

Practices and Reflections on Promotion of Selenium-rich Agriculture: A Case Study of Shatian Town in Huiyang District of Huizhou City

Zhihao HUANG, Zhen FANG, Yanfu WEN, Ruoning YAN, Liang LU*

Huizhou Engineering Vocational College, Huizhou 516023, China

Abstract This paper presents an overview of the agricultural background of Shatian Town, and the implementation process of selenium-rich agriculture, including scientific selection, technical training, demonstration projects, and market expansion. Additionally, the paper discusses the practical outcomes achieved, including improvements in economic benefits and enhancements to the ecological environment. Meantime, it identifies existing challenges, such as technical bottlenecks and insufficient funding, and proposes measures for improvement, including the strengthening of scientific and technological innovation and the enhancement of market mechanisms.

Key words Selenium-rich agriculture; Practice; Reflection

1 Introduction

Selenium-rich agriculture, an emerging field within contemporary agricultural development, is progressively emerging across the nation. Selenium is recognized as an essential trace element that plays a vital role in various physiological functions, including cancer prevention, anti-cancer properties, and antioxidant activity. In Shatian Town, the team of rural science and technology specialists has actively responded to the national initiative aimed at promoting rural revitalization and the high-quality development project for "Hundreds of Counties, Thousands of Towns, and Myriads of Villages". By aligning their efforts with the advancement of the local agricultural industry, they have actively promoted selenium-rich agriculture. This initiative aims to enhance the quality of agricultural products, increase farmers' incomes, and stimulate the development of the local economy. This paper aims to present a comprehensive analysis of the initiatives undertaken by the rural science and technology specialist team in Shatian Town to advance selenium-rich agriculture. The discussion will encompass the background of the practice, the procedure of its implementation, the effectiveness of the initiatives, the challenges encountered, the proposed measures for improvement, and reflections on the insights gained, as well as future prospects related to this agricultural practice.

2 Practice background

Situated in the Huiyang District of Huizhou City, Guangdong Province, Shatian Town has experienced significant development over the past four decades, a transformation attributed to the reform and opening-up policy. This industrial town plays a crucial role in the Huiyang District by offering numerous employment opportunities to

both urban and rural residents within the area. Due to the detrimental effects of industrial development, prolonged neglect of maintenance, and various other factors, the irrigation and water conservancy infrastructure for arable land has fallen into disrepair. This situation has been exacerbated by declining groundwater levels and changes in the utilization of water storage in the Shatian Reservoir. Consequently, the town has experienced a significant water shortage affecting agricultural practices. Since the middle 1990s, a substantial number of farmers have progressively ceased farming activities in favor of alternative employment. As of the present, a limited number of older villagers are actively involved in agricultural practices, resulting in suboptimal utilization of land resources. Of the town's total arable land, which constitutes 63.90%, only 10.81% is cultivated by villagers for personal consumption. The remaining land is predominantly allocated for the cultivation of fruit trees and other cash crops, with a portion left uncultivated. In 2021, the gross agricultural production was approximately 200 million yuan. The primary contributors to this output were vegetables and edible fungi cultivated by migrant farmers. In contrast, grain production, including rice and corn, was limited and occurred only sporadically, with less than 2 hm² dedicated to grain cultivation throughout the entire town. Consequently, the capacity for food self-sufficiency remains low.

Since 2021, the country has elevated the issue of food security to an unprecedented level. The state, along with provincial and municipal governments, has issued numerous documents to implement significant incentives and subsidies aimed at promoting food production. A variety of incentive measures have been introduced, allowing grain farmers who meet the specified criteria to receive subsidies up to 18 000 yuan/hm². Agricultural production in Shatian Town, characterized by the cultivation of staple foods, has been partially restored due to robust top-down policies. Furthermore, the production structure has been progressively rationalized. The team of rural science and technology specialists in Shatian Town has been monitoring the restoration of agricultural production

Received: October 20, 2024 Accepted: November 20, 2024

Supported by Huiyang District Rural Science and Technology Specialists Team Stationed in Shatian Town for Rural Revitalization in Guangdong Province.

