**Linkages in Production and Marketing of Medicinal Plants by Cooperatives in Tuyen Quang Province, Vietnam**

**ABSTRACT**

Determining the development of medicinal plants is one of the new directions contributing to the transformation of crop structure, creating momentum in economic development, and increasing income for people. Tuyen Quang province has had orientations and plans to develop forms of production organisation, improve capacity for enterprises and subjects participating in the program, develop agricultural products according to linkage and chain models, in order to promote creativity and potential internal strength of localities. The study aimed to assess the level of linkages between cooperatives and actors in the value chain, such as farmers, traders, material suppliers, state agencies and other cooperatives. This paper presents the results of a survey and analysis of the current status of linkages in the production and trading of medicinal plants of 18 cooperatives in Tuyen Quang province. OLS linear regression analysis was conducted to identify factors affecting the linkage index in the production and business of cooperatives. Moreover, SWOT analysis was done to determine the advantages, difficulties, opportunities and challenges in the process of strengthening linkages of cooperatives. The research results show that 100% of cooperatives have linkages with farming households, traders and state agencies, but the main form is still informal (verbal). On average, each cooperative has linkages with 55 farming households and 4 traders, but the rate of signing written contracts is still low (~30%). Over 22% of cooperatives have had disputes, mainly over price, quality and payment methods. Internal factors such as management capacity, capital, technology, etc., are major barriers to building sustainable linkages. Only 27.8% of cooperatives surveyed have direct connections with experts and scientists to receive advice on planting, processing or product development techniques. Up to 61.1% of cooperatives surveyed said that they do not have a clear mechanism or have never been connected with scientists, research institutes or universities to support in improving product quality and value. OLS regression results show that variables that have a positive impact on the linkage index include: the qualifications of management staff, the rate of written contracts, support from state agencies and the level of linkage with enterprises. The study also identified the advantages, disadvantages, opportunities and challenges of cooperatives through the SWOT model and proposed a system of specific solutions, including: raising awareness, signing clear contracts, enhancing technical support and digital technology, connecting long-term sellers and accessing policies. This document is an important basis for policy planning and designing support programs for developing local medicinal value chains.

**Keywords:** *Value chain linkage, medicinal cooperatives, sustainable agricultural production, SWOT and OLS analysis, Tuyen Quang.*

**I. INTRODUCTION**

**1. Why conduct this study?**

[Medicinal Plants](https://www.sciencedirect.com/topics/pharmacology-toxicology-and-pharmaceutical-science/medicinal-plant) continue to be a critical element of human healthcare systems. Over the past two decades, [herbal medicine](https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/herbal-medicines) practice and the use of natural therapies have increased significantly in industrialised countries, and the overall economic value of medicinal plants and plant products cannot be overlooked (Asigbaase et al., 2023; Kebede et al., 2021). Tuyen Quang province currently has nearly 2,315 hectares of medicinal plants, including many species of high economic value such as: Jiaogulan, Codonopsis, Tienchi ginseng, Polyscias fruticosa, Sacha Inchi, cinnamon, turmeric, Black galingale, Solanum procumbens, fo-ti... Medicinal plants are found in most districts but are mostly concentrated in the districts of Lam Binh, Chiem Hoa, and Son Duong. With a forest cover of up to 65%, the development of medicinal plant cultivation under the forest canopy in recent years has also brought high economic efficiency in some localities. In particular, Lam Binh district has also collected and tested the cultivation of precious medicinal herbs such as golden flower tea and longevity tea, known as the "Queen of teas". As the demand for medicinal plants has profoundly increased in the recent decade due to enormous chemical diversity, and the opportunity to develop new products presenting few side effects and economic values (Pant et al., 2021). Determining the development of medicinal plants is one of the new directions contributing to the transformation of crop structure, creating momentum in economic development, and increasing income for people (Mofokeng et al., 2022; Guo et al., 2021). Local authorities have mobilised people in some communes to grow medicinal plants, thereby forming concentrated medicinal plant areas. Tuyen Quang province has had orientations and plans to develop forms of production organisation, improve capacity for enterprises and subjects participating in the program, develop agricultural products according to linkage and chain models, in order to promote creativity and potential internal strength of localities. This helps to increase income and living standards for people and effectively implements the National Target Program on New Rural Development. However, the development of production and sale of herbal products in Tuyen Quang province still faces many difficulties in terms of production techniques, product quality, output, facilities, techniques for harvesting, preserving and processing, product brands and markets. Some problems still exist in the development of production and marketing of medicinal plant products in Tuyen Quang province such as: The scale of product output is still small; Production and processing facilities have not been invested in upgrading; Product designs and packaging have not been improved; Products have not reached consumers; The link between product owners and actors in the chain is not really tight; The interests and responsibilities of the parties have not been linked together, especially in the production of raw material areas; Products in the group of medicinal herbs and products from medicinal plants are potential products of the province, but the number of products meeting OCOP standards is still small (Department of Agriculture and Rural Development of Tuyen Quang, 2023).

Implementing Decree No. 98/2018/ND-CP dated July 5, 2018, of the Government on policies to encourage the development of cooperation and association in the production and consumption of agricultural products, the Province needs to propose solutions to review, propose amendments and supplements to product lines. Important products need to be encouraged and prioritised to support the implementation of association, linking production with the consumption of agricultural products.

