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Problems and prospects of Kinnow cultivation for sustainable livelihood: A case study of Sirsa District, Haryana, India

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Abstract

The study evaluated the current situations and emerging issues of Kinnow farming for sustainable livelihood within the Sirsa district of Haryana, India. The quantitative SWOT-QSPM approach was utilized to analyze the factors influencing Kinnow cultivation and to estimate interrelated strategies. A total of 29 factors encompassing 14 internal (7 strengths(S) and 7 weaknesses(W)) and 15 external (8 opportunities(O) and 7 threats(T)) were recognized by examining data collected through personal interviewing and using questionnaires from 100 farming households located across 10 different villages of district Sirsa with the help of purposive random sampling. Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) matrices identified that favorable climatic conditions of the region for kinnow farming (S1, 3.8) and *Phytophthora* infection, pests attack, diseases and lack of knowledge in the specific identification of symptoms in kinnow orchards (W6, 3.6) were the most listed internal strength and weaknesses. At the same time, potential opportunities for the establishment of food processing industries (O5, 3.6), organized cold storage to deal with the perishable nature of the product (O7, 3.4) and unfair pricing/ price crash in times of bumper production (T3, 3.2) encompassed the most concerning external opportunities and subsequent threats in the region. The results further revealed that the revitalization of kinnow export (WT1, 130.85), launching of cold storage chains (WT2, 124.9) and control of diseases (WT3, 101.15) may become the competent action plans to cope with the negative aspects. The establishment of citrus estates with post-harvest facilities (SO3, 96%) and developing food processing industries within the district to enhance local employment and income opportunities (SO1, 94%) may be considered the most appropriate positive (SO) strategies to ensure prosperity and sustainable development of Kinnow farming in the Sirsa region.

Key words: Citrus, Kinnow, sustainable livelihood, SWOT analysis, quantitative strategic planning matrix

Introduction

Citrus cultivation is a significant global horticultural endeavour, deeply embedded in the social, cultural, and economic fabric of societies (Vijaya *et al.,* 2017). In terms of area and production, citrus ranks second worldwide, only surpassed by grapes. China is the leading producer of citrus, with an annual output of 46,672,949.22 tonnes. Following behind, India ranks third, with its yearly production reaching 14,307,000 tonnes (FAO Stat, 2021).

In India, citrus fruits cover 10% of the total area dedicated to fruit crops, with Kinnow holding a special status among them. Kinnow is preferred due to its high yield, excellent processing qualities, suitability for fresh consumption and unique aroma. Rich in vitamin C and polyphenols like hesperidin, naringin, and limonin, Kinnow offers antioxidant, anti-inflammatory, and anticancer benefits.

The commercial processing of Kinnow into juice represents significant economic and health benefits, promising substantial returns in both domestic and international markets. Due to its rising popularity, the areas cultivating Kinnow are expanding into arid and semi-arid regions (Vijaya *et al.,* 2017). In recent years, the commercial appeal of Kinnow fruit, including its direct consumption, processing, and trading aspects, has seen a consistent increase (Priyadarshini *et al.,* 2020). Presently, Kinnow is commercially grown in the regions of Punjab, Haryana, the northwestern parts of Rajasthan and Uttar Pradesh in India.

In Haryana, Kinnow occupies over 80 percent of the area devoted to citrus fruit cultivation, as stated by horticulture experts from the district headquarter office, Panchkula. Fruit growers are increasingly adopting Kinnow cultivation due to its lucrative returns and robust market demand. However, despite its potential, Kinnow farming has not developed to a level that substantially boosts farm incomes or promotes a widespread transition to more non-traditional crops. This lag in development can be attributed to various internal and external factors, including the perishability of the fruit, the socio-economic status of farmers, regulatory constraints, and deficiencies in systematic supply chain management. Horticulture crops are vital for ensuring farmers' livelihoods in a changing agricultural environment (Kumar *et al.,* 2017).

The current study was conducted in Sirsa district, a prominent Kinnow-growing district in Haryana, to evaluate the condition of Kinnow orchards and identify both climatic/environmental and socio-economic challenges in its cultivation. It also aimed to analyze the positive and negative factors affecting Kinnow cultivation, which could influence sustainable livelihoods and future prosperity. Additionally, this research explores potential solutions to overcome the weaknesses and threats of Kinnow farming by employing quantifiable SWOT and QSPM analyses.

