

International Journal of Agriculture Extension and Social Development

Volume 7; Issue 8; August 2024; Page No. 07-14

Received: 07-05-2024
Accepted: 10-06-2024

Indexed Journal
Peer Reviewed Journal

Impact of sustainable development policy for orange tree on land use efficiency in Bac Quang district, Ha Giang province

¹Phan Thi Thanh Huyen, ¹Dinh Hong Duyen, ²Nguyen Duc Hung, ¹Nguyen Thi Thu Huong

¹Vietnam National University of Agriculture, Viet Nam

²Hanoi College of High Technology, Vietnam

DOI: <https://doi.org/10.33545/26180723.2024.v7.i8a.871>

Corresponding Author: Phan Thi Thanh Huyen

Abstract

This study was conducted to assess the impact of sustainable development policies for orange trees on the efficiency of land use in three aspects: economic, social, and environmental, thereby proposing some solutions for sustainable orange development in Bac Quang district, Ha Giang province. The research results show that sustainable development policies for orange trees have a positive impact on economic, social, and environmental efficiency indicators with indexes ranging from 3.59 to 4.3 (impact levels 1 and 2). However, orange cultivation in Bac Quang district still faces some difficulties in consumption and capital shortage. In addition, many of the King orange gardens also have yellow leaves, dry branch tips, degeneration; unplanned expansion of orange acreage; and fake and poor-quality fertilizers. To sustainably develop orange trees, it is necessary to implement the following solutions: apply appropriate cultivation measures to overcome yellow leaves, dry branch tips, and degradation; review and orient the development of orange acreage according to the planning; manage fertilizers and pesticides; promote production and consumption of oranges according to the linkage chain and value chain applying 4.0 technology; support organizations, households and individuals to borrow capital; replicate the model of orange gardens associated with digital transformation.

Keywords: Land use efficiency, policy, sustainable development, orange trees

Introduction

Bac Quang is the district with the largest orange area in Ha Giang province. According to Department of Agriculture and Rural Development of Bac Quang district (2023), the orange area of the whole district is 3,893.01 hectares, of which the largest area is the King orange variety with 2,144.06 hectares (accounting for 55.07%), followed by the Vinh orange variety with an area of 1,507.70 (accounting for 38.73%) and finally the V2 orange variety with the smallest area of 241.25 (accounting for 6.20%). The orange area for harvest is 3,469.20 hectares (the King orange variety is 2,030.70 hectares), the average yield is 10.5 tons/ha (the King orange variety is 11 tons/ha) and the total output is over 36,426 tons. Identifying orange trees, especially the King orange tree, as a key commodity in the economic development strategy and one of the key products of Ha Giang province in general and Bac Quang district in particular, however, in recent years, the area of the King orange tree in the whole Ha Giang province as well as Bac Quang district has decreased significantly due to degradation. The main reason is that gardeners apply inappropriate production processes and do not ensure nutritional factors and the King orange tree is susceptible to yellow leaves and dry branch tips. In Bac Quang district, the area of the King orange trees decreased by 922 hectares in the period 2021 - 2023. In addition, the development of the King orange tree has not been planned or oriented; there is

little investment in intensive farming, and care has not been applied according to genetic conservation techniques, resulting in poor fruit appearance, unevenness, acidic fruit quality, and numerous seeds. Furthermore, the product consumption market is unstable as a result of the absence of policies and mechanisms, which have not encouraged businesses to invest in product preservation and processing. In response to this circumstance, Ha Giang province and Bac Quang district have implemented numerous policies to promote and mobilize resources for the sustainable development of orange trees. These policies are intended to enhance land use efficiency, generate income, and ensure the livelihoods of rural residents.

Land use efficiency is the benefit that is derived from a specific area of land (Zhu *et al.*, 2019; Xie *et al.*, 2021) ^[1, 2]. It is crucial to evaluate the comprehensive development of land, ecological, social, and economic factors, or sustainable development, through the use of land use efficiency (Ma *et al.*, 2023) ^[3]. Many academicians have been interested in researching the impact of policies on the efficiency of land use (Ayoub *et al.*, 2017; Brady *et al.*, 2012; Minviel & Latruffe, 2017; Eagle *et al.*, 2016; Henderson & Lankoski, 2019) ^[4-8]. Nevertheless, there has been no research conducted to date on the effect of the policy on the efficacy of land use for orange cultivation. This study was conducted to evaluate the impact of the sustainable development policies of orange trees on the efficiency of orange

cultivation in three dimensions: economic, social, and environmental, thereby proposing some solutions for the sustainable development of orange trees in Bac Quang district, Ha Giang province.