Linking production with consumption helps to increase the scale of commodity production, facilitates the application of appropriate and modern production processes and ensures product quality. Ensure food safety and improve management and operational capacity for production and business entities. Organising production under contracts will avoid the situation of "good harvest, low price". To be effective and increase the value of agricultural products, it is necessary to cooperate for large-scale, synchronous production and have linkages from production, processing, to marketing between farmers, cooperatives and enterprises. Cooperation and linkage in the production and marketing of agricultural products is an inevitable trend in the current production of agricultural commodities. However, how to avoid the situation of "breakage" is always a concern, a question for each entity participating in the chain, and solutions are needed to resolve it. This study conducted a survey and analysed the current status of linkage in the production and business of medicinal plants of cooperatives in Tuyen Quang province, in order to assess the level of linkage between cooperatives and other actors in the product value chain. From there, propose solutions to promote the development of linkage relationships in the production and business of medicinal plants of cooperatives in Tuyen Quang province.

**1.2. Research objectives and methods**

***\* Research objectives:***

The main objectives of the study are:

- Assess the current status of linkages in the production and trading of medicinal plants of cooperatives in Tuyen Quang province.

- Determine the level of linkages between cooperatives and other actors in the value chain, including: farmers, traders, material suppliers, state agencies and other cooperatives.

- Analyse factors affecting linkages in the value chain of production and trading of medicinal plants.

- Propose specific solutions to promote the development of sustainable linkages in the production and trading of medicinal plants.

***\* Methodology:***

The study uses a combination of qualitative and quantitative methods, specifically:

- Field survey: Conduct a survey and collect information from 18 cooperatives producing and trading medicinal plants in Tuyen Quang province. The survey information includes the scale of operation, form and level of linkage, production and business results, difficulties and wishes of cooperatives in linkage.

- Quantitative analysis:

+ Use the OLS linear regression model to determine factors affecting the linkage index of cooperatives. Variables included in the model include: management staff capacity, the proportion of members with written contracts, the level of linkage with traders, support from state agencies, and the level of dependence on traders etc.

- SWOT analysis: To determine the advantages, difficulties, opportunities and challenges in the process of strengthening linkages of cooperatives.

**II. RESULTS AND DISCUSSION**

**2.1. Situation of production and business of medicinal plants in Tuyen Quang province**

Tuyen Quang province is gradually exploiting the potential for developing medicinal plants, contributing to transforming the crop structure and increasing people's income. Tuyen Quang has a forest cover of 65%, creating favourable conditions for the development of medicinal plants under the forest canopy. Many precious medicinal species have been found and grown in Lam Binh, Chiem Hoa, and Son Duong districts. In the period of 2016-2020, the province has planted 1,200 hectares of medicinal plants under the forest canopy; in the period of 2021-2025, it strives to plant an additional 300 hectares. By the end of 2025, the province aims to develop 2,000 hectares of medicinal plants and non-timber forest products under the forest canopy, forming a medicinal plant area that meets GACP-WHO standards (Department of Agriculture and Environment of Tuyen Quang, 2025).

Some typical production and linkage models in the production and business of medicinal plants in the province, such as... (Dao Thanh, 2023)::

+ Hop Hoa Agricultural and Forestry Service - Processing Cooperative (Son Duong): growing Solanum procumbens brings in an income of about 280 million VND/ha/year.

+ Tue Tam Herbal Medicine Company Limited (Tuyen Quang City) cooperates with farmers to develop a raw material area of ​​over 10 hectares, consumes products and produces products that meet OCOP 3 - 4 star standards.

+ Some cooperative models apply the method of growing medicinal herbs naturally, without using chemical fertilizers or pesticides, contributing to environmental protection and improving the quality of medicinal herbs such as Thao Moc Viet Cooperative (Tan Thanh commune, Ham Yen district); Binh Minh Organic Agricultural Products Cooperative (Tu Quan commune, Yen Son district); Thuan Hang Medicinal Herbs Cooperative (Son Duong district); Binh An Herbal Medicine Cooperative (Lam Binh district).

**Figure 1. Some images of medicinal plant growing areas of cooperatives**

**in Tuyen Quang province**

|  |  |  |
| --- | --- | --- |
|  |  |  |
| Nghệ An phát triển bền vững cây dược liệu | Phát triển cây dược liệu gắn với chế biến sâu để nâng cao giá trị |  |

According to the Department of Agriculture and Rural Development of Tuyen Quang province, the whole province currently has nearly 2,315 hectares of medicinal plants. The main medicinal plants include: Jiaogulan, Codonopsis, Tienchi ginseng, Polyscias fruticosa, Sacha Inchi, cinnamon, turmeric, Black galingale, Solanum procumbens, fo-ti...... In particular, lemongrass is grown on an area of ​​about 1,600 hectares, yielding over 11,000 tons per year. Black tea tree has an area of ​​218 hectares, mainly distributed in Lam Binh, Son Duong and Chiem Hoa districts.

Solanum procumbens is also a popular crop with an area of ​​about 167 hectares, bringing high economic efficiency to the people.