* Corresponding author. E-mail: hzh525@163.com

for three years across four administrative villages: Dong'ao, Jicheng, Huatang, and Dongming. This initiative focuses on non-food cultivated land and previously abandoned land. The majority of local farmers engage in the cultivation of traditional crops, which are often economically inefficient and provide limited incentives for sustainable development. Consequently, the overall recovery of agricultural production has yielded mixed outcomes, with many farmers incurring losses while only a small number achieve profitability.

To address this situation, the team of rural science and technology specialists in Shatian Town conducted comprehensive research and determined that selenium-rich agriculture holds significant potential for development. selenium-rich agricultural products not only possess enhanced nutritional value but also enhance the market competitiveness of agricultural goods, thereby providing greater economic benefits to farmers. Consequently, the research team has been advocating for selenium-rich agriculture in Shatian Town for the past three years, aiming to achieve the objectives of increasing agricultural productivity and improving farmers' income.

3 Practice process

3.1 Scientific selection of products To facilitate the effective promotion of selenium-rich agriculture, the team initially assembled a group of experts from the Huizhou Institute of Agricultural Sciences to perform a thorough analysis of the natural conditions in Shatian Town, including factors such as soil, water, and climate. This analysis led to the identification of appropriate selenium-rich crop varieties for cultivation, specifically rice, maize, and tea. Meantime, the team has developed a comprehensive plan for the advancement of selenium-rich agriculture. This plan delineates specific development objectives, industrial configurations, technical methodologies, and protective measures. Additionally, it thoroughly considers the production practices of local farmers and market demands to ensure that the development of selenium-rich agriculture aligns with the local context, thereby promoting both feasibility and sustainability.

3.2 Technical training To facilitate the effective promotion of selenium-rich agricultural practices, the team invited agricultural experts and technicians from the Huizhou Institute of Agricultural Sciences to deliver technical training to local farmers. The training program encompassed various aspects of selenium-rich agriculture, including soil enhancement techniques, crop cultivation methods, pest and disease management, and the processing of agricultural products. Participants acquired fundamental knowledge and skills related to selenium-rich agricultural practices, thereby establishing a robust foundation for future planting works. Additionally, the team implemented a technical advisory service mechanism designed to offer ongoing technical support to farmers and address their inquiries as needed.

3.3 Demonstration project To bolster farmers' confidence, the team selected several farmers in Shatian Town to establish demonstration sites for selenium-rich agriculture. These demonstration sites implemented advanced cultivation techniques and management practices, successfully achieving the goals of high yield, superior quality, and enhanced efficiency. Through the establishment of demonstration bases, farmers have recognized the extensive potential of selenium-rich agriculture. This initiative has facilitated a shift from initial skepticism to a strong willingness to engage, leading to increased participation in selenium-rich agricultural practices. Notably, one farmer has successfully cultivated selenium-rich rice for three consecutive years. Furthermore, the demonstration site has evolved into a platform for farmers to acquire knowledge and exchange ideas, thereby enhancing the dissemination and promotion of selenium-rich agricultural techniques.

3.4 Market expansion In the promotion of selenium-rich agricultural practices, the team emphasizes the importance of skills training for market expansion. This training includes instruction on utilizing e-commerce platforms, social media, and other contemporary media for online sales and marketing. The team also empowers farmers to effectively establish connections and generate leads that facilitate the sale of selenium-rich agricultural products. As a result, there has been a notable increase in the popularity and reputation of these products. Furthermore, through market expansion efforts, the sales channels for selenium-rich agricultural products have diversified, significantly enhancing their competitiveness in the market.