Methods

Data collection

Secondary data on orange cultivation was collected from the Statistics sub-office of Bac Quang district and the Department of Agriculture and Rural Development of Bac Quang district. Primary data was collected from a survey of 30 orange-growing households in the three communes with the largest orange-growing areas in the district, including

Vinh Hao, Tien Kieu, and Vinh Phuc. Research criteria to assess orange tree land efficiency based on three categories: economic (production value; added value; capital efficiency; access to credit), social (employment for people; food insecurity; rural poverty; orange consumption capacity; land use rights assurance) and environmental (soil degradation; fertilizer use; pesticide use; environmental pollution). The criteria are evaluated on a 5-level Likert scale with each level specified in Table 1. The evaluation score for each corresponding level is from 5 points to 1 point (Likert, 1932) [9].

Table 1: Criteria and scales for assessing impact level

Criteria	Level I (5 point)	Level II (4 point)	Level III (3 point)	Level IV (2 point)	Level V (1 point)
I. Economic efficiency					
1. Production value	Much higher	Higher	About the same	Lower	Much lower
2. Added value	Much higher	Higher	About the same	Lower	Much lower
3. Capital efficiency	Much higher	Higher	About the same	Lower	Much lower
4. Finance access	Much easier	Easier	About the same	Difficult	Much difficult
II. Social efficiency					
5. Jobs for the people	Much higher	Higher	About the same	Lower	Much lower
6. Food security assurance	Very good	Good	Acceptable	Poor	Very poor
7. Rural poverty decrease	Very good	Good	Acceptable	Poor	Very poor
8. Orange consumption capacity	Very good	Good	Acceptable	Poor	Very poor
9. Land use right assurance	Very good	Good	Acceptable	Poor	Very poor
III. Environment efficiency					
10. Soil degradation limitation	Very good	Good	Acceptable	Poor	Very poor
11. Proper fertilizer use	Very good	Good	Acceptable	Poor	Very poor
12. Pesticide limitation	Very good	Good	Acceptable	Poor	Very poor
13. Environmental pollution decrease	Very good	Good	Acceptable	Poor	Very poor

Data synthesis, processing, and analysis

The primary data sources were synthesized, processed, and analyzed using SPSS 20.0 software. The Likert scale was used to classify the weighted average value of the interview

results and determine the impact level of the sustainable development policy on economic, social, and environmental efficiency indicators of orange trees (Table 2).

Table 2: Impact level according to the Likert scale

Value (G_k)	Impact levels	Mean
$G_k \geq 4,20$	1	Much higher, much easier, and very good
$4,20 > G_k \geq 3,4$	2	Higher, easier, good
$3,4 > G_k \geq 2,6$	3	About the same, acceptable
$2,6 > G_k \geq 1,8$	4	Lower, difficult, poor
$G_{avk} < 1,8$	5	Much lower, much difficult, very poor

Results and Discussion

Overview of some policies for sustainable development of orange trees

Many policies have been implemented by the Ha Giang Provincial People's Council between 2015 and 2020 to promote the growth of commodity agriculture, which includes orange trees (Ha Giang Provincial People's Council, 2015, 2017, 2018) [10-12]. Specifically, on December 1, 2020, the Standing Committee of Ha Giang Provincial People's Council issued Resolution No. 04 on the sustainable development of the King orange trees in the province for the period of 2021-2025, with a vision to 2030. The objective of this resolution is to enhance the quality of the King orange products, shift the economic structure in agriculture, and develop the King orange trees in conjunction with the development of typical commodity agriculture to enhance the lives, income, and employment of

the populace. By 2025, the objective is to preserve a consistent 5,000 ha orange acreage throughout the province in 38 communes of the three districts of Bac Quang, Quang Binh, and Vi Xuyen that have been certified for geographical indications. The focus will be on renovation, with an emphasis on the application of intensive investment to enhance productivity and quality, as well as the establishment of a value chain that connects the production, processing, and consumption of products, with a total area of 2,000 hectares. By 2030, renovate and implement an intensive investment strategy to enhance productivity and quality, as well as establish a value chain that connects the production, processing, and consumption of products for the remaining 3,000 hectares. This will guarantee that all 5,000 hectares of pomelos meet the standard quality standard (Ha Giang Provincial Party Committee, 2020) [13].

Resolution No. 17-NQ/TU, dated October 10, 2021, of the

Provincial Party Committee, which is concerned with the development of high-quality agricultural products by the value chain associated with product brand establishment. The Resolution has advocated for the promotion of agricultural development that is based on the promotion of advantages in terms of climate, soil conditions, and seedlings with specific strengths that are suitable for market signals. It also promotes the application of science and technology in the development of typical agricultural products; the application of digital transformation and e-commerce in the management of growing areas and product consumption; the strict control of the production process according to the value chain, from gene conservation and seed sources to seed production, the selection of production areas, the harvesting, processing, and consumption of products; and the focus on the mobilization of resources, the strengthening of production linkages, and the support of tourism development to create sustainable livelihoods and improve the lives of people. The Resolution underscored the importance of e-commerce and digital transformation in the administration of agricultural production areas and the consumption of traditional agricultural products in Ha Giang province (Ha Giang Provincial Party Committee, 2021) ^[14]. Furthermore, the People's Council of Ha Giang province issued Resolution No. 58/2020/NQ-HDND on December 9, 2020, to further enhance the quality of pomelo products. This resolution outlines specific policies to promote the sustainable development of pomelo trees and the development of household garden economies in the province from 2021 to 2025 (Ha Giang Provincial People's Council, 2020) ^[15].