**Table 1. Area and main medicinal plant growing areas in Tuyen Quang province**

|  |  |  |  |
| --- | --- | --- | --- |
| **No.** | **Medicinal plants** | **Area (ha)** | **Growing area** |
| 1 | Lemongrass | 1,600 | Lam Binh, Son Duong, Chiem Hoa |
| 2 | Black galingale | 218 | Lam Binh, Son Duong, Chiem Hoa |
| 3 | Solanum procumbens | 167 | Son Duong |
| 4 | Jiaogulan, Codonopsis, Tienchi ginseng, Polyscias fruticosa, Sacha Inchi, Cinnamon, Turmeric, Fo-ti... | 330 | Scattered in the regions of the province |
|  | **Total** | **2,315** |  |

Medicinal plants are grown in most districts and cities in the province, but are most concentrated in the following districts:

+ Lam Binh: This locality has about 100 hectares of medicinal plants grown under the forest canopy, with plants such as Aristolochia debilis, Clematis chinensis, Red momordica, Seven-leaf aralia, Drynaria fortunei, Giant reed, Cardamom … The model of growing medicinal plants under the forest canopy not only brings economic efficiency but also contributes to forest protection and development.

+ Chiem Hoa: Hung My commune implements a model of growing Aristolochia debilis under the forest canopy, helping people improve their income. Aristolochia debilis has high economic value, with the selling price of dried leaves ranging from 200,000 - 300,000 VND/kg.

+ Son Duong: This district has formed areas for growing Solanum procumbens concentrated in the communes of Hop Hoa, Quyet Thang and Son Nam. The area for growing Solanum procumbens is about 16.5 hectares, bringing economic value 2-3 times higher than previous crops.

Tuyen Quang province aims to develop concentrated medicinal plant growing areas, linked to product consumption. The province has also implemented 10 provincial and district-level science and technology projects and topics on medicinal plant development, forming 11 models of linking planting and product consumption. In addition, the province encourages localities to convert ineffective cropland to medicinal plant growing, supports people to develop concentrated raw material areas, promotes science and technology transfer, and promotes trade to ensure the quality and food safety of medicinal products. The development of medicinal plants not only helps increase people's income but also contributes to the conservation of valuable genetic resources, biodiversity protection and sustainable economic development in Tuyen Quang (Agriculture and Environment Newspaper, 2025).

**2.2. Characteristics of surveyed medicinal plant production and trading cooperatives**

The study surveyed 18 cooperatives producing and trading medicinal plants in Tuyen Quang province. The cooperatives surveyed are located in districts such as Lam Binh, Ham Yen, Yen Son, Son Duong, and Tuyen Quang city. Most of these cooperatives were established from 2015 to 2023. The average area for growing medicinal plants is about 4.5 hectares/cooperative, ranging from less than 1 hectare to more than 20 hectares, depending on the type of plant and local conditions. The main plants include: Jiaogulan, Golden flower tea, Codonopsis, Aristolochia debilis, Wedelia, Fo-ti, Winged bean, Caterpillar fungus, Black galingale... Some cooperatives focus on developing plants with high economic value and strong medicinal properties (Jiaogulan, Aristolochia debilis), and some cooperatives invest in cultivating Caterpillar fungus using high technology. All cooperatives have full legal status and are registered at the district/provincial business registration office. Average number of members: about 20.4 members/cooperative; some cooperatives have only 7-10 members, some large-scale cooperatives have 40-50 members. Some cooperatives have the participation of ethnic minorities such as Dao, Tay, Mong. Regarding material and technical facilities, most cooperatives have primary processing workshops, but only about 30% have deep processing equipment or packaging lines. Some cooperatives have nurseries, greenhouses, and automatic irrigation systems, but they are still rudimentary. Many cooperatives face difficulties in capital to upgrade facilities, depending on support from the State or projects. Regarding production and business results: Average revenue: about 480 million VND/year/cooperative, fluctuating greatly according to scale. Profits are not stable, and many cooperatives are still operating at a low level, depending on output and season. There are about 5 cooperatives with products that have achieved OCOP certification (3 stars); the rest have not been ranked, mainly consumed within the province. Regarding the situation of production and consumption linkage: Linking with farmers: mainly in the form of oral contracts, lacking binding documents; Linking with enterprises: still limited, few cooperatives sign long-term contracts; Linking with state agencies, experts: mainly through training programs, technical support projects from the Department of Agriculture and Rural Development or farmers' associations. The survey results also show that the main difficulties and challenges in the SCKD activities of the surveyed medicinal plant cooperatives are: Lack of investment capital and processing machinery; Lack of specialized human resources in medicinal plants; Difficulty in finding stable output and building brands; Lack of understanding of GAP, GMP, OCOP standards.

The study surveyed and synthesised the basic characteristics of 18 medicinal plant production and trading cooperatives in Tuyen Quang province, including membership size, labour, area, products, financial capacity, management level and operating time.

The comparison data of characteristics between the 18 surveyed medicinal plant cooperatives and the average cooperatives in the whole province (all fields) are summarized in Table 2.

