



**AgEcon** SEARCH

RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

*No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.*



RESEARCH ARTICLE

## Enhancing the Cassava Value Chain: Policy Recommendations and Strategies for Sustainable Development

Piya Wongpit<sup>1,\*</sup> , Thone Boungvatthana<sup>2</sup>, Amphone Xaysombath<sup>1,3</sup>, Vilaphanh Chanhthlangma<sup>3</sup>

<sup>1</sup> Faculty of Economics and Business Administration, National University of Laos, Vientiane 7322, Lao PDR

<sup>2</sup> Enterprise and Development Consultants Co., Ltd., Vientiane 01000, Lao PDR

<sup>3</sup> Research and Training Division, Banking Institute, Vientiane 01000, Lao PDR

### ABSTRACT

Cassava has emerged as a significant cash crop in the Lao People's Democratic Republic, driven by the establishment of starch factories and favorable government policies promoting foreign direct investment. This study analyzes the cassava value chain in Champasak Province, the second-largest producer in the country, to identify key challenges and opportunities for enhancing the sector's sustainability and profitability. Through comprehensive mapping of stakeholders including farmers, traders, processing companies, exporters, and buyers, this research highlights critical issues such as land use, infrastructure development, market access, and financial support. Policy recommendations are provided to improve cassava production practices, enhance market linkages, and create conducive regulatory environments. The findings aim to guide policymakers and stakeholders in developing strategies that bolster the cassava value chain, contributing to economic growth and sustainable development in Lao PDR.

**Keywords:** Value chain; Value-added; Sustainable development

#### \*CORRESPONDING AUTHOR:

Piya Wongpit, Faculty of Economics and Business Management, National University of Laos, Vientiane 01000, Lao PDR; Email: [p.wongpit@nuol.edu.la](mailto:p.wongpit@nuol.edu.la)

#### ARTICLE INFO

Received: 5 July 2024 | Revised: 6 August 2024 | Accepted: 15 August 2024 | Published Online: 20 September 2024  
DOI: <https://doi.org/10.36956/rwae.v5i4.1163>

#### CITATION

Wongpit, P., Boungvatthana, T., Xaysombath, A., et al., 2024. Enhancing the Cassava Value Chain: Policy Recommendations and Strategies for Sustainable Development. *Research on World Agricultural Economy*. 5(4): 37–48. DOI: <https://doi.org/10.36956/rwae.v5i4.1163>

#### COPYRIGHT

Copyright © 2024 by the author(s). Published by Nan Yang Academy of Sciences Pte. Ltd. This is an open access article under the Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0) License (<https://creativecommons.org/licenses/by-nc/4.0/>).

## 1. Introduction

Cassava has emerged as a dominant cash crop in the Lao People's Democratic Republic (Lao PDR) following the establishment of starch factories in the early 2000s. This development is closely linked to government policies that incentivize foreign direct investment (FDI) in the cassava sector. The influx of FDI has played a pivotal role in bolstering the Lao economy by increasing foreign currency earnings and creating job opportunities, particularly for low-income households [1].

In recent years, global food demand has surged due to factors such as wars and climate change, leading to a significant rise in cassava prices since 2022. This trend has further cemented cassava's importance in the Lao agricultural landscape. The crop's resilience to climate variability and its adaptability to the diverse agroecological conditions of Lao PDR have also contributed to its growing prominence. Moreover, the expansion of the cassava sector has spurred the development of related industries, including transportation, processing, and export services, thereby generating additional economic benefits.

As the cassava industry continues to grow, it has also drawn attention to the environmental and social implications of large-scale production. Issues such as land degradation, deforestation, and the displacement of traditional farming practices have emerged as challenges that require careful management. To sustain the benefits of cassava cultivation while mitigating its negative impacts, the Lao government is exploring policies that promote sustainable agricultural practices, improve supply chain efficiency, and enhance value-added processing within the country.

However, the rapid expansion of cassava cultivation in the Lao PDR presents several potential challenges that warrant careful consideration. One of the most notable concerns is the shift in land use on the fertile Bolaven Plateau in Champasak province, traditionally a stronghold for coffee plantations. This region has seen an increasing conversion of coffee fields into cassava cultivation, which could have significant implications for coffee production in the long term. While the transition to cassava might offer farmers immediate financial bene-

fits, there are growing concerns about the sustainability of this practice, particularly in terms of soil quality degradation and the potential for rising production costs over time [2].

