



Agribusiness Prospects of Kachai Lemon Produced in Ukhrul District of Manipur, India: Status, Issues and Way Forward

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Kachai lemon (*Citrus jambhiri* Lush.) is a variety of citrus, known for its rich nutritional and medicinal benefits due to its high flavonoid content and ascorbic acid. It has played a significant role in enhancing the socio-economic development of the tribal communities by generating income and employment opportunities. The Geographical Indication (GI) tag awarded to Kachai lemon has increased its commercial cultivation and market value. This recognition and growing attention have led to the emergence of agripreneurs and farmer producer organizations (FPOs) for production, value addition and marketing of Kachai lemon in an organized manner. The present study is aimed

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to compile the success stories, challenges of farmers and explore various Kachai lemon brands available on online platforms. A SWOT (Strength, Weakness, Opportunities and Threats) analysis on production and marketing of kachai lemon was performed. For the study, descriptive analysis was carried out to assess its potential, current status and challenges. The study suggests that in order to compete globally, it is crucial to develop strong post-harvest processing and marketing systems with support from agencies and institutions to provide valuable resources and market linkages to enhance efficiency and gain economic benefits.

Keywords: Kachai lemon; agribusiness; SWOT; marketing; Manipur.

1. INTRODUCTION

Kachai lemon is a variety of citrus belonging to the species *Citrus jambhiri* Lush. and family rutaceae. It is locally referred as kachai champra and is widely cultivated in Manipur, particularly in Kachai village of Ukhrul district. It is a hybrid variety of mandarin orange (*Citrus reticulata* Blanco.) and citron (*Citrus medica* L.). The allure of kachai lemon is a key element of villages' economy and cultural identity that lies not only from its rich flavor but also from its remarkable nutritional benefits [1]. It has been accorded Geographical Indication (GI) registration (GI-446) in 2014 [2] due to its distinct taste, high content of ascorbic acid (51%) and juice containing 30-60 ml per 100 g of fruit weight [2,3,4]. Whereas the other citrus fruits found in India contains only 20-30% of ascorbic acid [5]. With high content of ascorbic acid (34.67 ± 1.02 mg/100ml of juice) it also contains high flavonoid content (199.51 ppm hesperidin). It is rich in antioxidant compounds and has high vitamin content [6,7,8]. The Kachai lemon also possesses medicinal properties that aids in treating various health issues such as high blood pressure, gastritis, dry scalp and fat reduction. Recognizing the crop's economic importance and commercial potential, the cultivation of Kachai lemon has now expanded to other districts [4,9].

Citrus crops like sweet lime and mandarin are sold easily in local market and despite the abundance of fresh lime and lemon during their peak production season it is more challenging to sell it and often fetching low prices [10]. Huge amount of Kachai lemon is wasted every year due to lack of storage facilities and post-harvest spoilage [11]. Transformation of raw agricultural commodities into higher-value products, known as value addition, is essential for enhancing profitability and fostering innovation in the agricultural sector [12,13]. This process plays a crucial role in agricultural entrepreneurship, contributing to economic growth and sustainability. The non-marketable or deformed

fruits after harvesting can be easily processed into value added products. Thus, processing and enhancing value of kachai lemon will not only reduce post harvest spoilage but also ensure higher returns to farmers, create employment opportunities for rural youths and helps in empowering farm women. However, no research works have been reported yet on prospects and challenges of kachai lemon. Thus, the present study is aimed to assess potentials, challenges and compile documented success stories of farmers engaged in kachai lemon cultivation to provide a better understanding of the agribusiness opportunities it offers and gather/provide information on various brands of kachai lemon sold on online platforms.

2. METHODOLOGY

The study gathered secondary information from various articles published in journals, magazines, books, newsletters and other internet sources. Descriptive analysis was carried out to assess the potentials, current status and challenges. The present study is an attempt to compile the success stories and challenges of farmers as reported in different print and digital media and presenting them in one comprehensive resource. Based on information gathered, a SWOT (Strength, weakness, opportunities and Threats) analysis was conducted and also highlighted various strategies for the promotion of kachai lemon in the state. Additionally, this study tries to identify various brands of kachai lemon sold through online marketing platform.