Table 2. Comparison of characteristics of surveyed medicinal plant production and trading cooperatives with other cooperatives in the whole Tuyen Quang province

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **No.** | **Indicator** | **Unit of measurement** | **Surveyed medicinal cooperatives** | **Cooperatives in the whole province (all fields)** | **Comparison** | |
| **A** | **B** | **(1)** | **(2)** | **Amount** | **%** |
| 1 | Number of members/cooperative | Person | 20.4 | 25 | -7 | 72% |
| 2 | Regular workers/cooperative | Person | 12 | 15 | -3 | 80% |
| 3 | Proportion of female workers | % | 55 | 52 | 3 | 106% |
| 4 | Proportion of ethnic minority workers | % | 60 | 40 | 20 | 150% |
| 5 | Average production area/cooperative | Ha | 4.5 | 6 | -1.5 | 75% |
| 6 | Proportion of cooperatives with OCOP products | % | 30 | 20 | 10 | 150% |
| 7 | Annual revenue/cooperative | Million VND | 480 | 600 | -120 | 80% |
| 8 | Average capital/cooperative | Million VND | 820 | 850 | -30 | 96.5% |
| 9 | Equity capital ratio | % | 48.7 | 68 | -19.3 | 71.6% |
| 10 | Directors with intermediate or higher qualifications | % | 70 | 78 | -8 | 90% |
| 11 | Cooperatives with output linkage contracts | % | 50 | 60 | -10 | 83% |
| 12 | Average years of operation | Year | 5.4 | 9.5 | -6.1 | 35.7% |

*(Source: (1): Survey data in 2024; (2): Tuyen Quang Statistical Office, 2024; Tuyen Quang Provincial Cooperative Union, 2024).*

Comparing the characteristics of surveyed medicinal plant production and trading cooperatives with cooperatives operating in all fields in Tuyen Quang province shows that: most of the average indicators of medicinal plant cooperatives are lower than the average of cooperatives in the whole province, such as: Number of members/cooperative; Regular labor/cooperative; Average production area/cooperative; Annual revenue/cooperative; Average production and business capital/cooperative; Equity capital ratio; Percentage of cooperatives with directors with intermediate qualifications or higher; Average number of years of operation; Cooperatives with output linkage contracts. This shows that the scale of production and business, conditions of labour resources, land, capital, qualifications, management experience and production and business results of medicinal plant cooperatives are somewhat limited and weaker than the average level of the whole province. However, some indicators of medicinal plant cooperatives are higher than the average level of the province, such as: Percentage of female workers; Percentage of ethnic minority workers; The rate of cooperatives with OCOP products. This also shows the characteristics of the medicinal plant production and business industry, taking into account gender and ethnic policies and the potential for developing medicinal products according to OCOP standards.

Table 3. Comparison of characteristics of medicinal cooperatives surveyed in Tuyen Quang province with medicinal cooperatives nationwide

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **No.** | **Indicator** | **Unit of measurement** | **Surveyed medicinal cooperatives** | **National medicinal cooperatives** | Comparison | |
| **A** | **B** | **(1)** | **(2)** | **Amount** | **%** |
| 1 | Number of members/cooperative | Person | 20.4 | 22 | -4 | 82% |
| 2 | Regular workers/cooperative | Person | 12 | 13 | -1 | 92% |
| 3 | Proportion of female workers | % | 55 | 50 | 5 | 110% |
| 4 | Proportion of ethnic minority workers | % | 60 | 35 | 25 | 171% |
| 5 | Average production area/cooperative | Ha | 4.5 | 6.5 | -2 | 69% |
| 6 | Proportion of cooperatives with OCOP products | % | 30 | 40 | -10 | 75% |
| 7 | Annual revenue/cooperative | Million VND | 480 | 550 | -70 | 87.2% |
| 8 | Average capital/cooperative | Million VND | 820 | 900 | -80 | 91.1% |
| 9 | Equity capital ratio | % | 48.7 | 51 | -2.3 | 95.4% |
| 10 | Directors with intermediate or higher qualifications | % | 70 | 75 | -5 | 93% |
| 11 | Cooperatives with output linkage contracts | % | 50 | 65 | -15 | 77% |
| 12 | Average years of operation | Year | 5.4 | 6.5 | -1.1 | 83% |

*(Source: (1): Survey data in 2024; (2): Ministry of Agriculture and Rural Development, 2024; New Rural Area Coordination Office, 2024)*

Comparing the characteristics of medicinal plant production and trading cooperatives surveyed in Tuyen Quang province with medicinal plant cooperatives nationwide, it is shown that most of the average indicators of medicinal plant cooperatives in Tuyen Quang are lower than the average of medicinal plant cooperatives nationwide. This shows that the scale of production and trading, conditions of resources in terms of labour, land, capital, qualifications, management experience and production and trading results of medicinal plant cooperatives in Tuyen Quang province are somewhat limited and weaker than the average level of medicinal plant cooperatives nationwide. There should be mechanisms, policies and solutions to develop medicinal plant production and trading cooperatives in Tuyen Quang province more strongly to exploit the potential and advantages of the locality.

**2.3. Current status of linkages in medicinal plant production and business of surveyed cooperatives**

***2.3.1. Linking with suppliers***

The linkage between medicinal cooperatives and agricultural material and service suppliers mainly takes place in an informal form. 72% of cooperatives (13/18) purchase materials through traders or local stores in the form of free trade or verbal agreements. Only 28% of cooperatives (5/18) have written contracts with material suppliers, mainly large-scale cooperatives or those that have participated in technical assistance projects. On average, each cooperative has 2-4 material suppliers that regularly trade. However, the proportion of establishments with long-term commitments is very low, only about 20%. The characteristics and nature of the linkage are still fragmented, lacking a mechanism to monitor the quality of materials, and difficult to trace the origin of products. Some cooperatives reflect the situation of dependence on unstable supply sources, making them susceptible to price pressure. The difficulties in linkage are: Lack of transparent information about suppliers; Insufficient financial capacity to sign long-term contracts; Lack of support from intermediaries. Weak linkages increase input costs, disrupt production, and affect the quality of medicinal output.

