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Scope and future prospects of oil palm plantation in Arunachal Pradesh

Arunachal Pradesh holds immense potential for oil palm cultivation under the National Mission on Edible Oils–Oil Palm (NMEO-OP), with 133,811 hectares identified, yet only 5,677 hectares is currently planted. High-yielding Tenera hybrids (up to 25 MT/ha) offer farmers a lucrative, low-maintenance crop with significant carbon sequestration benefits. Government support for planting material imports, quarantine, and processing industries is accelerating growth. While the region is currently free from major insect pests, proactive monitoring remains essential. With strong policy backing and infrastructure development, oil palm can significantly boost India's edible oil self-sufficiency while transforming Arunachal's agricultural economy.

ARUNACHAL Pradesh, with its distinctive topographic and climatic conditions, stands out from the rest of India. This unique composition necessitates focused attention and support to revive the region's previously robust growth trajectory. Agriculture is the backbone of the state's economy, providing livelihood for the majority of its population. However, the benefits of the Green Revolution have not yet fully reached this region, leaving its agricultural potential underutilized.

Simultaneously, India faces a persistent gap between the demand and production of edible oils, a trend that has shown no signs of abating in recent years. To address both the regional agricultural challenges and the national edible oil deficit, the cultivation of oil palm (*Elaeis guineensis*) presents a promising solution.

Oil palm is an environmentally friendly crop, advantageous in several ways:

- ***Low maintenance***: It is relatively hassle-free concerning insect-pests and diseases, making it a low-maintenance option for farmers.
- ***Labour requirements***: The labour demand for oil palm cultivation are moderate, reducing the strain on local agricultural workers.
- ***Marketing***: The marketing of oil palm products is straightforward, providing farmers with a reliable and steady market for their produce.
- ***Regular income***: Oil palm plantations offer a consistent monthly income, which is particularly beneficial for the small and marginal farmers of Arunachal Pradesh.

By focusing on oil palm cultivation, Arunachal Pradesh can enhance its agricultural productivity and significantly narrow the national edible oil production gap. This dual benefit underscores the importance of targeted initiatives and support, ensuring sustainable development and economic growth for the region.

Table 1. Potential area and cultivable area under oil palm in North Eastern states

State	Potential area (ha)	Cultivated area (ha) as on 2024	Districts covered
Arunachal Pradesh	133,811	5,677	East Siang, Lower Siang, Kamle, Papumpare, Pakke Kesang, Lower Dibang Valley, Namsai, Tirap and Changlang
Assam	375,428	2,496	Kamrup, Goalpara and Dhemaji
Mizoram	66,792	26,832	Aizawl, Kolasib, Mamit, Serchhip, Lunglei, Lawngtlai and Saiha
Manipur	66,652	171	Bishnupur, Chandel, Churachandpur, Imphal west, Thoubal and Ukhrul
Meghalaya	122,637	0	-
Nagaland	51,297	7,801	Dimapur, Peren, Mokokchung, Wokha, Mon, Longleng and Kohima.
Tripura	146,364	530	Unakoti and West-Tripura
Total	962,981	43,507	

Source: The National Mission on Edible Oils - Oil Palm.

Post-entry quarantine facility at Pasighat, Arunachal Pradesh

In the North Eastern states of India, 962,981 hectares have been identified as potential land for oil palm plantation. In Arunachal Pradesh, 5,677 hectares in foothill districts are currently under oil palm cultivation (Table 1).

Initiatives by Government of India

The National Mission on Edible Oils - Oil Palm (NMEO-OP) is a centrally-sponsored scheme initiated by the Government of India in August 2021. Its goals include boosting edible oilseed and oil production, reducing dependency on imports, and expanding oil palm cultivation, with a special emphasis on the Andaman and Nicobar Islands and the Northeast region.