3. RESULTS AND DISCUSSION

3.1 Status of Kachai Lemon Production in Manipur

The state promotes cultivation of kachai lemon as One District One Product (ODOP) for Ukhrul district [14]. To support expansion, conservation

and recognition of Kachai Lemon, the villagers have implemented 'Community Plantation Programme' where every household maintains 50-100 plants in their orchards or fields allotted by the Kachai Village Authority. The community plantation covers more than 200 hectares and one community orchard has also been developed by kachai fruit farming and processing Cooperative Society Limited with 10,000 kachai lemon plants [3]. For this unique conservation effort, the kachai village community was awarded the prestigious "Plant Genome Saviour Community Awards" by Protection of Plant Varieties and Farmers' Rights Authority, Ministry of Agriculture and Farmers Welfare, Government of India [15]. Recently kachai villagers have planted more than 1.2 lakhs kachai lemon plants in the village [16]. For the promotion of kachai lemon, every year kachai fruit farming and processing Cooperative Society Limited has been organizing kachai lemon festival annually since 2005 in collaboration with Kachai Village Authority, North Eastern Council-Shillong, Department of horticulture & Soil Conservation-Government of Manipur, ICAR Research Complex for NEH Region-Manipur Centre, KVK-Ukhrul and other organizations [16,17]. The total estimated area and production of kachai lemon for the year 2023-24 was 320 hectare and 2240 MT respectively, out of which 200-hectare area are under organic cultivation [18]. The production detail of kachai lemon is presented in Table 1.

3.2 Success Stories of Successful Kachai Lemon Farmers

3.2.1 Case I: Success story of Mr. Yangmiso Humao

Shri Yangmiso Humao is a 54-year-old progressive kachai lemon farmer from Kachai Village of Ukhrul district, Manipur. He has experienced remarkable success through his transition from paddy farming to Kachai Lemon cultivation. Earlier, he was engaged in the cultivation of paddy on 1.2 acres of land, earning an income of ₹35,000 per year. Over time, he gradually shifted to cultivation of kachai lemons, which initially brought him an annual income of

₹2.15 lakhs. However, with the introduction of technological interventions by the Krishi Vigyan Kendra (KVK) such as improved spacing, nutrient management and plant protection techniques, his production and income has increased. Currently, he is managing a 4-hectare orchard that produces 9-10 metric tons of lemon fruits annually, generating an income of ₹4.50 lakhs. Additionally, by selling kachai lemon saplings, he earns ₹2.50 lakhs every year. His success has not only elevated his social prestige but has also inspired fellow farmers and rural youth in Kachai and surrounding areas to start commercial kachai lemon cultivation and nursery operations [4,16,19].

3.2.2 Case II: Success story of Mr. V. Tuime Lolly

Mr. V. Tuime Lolly, resident of kachai village is actively engaged in the cultivation of kachai lemon with the adoption of improved production and rejuvenation technology. In improved production technology, he invests approximately ₹1,60,000 per hectare annually in cultivation, generating a return of ₹5,40,000 per hectare with the productivity of 18tonnes/ha. Besides selling fresh fruits, he also produces value added products like pickle and juice and marketing with a brand name "TuWa fruits". He has received financial support from NABARD for the establishment of Farmers' Club and has been selected for expanding his fruit processing unit by TM Cell of state govt. [20].

3.2.3 Case III: Success story of Mr. Hamring Vashung

Mr. Hamring Vashung is a 74 year old resident of kachai who relied primarily on kachai lemon cultivation as his main source of income. Besides growing paddy and other seasonal vegetables Vashung has been dedicated to kachai lemon farming since the early 1960s. He cultivated over a hundred lemon trees on his farm, generating an annual income of approximately ₹40,000 which played a crucial role in supporting his family, covering expenses like children's education and daily necessities [21].