Materials and methods

Study area: Haryana is located between 27° 39' and 30° 56' North latitude, and 74° 27' to 77° 36' East longitude, encompassing 22 districts. Sirsa, positioned in the northwestern corner of the state, borders Punjab and Rajasthan. The district Sirsa is further divided in to six Tehsils (Sirsa, Dabwali, Ellenabad, Rania, Kalanwali and Nathusari Chopta). The Ghaggar River, a significant seasonal waterway, flows through the district. Sirsa is characterized by a mostly dry climate, with hot summers and cold winters, except for the monsoon season. The district's landscape comprises plains, alluvial beds, and sand-dune tracts.

SWOT-QSPM analysis: The integrated SWOT-QSPM approach was utilized to analyze the factors influencing sustainable Kinnow cultivation and to evaluate interrelated strategies. Originally developed by Albert Humphrey in the 1960s (Nyarku & Agyapong, 2011), the SWOT framework is a robust tool for strategic management that assesses four key dimensions—internal strengths (S) and weaknesses (W), and external opportunities (O) and threats (T) through both qualitative and quantitative methods (Gürel and Tat, 2017). Strengths refer to well-managed attributes, while weaknesses involve poorly managed controllable activities (Hunger, 2010). Opportunities are seen as latent potential, whereas threats represent possible losses (Ahmadi *et al.,* 2008). In this study, a quantitative SWOT analysis was conducted, with weighted scores assigned to 7 strengths, 7 weaknesses, 8 opportunities, and 7 threats identified through personal interviewing and using questionnaires from March 2022 to March 2024.

As district Sirsa is further divided into six Tehsils (Sirsa, Dabwali, Ellenabad, Rania, Kalanwali and Nathusari Chopta), the data was collected from farming households of ten villages (Darbi and Panniwala Mota from tehsil Sirsa; Dhudian Wali and Bhoona from tehsil Rania; Abub Shahar and Teja Khera from tehsil Dabwali; Neemla and Umedpura from tehsil Ellenabad; Bhadra from tehsil Kalanwali; Gudia Khera from tehsil Nathusari Chopta) by using questionnaires and personal interviewing. Samples were distributed across the 10 villages so that variations between villages could be adequately captured. Further, 10 households were selected from each village, applying the purposive random sampling. Hence, Sample size = 100 farmers households (10 Villages × 10 households/village). We quantified participant perceptions by determining the Rating Value (RV) and Weighted Value (WV) for each factor. The weights varied from 0.1 (insignificant) to 1.0 (highly significant), and the ratings spanned from 1 (below average) to 4 (superior). The Weighted Score for each factor was determined by multiplying these values (David *et al.*, 2009) using the formula:

$$WS = RV \times WV$$

The internal and external factors identified were utilized to construct the Internal Factor Evaluation Matrix (IFEM) (Table 2) and the External Factor Evaluation Matrix (EFEM) (Table 3) to distinguish between crucial and negligible factors affecting Kinnow cultivation in the region. These matrices served as the basis for the Quantitative Strategic Planning Matrix framework, leading to the formation of two strategic groups: SO and WT (Shri *et al.,* 2015).

Strength-Opportunity (SO): SO strategies focus on leveraging strengths to capitalize on opportunities in Kinnow farming. Subsequently, the opinions of respondents on the SO strategies were gathered using a rating scale and categorized into agree, disagree, and neutral. The strategy that received the most favourable responses was selected as the most promising for the future advancement of Kinnow production.

Weakness-Threat (WT): The WT strategies propose alternative actions to address both current weaknesses and forthcoming threats. In this context, SWOT analysis elements were integrated with various WT strategies from the Quantitative Strategic Planning Matrix (QSPM) to identify the most effective policies for successful development. The QSPM utilizes the Attractiveness Score (AS) and the Total Attractiveness Score (TAS) to assess and mitigate the vulnerabilities associated with WT strategies. Each factor's degree of attractiveness for each strategic alternative was measured by the AS, which ranged from 1 (least attractive) to 4 (most attractive). The weighted scores from the IFE and EFE matrices were multiplied by the AS to calculate the TAS for each WT strategy. By aggregating the TAS for each WT strategy, the Sum Total Attractiveness Scores (STAS) were obtained. The WT strategy with the highest STAS was considered the optimal approach for mitigating weaknesses and threats as per the methodology of David *et al.,* 2009.