The shift towards cassava monoculture raises questions about the long-term viability of agriculture in these areas. The intensive cultivation of cassava can lead to soil nutrient depletion, increased vulnerability to pests and diseases, and a higher dependency on chemical inputs. These factors may not only affect cassava yields but also reduce the overall agricultural productivity of the region, potentially leading to a decline in farm income and food security in the future.

Moreover, while some research has been conducted on the cassava value chain in Lao PDR, these studies have largely focused on the supply chain and have been conducted before the onset of the COVID-19 pandemic [3]. The pandemic has brought about significant disruptions and changes in the cassava industry, making it imperative to revisit and thoroughly analyze the entire value chain—from farmers to exporters. This updated analysis is essential to understanding the current dynamics, including new challenges and opportunities that have emerged in the post-pandemic context.

The cassava value chain in Lao PDR is characterized by a complex network of stakeholders, including smallholder farmers, local traders, processing companies, exporters and international buyers. Each of these actors plays a critical role in the functioning of the value chain, and their interactions can significantly influence the sector's overall performance. Therefore, a comprehensive analysis that maps the entire value chain is crucial for identifying key issues, such as bottlenecks in production, inefficiencies in processing, and barriers to market access.

This study aims to conduct such a mapping to generate valuable insights into the opportunities and challenges facing the cassava sector in Lao PDR. By doing so, the study seeks to provide evidence-based policy recommendations that can support the development of a more competitive and sustainable cassava industry. The findings will be particularly relevant for policymakers, who need to design and implement strategies that not only enhance the sector's resilience in the face of global market fluctuations but also ensure the equitable distribution of

benefits among all stakeholders involved in the cassava value chain.

## 2. Literature Review

In Southeast Asia, private-sector value-chain actors are motivated to invest in promoting suitable cassava varieties, fertilizer regimes, pest control methods and other production practices. Nevertheless, the potential adoption of fertilizers remains low due to the lack of formulations specifically designed for cassava production<sup>[4-6]</sup>. Targeted interventions are needed to ensure the sustainability and profitability of cassava farming in the region. Effective cassava production in Lao PDR and other parts of Southeast Asia requires a combination of improved agricultural practices, tailored fertilizer use, and strategic investments from both the public and private sectors<sup>[2]</sup>.

Previous research on cassava has mainly focused on its impact at the regional level, addressing both income generation and sustainability<sup>[4,5]</sup>, as well as its impact on soil quality<sup>[7,8]</sup>. A study of cassava production across Asia revealed that cassava yields tend to decline when cassava is grown continuously in the same field<sup>[5]</sup>. However, continuous cassava production does not necessarily degrade the soil if high yields are maintained through the judicious use of chemical fertilizers combined with various sources of organic matter. This approach supplies secondary nutrients and micronutrients while maintaining soil health and good physical conditions<sup>[5]</sup>.

Extensive studies have explored the value chain in Lao PDR for several agricultural products such as bananas<sup>[9]</sup>, coffee<sup>[10,11]</sup> and tea<sup>[12]</sup>, with few studies focusing on the cassava value chain. The analysis of the agribusiness potential in the Lao-China railway corridor identifies cassava as a key agricultural product with significant export potential<sup>[13]</sup>. However, the cassava value chain in Lao PDR faces several weaknesses and challenges, including low-quality yields, limited knowledge of disease management and control, soil degradation, and fluctuating prices<sup>[14]</sup>. The technical efficiency of small-scale cassava farmers in Lao PDR has shown that planting cassava with good land preparation, a suit-

able planting period, and young farmers play a key role in improving technical efficiency for cassava farming<sup>[15]</sup>.

The food value chain in the northern part of Lao PDR was examined, revealing that participating in Farmer Producer Groups (FPGs) within contract farming and value chain collaboration with Chinese investors enables farmers, especially smallholders, to achieve increased income<sup>[16]</sup>. In terms of inclusivity in the food value chain with China, both FPG and non-FPG farmers have the potential to leverage opportunities, participating in value chains to enhance overall agricultural production<sup>[16]</sup>.

The cost-effectiveness of fertilizer use among cassava farmers in Xiengkhouang province, Lao PDR, is influenced by several factors. Research suggests that adopting higher-yielding varieties, ensuring sufficient and well-balanced fertilization, effective weed control, utilizing high-quality planting material, and implementing optimal plant spacing are crucial for enhancing productivity<sup>[17]</sup>. Additionally, the market price of maize and cassava in Lao PDR is significantly influenced by cassava prices in Thailand. Related institutions have not adequately provided information accounting for the local market structure, which is a primary factor contributing to price fluctuation<sup>[18]</sup>.

