

from the free to a restricted category in August 2019, and import duty on round sticks was uniformly increased to 25% in June 2020.

Bamboo needs a special focus for mainstreaming products and entering global markets commensurate to our resource base. The restructured National Bamboo Mission launched in 2018 did catalyse the ecosystem. However, a complete change of discourse is imperative due to the slow convergence of sectors and the need to develop new technology for high-end uses. At 2% of the furniture industry, the scale of the bamboo furniture industry is small. Furniture made from bamboo wood, some of which is do it yourself (DIY) and suitable for online suppliers, needs to be mainstreamed. While we look at global markets, research and lab-to-field connectivity are required for developing and standardizing processes that meet international requirements for the complete value chain.

With climate change hitting Indian agriculture through reduced *kharif* rice production predicted to fall in 2022, it is the

opportune time to encourage agroforestry as a fall-back option for farmers in cases of crop reduction and/or failure. Laudable is the initiative of the Government of Assam for setting up an Assam Agroforestry Development Board as a Section 8 Company for need assessment-based operationalization to increase investment by industry and backward linkages to encourage tree growing on private lands. 'Trees Outside Forests in India' (TOFI), the five-year joint initiative of United States Agency for International Development and Ministry of Environment, Forest and Climate Change, Government of India, being implemented in seven states, viz. Andhra Pradesh, Assam, Haryana, Odisha, Rajasthan, Tamil Nadu and Uttar Pradesh, seeks to expand the area of TOF by 2.8 m ha, sequester 420 million tonnes of CO<sub>2</sub> equivalent and benefit 13.1 million people with improved livelihood and environmental services<sup>4</sup>. With a supportive Union Budget and initiatives by States, a multidisciplinary core team must delve into policy bottlenecks, incentives, adoption of Forest Stewardship Certifica-

tion for establishing the chain of custody, skilling and branding for agroforestry in a holistic mission approach to tackle the multitude of issues hampering its growth.

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## COMMENTARY

### Assessing the export potential of Nagpur mandarin: the promising citrus fruit of Central India

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Globally, citrus is acknowledged as one of the most important perennial fruit crops. India is the third highest citrus producer in the world after China and Brazil. Worldwide, citrus is grown in more than 150 countries, of which 53 cultivate it commercially. India contributes about 7–8% of the global citrus production. Citrus ranks third in the country after mango and banana and is cultivated in 10.86 lakh hectares with an annual production of 142.62 lakh tonnes<sup>1</sup>. The genus *Citrus* belongs to the family Rutaceae. Citrus fruits have a distinct aroma, taste and are storehouses of several important nutrients like vitamin C, phytochemicals and dietary fibre, which are vital for human health due to their antioxidant properties and protection from various chronic diseases<sup>2</sup>.

There exists a wide range of species in this citrus genus across the globe, but the commercially important ones cultivated in

India are mandarins (santra/narangi), sweet oranges (mosambi, sathgudi), acid limes (nimbu), lemons, grapefruits and pummelos. Amongst all cultivars, mandarins (*Citrus reticulata* Blanco) are produced in the highest quantity in India (Table 1). These fruits secure a special place in the dietary platter of Indians, mostly as fresh fruit. Different varieties of mandarin are found throughout the length and breadth of the country. Nagpur mandarin is widely cultivated in the Vidarbha region (Nagpur and Amravati divisions) of Maharashtra and some parts of Madhya Pradesh. Kinnow mandarin is grown in Abohar and Ganganagar regions of Punjab, and parts of Haryana. In Karnataka, Coorg mandarin is popular, while Khasi mandarin is popular in North East India.

Amongst all, Nagpur mandarin (Nagpuri santra) is considered one of the finest mandarins in the world, with a unique acid-sugar

blend that imparts a sweet-sour flavour; it also has an unmatched aroma. The Amravati and Nagpur districts of Maharashtra contribute about 80% of the total area under mandarin orchards in the state, sharing 48.88% and 31.45% respectively. With regard to the production of mandarin, Amravati district occupies 37.36% while Nagpur occupies 23.87% share in the Vidarbha citrus market<sup>3</sup>. Further, Vidarbha is India's only citrus-growing region with two fruiting seasons (Ambia and Mrig). The fruit available from September to December is Ambia, which has a slightly sour taste. This is followed by the sweeter Mrig crop in February. Hence Nagpur mandarin enjoys favourable climatic conditions to provide bulk production twice a year.

Nagpur mandarin received the Geographical Indicators (GI) tag 385 in 2014 under the Geographical Indication of Goods (Registration and Protection) Act, 1999.