Environmental impact

Oil palm is indeed an environmentally friendly crop. Introduced to India in the 1970s as a commercial crop, it has since been planted across 4.25 lakh hectares in various states. Notably, no environmental issues have been reported in any of these states due to oil palm cultivation. Additionally, its substantial biomass production makes it an effective carbon sink, mitigating the impacts of climate change.

Planting material

In Arunachal Pradesh, oil palm seed sprouts, whether indigenous or imported, are utilized for raising nurseries. Mainly imported from Indonesia, Thailand, Costa Rica, and Malaysia, these sprouts are crucial for oil palm cultivation in the region.

Post entry quarantine (PEQ)

In Arunachal Pradesh, inspections of imported agricultural commodities are done aim to prevent the introduction of exotic insect-pests and diseases. This is executed through the implementation of the Destructive Insects and Pests Act, 1914, and the Plant Quarantine (Regulation of Import into India) Order, 2003. The Designated Inspection Authority (DIA) conducts these inspections at the ICAR Research Complex for NEH Region, Arunachal Pradesh Centre in Basar.

Favourable climatic conditions and soil in Arunachal Pradesh

In Arunachal Pradesh, the average annual rainfall is high, approximately 2,500 mm, with 20.80% occurring in the pre-monsoon and 63.20% during the South West monsoon period. Oil palm plantation requires evenly distributed rainfall of 150 mm/month or 2,500-4,000 mm/annum, along with temperatures between 29-33°C (maximum) and 22-24°C (minimum). Bright sunlight for at least 5 hours per day and humidity of more than 80% are also needed, all of which are available in the foothills of Arunachal Pradesh.

To assess individual sites for oil palm cultivation, factors influencing production throughout its economic life must be considered. An expert system called the 'Oil Palm Site Suitability Evaluator' (OPSSE), developed by ICAR-IIOPR, facilitates this evaluation. OPSSE is available as both a computer and mobile application.

Planting

The best season for planting oil palm in Arunachal Pradesh is typically during May-June. This period aligns with the onset of the South West monsoon, ensuring adequate moisture for initial growth and establishment of the crop.

Cultivated variety

In Arunachal Pradesh, Tenera is the dominant hybrid for oil palm cultivation. It is a cross between the thick-shelled Dura and the shell-less Pisifera varieties, offering

Table 2. Post-entry quarantine (PEQ) facility in Arunachal Pradesh

Importer	PEQ facility (Number)	Import permit (Lakhs)	Final released (Lakhs)	Quarantine pest
M/s 3F Oil palm Private Limited	02	15.00	05.00	*Fusarium oxysporum* f. sp. *elaeidis*
Patanjali Foods Limited	08	24.00	04.00	*Cercospora elaeidis* *Rhadinaphelenchus cocophilus*
Total	10	39.00	09.00	*Marchites sorpresiva* *Phytomonas staheli* Leaf mottle virus *Cadang cadang* and related viroids


Oil palm plantation in Pasighat, Arunachal Pradesh

favourable characteristics for optimal oil palm production in the region.

Yield

Plantations of oil palm in Arunachal Pradesh, with proper irrigation and high-quality planting material, have the potential to yield up to 20–25 metric tonnes (MT) of fresh fruit bunches (FFB) per hectare after five years of growth.

Insect-pests

Oil palm, being a newly introduced crop in Arunachal Pradesh, is presently not targeted by any specific insect-pests. However, native insect species may eventually explore oil palm, potentially leading to the adaptation of some as pests over time. Additionally, existing insect-pests of oil palm may geographically expand into the region. Vigilance and proactive pest management strategies are crucial to address these potential challenges in the future.

Processing industries in Arunachal Pradesh

As of now, two processing units for oil palm have been recently established in Arunachal Pradesh.

Useful by-products in oil palm processing unit

Palm nuts are valuable as they can be used to produce three raw products viz. empty fruit bunches (EFB), palm kernel shell (PKS), and mesocarp fiber (MF).