Previous studies have discussed the cassava value chain at the regional level, but few have focused specifically on Lao PDR, which is currently experiencing a boom in cassava production. This paper examines who is involved in the value chain, who benefits from it, and the challenges and opportunities for promoting the cassava value chain in Lao PDR.

## 3. Methodology

This research employed desk reviews and field surveys to gather comprehensive insights into the cassava value chain. Policy documents on cassava were sourced from various entities, including the Provincial Agriculture and Forestry Office, the Department of Industry and Commerce, Champasak Province, the Chamber of Commerce and Industry, the Vangtao International Customs Office, and the Laos Cassava Association (LCA).

Detailed questionnaires were meticulously devel-

oped using a value chain analysis approach, incorporating insights from experts in the cassava industry. These experts included farmers, exporters, and staff from the LCA, and their input was gathered through focus group discussions. The questionnaires were specifically tailored to address the unique roles and challenges faced by different stakeholders in the cassava value chain, including farmers, traders, exporters, and processing factories.

The primary aim of these questionnaires was to gather comprehensive data for mapping the cassava value chain. Key questions were designed to capture critical information on the processes, roles, and responsibilities of each actor involved in the chain. This included details on the flow of products, transportation logistics, and the linkages between different actors, such as how farmers connect with traders, and how traders interact with exporters and factories. The information collected was used to create a detailed value chain map that visually represents the sequence of activities and the interactions between stakeholders, highlighting areas where efficiency could be improved or where value could be added<sup>[19]</sup>.

In addition to mapping the value chain, the questionnaires also focused on gathering data related to value added at each stage of the chain. Key questions were included to assess production costs, covering inputs such as labor, fertilizers, land preparation and cultivation, and other associated expenses. Information on output levels, revenue, and buying and selling prices at different stages of the chain was also collected. This data was crucial for calculating both variable and fixed costs, enabling the determination of the cost per kilogram of cassava produced<sup>[18]</sup>.

Once the costs were established, the revenue per kilogram was calculated to estimate the profit margin for each actor within the value chain. By comparing the costs and revenues, the analysis aimed to identify which stages of the value chain were most profitable and which were underperforming. This profit margin estimation was critical for understanding the economic viability of cassava production and trade in Lao PDR, providing a basis for recommending improvements and interventions that could enhance profitability across the entire value

chain<sup>[19]</sup>.

Moreover, this detailed value chain analysis not only provided insights into the current state of the cassava industry but also served as a foundational tool for policymakers and stakeholders. The findings could be used to design targeted strategies that address inefficiencies, reduce costs, and ultimately increase the competitiveness of Lao cassava in both domestic and international markets. The resulting policy recommendations would aim to support sustainable growth in the cassava sector, ensuring that all actors, from farmers to exporters, can benefit from the industry's expansion<sup>[19]</sup>.

The target actors within the cassava value chain were categorized into two distinct groups: direct actors and indirect actors. Direct actors include the primary stakeholders involved directly in the cassava value chain, such as farmers, traders, exporters, and processing factories. Indirect actors, on the other hand, consist of supporting stakeholders who operate parallel to these key actors, providing essential services and support that facilitate the functioning of the value chain. A field survey was conducted from February to March 2023 in Paksong District, Champasak province, a region traditionally known for its cassava production increasingly engaged in cassava cultivation. The LCA support team played a crucial role in coordinating the survey by contacting stakeholders, informing them of the survey's purpose, and scheduling meetings with them. The survey sample included 30 cassava farmers, 8 traders, 4 exporters, and 1 processing factory. This sample size was deemed sufficient for conducting a comprehensive value chain analysis. The survey was conducted in various locations, including farms, traders' residences, and the factory, depending on the availability of the respondents.

The data collected from this survey provided valuable insights into the operations, challenges, and opportunities within the cassava value chain in Paksong District. It enabled a thorough understanding of the interactions between different actors and the dynamics of the cassava industry in this region, laying the groundwork for targeted interventions and policy recommendations aimed at enhancing the efficiency and sustainability of the value chain.

## 4. Results and Discussion

### 4.1. Cassava Production and Export

Cassava has become one of the most significant agricultural products in Lao PDR. In 2020, the plantation area for cassava covered 112,450 hectares, making it the second-largest crop area after rice, which covered over 714,030 hectares. By 2022, the production area for cassava had increased to 191,300 hectares, representing a 70% increase compared to 2020. Correspondingly, cassava production rose from 3.68 million tons in 2020 to 4.86 million tons in 2022. However, despite this increase in production, productivity has declined, dropping from 32.77 tons per hectare in 2020 to 25.42 tons per hectare in 2022<sup>[20]</sup>.