The GI tag was accorded on the basis of the unique qualities of the fruit that can be attained only under specific soil and agro-climatic conditions of the Vidarbha region. The growers of Nagpur mandarin are able to brand their products under the GI tag, which protects their rights and fetches a premium price in the market for the unique variety.

India is the third highest producer of citrus fruits in the world and successfully exports the fruit to several countries. Bangladesh is the biggest market for Nagpur mandarins (Table 2). Nagpur and Amravati districts of Maharashtra together produce 7 lakh MT of Nagpur mandarin on 1.26 lakh ha area. Of this, Bangladesh alone imports 25% of the produce. However, recent custom duty hike by Bangladesh from Rs 31 per kg to Rs 39 per kg has somewhat hindered export. The All India Indo-Bangla Orange Export Association, Warud (Amravati, Maharashtra), has urged the Central Government to pursue Bangladesh to stall the duty hike<sup>4</sup>.

On the other hand, UAE has signed a Free Trade Agreement (FTA) under the Comprehensive Economic Partnership Agreement (CEPA) with India, which has opened duty-free access of Indian exporters to the UAE market. This will boost the export of citrus fruits and other agricultural and non-agricultural produce from India to the UAE<sup>5</sup>. It also proves that trade policy reforms are the need of the hour to assist Indian exports.

As Nagpur mandarin enjoys two fruiting seasons in Vidarbha, coupled with the world-renowned GI tag, it has a greater edge in export potential than other citrus fruits. However, Indian citrus growers have yet to exploit this potential. At the same time, various constraints and weaknesses plague citrus export from India. Amongst them, the lack of availability of exportable quality fruits is a major drawback. Only 10–20% of fruits, particularly Nagpur mandarin, produced in the country fulfil the quality requirements for export. India has a limited varietal base of Nagpur mandarin, and more varieties need to be developed according to market demand. There is a lack of sufficient infrastructure like packing houses, pre-cooling units and transport vehicles for timely delivery of fresh fruits and prevention of post-harvest losses. Diseases and insect infestations remain a major constraint to citrus crops. Diseases like *Phytophthora* root rot, greening, twig blight, citrus tristeza virus (CTV), citrus yellow mosaic, citrus canker and infestation of leaf

miner, psylla, mites, thrips, scales, fruit-sucking moth, fruit flies and aphids pose a major hurdle to citrus cultivation. The lack of export promotion and market development campaigns is also a drawback in our system. Marketing and advertising campaigns for citrus fruits are essential to sensitize citrus growers about the strength of Nagpur mandarin and opportunities regarding its export. With more free trade

opening up and insurance covers for exporters, a wide range of export opportunities exist. Figure 1 shows the SWOT analysis of the export potential of Nagpur mandarin.

Certain points should be kept in mind before the export of mandarins. The minimum requirements for export have to be met by the growers before they can prepare their crop for export as fresh fruit. Grades A and B of mandarin are eligible for export

**Table 1.** Area ('000 ha) and production ('000 MT) of citrus in India

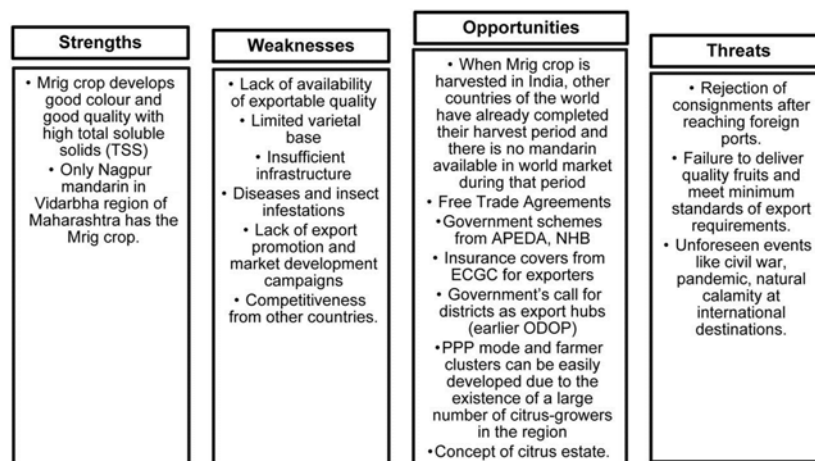
Crop	2018–19		2019–20		2020–21 (3rd advance estimate)	
	Area	Production	Area	Production	Area	Production
Lime/lemon	305	3,482	322	3,687	333	3,750
Mandarin	469	6,243	454	6,136	462	6,026
Sweet orange	187	3,266	217	4,040	203	3,825
Others	67	412	81	704	88	661
Citrus total	1,028	13,404	1,075	14,568	1,086	14,262

Source: Ref. 1.