Under Resolution No. 58/2020/NQ-HDND, organizations and individuals may receive loans to enhance the quality of the King orange trees. The maximum loan amount is 60 million VND/ha, and the loan term is 36 months from the date of disbursement with an interest rate is 0%. In addition, the Resolution establishes policies for the promotion and consumption of King orange products, as well as for the conservation of genes, the transfer of technology, and the promotion of sound breeding. We will provide direct support of 500,000 VND per original tree per year to organizations and individuals who preserve existing original King orange trees and apply scientific and technological advances to seed production to create a source of quality, disease-free seeds to supply new planting areas to replace old areas (if any). Support for transportation costs of VietGAP and organic orange products when there is a contract to consume products in markets outside the province with a direct support level of 100,000 VND/ton of fresh fruit, and at the same time, participate in the trade promotion program according to the province's annual plan. Furthermore, orange producers are provided with assistance in the form of technology transfer, product promotion, and the development of high-quality varieties. Organizations and individuals who invest in the construction of citrus fruit processing factories are provided with 100% of the compensation costs, ground clearance by the specific project, and support for the construction of infrastructure outside the project (such as electricity, water, roads, and wastewater treatment). The level of support is contingent upon the specific circumstances of each project and is not to exceed 2 billion VND per project (Ha Giang Provincial

People's Council, 2020) ^[15].

On January 7, 2021, the People's Committee of Ha Giang province issued Decision No. 14/QD-UBND, which included the project on sustainable development of Sanh orange trees in the province of Ha Giang for the years 2021-2025, with a vision of 2030. On February 20, 2024, the People's Committee of Ha Giang province also issued Plan No. 58/KH-UBND to implement the Project on sustainable development of Sanh orange trees - 2024. This is the foundation for the critical orange-growing regions of Ha Giang province to invest in the restoration and development of orange trees, the enhancement of quality, and the continuous promotion and expansion of the consumption market.

To establish a foundation for the sustainable development of orange trees in Bac Quang District, the Party Executive Committee of Bac Quang District issued Resolution No. 04-NQ/HU on February 26, 2021, which focuses on the development of citrus fruit trees from 2021 to 2025 with a vision of 2025. The resolution aims to enhance the quality of products by focusing on the improvement and application of science and technology. This will be achieved by establishing a value chain in the production, consumption, and processing of products, which will involve specific solutions such as planning, propaganda, mechanisms, and policies. Trade promotion will be achieved through various methods, such as participating in events to introduce and promote Sanh oranges, organizing seminars and conferences with customers, building websites to promote e-commerce, and connecting with e-commerce trading floors. Simultaneously, to optimize the region's potential and advantages, as well as to foster rapid and stable economic growth, the District Party Executive Committee issued Resolution No. 07/NQ-HU on October 11, 2016, to develop commodity production for key products with strengths in the period 2016-2020 and Resolution No. 05/NQ-HU on May 28, 2021, to develop key products with strengths of the district according to the value chain in the period 2021-2025. Orange trees are identified as one of the five main key products of the district in economic development. Furthermore, the People's Committee of Bac Quang district has also released the Project on Planning for Citrus Trees in the district until 2025, with a vision to 2030, and the planning for the development of commodity production for key products with strengths in Bac Quang district from 2017 to 2020, with a vision to 2025. In particular, the orange production area is designated to be concentrated in communes that have numerous advantages in the development of citrus fruit trees in the district, such as Tan Thanh, Dong Thanh, Dong Yen, Vinh Phuc, Vinh Hao, Viet Hong, Dong Tam, and Tien Kieu.

The aforementioned policies serve as the foundation for the development of targeted solutions for the sustainable development of orange trees in the Bac Quang district. Bac Quang district has conducted 252 dissemination sessions for more than 8,600 individuals and has initiated 4 training courses for households and cooperatives on the procedures for planting, caring for, and harvesting oranges by Resolution No. 04-NQ/TU of the Provincial Party Committee Standing Committee (Thu Phuong, 2022) ^[16]. Furthermore, Bac Quang district has implemented numerous policies to promote the development of commodity

production, thereby encouraging the production of oranges by VietGAP and organic standards, as well as value chains and linkage chains, to further enhance the quality of orange products. Furthermore, the Bac Quang district People's Committee has collaborated with relevant agencies and units to establish a model orange garden that is linked to digital transformation. This garden is intended to assist individuals in the intensive cultivation and growth of orange trees by VietGAP and organic processes, while also enhancing the quality of the product through the application of science and technology in the production process. The digital transformation strategy is particularly relevant in the production and consumption of orange products, as it aims to increase the value of the product.