Xayaboury Province has the largest cassava plantation area, covering 34,660 hectares with a production output of 1.16 million tons. The second-largest area is in Champasak Province, which has a plantation area of 28,111 hectares and produces 0.99 million tons. Saravan Province follows with 26,150 hectares yielding 0.81 million tons. Cassava production in the southern part of Lao PDR, including Saravan, Sekong, Champasak, and Attapeu provinces, accounts for 46% of the country's total production<sup>[20]</sup>.

Cassava has emerged as a crucial contributor to the economic growth of the Lao PDR, generating significant income for both the nation and various businesses associated with its production. Additionally, a substantial number of smallholder farmers are reliant on cassava cultivation for their livelihoods. In 2022, cassava exports soared to USD 371 million, cementing its position as the second-highest earner among agricultural products in Laos, trailing only behind rubber (USD 629 million). Other notable earners include cereal grains which account for USD 100 million and coffee account for USD 153 million<sup>[21]</sup>.

The export price per kilogram of Cassava from Lao has seen a steady increase over the last five years. In 2012, the price was USD 0.70 per kg, and in 2021, it was USD 0.14 per kg. This represents an increase of 80%. In 2017, the price peaked at USD 1.22 per kg, and in 2018, it dropped to 1.05 USD per kg. The price has been steadily increasing since then, with the most recent price being

USD 0.14 per kg in 2021. Based on this trend, it is predicted that the export price per kg of Cassava could be USD 0.17 per kg in 2023 and USD 0.20 per kg in 2024<sup>[22]</sup>.

### 4.2. Cassava in Champasak Province

Champasak province is a significant hub for agricultural production, particularly on the Bolaven Plateau, which boasts fertile volcanic soil and high altitudes ideal for coffee cultivation. The main agricultural products in Champasak province are rice, coffee, cassava, and maize. Cassava has emerged as a lucrative cash crop, providing substantial income for smallholder farmers. In recent years, the number of cassava farmers and the land area dedicated to cassava cultivation have increased significantly.

**Table 1** shows that from 2019 to 2020 the number of households planting cassava rose by 160%, and the land area for cassava plantations grew by 24%. By 2022, there were 18,322 cassava farmers, with a total cassava plantation area of 28,111 hectares, producing 993,455 tons of cassava. The average cassava yield was high, around 40 tons per hectare from 2019 to 2021, although it decreased to 35 tons per hectare in 2022 due to soil quality and disease.

In 2023, there are 127 cassava collecting points across nine districts in Champasak province, with the number of these points increasing dramatically by 82% from 2021 to 2022<sup>[20]</sup>. This increase reflects the growing number of businesses involved in cassava collection, leading to competitive buying prices. One of the main border checkpoints for exporting cassava, Vangtao International Border Checkpoint, reported the export of cassava rose from USD 146 million in 2020 to USD 167 million in 2021 highlighting its significance for smallholder farmers income generation and the economic development of the region.

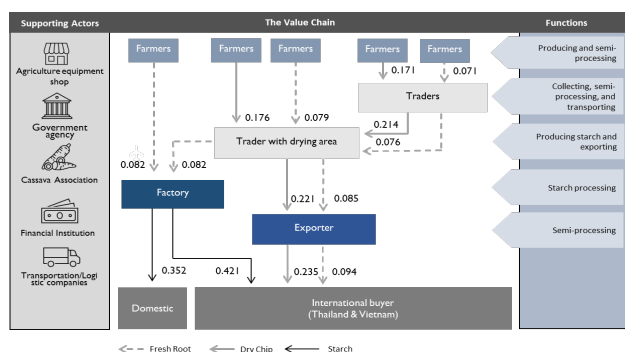
### 4.3. Cassava Value Chain Map

The cassava value chain map in Champasak province, depicted in **Figure 1**, outlines the functions and interactions of various stakeholders, primary actors, and supporting actors involved in the production, processing, and export of cassava products. This detailed

**Table 1.** Cassava farmers, plantations, and production<sup>[20]</sup>.

Description	2019	2020	2021	2022
Number of cassava farmers (family)	4,723	12,262	14,298	18,322
Number of cassava plantations (hectare)	17,528	21,651	24,643	28,111
Number of cassava production (ton)	788,760	887,732	985,739	993,455

structure highlights five key primary actors: farmers, traders, traders with drying facilities, exporters, and processing factories. The supporting actors include agricultural equipment shops, government agencies, cassava associations, financial institutions, and transportation/logistics companies. The supply chain is illustrated with different lines: the grey line represents the supply chain of dried chips; the dashed line represents the supply chain of fresh roots; the black line represents the supply chain of starch. Prices are expressed in USD per kilogram, with the proximity of the price to stakeholders indicating the buying and selling location. For instance, farmers sell fresh cassava roots to factories for USD 0.082 per kg at the factory.