**Table 2.** Export status of citrus fruits (fresh/dried) from India to other countries

Country	2020–21	
	Quantity (MT)	Revenue (Rs lakhs)
Bangladesh	141,262.63	40,764.38
Nepal	20,214.26	4,103.90
UAE	442.88	201.13
Oman	108.92	50.39
Qatar	85.05	44.27
Saudi Arab	93.41	37.76
Kuwait	78.11	30.31
Bahrain	34.19	13.10
Bhutan	11.35	11.16
Singapore	0.32	0.22
South Africa	0.00	0.00

Source: Ref. 9.



**Figure 1.** SWOT analysis of export potential of Nagpur mandarin.

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with sizes 7–8 and 6–7 cm respectively. The minimum maturity requirements for the export of Nagpur mandarin are when its juice content is 40%, minimum total soluble solids (TSS) content is 10° Brix, minimum sugar content is 80% of TSS, TSS/acidity ratio is 14, and colour is greenish-yellow in ambia season and orange in mrig season. These are possible only when good agricultural practices (GAPs) are followed by the citrus growers from production to harvest. While exporting, the fruits must be intact and free of bruising, cuts and rotting. The development and condition of citrus fruits must be such as to enable them to withstand transport and handling, and to arrive in satisfactory condition at their destination.

Some non-destructive techniques for the quality evaluation of citrus fruits have been developed. These can be used to evaluate the quality of Nagpur mandarin so that without destroying the fruit, the quality can be evaluated for on-line sorting and certifying high-quality fruits for export purposes. Electronic noses, acoustic methods and optical methods like near-infrared spectroscopy are popular. Time-resolved reflectance spectroscopy can measure the optical properties of the fruit at selected wavelengths in highly diffusive media<sup>6</sup>. Such technologies can be leveraged for the benefit of exporters.

On 19 October 2020, Nitin Gadkari, the Union Minister for Road and Transport, Government of India, flagged-off the Kisan Rail, the first train carrying 460 tonnes of mandarin consignment from Warud tehsil, Amravati district to Bangladesh. The train passes through Warud, Katol and Narkhed for uploading of mandarin consignments. These are the mandarin hotspots of Vidarbha, Maharashtra. Even as the fruit from this region is being regularly exported to Bangladesh, in 2020, for the first time a consignment was sent through the rail link between the two countries. The rail route has cut the travel time to less than half compared to road travel<sup>7</sup>.

On the basis of the foregoing discussion, the following recommendations can be made for improving the export of Nagpur mandarin from India:

- Developing/importing and domesticating citrus varieties having wide harvesting time (early, mid and late).
- Producing more export-quality fruits using a better scientific package of production practices (pre- and post-harvest).
- Strengthening and improving the infrastructure, cold-chain system and cold-storage facility.
- Leveraging the benefits of the GI tag.
- Implementing trade policy decisions with the importing countries.
- Promoting the mrig crop.
- Developing farmer clusters and FPOs.
- Cost–benefit ratio may be estimated for better economic returns.
- Food-testing laboratories to be set up and accredited by international agencies.
- Providing timely market intelligence: Exporters need information on major importing markets of citrus in the world, India's competitiveness vis-à-vis her competitors, the current status of tariff and non-tariff barriers and likely changes in the context of WTO requirements, the current status of quality standards and regulations in importing target markets<sup>8</sup>, harmonization with international standards, practices, certification and testing.
- Supply-chain alignment with international requirements.
- Integration of Government schemes promoting export.
- Sensitizing citrus growers and assuring them of export-related insurance covers.
- Strengthening public private partnership (PPP) mode. The areas where private investments could make effective results are as follows:
  - (a) Pre-harvest management: Germplasm import and evaluation, input supply, accelerated technology transfer and mechanization at the farm level.
  - (b) Post-harvest management: Collection centres, pack houses, testing laboratory, special treatment infrastructure and logistics.
  - (c) Support in market access and developmental activities.
  - (d) Food-testing laboratories.
  - (e) Duty-free export and infrastructural support at railway stations, airports and ports.

Nagpur mandarin has immense potential for export, and given the favourable agro-climatic conditions, support from the Government, research institutions and industrious citrus growers who are willing to boost their production and venture into the world of export, some coordinated and integrated efforts of all the related stakeholders can create a favourable ground for the export of this fruit crop and thus boost the Indian economy.

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