**Table 4. Current status of linkage with suppliers**

|  |  |  |  |
| --- | --- | --- | --- |
| **No.** | **Criteria** | **Number of cooperatives** | **Percentage (%)** |
| 1 | Have a written contract with the supplier | 5 | 27.8% |
| 2 | Link by verbal agreement | 13 | 72.2% |
| 3 | Buy materials yourself without a link | 6 | 33.3% |
| 4 | Have difficulty tracing the origin of materials | 11 | 61.1% |
| 5 | Want to connect with a reputable supplier | 16 | 88.9% |

The survey results show that there is a high level of agreement among cooperatives in assessing and wanting to continue to maintain this relationship. Although most cooperatives have had disputes with suppliers, they have resolved the disputes by negotiating and reaching a consensus. The level of association is assessed on a strict or very strict scale. Cooperatives are aware of the benefits of association, which include being provided with adequate and timely agricultural materials and being paid late. However, there are also difficulties and limitations in this association due to the small quantity of purchased goods, not being eligible to sign contracts and not enjoying preferential policies. 100% of cooperatives responded that they would like to continue to sign association contracts in the future.

The common proposals and recommendations were made by cooperatives to improve the effectiveness of their association with suppliers of agricultural materials and services. The majority of opinions agreed on practical solutions that are suitable for actual production conditions. 100% of surveyed cooperatives believe that to strengthen the relationship between cooperatives and input suppliers, it is necessary to build a long-term, stable partnership; Sign a clear legally binding contract; Make large-scale joint purchases; Participate in closely linked models between the four parties; Take advantage of State policies, connect target programs (OCOP, new rural areas); Use material management software: track quantity, usage time, cost, quality.

***2.3.2. Linking with farmers growing medicinal plants***

The linkage between medicinal plant cooperatives and farming households mainly takes place in three forms: oral agreements, written contracts and purchasing raw materials from households not participating in the cooperative. According to the survey results of 18 cooperatives, 66.7% of cooperatives have verbal agreements, 22.2% have written contracts and 44.4% purchase raw materials from households outside the cooperative. On average, each cooperative has 20-70 farming households linked to grow medicinal plants, but only about 30-35% of households have committed to stable linkages through contracts. The linkage is still loose and easily broken when market prices fluctuate. Many households do not really trust the cooperative or lack awareness of the benefits of the linkage model. Cooperatives have difficulty in monitoring the production process and product quality from households, due to the lack of specialised technical teams and effective inspection mechanisms. At the same time, cooperatives do not have enough capacity to support inputs or clearly divide profits, making it difficult to maintain long-term commitments to farmers.

**Table 5. Current status of linkage between cooperatives and medicinal plant growing households**

|  |  |  |  |
| --- | --- | --- | --- |
| **No.** | **Criteria** | **Number of cooperatives** | **Percentage (%)** |
| 1 | Verbal Agreement | 12 | 66.7% |
| 2 | Have Written Contracts with Households | 4 | 22.2% |
| 3 | Buy Raw Materials from Households Outside the Cooperative | 8 | 44.4% |
| 4 | Have a Mechanism for Technical Support for Farmers | 7 | 38.9% |
| 5 | Have Breached Commitments | 10 | 55.6% |

Some cooperatives have advantages in linkages such as households having experience in growing indigenous medicinal plants, receiving technical training or participating in production linkage models. However, to develop sustainable linkages, it is necessary to strengthen the signing of written contracts, support input materials, establish technical supervision teams and apply traceability technology.

The survey results also summarise proposals and recommendations to improve the effectiveness of the linkage relationship between cooperatives and farming households, including:

+ Strengthening propaganda and raising awareness for farming households: Organising training sessions and seminars to help farmers clearly understand the benefits and responsibilities when participating in linkages; Raising awareness of contract compliance and proper implementation of production processes.

+ Signing clear, legally binding contracts: Drafting model contracts according to the instructions of competent authorities or the Law on Cooperatives; Stipulating specific responsibilities of each party, and mechanisms for handling violations.

+ Have initial support policies for cooperative households: Request the State or cooperatives to support seeds, fertilisers, and input materials for households when they first join the cooperative; Can advance a portion of the input and recover it after consuming the product.

+ Apply digital technology to manage production: Use software to monitor output, field diaries, and evaluate quality; Increase transparency and easily control the process of member households.

+ Strengthen the coordination and technical support role of cooperatives: Cooperatives need to have technical staff to regularly guide and inspect the fields; Establish production groups by area for easy management and timely support.

+ Connect with enterprises to consume products long-term: Cooperatives need to proactively seek and sign product consumption contracts with enterprises; Having a stable output will help increase the trust and participation of farming households.

## 2.3.3. Linkage between cooperatives

The linkage between cooperatives in the production, processing and consumption of medicinal plants is still very limited, spontaneous, fragmented and lacks a formal coordination mechanism. Only 4/18 cooperatives (22.2%) said that they have ever linked to share plant varieties, materials or technical support with other cooperatives. No cooperative has built a production - processing - consumption linkage between regions or districts by formal contracts. Some existing forms of linkage include sharing production models through workshops (33.3%), participating in fairs, and promoting products (27.8%). However, there has not been any case of joint brand building or sustainable consumption linkage. The main reason is that cooperative activities are still scattered, lacking motivation and trust in cooperation, and there is no intermediary coordinating organisation. This reduces the competitiveness and economic efficiency of the entire medicinal plant cooperative system in the province.

