between 29 to 34° C which is why, the performance of citrus is so good.

The orchards are mostly organically grown because of the unavailability of chemical fertilizers. The consumption of chemical fertilizers in the state is just 3.42 Kg/Ha, whereas the usage of agro – chemicals is limited to about 0.08 kg/ha. The produce is by default organic however Organic certification needs to be formally obtained.

9. Future Potential and Scope of GI for Arunachal Orange

9.1. Export

In the era of globalisation, the issue of trans-border trade has attracted the attention of politicians and planners in the North-Eastern States. Arunachal Orange is being already transported to Bangladesh via Karinganj, Assam. The GI registration and its subsequent promotion can help develop demand from other South Asian countries, which can help the state move forward towards self dependency. Farmers will also be benefited by the increased demand which can fetch better price for them.

9.2. Promotion of Organic Farming

The production of Arunachal Orange is by default organic but hither to no substantial program has not being launched to formally acquire organic certification for the products. This type of certification along with GI will surely be a revolutionary market change that can leverage the demand significantly.

9.3. Processing

The absence of regulated marketing network and supporting infrastructure like cold storages, warehouses and godowns provide little incentives to the farmers to cultivate agriculture and horticulture produces and to generate income and employment opportunity. Therefore, there is urgent need to improve the marketing network and construction of cold storages, godowns for marketing of surplus produces of the State. Processing is one area which has not been explored as yet for in the state. This stands true not just for Arunachal Orange but also for other agricultural and horticultural crops of the state. GI of Arunachal Orange is bound to attract public and private interest in development of processing facilities in the area.

9.4. Addressing the problems related to Shifting Cultivation

Jhum cultivation or shifting cultivation is a way of life in North Eastern state and people have been practicing this since time immemorial. But with increased population Jhum farming is becoming less productive with a shrinking Jhum cycle and has caused erosion and forest regression in certain

areas. Along with this setting forest on fire also increase global warming and situation is getting alarming day by day.

One of the ways to tackle the issue of Jhum cultivation is through promotion permanent horticultural corps in the state. An increased demand and economic returns from Arunachal Orange can become an incentive for the farmers to settle down with permanent holdings instead of practicing shifting cultivation. Owing to the fact that only 0.88 Lakh Ha are is covered under Horticulture out of the total 18.0 Lakh Ha of area suitable for horticulture, there is huge untapped potential waiting to be unleashed.

9.5. *SWOT Analysis for Arunachal Pradesh With Respect to GI of Arunachal Orange*

| STRENGTHS | WEAKNESS |
|---|--|
| <ul style="list-style-type: none"> • Availability of a good quality marketable surplus of Arunachal Orange • Large area of 18 lakh Ha suitable for horticulture cultivation • Diverse Agro-climatic conditions ranging from 1. Humid Tropical, 2. Sub-tropical to 3. Temperate • Adequate rainfall well spread through-out the year • Natural home of many citrus varieties • History of organic farming by default (through minimal chemical inputs) for cultivation resulting in maintenance of rich soil nutrients. | <ul style="list-style-type: none"> • Lack of proper branding and marketing at national and international platform about high quality Arunachal Orange produce of the state • Inadequate infrastructure, poor accessibility to good quality roads and communication for marketing, lack of infrastructure for post-harvest management, processing and value addition and weak extension support. • Non availability of rail network for bulk transport of products implying that the only alternative mode of transport is by road. • Low productivity and weak information and statistics availability |
| OPPORTUNITY | THREATS |
| <ul style="list-style-type: none"> • Opportunity of GI registration and marketing the quality produce to get better share of value chain for the farmers. • Huge unexplored area and the sloping marginal lands could be suitably diversified for increasing the production of Arunachal Orange and help in economic well being of the farmers, as well as avoiding soil degradation and soil erosion. • Increasing international demand for organic products. • "Look East Policy" of the Government of India along with the various Regional Trade Agreement with countries of Southeast Asia | <ul style="list-style-type: none"> • Heavy rainfall during monsoon season results in landslide in several part of the State, which hampers transportation for marketing. Many times the horticultural crops like off season vegetables grown in the interior areas cannot be marketed and the farmers suffer heavy loss. • Price fluctuations during the glut-season forced farmers to sell their produce at low prices. • The National Insurance Scheme is yet to provide insurance for horticultural crops. |

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