Assessing the impact of sustainable development policy for orange trees on land use efficiency

Economic efficiency: The economic efficiency is positively influenced by the sustainable development policy for orange trees. The data in Figure 1 indicates that the three economic efficiency indicators (added value, capital efficiency, and production value) have been evaluated at levels of higher and much higher, with indexes of 4.17, 3.93, and 4.38, respectively. To accomplish this objective, the Bac Quang district has implemented numerous strategies to enhance the productivity, quality, and income of orange growers. These strategies include the encouragement and support of new planting in the old and degraded orange areas, the renovation of old gardens, the application of advanced technology in production, the promotion of brands and trade, the establishment of geographical indications, and the recognition of VietGAP production processes. Digital transformation and 4.0 technology have been utilized to promote orange consumption through various methods, including propaganda and electronic applications. These efforts have yielded favorable outcomes. Furthermore, the district has fostered partnerships with supermarket systems such as Vinmart and Vinmart+, Big C, Saigon Coop, and Coop. mart, clean produce stores, wholesale markets, and traders to guarantee a consistent quantity of orange products during the harvest. According to Phuong Duyen & Hai Tu (2023) [17], implementing Resolution No. 58/2020/NQ-HDND, the Transaction Office of the Social Policy Bank of Bac Quang district has disbursed over 14 billion VND to 157 households with 0% interest rate loans to develop Sanh orange trees. In addition, over 2,800 tons of oranges were supported with transportation costs for consumption outside the province with a total budget of 289.5 million VND (Thu Phuong, 2023) [18]. The income of orange producers has increased by nearly 30 million VND, an average of 1.5 to 2 times compared to the period before receiving capital investment support. The value of the King orange trees has been elevated as a result of the rapid disbursement of preferential capital (Phuong Duyen & Hai Tu, 2023; Thu Phuong (2022) [16,17].

According to orange producers, the loan enabled the investment in intensive orange cultivation to be made by the VietGAP process, with the products being labeled with traceability labels and internal garden traffic being invested. Consequently, the orange garden grew and developed well, the fruit was uniform, beautiful in appearance, and of superior quality, and the rate of fruit damage due to

harvesting was reduced, thereby contributing to increased economic efficiency. This was the assessment of the people. Numerous studies have demonstrated that the implementation of sophisticated technology in agricultural production enhances the efficiency of land use (Jin *et al.*, 2019; Sui *et al.*, 2022) [19, 20]. The utilization of digital technology in agriculture enhances and optimizes agricultural systems, thereby increasing crop productivity and quality, reducing costs, and managing pests and diseases, thereby increasing land use efficiency (Scholz *et al.*, 2018) [21].

Figure 1 indicates that the finance access criterion is evaluated at a level of much easier, with an assessment index of 4.28. To help individuals and businesses conveniently access finance sources for the sustainable development of the King orange trees by Resolution No. 58/2020/NQ-HDND, the People's Committee of Ha Giang province issued Instruction No. 51/HD-UBND dated January 12, 2021. As a result, all individuals and businesses who require loans to enhance the quality of the King orange trees, preserve genes, propagate good varieties, and transfer techniques, promote and consume pomelo products, and invest in the construction of citrus fruit processing factories can easily access loans from the policy through clear, convenient, and rapid procedures.

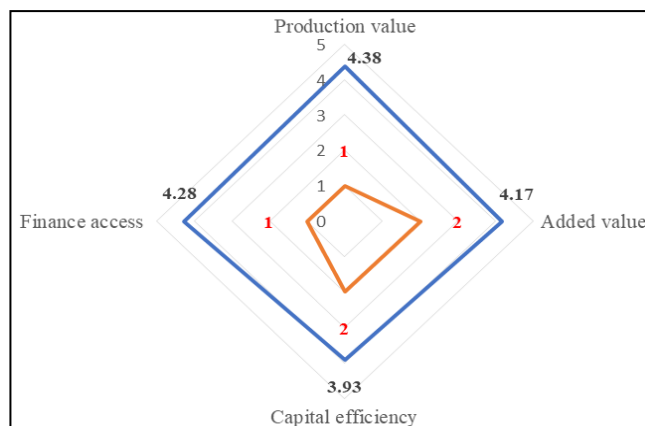


Fig 1: Impact of sustainable development policy for orange tree on economic efficiency

