

Enhancing Productivity and Income through Improved Orchard Management in GI-Tagged Kachai Lemon: A Success Story from Manipur

Kachai Lemon (*Citrus jambhiri* Lush.), a unique citrus species from Manipur, is not only a cultural and economic pillar for the tribal communities of Ukhrul district but also a powerhouse of nutrition. Rich in flavonoids and ascorbic acid, it offers significant health benefits. Despite its Geographical Indication (GI) tag, its potential was constrained by traditional, low-yielding practices. This article chronicles the transformative journey of Shri Humao, a progressive farmer from Kachai village, who adopted scientific orchard and nursery management interventions from KVK, Ukhrul. His integrated approach of combining soil conservation, pest management, canopy architecture improvement and apiculture led to a staggering 297% increase in his annual income over five years (from ₹2.15 lakh to ₹8.54 lakh). More importantly, it ensured the production of high-quality, nutrient-dense fruits, reinforcing the link between scientific farming, income enhancement and community health. His success has ignited a rural entrepreneurship movement, inspiring fellow farmers to adopt commercial cultivation and diversify into nursery enterprises, thereby strengthening the local bio-economy and food system.

Keywords: *Citrus jambhiri*, GI tag, Kachai lemon, Orchard management

THE North-eastern region of India, a treasure trove of biodiversity, harbours a vast array of indigenous crops with immense nutritional and medicinal value. Among these is the Kachai Lemon (*Citrus jambhiri* Lush.), locally known as 'Kachai champpra'. Endemic to Kachai village in the Ukhrul district of Manipur, this unique fruit is a natural hybrid of mandarin orange (*Citrus reticulata*) and citron (*Citrus medica*). Its recent conferment of a Geographical Indication (GI) tag has rightfully acknowledged its distinctiveness, driven by its bold flavour, aroma and superior nutritional profile. It is exceptionally rich in ascorbic acid (vitamin C), a potent antioxidant that bolsters immunity, aids in collagen synthesis and protects against cellular damage.

However, for years, the cultivation of this nutritional goldmine was hampered by traditional, low-input practices. Farmers faced challenges like improper spacing, severe pest infestations (trunk borer, leaf miner, fruit fly), nutrient deficiencies and a lack of scientific post-harvest management. This resulted in low productivity and significant post-harvest losses, which limited both the income of farmers and the accessibility of this healthy fruit.

Technological interventions for a healthier orchard

Shri Humao, a forward-thinking farmer owning 4.5 hectares of land in Kachai village, experienced these challenges firsthand, with his initial annual income

stagnating at ₹2,15,000. In collaboration with the Krishi Vigyan Kendra, Ukhrul, he implemented a series of scientific interventions designed to rejuvenate his orchard and boost productivity. These practices not only improved fruit yield but also enhanced its quality and nutritional value.



Orchard view of Kachai Lemon

Key interventions adopted by Shri Humao:

Soil and water conservation: Given the hilly terrain, soil erosion was a major concern. The adoption of half-moon terraces prevented nutrient-rich topsoil loss, improved moisture retention and promoted healthier root systems. Healthy soil is the foundation for nutrient-dense crops.

Integrated pest management (IPM): To combat pests without resorting to harmful chemical pesticides, yellow sticky traps and pheromone traps were introduced for managing fruit flies, leaf miners and trunk borers. This

approach ensured the production of clean, residue-free fruits, preserving their natural nutritional quality and safety.

Scientific canopy and shoot management:

- Regular pruning of dried, diseased and undesirable shoots improved air circulation and sunlight penetration, which is crucial for reducing fungal diseases and enhancing the photosynthetic process that builds nutrients.
- Removal of unwanted shoots (up to 30–45 cm from ground level) directed the plant's energy into productive branches, leading to better fruit setting and larger, juicier fruits.

Disease prevention: Application of bordeaux paste on the trunk during winter acted as a powerful prophylactic measure, protecting trees from fungal infections and trunk borers, thereby ensuring the orchard's longevity and sustained production of healthy fruits.

Integration of apiculture (honeybees): Introducing honeybee colonies in the orchard served a dual purpose. It enhanced pollination efficiency, leading to a higher fruit set and more uniformly developed fruits. It also provided an additional income stream from honey, which itself is a health product.