4 Effectiveness of practice

4.1 Improvement in economic benefits The team concentrated on the evaluation and promotion of three selenium-rich agricultural products: rice, maize, and tea. The quality and flavor of these products have been markedly enhanced, resulting in positive consumer reception and significantly higher sales compared to conventional products. Simultaneously, the relatively elevated prices of selenium-rich agricultural products have led to a substantial increase in farmers' incomes and a significant acceleration in capital turnover. For instance, the incomes of rice farmers at the demonstration sites have risen by nearly 40%. Additionally, the initial batch of 300 kg of high-quality selenium-rich tea produced by tea farmers was sold out within one month, resulting in a markedly faster return on capital compared to that of conventional tea.

4.2 Enhancement to the ecological environment The promotion of selenium-rich agricultural practices has significantly contributed to the enhancement of the ecological environment. Through the implementation of scientific planting and management techniques, the reliance on chemical fertilizers and pesticides has been diminished, resulting in a reduction of agricultural surface pollution. Furthermore, selenium-rich soil positively influences

soil structure and fertility, thereby facilitating sustainable agricultural development and providing ecological benefits to the local community.

4.3 Enhancement in brand influence In the endeavor to promote selenium-rich agriculture, the team focuses on brand development and marketing strategies. In collaboration with the local cultural and publicity department, the team has successfully elevated the popularity and reputation of these products by integrating them with the local kylin culture, registering trademarks, and actively participating in kylin culture festivals. In contemporary times, Shatian Kylin selenium-rich Agricultural Product has emerged as a prominent local brand, garnering significant interest from both consumers and investors. The enhancement of brand influence not only facilitates the marketing and sales of selenium-rich agricultural products, but also creates additional opportunities for the advancement of the local agricultural industry.

4.4 Improvement of farmers' quality The promotion of selenium-rich agricultural practices has significantly enhanced the quality of farmers. Through technical training and practical exercises, farmers have gained increased agricultural knowledge and skills, thereby improving their production capacity and market competitiveness. Simultaneously, the advancement of selenium-rich agriculture has facilitated exchanges and collaborations among farmers, thereby strengthening their cohesion and collective unity. These transformations not only foster the growth and development of individual farmers, but also offer a robust talent foundation for the sustainable development of the local agricultural industry.

5 Existing problems and improvement measures

Although the implementation of selenium-rich agriculture in Shatian Town has yielded some positive outcomes, it has also faced several challenges during the promotion process.

5.1 Technical bottlenecks Currently, the technical level associated with selenium-rich agriculture requires enhancement. Numerous farmers have faced technical challenges during the cultivation process, including pest management and soil enhancement, which necessitate sustained technical support over an extended period.

5.2 Financial shortage The advancement of selenium-rich agriculture necessitates significant financial investment. Nevertheless, in recent years, the financial limitations faced by local governments have hindered their ability to invest in large-scale promotional efforts, while farmers themselves possess limited financial resources. To address this issue, the team has allocated a portion of its constrained operational funds to acquire selenium-rich fertilizers and organic fertilizers, thereby assisting farmers in cultivating selenium-rich rice, maize, tea, and other crops. However, this initiative represents only a minor contribution relative to the extensive extension programs and the actual needs of farmers, rendering the task of implementation particularly challenging.

5.3 Fierce competition The market for agricultural products is characterized by significant competition, and selenium-rich agricultural products are no exception. Currently, these products have not achieved widespread recognition or consumption, particularly due to the lack of established brand awareness and fully developed sales channels. Consequently, the market competitiveness of selenium-rich agricultural products in Shatian Town is relatively low, resulting in challenges in sales and the absence of a pronounced brand effect.

5.4 Shortage of talent The promotion and advancement of selenium-rich agriculture necessitate extensive exploration and practical implementation, as well as the support of a substantial number of highly qualified professionals. Currently, however, there is a relative scarcity of agricultural talents and practitioner resources in Shatian Town, which poses challenges in addressing the demands of selenium-rich agricultural development.

6 Reflections and prospects

Through the practice and exploration of promoting selenium-rich agriculture in Shatian Town, we have come to a profound understanding that the advancement of modern agriculture must prioritize scientific and technological innovation alongside sustainable development. selenium-rich agriculture, as an emerging model of agricultural development, presents significant prospects for growth and substantial market potential. In the future, efforts will persist in advancing research and promoting selenium-enriched agriculture. This will involve the continuous enhancement of the technical framework and market mechanisms, thereby facilitating the development of selenium-rich agriculture to a more advanced level and broader scope.