Results and discussion

Haryana excels in the production of horticultural crops. Data from 1966-67 shows that horticultural land comprised only 0.42% of the cropped area, a figure that rose to 2.94% by 2000-01. By the 2019-20 period, the land dedicated to horticultural crops increased to 478,444 hectares, which represents approximately 7.07% of the total area cultivated (Statistical Abstract of Haryana, 2024).

In Haryana, fruit crops hold a prominent place among horticultural crops. Rising per capita income, along with the impacts of urbanization and globalization, has led to a significant change in how fruits are consumed across households of varying economic status. In 1991-92, fruit crops covered 2.87 million hectares in Haryana, producing 28.63 million tonnes at a productivity rate of 9.96 tonnes per hectare. By 2022-23, this area expanded to 6.9 million hectares, yielding 101 million tonnes of fruits with an improved productivity of 14.64 tonnes per hectare. (Statistical Abstract of Haryana, various issues). Among the primary fruit crops in Haryana, Kinnow is the most extensively cultivated, both in terms of the area covered and total production. It dominates the citrus fruit cultivation in the state. In 1991-92, the area dedicated to Kinnow farming was 3,189 hectares, which expanded to 5,041 hectares by 2005-06, according to Horticulture sources from that period. By 2014-15, this had increased to 19,499 hectares with a production of 302,065 metric tons, and by 2022-23, Kinnow was cultivated over 23,920 hectares, producing 470,852 metric tons (Department of Horticulture, Sirsa, Haryana).

Present status of Kinnow cultivation: Sirsa district is the leading producer of Kinnow in Haryana, accounting for 74% of the state's total output and 52% of the cultivation

area. This is followed by Bhiwani, Hisar, and Narnaul, as shown in Table 1 (Department of Horticulture, Sirsa, Haryana).

Table 1. Area and production of Kinnow in different districts of Haryana (2022-23).

Districts	Area (ha)	Production (MT)
Ambala	52	780
Bhiwani	2443	10236
Charkhidadri	362.6	412
Faridabad	51	4930
Fatehabad	1248.5	30176
Gurugram	353	4116
Hisar	2337	4610
Jhajjar	402	2865
Jind	622.4	7761
Kaithal	43.39	690
Karnal	77	12.3
Kurukshetra	8	48
Narnaul	1469	40972
Mewat	491	65
Palwal	422	3961
Panchkula	93.3	40
Panipat	61.8	2761
Rewari	278.6	2291
Rohtak	246.4	3315
Sirsa	12548.3	348926
Sonipat	52.2	1775
Yamunanagar	257.8	110

Kinnow cultivation in the Sirsa district has seen substantial growth, expanding area from 5,905 hectares in 2008-09 to 12,548 hectares in 2022-23, as illustrated in Fig. 1 and 2. Correspondingly, production has amplified from 36,831 metric tons to 348,926 metric tons, and productivity has surged from 6.24 metric tons per hectare to 27.81 metric tons per hectare over these fifteen years. During this period, Sirsa has exhibited consistent positive trends in both the area (R^2= 0.8821, Fig. 1) and production (R^2 = 0.949, Fig. 2) of Kinnow. This expansion of Kinnow orchards is attributed to the higher guaranteed income from Kinnow compared to other crops and fruits, drawing a significant portion of the district's population into related sectors like farming, retailing, processing, and marketing. These shifts in cropping patterns and livelihood strategies are creating new socio-economic challenges for local farmers, even as the socio-economic conditions of Kinnow cultivators and traders improve with the orchards' growth.