Social efficiency: One of the five criteria for social efficiency is land use right assurance, which is rated at level 1 (Very good). Sustainable development policies for orange trees motivate farmers to be more committed to their fields and gardens. Through the implementation of policies, farmers can incorporate scientific advancements into their production processes, which are bolstered by capital and product consumption. This process contributes to the growth of income, the establishment of sustainable livelihoods for rural families, and the restriction of the transfer of land use rights. From that point forward, their agricultural land use rights are ensured. According to Nguyen *et al.* (2016) [22], land tenure security in Thailand is positively impacted by increased investment in agriculture. Agricultural land tenure that is secure will motivate households to invest in agricultural land, particularly continuous investment in agricultural land (Jacoby *et al.*, 2002; Deininger *et al.*, 2003) [23, 24]. In addition to reducing poverty and ensuring food security in rural areas, the sustainable development policies

of orange trees in Ha Giang also generate numerous new employment opportunities for workers, while also supporting the expansion of superior orange consumption markets. The corresponding assessment indexes range from 3.59 to 4.10. In Bac Quang district, the policies for sustainable development of orange trees have generated capital that has enabled individuals to invest in intensive cultivation, expand consumption markets, and develop production. This has resulted in an increase in income, an improvement in the quality of life, and the creation of numerous new jobs for workers. Additionally, the economic efficiency per unit of cultivated area has been enhanced.

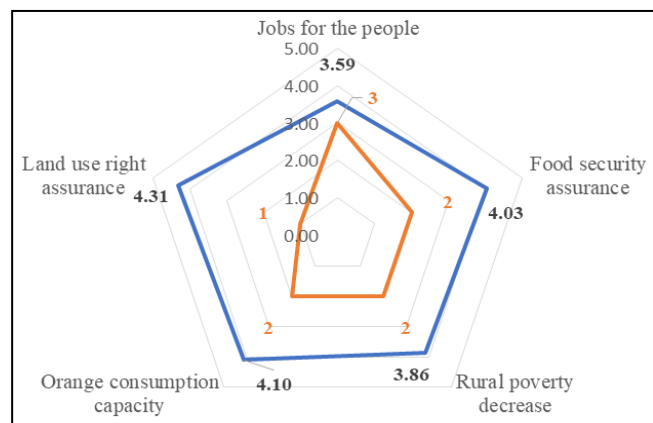


Fig 2: Impact of sustainable development policy for orange tree on social efficiency

Environment efficiency: The results illustrated in Figure 3 demonstrate that the sustainable development policies of orange trees have beneficial environmental consequences. The four criteria, which include soil degradation limitation, proper fertilizer use, pesticide limitation, and environmental pollution decrease all achieved a level 2 (good level), with indexes ranging from 3.59 to 4.17. In recent years, Bac Quang district has implemented numerous policies to promote the development of commodity production, thereby encouraging the production of oranges by VietGap and organic standards, as well as value chains and linkage chains, to further enhance the quality of orange products. According to Thu Phuong (2023) [18], Bac Quang district has implemented six chains of linkage and is intensively cultivating the King orange trees by VietGAP and organic standards on 215.5 hectares of land owned by 121 households in three communes of Vinh Hao, Vinh Phuc, and Dong Thanh. Furthermore, the People's Committee of Bac Quang district collaborated with pertinent agencies and units to establish a model orange garden that is linked to digital transformation. This garden is intended to assist farmers in the cultivation and growth of orange trees following VietGAP and organic processes, while also enhancing the quality of the product through the application of science and technology in the production process.

The digital transformation is particularly relevant in the production and consumption of orange products, as it enhances their value. Five households in Vinh Phuc, Tien Kieu, Vinh Hao, and Viet Quang have constructed model orange plantations in conjunction with digital transformation, totaling 20 hectares of oranges. During the orange cultivation process, households update their orange

tree care diary on the digital authentication software provided by Digital Authentication Technology Joint Stock Company. In recent years, farmers have implemented a variety of strategies to address the issue of yellow leaves and dry branch tips on the King orange trees. These include the application of organic microbial fertilizers, the application of fungicides, the administration of root stimulants, the drainage of orange gardens following rainfall, and the avoidance of herbicides. Particularly, in 2023, a model of utilizing Lucavi organic fertilizer to address the issue of yellow leaves and root rot on the King orange trees caused by nutritional metabolism disorders was implemented in the King orange garden in Khuoi Nieng village, Dong Thanh commune, and the Vinh orange garden in Viet Ha village, Viet Hong commune.

The use of organic fertilizers, the application of VietGAP agricultural processes, the non-use of pesticides, and the application of science and technology in orange production have all contributed to the reduction of soil degradation and the limitation of environmental pollution.