**Table 6. Current status of linkages between cooperatives producing and trading medicinal plants**

|  |  |  |  |
| --- | --- | --- | --- |
| **No.** | **Criteria** | **Number of cooperatives** | **Percentage (%)** |
| 1 | Have links to support materials and seeds | 4 | 22.2% |
| 2 | Have models to share | 6 | 33.3% |
| 3 | Participate in fairs and promotions | 5 | 27.8% |
| 4 | Have official agreements/contracts to link | 0 | 0% |
| 5 | Want to link to build a common value chain | 13 | 72.2% |

The survey results also summarize proposals and recommendations to improve the effectiveness of the linkage relationship between cooperatives, including:

+ Establishing a formal and sustainable linkage mechanism: There should be a clear and transparent linkage contract between cooperatives, with specific assignment of responsibilities; Establishing cooperative alliances by industry and production area for general coordination.

+ Strengthening the coordination role of the Cooperative Alliance and State agencies: Functional agencies should act as intermediaries to connect, guide cooperatives in signing and implementing contracts; Organising seminars and discussions to share experiences and introduce effective linkage models.

+ Supporting cooperatives in terms of capital, technology, and market to participate in linkage: The State needs to have preferential credit policies, support trade promotion, and technology transfer for linked cooperatives; Prioritise cooperatives that have links in participating in the OCOP program, new rural areas, value chain projects, etc.

+ Build a shared information system among cooperatives: There needs to be an electronic information portal or a shared software system to share information on markets, prices, sources of goods, etc.; Promote digital transformation in cooperative management, helping to coordinate effectively between parties.

+ Train and improve the capacity of cooperative management staff: It is necessary to organise training courses on cooperative management, negotiation skills, and organisation of joint production; Raise awareness among cooperative leaders about the benefits of inter-regional and inter-sectoral cooperation.

## 2.3.4. Linking with traders, agents, and outlets for output products

The links between medicinal cooperatives and traders and agents consuming output products are still mainly short-term, lacking legal binding and sustainability. According to the survey results, up to 11/18 cooperatives (61.1%) link with traders by verbal agreements, without signing official purchase contracts. Only 5 cooperatives (27.8%) said they have written contracts with fixed purchasing agents. 12 cooperatives (66.7%) admit to depending on traders and the free market, leading to price pressure or the risk of not being able to sell products. 8 cooperatives (44.4%) have had disputes over price, volume, and delivery time with traders. However, up to 14 cooperatives (77.8%) still want to establish stable, long-term links with consumption sources. They propose signing purchase contracts before the season, having a minimum floor price agreement and sharing transportation and product preservation costs. Lack of transparency in the market, prices and lack of support from intermediaries are the main reasons why cooperatives are weak in negotiations. Developing a system of close links with agents and large consuming enterprises is a necessary direction to stabilise output and increase the value of medicinal products.

**Table 7. Current status of the linkage between cooperatives and traders, and sales agents**

|  |  |  |  |
| --- | --- | --- | --- |
| **No.** | **Criteria** | **Number of cooperatives** | **Percentage (%)** |
| 1 | Oral connection without contract | 11 | 61.1% |
| 2 | With sales contract | 5 | 27.8% |
| 3 | Depends on traders | 12 | 66.7% |
| 4 | Experience price or delivery disputes | 8 | 44.4% |
| 5 | Desire for long-term stable connection | 14 | 77.8% |

Research and synthesize suggestions and recommendations to improve the effectiveness of the relationship between cooperatives and product consumption establishments, including:

+ Strengthening the signing of clear and transparent contracts: There should be a unified contract template, clearly stipulating prices, quality, payment methods and handling of violations; Limiting oral transactions or free trade that can easily lead to disputes.

+ Supporting cooperatives to access large consumption enterprises: Recommending competent agencies to connect cooperatives with enterprises, supermarkets, clean food chains, prioritising OCOP products, meeting VietGAP, GACP-WHO standards...

+ Supporting cooperatives to improve production capacity and product standardization: There should be policies to support cooperatives in technical training, quality certification, packaging, and labeling to meet the requirements of consumption establishments; Supporting investment in storage warehouses, dryers, and processing workshops to maintain output quality.

+ Building a sustainable linkage mechanism along the value chain: Encourage the cooperative-enterprise model to sign long-term contracts, sharing benefits and risks; There needs to be a mechanism to monitor contract implementation and quickly handle disputes. + Strengthening trade promotion and product communication: Supporting cooperatives to participate in fairs, agricultural product trading floors, e-commerce platforms, helping to expand consumption channels; Promoting the image of cooperatives, typical regional products to attract consumption partners.

## 2.3.5. Linking with state agencies, experts, scientists

The linkage between cooperatives and state agencies, experts and scientists is assessed as having potential but has not yet been fully exploited. Only 27.8% of cooperatives surveyed have direct connections with experts and scientists to receive advice on planting, processing or product development techniques. Most of these linkages are temporary, lack a stable cooperation mechanism or have not been regularly supported. Up to 61.1% of cooperatives surveyed said that they do not have a clear mechanism or have never been connected with scientists, research institutes or universities to support in improving product quality and value. However, up to 88.9% of cooperatives expressed their desire to be more closely connected with state agencies, researchers and experts to receive technical advice, apply science and technology, develop quality standards and participate in product development support programs.