Table 1. Estimation of area and production of Kachai lemon

Area (in ha.)	Production (MT)	Average productivity (Kg/ha)
320	2240	7000

Source: Department of Horticulture & Soil Conservation, Govt. of Manipur, 2024

Table 2. Kachai lemon brands sold on online platforms

Sl. No.	Brand	Rate (Rs.)	Sold by	Sold on
1	Smile- Kachai lemon tea, 16 Sachets	240	Smile Blue Ocean Academy	https://pabung.com/
2	Smile- Spicy dehydrated Kachai lemon, 40gm	70	Smile Blue Ocean Academy	https://pabung.com/
3	Smile-kachai lemon spicy candy, 100gm	90	Smile Blue Ocean Academy	https://pabung.com/
4	Smile- Kachai lemon sweet candy, 100gm	100	Smile Blue Ocean Academy	https://pabung.com/
5	Smile- Kachai lemon sweet & salty, 100gm	100	Smile Blue Ocean Academy	https://pabung.com/
6	Soyam Foods- Kachai lemon candy, 100gm	100	M/S Soyam Products	https://pabung.com/
7	Soyam Foods- Kachai lemon pickle, 200gm	150	M/S Soyam Products	https://pabung.com/
8	TuWa- Kachai lemon pickle, 200gm	100	M/S Tuwa fruits	https://www.tribesindia.com/
9	Welnest-Kachai lemon pickle, 250gm	299	Welnest	https://www.welnest.in/
10	North-East heritage- Manipur Kachai lemon pickle, 170gm	299	Secrets of Brahmaputra	https://secretsofbrahmaputra.com/
11	North-East heritage- Manipur Kachai lemon pickle, 170gm	180	North East Farm Sales Promotion	https://www.lucknowfarmersmarket.com/
12	GI Kachai lemon handmade soap, 100gms	130	North East Farm Sales Promotion	https://www.lucknowfarmersmarket.com/
13	GI Kachai lemon handmade soap, pack of 4	620	North East Farm Sales Promotion	https://secretsofbrahmaputra.com/

Source: Site viewed on 22/08/2024

Table 3. SWOT analysis of kachai lemon production and marketing

STRENGTH	WEAKNESS
<ul style="list-style-type: none"> • Accorded GI tag for kachai lemon • Contains highest content of ascorbic acid and flavonoid • Rich in antioxidant compounds and high vitamin content • Possess medicinal properties • Help in treating various health issues such as high blood pressure, gastritis, dry scalp and fat reduction • Kachai lemon festival creating premium value and space in domestic and export market. 	<ul style="list-style-type: none"> • Lack of standardized cultivation practices • Low adoption of modern technologies • Limited marketing platform • Inconsistent Demand • Lack of systematically organized supply chain or value chain network • Lack of widespread recognition outside the region
OPPORTUNITIES	THREATS/CHALLENGES
<ul style="list-style-type: none"> • Can serve as an ingredient for natural medicine & pharmaceutical industries. • Number of agripreneurs can be developed • High market value and has huge export potential for value added products • Potential for doubling farmers' income • Can be marketed through online platform • Wide variety of value-added products can be produced 	<ul style="list-style-type: none"> • Unstable market prices • Limited awareness and branding • Limited infrastructure for large-scale production and distribution • Ensuring efficient transportation from remote growing areas to markets while maintaining freshness. • Potential impacts of changing weather patterns on yield and quality.

3.3 Marketing of Value Added Kachai Lemon Products through Online Platforms

A number of traders or companies sold value added kachai lemon products in various online marketing platforms. The primary platforms include Pabung, Tribes India, Secrets of Brahmaputra and Welnest. These platforms feature various kachai lemon products offering under multiple brand names by different suppliers and companies. Various value-added products such as dehydrated kachai lemon, pickles, candies and tea are available in different price ranges and packaging sizes. Among these, Pabung stands as the leading online marketing platform offering a wide variety of kachai lemon products. The details of various marketing firms and brands with the price are presented in Table 2.

3.4 SWOT Analysis of Kachai Lemon Production and Marketing

SWOT analysis is used to formulate strategies that leverage strength and opportunities while addressing threats and minimizing the

weaknesses [22]. The detail of SWOT analysis of kachai lemon production and marketing is presented in Table 3.

3.5 Agencies and Agripreneurs Involved in Trading and Marketing of Kachai Lemon

Some of the prominent kachai lemon agripreneurs and marketers of kachai lemon in the state are

1. Ngayam Foods, Ukhrul, Manipur
2. Hill Wild Private Ltd., Ukhrul, Manipur
3. M/S Soyam Products, Ukhrul, Manipur
4. M/S Tuwa fruits, Ukhrul, Manipur
5. Smile Blue Ocean Academy, Imphal East, Manipur
6. MOMA - Organic Outlet, Imphal, Manipur

3.6 Constraints Faced by the Farmers in Kachai Lemon Cultivation and Marketing

Farmers engaged in kachai lemon cultivation face several challenges such as most orchards are seedling-origin, leading to a long juvenile period. Additionally, vegetative propagation

methods such as budding, grafting and layering have not been standardized, which hampers the efficient production of quality plants. Other constraints are lack of access to quality planting materials, limited knowledge about processing Kachai lemons into value-added products and poor shelf life leading to post-harvest losses [1,7].