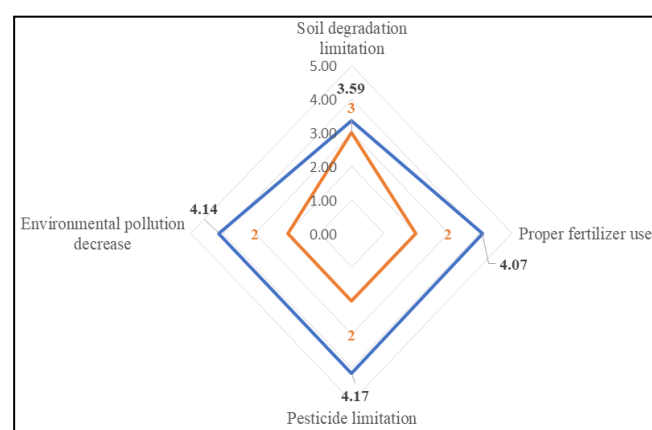


Fig 3: Impact of sustainable development policy for orange tree on environmental efficiency

Some shortcomings and limitations in the sustainable development for orange trees in Bac Quang district

- Yellow leaves, dry branch tips, poor growth and development, and death of orange trees have been prevalent in the majority of communes and towns since 2021, and they have since disseminated extensively in early 2022. According to Duy Tuan (2022) [25], 979.69 ha/1,146 households in 20 communes and towns are the area of orange trees in Bac Quang district with yellow leaves, dry branch tips, poor growth and development, and mortality, as per. In addition, the orange area that has been degraded is also substantial. According to the Department of Agriculture and Rural Development of Bac Quang district (2023), there are currently 2,091.28 ha of degraded oranges in the district. Of this total, 531.17 ha are classified as level I degradation, accounting for 25.40%, 714.05 ha as level II degradation (40.56%), and 714.05 ha as level III degradation (34.14%).
- Orange tree development is still haphazard and unplanned in certain villages and regions. According to both the Project on citrus tree planning of Bac Quang district until 2025, with a vision to 2030, and the Planning for developing commodity production for key

products in Bac Quang district from 2017 to 2020, with a vision to 2025, the orange production area of Bac Quang District focuses on communes and towns with many advantages in developing citrus fruit trees, such as Dong Thanh, Dong Yen, Tien Kieu, Vinh Phuc, Vinh Hao, Tan Thanh, Dong Tien, Viet Hong, Vinh Tuy, and Viet Quang. Currently, however, orange trees are planted in all 22 communes and cities within the district; some of these communes, such as Dong Tien, Thuong Binh, Huu San, and Lien Hiep, have extremely tiny areas, less than 10 hectares.

- Pesticides and fertilizers are essential supplies for agricultural production. These are significant factors that impact user health, quality, and productivity of orange trees. However, some orange-growing households in the Bac Quang district have been buying fake and poor-quality pesticides and fertilizers in recent years, which has negatively impacted the environment and cost orange growers money.
- The orange consumption market continues to face challenges, with low pricing, particularly during the ripe season. Nowadays, the Bac Quang Orange Association and cooperatives handle the majority of the district's orange product consumption on a domestic level. There is now no export market, and businesses only buy, preserve, and process a small amount of orange produce for juice. Every season, depending on the state of production, cooperatives and the Bac Quang Orange Association actively look for markets to enter into contracts to purchase oranges in supermarkets and wholesale markets in Gia Lam, Ha Dong (Hanoi); Hai Phong, Bac Ninh; Vinh (Nghe An). Furthermore, the government of Bac Quang district also gives special attention to trade promotion, market research, and promotional activities. These take many different forms, such as the organization of King Orange Week, the competition of King Orange Products, the participation in fairs in Quang Ninh, Ha Noi, etc. In some crop years, the orange consumption market still faces challenges despite the efforts of the government, cooperatives, and the Bac Quang Orange Association to promote, find markets, and find ways to increase trade. It is also not uncommon for some individuals to sell orange products on the open market without properly labeling them, which results in low selling prices.
- The number of households receiving support and transfer for intensive farming by the orange model linked to digital transformation, as well as the number of organizations, households, and individuals accessing capital sources under Resolution No. 58/2020/NQ-HDND dated December 9, 2020, are still relatively small.

Some solutions for sustainable orange development in Bac Quang district

First, any orange tree in the vicinity that has yellow leaves, dry branch tips, and degeneration has to be inspected. Oranges with yellow leaves and dry branch tips require proper fertilization at the right dosage, with an emphasis on organic fertilizers; biological pesticides rather than herbicides; frequent garden maintenance; diseased tree removal; pruning to create a canopy; and other measures.

Support and guidance are required for people to implement technical methods to restore orange gardens in areas with level I deterioration. It is advised that people proactively switch to other more suitable crops, such as growing other fruit trees or forestry, in orange areas with level II degradation that is difficult to fix and level III degradation that cannot be fixed. They should also support inputs and work with some companies to support input varieties for households switching to growing medicinal plants. To help people plan wise investments and orange production, authorities at all levels must also enhance their knowledge and forecasting capabilities about weather, pests and illnesses, and consumer markets.