**Table 8. Current status of the linkage between cooperatives and state agencies, experts and scientists**

|  |  |  |  |
| --- | --- | --- | --- |
| **No.** | **Criteria** | **Number of cooperatives** | **Percentage (%)** |
| 1 | Participate in technical training | 10 | 55.6% |
| 2 | Supported by state projects | 7 | 38.9% |
| 3 | Linked to experts/scientists | 5 | 27.8% |
| 4 | No clear linkage mechanism | 11 | 61.1% |
| 5 | Want to strengthen linkages | 16 | 88.9% |

The study has compiled proposals and recommendations to improve the effectiveness of the relationship between cooperatives and state agencies, experts and scientists, including:

+ Strengthen regular and substantive coordination: Agencies and organisations need to regularly update information, listen to feedback from cooperatives, avoid formal support; Have a clear contact point, guide cooperatives from the time of access to the completion of support.

+ Simplify procedures, improve support processes: Shorten administrative procedures in accessing policies, registering for training, requesting technical support, capital, equipment, etc.; Have a set of specific, easy-to-access guidance documents for cooperative staff.

+ Provide in-depth support and long-term accompaniment: Agencies and organisations should implement support in stages (before, during, after cultivation, production) instead of one-time support; Experts and technical staff should stick to reality, accompany cooperatives throughout the production and consumption cycle.

+ Prioritise cooperatives with practical efficiency when allocating resources: Develop a mechanism for selecting supported cooperatives based on performance, production capacity and level of commitment to join the association; Encourage cooperatives to follow the value chain, produce products that meet high-quality standards. + Create a three-party association mechanism: cooperatives - experts - enterprises: Support a closed association model, helping cooperatives to both produce technically correct products and have an output market; Organise forums and seminars on regional and industry associations between cooperatives and related parties.

**2.4. Analysis of factors affecting the linkage of medicinal plant production and trading cooperatives in Tuyen Quang province**

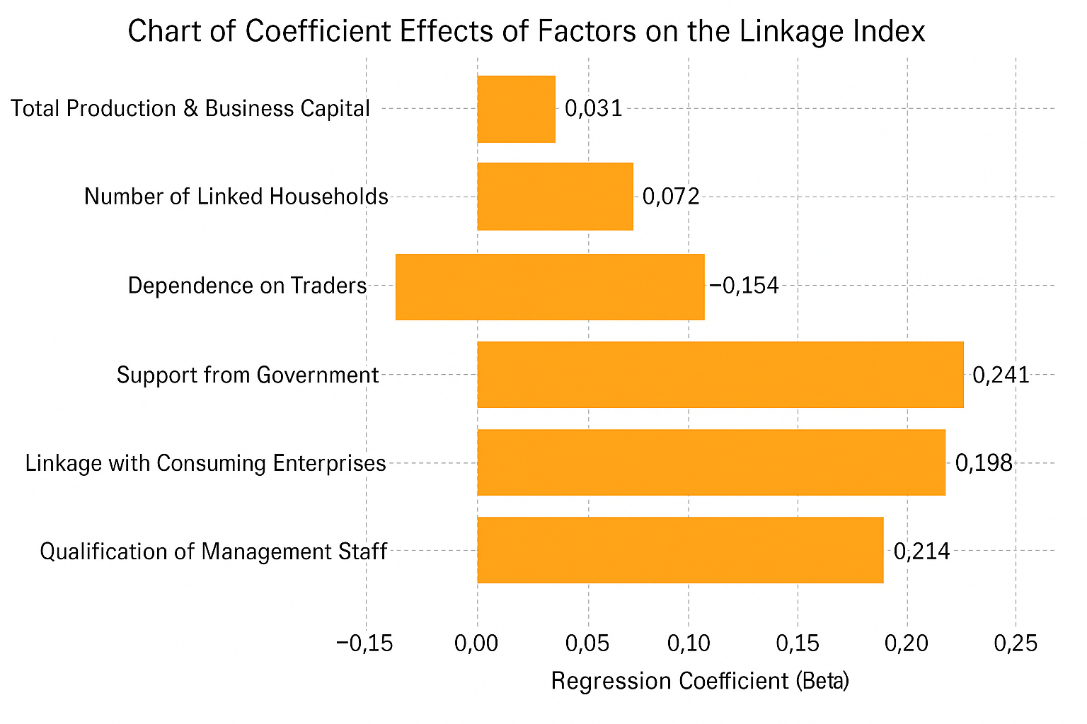
The linkage in the production and business of medicinal plants of cooperatives in Tuyen Quang province is affected by many factors, which can be divided into two main groups: internal factors within the cooperative and external factors from the linkage environment.

Regarding internal factors, the management and organisational capacity of many cooperatives is still limited; there is no contract monitoring system or transparent traceability, making the linkage unprofessional and lacking a mechanism to ensure implementation. Financial resources and facilities are also weak, with an average capital of only about 820 million VND per cooperative, not enough to invest in the chain production process. Moreover, the linkage between cooperatives and farmers mainly takes place in an informal form, mostly by oral agreements, without binding contracts, which can easily lead to broken commitments when there are fluctuations in prices or market conditions.