Analyses of the influential factors: Internal Factors Evaluation (IFE) Matrix and External Factors Evaluation (EFE) Matrix: The evaluation of the IFE and EFE matrices identifies critical and minor SWOT factors for Kinnow cultivation, as outlined in Tables 2 and 3. The IFE Matrix emphasizes the key strengths in Kinnow farming, such as optimal agro-climatic conditions (S1, 3.8), increasing market demand both domestically and internationally (S2, 3.6), extensive agricultural knowledge (S5, 2.55), and deep-rooted traditional farming techniques among local farmers (S6, 2.4). Likewise, studies on apple

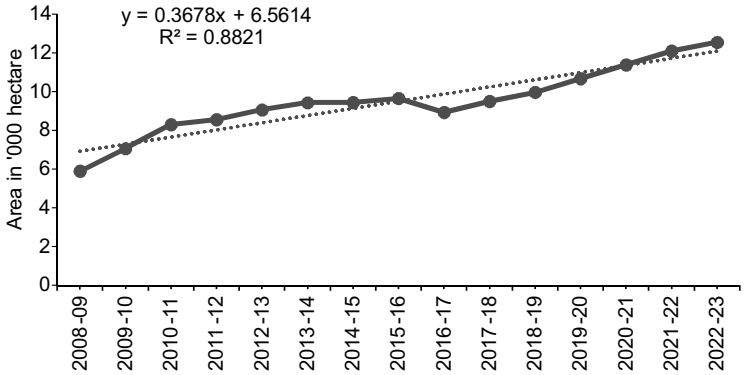

Fig. 1. Progressive variation of the area of Kinnow cultivation in Sirsa districts of Haryana (2008-09 to 2022-23).

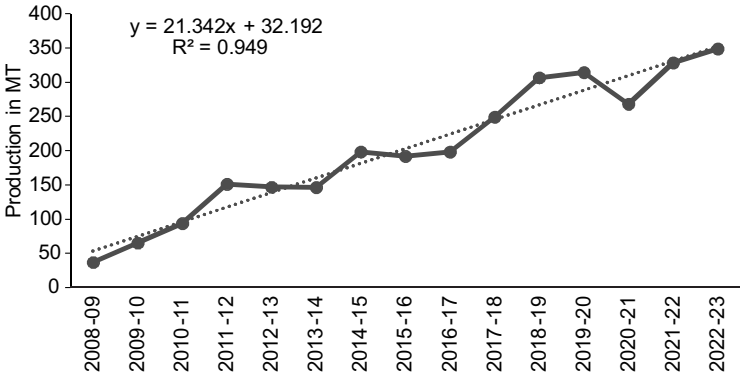

Fig. 2. Progressive variation of production of Kinnow cultivation in Sirsa districts of Haryana (2008-09 to 2022-23).

farming in Himachal Pradesh by Sen *et al.* (2015), Singh *et al.* (2016), Sahu *et al.* (2020) and Yasmin *et al.* (2023) highlight the essential role of favorable agro-climatic conditions in fostering successful and sustainable agriculture. The participants' feedback identified major weaknesses in Kinnow cultivation, such as Phytophthora infections, pest attacks, disease issues, and a gap in symptom identification skills (W6, 3.6), inadequate knowledge about proper fertilizer and pesticide usage (W3, 2.55), and the high costs associated with seeds, pesticides, and fertilizers (W2, 2.25). Similar encounters were observed in apple cultivation in Kullu, Himachal Pradesh by Singh *et al.* (2015), and studies by Kumar *et al.* (2021) and Kumar and Sharma (2019) charted comparable difficulties in both Haryana and Himachal Pradesh.

The assessment of external factors highlighted several opportunities that could enhance Kinnow farming: the establishment of food-processing industries (O5, 3.6), development of organized cold storage systems to address the perishability of Kinnow fruits and ensure its availability throughout the year (O7, 3.4), and the expansion of structured, multi-functional marketing systems (O6, 2.55). Conversely, significant threats include unfair pricing and market crashes during high production periods (T3, 3.2), the absence of Minimum Support Prices (MSP) (T1, 3.0), a reduction in exports due to substandard quality (T7, 2.55), and the scarcity of suitable seedless varieties for processing (T5, 2.25). Findings of Kumar *et al.* (2017) corroborates these findings, indicating that insufficient support prices, ineffective market structures, and marketing malpractices pose critical risks to fruit farming in Haryana and Punjab.

Following a weighted score analysis of the internal and external factor evaluation matrices, pivotal factors influencing Kinnow cultivation in the Sirsa district were prioritized. Based on these priorities, two strategic groups were systematically developed to guide future actions.