Second, reviewing the region where orange trees are growing unplanned or on land that is not suited to the environment is essential to encourage people to convert to more productive and appropriate crops. The orange area will be grown in communes and towns by the orientation of Resolution No. 04-NQ/HU and other pertinent rules,

Third, authorities must have certain plans in place to control pesticides and fertilizers that are sold. Bac Quang district and Ha Giang province must improve their inspection processes, and swiftly identify, and address instances of the manufacturing and sale of fake and subpar goods to defend the rights of consumers. Promote misinformation, create awareness, and instruct farmers on how to differentiate between fake and poor-quality pesticides and fertilizers. Encourage businesses and individuals to freely and consciously adhere to legal requirements in both production and business; additionally, proactively publicize criteria for product quality and make available to the public the list and selling price of each type of product.

Fourth, encouraging orange production and consumption in line with the value and linkage chains with cooperatives and associations of the King oranges. Orange growers must closely adhere to VietGAP and organic standards in their production procedures to yield high-quality Sanh oranges with a high added value. Encourage the use of 4.0 technology and digital transformation in the marketing and consumption of orange products on social media, e-commerce platforms, and business organizations. In addition, it is necessary to have incentive policies to attract and encourage businesses to invest in advanced technologies in processing orange products to diversify products. More specifically, to produce orange products that are competitive in the market and have high added value per unit area, a close link in production between "4 houses: Farmers, Scientists, Businessmen, and Managers" must be established in the manufacturing process.

Last, to enhance the quality and value of the King orange products, as per the guidelines outlined in Resolution No. 58/2020/NQ-HDND dated December 9, 2020, it is imperative to provide support to organizations, households, and individuals engaged in the production and trade of the King orange products. This support can take the form of loans for intensive cultivation, care, pruning, application of techniques, improvement of the soil, and product consumption. To encourage people to grow and cultivate oranges intensively under the process, it is necessary to replicate the model of orange gardens associated with digital transformation. At the same time, digital transformation is applied in the production and consumption of orange

products by the value chain to increase product value.

Conclusion

- To achieve economic, social, and environmental efficiency, sustainable development is an unavoidable trend. At 3,893.01 hectares overall in 2023, Bac Quang is the largest orange region in Ha Giang province of which the Sanh orange tree has the largest area with 2,144.06 ha (accounting for 55.07%). The area of the King oranges fell by 922 hectares between 2021 and 2023, and there was also extensive degradation of orange gardens, totaling 2,091.28 hectares (level I degradation is 531.17 hectares, level II is 714.05 hectares and level III is 714.05 hectares). Ha Giang Provincial Party Committee, the Ha Giang Provincial People's Council, and Bac Quang District have released numerous policies for sustainable orange development to stop the degradation and raise the status and income of those involved in orange cultivation. In the economic, social, and environmental domains, these policies have improved the efficiency of land usage for orange farming. The survey results indicate that, out of the 13 analyzed indicators, three are evaluated at impact level 1 (much higher/much easier), namely production value, finance access, and land use rights assurance; the remaining indicators are evaluated at impact level 2 (higher/goog/easier).
- Even though the policies aimed at promoting the sustainable development of orange trees have significantly raised the orange producers' revenue and worth, there are still certain challenges with consumption and financial availability related to orange farming in the Bac Quang area. In addition, yellow leaves, dry branch tips, and degeneration are common in many the King orange gardens. Other issues include fertilizers that are of low quality and phony, as well as the expansion of orange land without planning. The following solutions must be put into practice to grow orange trees sustainably: apply appropriate cultivation measures to overcome yellow leaves, dry branch tips, and degradation; review and orient the development of orange acreage according to the planning; manage fertilizers and pesticides; promote production and consumption of oranges according to the linkage chain and value chain applying 4.0 technology; support organizations, households and individuals to borrow capital; replicate the model of orange gardens associated with digital transformation.