Regarding external factors, cooperatives still face difficulties in establishing and maintaining close links with product-consuming enterprises. Most of the links are loose, lacking binding contracts, leading to a high dependence on the free market, making them vulnerable to market fluctuations. Links with technical material suppliers are also mainly informal, making it difficult to handle disputes when they arise. In addition, farmers often violate contracts when market prices change, showing a lack of trust in cooperatives and a low commitment to the links. Although there are support policies from the State, access is still limited, procedures are cumbersome, and there is a lack of real connection with experts and scientists.

OLS linear regression analysis was conducted to identify factors affecting the linkage index in production and business of cooperatives. The results of OLS regression analysis from a survey of 18 medicinal cooperatives in Tuyen Quang province are presented in Chart 1.

**Chart 1. Influence coefficient of factors on the linkage index**



*Source: OLS regression analysis results from a survey of 18 medicinal cooperatives in Tuyen Quang province.*

The regression results show that:

\* Factors that have a positive and statistically significant impact on the level of linkage are:

+ Management staff qualifications (Beta = 0.214, P = 0.014): High qualifications help increase the effectiveness of organization and management of linkages.

+ Proportion of members participating in written contracts (Beta = 0.198, P = 0.021): Contributes to enhancing the binding and commitment between the parties.

+ Level of linkage with consuming enterprises (Beta = 0.241, P = 0.009): This is the strongest influencing factor. Good relationships with enterprises help stabilise consumption and develop sustainably.

+ Cooperatives are supported by state agencies (Beta = 0.167, P = 0.037): Support in terms of policies, capital, and technology plays an important role.

\* Factors with negative but statistically significant influence: Dependence on traders (Beta = -0.153, P = 0.048): Reduces stability and initiative in linkage, making it difficult for cooperatives to develop long-term strategies.

\* Factors with no statistical significance in the model:

+ Number of farmer households in linkage (Beta = 0.072, P = 0.112).

+ Total production and business capital (Beta = 0.031, P = 0.185).

The results of quantitative analysis through the OLS linear regression model showed that the factors that positively affect the linkage index include: the level of management staff, the rate of members participating in written contracts, and the cooperative receiving support from state agencies. On the contrary, dependence on traders has a negative impact on the linkage index, reducing the sustainability and stability of relationships in the value chain. Some factors, such as the number of farmer households participating in the linkage or the total production and business capital, although playing a certain role, do not show a statistically significant effect in the model. The results of the regression analysis indicate that, in order to strengthen the linkage relationships in the production and business of medicinal plant cooperatives in Tuyen Quang province, it is necessary to focus on implementing a number of policies: Improving the level of cooperative management; Increasing the proportion of members signing formal contracts; Expanding linkages with enterprises consuming products; Strengthening the role of state support; Reducing dependence on traders by developing stable distribution channels.

- SWOT analysis:

SWOT analysis aims to identify the advantages, difficulties, opportunities and challenges in the process of strengthening the linkage of cooperatives. The analysis results are presented in Table 9.

**Table 9. SWOT analysis in the production and business linkage of medicinal plants of cooperatives in Tuyen Quang**

|  |  |
| --- | --- |
| **Strengths** | **Weaknesses** |
| - There are areas for growing traditional medicinal plants with diverse biodiversity.  - High proportion of ethnic workers, knowledgeable about local growing techniques.  - Some cooperatives have products that meet OCOP standards.  - There is attention and support from local authorities. | - Limited cooperative management capacity.  - Low capital for production and business.  - Lack of binding contracts in association.  - Lack of post-harvest processing and preservation equipment. |
| **Opportunities** | **Threats** |
| - Increasing domestic and foreign market demand.  - Policies to encourage value chain development, OCOP.  - Application of science and technology in production.  - Support from national target programs. | - Competition with cheap imported products.  - Market price fluctuations, risk of breaking links.  - Difficulty in accessing capital and consumer markets.  - Impact of climate change and pests. |

From the above analysis, it can be seen that the internal organisational capacity of cooperatives, the formality of the association contract, as well as the supporting factors from state policies play a key role in improving the effectiveness of the association. To improve the situation, it is necessary to promote professionalism in contract signing, strengthen value chain management and build stable, long-term cooperative relationships with enterprises consuming medicinal products.

**III. CONCLUSION**

Through surveying and synthesising information from 18 medicinal plant production and trading cooperatives in Tuyen Quang province, the research team assessed the current status of linkage activities in the value chain from production, supply of input materials, production organisation, purchasing, processing, to product consumption. The cooperatives have initially built raw material areas, established linkages with farmers, consumer enterprises and state agencies. However, linkage activities still have many limitations, such as loose forms of cooperation, lack of binding contracts, frequent disputes, lack of capital, weak management capacity and market access. In the context of an increasingly expanding medicinal plant market and high-quality requirements, consolidating and developing sustainable linkage models is an urgent requirement. The study has proposed a system of specific solutions to improve the effectiveness of linkages, contributing to promoting sustainable development of the medicinal herbs industry, increasing income for cooperative members, and creating momentum for the development of the rural agricultural economy.

This study has several limitations. First, the sample size is relatively small, limited to 18 cooperatives in a single province, which may not fully represent the diversity of medicinal plant cooperatives in Vietnam. Second, the data was collected at one point in time, which restricts the ability to assess temporal changes in linkage effectiveness. Third, the model used focuses primarily on linear relationships; further studies could employ more complex models to explore nonlinear and interaction effects. Future research should expand the geographic scope, include a larger sample, and adopt longitudinal and comparative approaches to validate and generalise the findings.

**COMPETING INTERESTS DISCLAIMER:**

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

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1.

2.

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