6.1 Strengthening science, technology and innovation In the future, Shatian Town must enhance its collaboration with scientific research institutions and universities to incorporate more advanced technologies and management practices, thus promoting selenium-rich agriculture comprehensively. Concurrently, the town should bolster its independent research and development capabilities, as well as its innovation capacity, to facilitate the ongoing advancement and refinement of selenium-rich agricultural technologies. By leveraging scientific and technological innovations, the quality and yield of selenium-rich agricultural products can be significantly improved to satisfy the increasing demands of consumers.

6.2 Improving market mechanisms In the future, Shatian Town must persist in enhancing its market expansion and brand development initiatives. It is essential to actively cultivate cooperative relationships with both domestic and international markets to expand sales channels and increase market share. Concurrently, efforts should be directed towards strengthening brand development, as well as marketing and promotional activities, to elevate the popularity and reputation of selenium-rich agricultural prod-

6.5 Strengthening policy support and funding In the future, Shatian Town must persist in actively pursuing support from governmental policies and funding. It should collaborate closely with local government entities to formulate improved policy measures and financial support programs. By leveraging policy and financial assistance, the development of selenium-rich agriculture

spikes, and effective maturity performance. This variety is well-suited for promotion across diverse regions and holds significant potential for market development.

- [1] HE ZH, ZHUANG QS, CHENG SH, *et al.* Wheat Production and technology improvement in China[J]. Journal of Agriculture, 2018, 8(1): 99–106. (in Chinese).
- [2] HE ZH, XIA XC, LUO J, *et al.* Trend analysis of international wheat breeding[J]. Journal of Triticeae Crops, 2006(2): 154–156. (in Chinese).

Selenium-rich agriculture is an emerging field within contemporary agricultural development, characterized by significant prospects for growth and substantial market potential. In the future, it is imperative to further advance research and dissemination efforts related to selenium-rich agriculture, and continuously enhance the technical framework and market mechanisms, thereby elevating the development of selenium-rich agriculture to a more advanced level and expanding its application across broader sectors.

- [1] GUO JQ. Current situation, existing problems and suggestions on the development of selenium-rich industry in China[J]. Agriculture of Henan, 2024(19): 48–50. (in Chinese).
- [2] WANG P, JIA K. Analysis on the development trend and restricting factors of modern agriculture in Liaoning[J]. Liaoning Agricultural Sciences, 2017(6): 63–68. (in Chinese).
- [3] ZHANG LL, XU SJ. Development trend of modern agriculture under the new normal[J]. Agricultural Outlook, 2018, 14(2): 26–28. (in Chinese).
- [4] ZHANG W. Brief analysis on the development trend of China's agriculture [J]. Agricultural Technology Service, 2016, 33(6): 32. (in Chinese).
- [5] FENG Y. Science and technology play an important role in invigorating agriculture[N]. Bingtuan Daily (Chinese), 2019–06–18(006). (in Chinese).
- [6] PENG Q, CHANG Y, WANG ZW, *et al.* Developing selenium-rich agriculture to boost rural revitalization[J]. Bulletin of Agricultural Science and Technology, 2019(3): 27–29. (in Chinese).

- [3] YANG JZ, WANG XF, WEN SX, *et al.* Yield-enhancing effects of chemical control on the prevention of fall in wheat[J]. Journal of Anhui Agricultural Sciences, 2000, 28(6): 715–716. (in Chinese).
- [4] WU XJ. Cultivation techniques for the new wheat variety Luo Mai 8[J]. Anhui Agricultural Science Bulletin, 2012, 18(12): 67, 87. (in Chinese).
- [5] MA ZZ, FANG CX. New wheat variety Liangxing 66 high yield cultivation technology standard[J]. Anhui Agricultural Science Bulletin, 2012 (18): 54–55. (in Chinese).