Despite the uniqueness of the fruit, kachai lemon farmers often receive low market prices, faces high price fluctuations, making it difficult for farmers to secure consistent income. Additionally, lack of proper storage facilities and inadequate market linkages hinder their ability to preserve and sell their produce effectively. Farmers also struggle due to lack of linkages with bulk purchasers and processors, limiting their market reach. High cost of transportation and poor transportation infrastructure are also the constraints faced by farmers in marketing of kachai lemon [1,4,7].

3.7 Strategies for Promotion of Kachai Lemon in Manipur

- 1. Linking farmers with fruit processors:** As kachai lemon is seasonal in its production and consumption in fresh form is limited, developing strong linkages with processors and ensuring a steady supply chain is crucial. By connecting farmers directly with processors, the surplus produced can be efficiently utilized, reducing wastage and adding value through processed products and thereby enhancing market access and generate revenue.
- 2. Popularization of kachai lemon and its products through mass media:** Kachai lemon is mainly cultivated in and around the Kachai village having certain agro-climatic condition and available only in particular seasons. Expansion of its production on a larger scale requires targeted efforts and initiatives. Promoting the uniqueness of Kachai lemon by showcasing it at expos, exhibitions and other public platforms is important. Highlighting its distinct characteristics, health benefits and medicinal properties through mass media advertisements and introducing new value-added products can enhance its market presence and popularity, leading to better recognition and demand on a broader scale.
- 3. Attracting investment and funding from institutions:** Establishing procurement unit at village level, creation of cold storage facilities, setting up of grading and packaging units to improve product quality, development of marketing outlets for sale of the produce and its value-added product along with improved road connectivity for transportation requires considerable financial support from diverse sources, such as government programs, private investments and cooperative initiatives. This holistic strategy will not only empower local farmers but also bolsters rural economies by optimizing the value chain from production to market.
- 4. Standardized package of practices for sustainable production:** To rejuvenate declining productivity, it is essential to develop standardized cultivation practices based on the specific agro-climatic conditions. These practices encompass the appropriate timing for propagation and nursery management, proper land preparation, nutrient management, mulching, plant protection measures, Integrated Pest Management (IPM) modules and timely harvesting, etc. By implementing these practices, farmers can achieve optimal utilization of available farm resources, resulting in higher yields and greater market acceptability of produce both nationally and internationally which in turn will lead to better market prices and increased profitability for the farmers.
- 5. Up scaling production volume:** For companies to achieve economies of scale in producing value-added products, they need large quantities of raw materials, usually in terms of hundreds of metric tonnes. Smaller quantities are not cost-effective for transportation and processing, making operations inefficient and unviable. Therefore, large-scale production is crucial to attract major buyers and maintain stable supply chains. By securing bulk raw materials, producers can access larger markets, secure better deals and streamline production and distribution.
- 6. Developing strong marketing channels:** A strong marketing channel is important for the movement of produce from farmer to the destination. The involvement of informal middlemen and traders should be avoided or minimized to reduce the price spread and increase the marketing efficiency. Strong marketing systems with the support from

agencies and institutions such as APEDA, NERAMAC, MOMA, TRIFED, NABARD, etc. is crucial to develop better market linkages.

4. CONCLUSION

Even though commercialization of this particular crop has started, it is still in the budding stage and it is evident that there is an enormous potential for commercialization of kachai lemon in Manipur. The implementation of ODOP for kachai lemon combined with community plantation programs and technological support from institutes and agencies has increased the production area and productivity. The findings demonstrate that adoption of technological interventions and value-added product development have resulted in higher income and employment generation and inspired others to start kachai lemon farming. Since value added products can be produced from kachai lemon the state government should implement necessary measures to attract food processing units to establish operations in the region.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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