***Empty fruit bunches (EFB)*:** Indeed, empty fruit bunches, the fibres that hold the fruits as they grow on the palm tree, are valuable biomasses formed during the palm oil extraction process. Once moisture is removed, EFB can serve as an efficient fuel with sufficient combustion temperature. These bunches can be recycled to power steam boilers, producing steam that can run turbines to generate electricity. This sustainable approach not only maximizes resource utilization but also contributes to renewable energy production.

***Palm kernel shell (PKS)*:** After the seed is removed from its kernel for oil extraction, the remaining fractions


Harvested FFB in farmer's field



Processing industry at Roing, Lower Dibang Valley, Arunachal Pradesh

Table 3. Different uses of palm oil

Food product	Non-Food product
Cooking oil, dough fat, vanaspati	Bio-fuel and Bio-lubricants
Coca butter substitutes	Oleo chemicals, fatty acids and fatty alcohols
Margarine	Cosmetic products/Aromatherapy
Salad oil	Pharmaceuticals products
Chocolate/Ice-cream/Frying fats, specialty fats for coatings	Toiletries, detergents including soaps & soap blends
Vegetable ghee	Esters

of shell become a valuable by-product known as palm kernel shells (PKS). These shells can vary in size and texture, ranging from large, fibrous, and bulky to small and dust-like. When mixed together, they create a high-quality biomass fuel with low moisture content, making it easy to handle and store. These fibres can be pressed to form solid fuels, similar to EFB, to power steam boilers for electricity generation.

***Mesocarp fibers (MF)*:** After pressing palm oil fruits, the remaining dry 'cake' consists of mesocarp fibres. These cakes have various uses, including being converted into fertilizer, utilized in the production of fiber boards and blackboards, and serving as the base for fatty-acid-based animal feed.

Major constraints in oil palm cultivation in Arunachal Pradesh

- Long gestation period, delayed income flow to farmers for 4-5 years initially.
- Small holdings of farmers with limited resources.
- Poor transportation and logistics facilities.
- Non-synchronized maturity of oil palm.
- Lack of mechanical harvesting equipment/tools in the state.

Future prospects

Arunachal Pradesh has substantial land suitable for large-scale oil palm plantations, supported by favourable climate and surplus rainfall. With rising edible oil demand, urgent development of advanced agro-techniques and refinement of existing technologies is essential.

SUMMARY

Oil palm cultivation is crucial for increasing edible oil availability due to its high yield. With good planting material, irrigation, and management, it can produce 25-30 MT fresh fruit bunches per hectare after 5 years, yielding 4-5 MT palm oil and 0.4-0.5 MT palm kernel oil. This yield is five times higher than traditional oilseeds. The crop has a 30-year economic lifespan, with three phases viz. juvenile (1-3 years), stabilizing (4-8 years), and stabilized (9-30 years).

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Vertical expansion of nursery under protected conditions using soilless rooting medium

An efficient technology for multiplication of clonal rootstock (M-9, MM-106, MM-111, P-22, B-9, M-27) of apple under greenhouse conditions was standardized. The technique involves wounding/incision on branches with diameter of 5 mm at 30 cm above ground level using sharp knife/blade to remove the bark followed by application of 2,500 ppm IBA as rooting hormone. The treatment starts from the second week of June till the last week of August. Small polybags (filled with rooting medium) are fastened at the points where rooting needs to be initiated. A lightweight substrate (cocopeat) having high moisture holding capacity is used as rooting medium. Staking is accomplished with the help of bamboo poles to hold the bags in a proper position and to keep the plants straight. This technology is very useful in promoting the vertical expansion of the nursery in greenhouse conditions and the multiplication of number of plants per unit area has increased by three to four times with minimum utilization of extra inputs and area. One more additional benefit of this technology is that under the greenhouse conditions, the rootstocks attain sufficient girth (> 6 mm) and all the plants are suitable for budding. The technology not only produced the additional 3-4 rootstocks but also the budded plants which have added advantage to this technology.

Source: ICAR Annual Report 2022-23