Training and pruning of lemon plant



Application of bordeaux paste

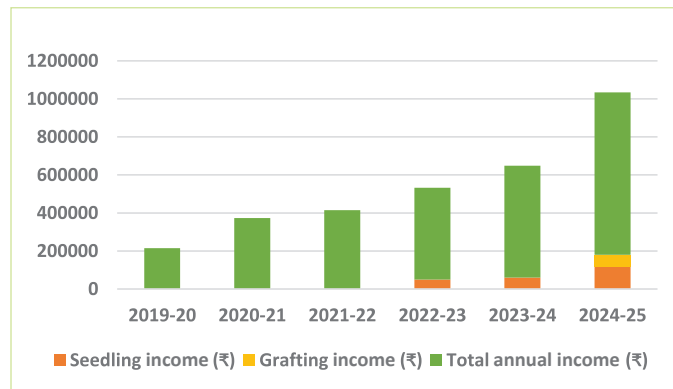


Sticky trap and pheromone trap

From subsistence to prosperity: The economic impact

The cumulative effect of these interventions was a dramatic transformation in both yield and income, as detailed below:

A. Diversification and income growth: Shri Humao diversified from only fruit sales to include nursery activities, creating multiple revenue streams.

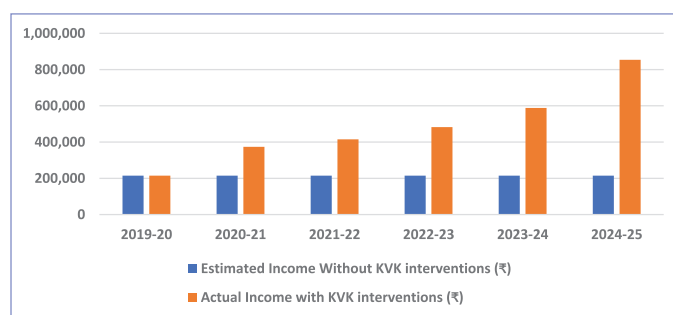


Year-wise income from Kachai lemon and nursery activities

B. Quantifying the impact of KVK interventions: The direct comparison highlights the power of scientific adoption. The price per kilogram of lemon also increased from ₹40 to ₹60, reflecting the better quality and possibly the GI tag's growing influence.



Fruit harvesting for marketing



Comparison of income with and without KVK interventions

The results are undeniable. By adopting scientific practices, Shri Humao didn't just increase his income; he ensured the production of healthier and chemical-free fruits. While the estimated annual income without intervention remained at the baseline level of ₹2.15 lakh, the actual income increased steadily over the years, reaching ₹8.54 lakh in 2024–25. This represents a 297.2% increase over the baseline, indicating the effectiveness of scientific orchard management, enterprise diversification and market-oriented interventions introduced by KVK.



Nursery preparation under low-cost polyhouse

The establishment of polyhouses for nursery production also ensures the availability of high-quality, disease-free planting material for the community, further promoting the cultivation of this health-promoting crop.

A ripple effect: From individual success to community strength: Shri Humao's success has catalysed a positive change throughout the region. His farm became a living demonstration of the benefits of scientific horticulture.

- Inspiring 15 fellow farmers to take up scientific Kachai lemon cultivation across 20 hectares, multiplying the production of this nutritious fruit in the district.
- Motivating 10 farmers to start their own seedling and grafting businesses, creating a local source of healthy planting material and generating additional income.
- Strengthening the local economy by creating employment opportunities in orchard management, nursery operations and potentially in future value-addition units.

This collective shift towards commercial scientific farming ensures a greater supply of high-quality and nutrient-rich Kachai lemons for local and regional markets. It directly contributes to the nutritional security of the community and beyond.

Way forward: This success model holds immense potential for replication across the North-eastern region to unlock the value of its unique biodiversity. To scale up

such initiatives, a concerted effort is needed:

- Strengthening KVK outreach to provide need-based, hands-on training to more farmers.
- Promoting value addition by establishing small-scale processing units for juice, squash, pickles and dried rinds, which can reduce post-harvest losses and create nutritious, shelf-stable products.
- Leveraging the GI tag for robust branding and marketing, connecting consumers who value health and unique food origins with premium products.
- Encouraging Farmer Producer Organizations (FPOs) to collectively invest in infrastructure, quality certification and stronger market linkages.

Shri Humao's story is a microcosm of a larger truth: Investing in the farmer and equipping them with scientific knowledge yields a rich dividend - prosperous farms, thriving communities and a healthier nation.

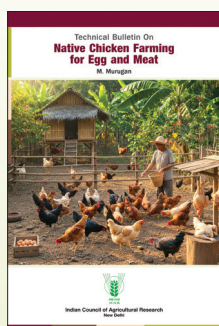
SUMMARY

The journey of Shri Humao is a powerful testament to the transformative potential of science-led and entrepreneurially-driven agriculture. It demonstrates that improving orchard management is not just about increasing yield and income; it is intrinsically linked to enhancing the nutritional quality of the produce and the health of the community. By adopting IPM and soil health practices, he has become a producer of safe and functional food.

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