Table 2. Internal factors evaluation matrix (Source-Field survey 2022-24)

	Sr. No.	Internal Factors	Weighted value	Rating value	Weighted score
STRENGTHS	S1	Suitable agro-climatic condition	0.95	4	3.8
	S2	Growing demand in both the domestic and global markets	0.9	4	3.6
	S3	Sufficient resources for irrigation	0.6	2	1.2
	S4	The availability of contracting agents to support marketing	0.7	2	1.4
	S5	Vast experience of agriculture	0.85	3	2.55
	S6	Good traditional knowledge among the farmers of the area	0.8	3	2.4
	S7	An adequate supply of planting materials from organized nurseries and state horticulture department	0.6	2	1.2
WEAKNESSES	W1	Climatic and seasonal disturbances	0.65	2	1.3
	W2	High cost of seeds, pesticides and fertilizers	0.75	3	2.25
	W3	Lack of knowledge of recommended fertilizer & pesticides doses	0.85	3	2.55
	W4	Inadequate infrastructure (cold storage, transportation, and warehousing facilities)	0.75	2	1.5
	W5	Shortage of advanced processing set-up (Sensor based grading and waxing)	0.75	2	1.5
	W6	Phytophthora infection, pests attack, diseases and lack of knowledge in specific identification of symptoms.	0.9	4	3.6
	W7	Insufficient knowledge of international marketing skills.	0.7	3	2.1

Table 3. External factors evaluation matrix (Source-Field survey 2022-24)

	Sr. No.	External Factors	Weighted value	Rating value	Weighted score
OPPORTUNITIES	O1	Government Crop Assurance Program (Mukhyamantri Bagwani Bima Yojana) to compensate losses due to climatic disturbances	0.65	2	1.3
	O2	Subsidy/loans schemes by Haryana govt. for farmers to bring in the required equipment needed such as sprinkler and automated irrigation systems.	0.75	2	1.5
	O3	Practicing of green horticultural techniques improve ecological sustainability, which maintains future output potential	0.65	3	1.95
	O4	Training programs and skill classes offered by state horticulture department for equipping farmers with eco-friendly and organic farming techniques.	0.75	2	1.5
	O5	Setting- up of food-processing industries	0.9	4	3.6
	O6	Establishment of multi-operational marketing systems	0.85	3	2.55
	O7	Development of organized cold storage to deal with perishable nature of the product and ensure a year-round supply	0.85	4	3.4
	O8	Growth of tourism along with the orchards	0.75	3	2.25
THREATS	T1	Absence of MSP (Minimum Support Prices)	0.75	4	3
	T2	Unorganized marketing system and market malpractices	0.6	2	1.2
	T3	Unfair pricing and price crash in times of bumper production	0.8	4	3.2
	T4	Labour intensive	0.7	2	1.4
	T5	Lack of suitable(seedless) varieties for processing	0.75	3	2.25
	T6	Ecological or biological disasters	0.65	2	1.3
	T7	Decline in export due to poor quality	0.85	3	2.55

Strength-Opportunity (SO) strategies: By compounding weighty Strength-Opportunity (SO) determinants, the following strategies were proposed-

SO1: Expansion of the food processing industry- The growth of the food processing industry in the area will encourage local farmers to increase fruit production.

SO2: Organized exporting system- A well-organized export system, paired with advantageous agro-climatic conditions, will expand the market and meet the growing demand from domestic and international markets.

SO3: Institution of citrus estates - Creating comprehensive citrus estates equipped with post-harvest facilities like waxing machines, packing houses, automated sorting systems, and efficiently managed cold storage can help manage overproduction and ensure a consistent year-round supply.

SO4: Preferment of green technology- Sustainable ecological practices can be achieved through the enhancement of green technologies, including the adoption of biofertilizers, biocontrol agents, biopesticides, and natural manures. This approach diminishes reliance on synthetic pesticides and fertilizers. It not only boosts productivity and yields but also emphasizes the importance of pollution reduction methods, implementation of environmentally friendly policies, and the promotion of public awareness about ecological preservation to sustain natural equilibrium.

SO5: Promotion of tourism- As tourism flourishes alongside orchards, both the size and demand for the products will see a significant increase.