References

1. Zhu X, Zhang P, Wei Y, Li Y, Zhao H. Measuring the efficiency and driving factors of urban land use based on the DEA method and the PLS-SEM model - A case study of 35 large and medium-sized cities in China. *Sustainable Cities and Society*. 2019 Oct;50:101646.
2. Xie X, Fang B, Xu H, He S, Li X. Study on the coordinated relationship between Urban Land use efficiency and ecosystem health in China. *Land Use Policy*. 2021 Mar;102:105235.
3. Ma Y, Zheng M, Zheng X, Huang Y, Xu F, Wang X, *et al*. Land Use Efficiency Assessment under Sustainable Development Goals: A Systematic Review. *Land*. 2023 Apr;12(4):894.
4. Ayoub K, Boussemart JP, Vigeant S. The impact of single farm payments on technical inefficiency of French crop farms. *Rev Agric Food Environ Stud*. 2017 Jul;98(1):1-23.
5. Brady M, Sahrbacher C, Kellermann K, Happe K. An agent-based approach to modeling impacts of agricultural policy on land use, biodiversity and ecosystem services. *Landscape Ecol*. 2012 Nov;27(9):1363-1381.
6. Minviel JJ, Latruffe L. Effect of public subsidies on farm technical efficiency: a meta-analysis of empirical results. *Applied Economics*. 2017 Jan;49(2):213-226.
7. Eagle AJ, Rude J, Boxall PC. Agricultural support policy in Canada: What are the environmental consequences? *Environ Rev*. 2016 Mar;24(1):13-24.
8. Henderson B, Lankoski J. Evaluating the environmental impact of agricultural policies. Paris: OECD; c2019. DOI: 10.1787/add0f27c-en
9. Likert R. A technique for the measurement of attitudes. *Archives of Psychology*. 1932;22(140):5-55.
10. Ha Giang Provincial People's Council. Resolution No. 209/2015/NQ-HDND dated December 10, 2015 on promulgating policies to encourage the development of agricultural commodity production in Ha Giang province; c2015.
11. Ha Giang Provincial People's Council. Resolution No. 86/2017/NQ-HDND dated July 14, 2017 on amending and supplementing several contents of Article 1 in Resolution No. 209/2015/NQ-HDND dated December 10, 2015 of the Provincial People's Council promulgating policies to encourage the development of agricultural commodity production in Ha Giang province; c2017.
12. Ha Giang Provincial People's Council. Resolution No. 29/2018/NQ-HDND dated December 7, 2018 on promulgating policies to encourage the development of commodity agricultural production in Ha Giang province; c2018.
13. Ha Giang Provincial Party Committee. Resolution No. 04-NQ/TU dated December 1, 2020 of the Provincial Party Committee Standing Committee on the development of pomelo trees in Ha Giang province for the period 2021-2025, with a vision to 2025; c2020.
14. Ha Giang Provincial Party Committee. Resolution No. 17-NQ/TU dated October 10, 2021 of the Provincial Party Executive Committee on developing high-quality commodity agriculture according to the value chain in the province for the period 2021-2025; c2021.
15. Ha Giang Provincial People's Council. Resolution 58/2020/NQ-HDND dated December 9, 2020 of the People's Council of Ha Giang on specific policies to support the development of household gardens and sustainable development of orange trees in the province for the period 2021-2025; c2020.
16. Thu Phuong. Sustainable development of the King orange trees; c2022. <https://xtungba.hagiang.gov.vn/chi-tiet-tin-tuc/-/news/1326098/phat-trien-ben-vung-cay-cam-sanh.html>.
17. Phuong Duyen, Hai Tu. New vitality from Resolution No. 58 of the People's Council of Ha Giang province;

- c2023. <https://hagiangtv.vn/kinh-te/202312/suc-song-moi-tu-nghi-quyet-so-58-cua-hdnd-tinh-2b322fc/>.
18. Thu Phuong. Developing the King Sanh orange trees to be worthy of being a key crop; c2023. <https://www.vietnam.vn/hagiang/phat-trien-cam-sanh-xung-tam-cay-trong-chu-luc/>.
 19. Jin G, Li Z, Deng X, Yang J, Chen D, Li W. An analysis of spatiotemporal patterns in Chinese agricultural productivity between 2004 and 2014. *Ecological Indicators*. 2019 Oct;105:591-600.
 20. Sui F, Yang Y, Zhao S. Labor Structure, Land Fragmentation, and Land-Use Efficiency from the Perspective of Mediation Effect: Based on a Survey of Garlic Growers in Lanling, China. *Land*. 2022 Jun;11(6):952.
 21. Scholz RW, Bartelsman EJ, Diefenbach S, Franke L, Grunwald A, Helbing D, *et al.* Unintended Side Effects of the Digital Transition: European Scientists' Messages from a Proposition-Based Expert Round Table. *Sustainability*. 2018 Jun;10(6):2001.
 22. Nguyen TT, Bauer S, Grote U. Does Land Tenure Security Promote Manure Use by Farm Households in Vietnam? *Sustainability*. 2016 Feb;8(2):178.
 23. Jacoby HG, Li G, Rozelle S. Hazards of Expropriation: Tenure Insecurity and Investment in Rural China. *American Economic Review*. 2002 Dec;92(5):1420-1447.
 24. Deininger K, Jin S, Adenew B, Gebre-Selassie S, Nega B. Tenure Security and Land-Related Investment: Evidence from Ethiopia. The World Bank; c2003. DOI: 10.1596/1813-9450-2991
 25. Duy Tuan. Over 1,500 hectares of oranges have yellow leaves and dry branch tips; c2022. <https://khuyennong.hagiang.gov.vn/web/trang-chu/hoat-dong-khuyen-nong-trong-tinh/tren-1-500-ha-cam-bi-vang-la-kho-dau-can-h.html>.