According to participant feedback from a 2022-24 primary survey (Fig. 3), the most appreciated strategy was SO3 which involves establishing citrus estates equipped with modern grading, packing, and cold storage facilities to manage overproduction and ensure consistent market demand for Kinnow year-round. The response/perception for SO3 strategy was that 96% of the participants agreed, 2% disagree and 2% were neutral in deciding that SO3 is the best among the proposed SO strategies for exploring strengths and opportunities of the region for Kinnow cultivation. Following closely, SO1 (94%) supports developing food processing industries in the Sirsa district to enhance local employment and income opportunities, reduce transportation costs, and boost product demand,

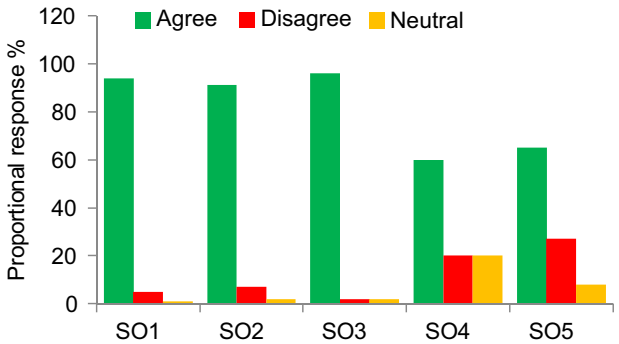

Fig. 3. Perception of the participants for SO Strategies; Source-Primary survey 2022-24

thereby encouraging farmers. The momentous number of participants (91%) also favored the implementation of an organized export system (SO2) to serve both domestic and international markets, alongside training initiatives to empower farmers and reduce middleman exploitation. Additionally, around 65% supported SO5 *i.e.,* promoting tourism activities like fruit picking and on-site juice extraction in Kinnow orchards, which would not only increase demand for fresh fruits and derivatives like jams and juices but also potentially augment incomes through related businesses such as hospitality and dining.

Weakness- Threat (WT) strategies: To cope with the prevailing weakness and upcoming threats of Kinnow farming in Sirsa district the following Weakness- Threat (WT) strategies are recommended:

WT1: Launching of cold storage chains- During January, the demand for fresh Kinnow drops significantly in North India due to low temperatures, leading to oversupply, plummeting prices, and considerable post-harvest losses. According to Khandelwal *et al.* (2019), addressing food losses, which account for 30-40%, could notably enhance profitability. A major issue in the supply chain is the lack of cold storage facilities and refrigerated transportation, which results in inefficiencies in handling perishable items and leads to waste. Thus, introducing cold storage chains for Kinnow could minimize post-harvest losses and stabilize the market during the off-season. Research indicates that Kinnows that are unblemished, mature, and properly waxed, and stored in corrugated fibre board boxes or plastic crates, can be preserved for up to 45 days in cold storage at 5-6°C and 90-95% relative humidity, provided the temperature does not drop below 5°C to prevent chilling injury to the fruit.

WT2: Revitalization of Kinnow export - A significant factor contributing to the decline in exports is the rejection of fruits due to the presence of heavy metals, chemical residues, and subpar cosmetic appearance. Given that Kinnow is a perishable and soft fruit that peels easily, it demands meticulous care and management throughout its production and post-harvest phases. Implementing scientific approaches to manage fruit disorders and blemishes can enhance the quality and market value of the produce, thereby boosting its acceptance in global markets (Yasmin *et al.,* 2023). To reduce export rejections linked to contaminants, it's advisable to locate orchards away from roadways to lessen heavy metal uptake and establish windbreaks to shield against vehicular pollution. Moreover, maintaining export quality standards such as high-quality fruit, consistent colour, absence of wax and heavy metals, and excellent size and nutritional content is crucial for boosting Kinnow exports.

WT3: Introduction of seedless and disease-resistant varieties- Currently, Sirsa lacks seedless Kinnow varieties, which are increasingly sought after by both national and international food processing industries. This gap highlights the urgent need for research institutions to focus on developing seedless, disease-resistant Kinnow varieties with extended shelf lives. Once developed, these new varieties should be made available to local farmers to meet industry demands.

WT4: Control of diseases and pests- Like many fruit-bearing plants, Kinnow is susceptible to a range of pests and diseases. These issues jeopardize not only the fruit production levels and quality but also its marketable value internationally. Significant damage is often the result of diseases caused by fungi and bacteria, including Phytophthora, Citrus canker, Scab, and Dieback, which undermine both the export potential and yield. Addressing this challenge requires educating farmers through agricultural science centers, field camps, or consultations with plant experts in orchards to spot and treat disease symptoms accurately, including the precise application of treatments (Vijaya *et al.,* 2017). Implementing strategies such as prompting soil treatment, leveraging biological control over soil borne organisms (Yogi *et al.,* 2019) and selecting rootstock seeds from vigorous trees.

The quantifiable analytical QSPM technique (Table 4) was applied to examine the degree of comparative attractiveness of one strategy over another. Through this method, it was shown that WT 2, with a rating of 129.95, is the most preferred strategy. It is followed by WT 1 with a score of 124, WT 4 at 101.15, and finally WT 3 at 78.15, in their effectiveness at addressing the challenges and risks associated with the cultivation of Kinnow in the Sirsa district.

Hence, this investigation delves into the intrinsic strengths and outward opportunities of Kinnow cultivation in Sirsa district.

Table 4. Quantitative strategic planning matrix for evaluating weakness-threat strategies (Source-Field survey 2022-24)

Factors	Weighted Score	WT1		WT2		WT3		WT4	
		AS	TAS	AS	TAS	AS	TAS	AS	TAS
S1	3.8	-	-	2	7.6	-	-	-	-
S2	3.6	3	10.8	4	14.4	3	10.8	2	7.2
S3	1.2	-	-	-	-	-	-	-	-
S4	1.4	2	2.8	3	4.2	-	-	-	-
S5	2.55	-	-	1	2.55	2	5.1	2	5.1
S6	2.4	-	-	4	9.6	2	4.8	2	4.8
S7	1.2	1	1.2	3	3.6	-	-	-	-
W1	1.3	3	3.9	-	-	-	-	2	2.6
W2	2.25	2	4.5	1	2.25	-	-	4	9
W3	2.55	1	2.55	2	5.1	-	-	3	7.65
W4	1.5	4	6	3	4.5	1	1.5	-	-
W5	1.5	2	3	1	1.5	-	-	-	-
W6	3.6	2	7.2	2	7.2	4	14.4	4	14.4
W7	2.1	2	4.2	4	8.4	-	-	-	-
O1	1.3	-	-	-	-	1	1.3	-	-
O2	1.5	3	4.5	2	3	-	-	2	3
O3	1.95	-	-	-	-	1	1.95	2	5.85
O4	1.5	1	1.5	-	-	2	3	-	-
O5	3.6	3	10.8	2	7.2	4	14.4	2	7.2
O6	2.55	3	7.65	3	7.65	2	5.1	1	2.55
O7	3.4	4	13.6	3	10.2	2	6.8	3	10.2
O8	2.25	2	4.5	-	-	-	-	-	-
T1	3	4	12	2	6	-	-	1	3
T2	1.2	2	2.4	4	4.8	-	-	-	-
T3	3.2	4	12.8	2	6.4	-	-	-	-
T4	1.4	-	-	-	-	-	-	-	-
T5	2.25	-		2	4.5	4	9	2	4.5
T6	1.3	3	3.9	-	-	-	-	3	3.9
T7	2.55	2	5.1	4	10.2	-	-	4	10.2
STAS			124.9		130.85		78.15		101.15
Ranking	3.8	-	2nd		1st	-	4th	-	3rd

Presently, Kinnow orchards offer a vital means of employment, revenue, and well-being for a substantial segment of the community, knowingly impacting the socio-cultural dynamics of local stakeholders of the Sirsa region. Analyses conducted using SWOT and QSPM methodologies suggest that advancing food processing sectors, along with founding citrus farms equipped with contemporary sorting, packaging, and refrigeration services, can mitigate the challenges of surplus production by ensuring consistent Kinnow demand year-round. Moreover, strategies such as rejuvenating Kinnow exports, introducing less-seeded varieties, managing pest control, implementing a soil health surveillance system and enhancing infrastructure facilities are recommended to augment Kinnow farming in the district. These strategies offer a foundational basis for making pivotal decisions that promote progressive growth, sustainable agricultural methods, and, as a result, sustainable living standards for the inhabitants of the Sirsa district.

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