**Figure 1.** Cassava value chain map.

### 4.3.1. Farmers

Cassava farmers in Champasak province are responsible for producing fresh roots and often engage in semi-processing by chopping and drying the fresh roots to produce dried chips before selling. These farmers typically have over five years of experience growing cassava, with the average family earning at least USD 1,800 per year from cassava, which constitutes about 80 percent of their total income. A family member is heavily involved in cassava-related activities. The planting methods are quite basic, involving land clearing, plowing, planting, weeding, and fence repair to protect the crops from livestock. Harvesting is done manually with the help of steel tools. Despite their long experience, most cassava farm-

ers have not adopted new tools or techniques for planting.

Most cassava farmers initially use purchased cassava varieties, but they store stems from their harvest to replant for subsequent seasons, avoiding the annual purchase of seeds. This practice of using old varieties may affect yields in future seasons. Given the simple planting methods, the production cost for cassava farmers is relatively low, averaging USD 145 per hectare. This cost includes preparation, planting, maintenance, and harvesting but does not account for the farmers' labour. The investment in assets and equipment for cassava farming is minimal, typically including only tractors, lawnmowers, fences, and shovels. Cassava farmers sell both fresh roots and dried chips. Fresh roots are usually sold to domestic processing factories, while some farmers sell their fresh roots and dried chips to traders in dry areas.

Farmers who process fresh roots into dried chips fetch a higher price. However, none of the farmers have contracts with buyers, leading to price fluctuations and uncertainty. Productivity per hectare varies, with some families reporting increases. Farmers sell cassava fresh roots and dried chips at the farm gate to traders at USD 0.071 per kg and USD 0.171 per kg, respectively.

Most of these farmers have farms in remote areas and lack trucks to transport cassava to traders with drying areas or factories. Those farmers who have trucks sell cassava to traders with drying areas and processing factories. The selling price is higher than at the farm gate as it includes transportation costs. At traders with drying areas, fresh roots and dried chips are sold at USD 0.176 per kg and USD 0.079 per kg, respectively, while at processing factories, fresh roots are sold at USD 0.082 per kg.

### 4.3.2. Traders

Traders usually buy cassava from farmers and sell it to processing factories or traders with drying areas.

They typically operate as small-scale businesses and have been involved in cassava trading for 3 years. The average annual income for cassava traders can reach up to USD 30,000 during the operation period from November to April each year. Many traders entered the business due to increased market demand, with some transitioning from cassava growers to traders. Generally, cassava traders collect and buy cassava from neighbouring villages and sell it to district factories, traders with drying areas, or cassava exporters.

Traders play a crucial role in transporting cassava from farmers in remote areas to factories or traders with drying areas. They assess the quality of cassava primarily through experience and expertise, using methods such as touching, listening to the sound of dried cassava, and sometimes observing the weight of the cassava bags. However, the number of traditional traders is decreasing as many have transitioned into traders with drying areas. Traders buy cassava from farmers and sell it to traders with drying areas at USD 0.214 per kg for dried chips and USD 0.074 per kg for fresh roots.

#### 4.3.3. Traders with Drying Areas

These traders not only transport cassava but also engage in semi-processing within the value chain. They serve as intermediaries, connecting farmers and smaller traders to exporters, and are typically larger businesses. These traders purchase fresh cassava roots and semi-process them into dried chips before selling them to exporters. Several traders are transitioning to become traders with drying areas due to higher added value. There has been a significant increase in the number of cassava traders with drying areas because this business model requires relatively low initial investment and allows traders to purchase larger quantities of cassava compared to those without drying facilities.

Traders with drying areas can store cassava for two to three days, which enables them to buy more cassava from farmers during the cultivation period. This contrasts with traders without drying areas, who must buy and sell cassava within a day or the next day at most. The investment in drying areas can vary in scale, leading to a diverse range of cassava traders with drying areas, from micro-enterprises to small and medium-sized enterprises. The average income of cassava traders with

drying areas ranges from USD 100,000 to USD 400,000. The buying and selling of cassava occur between November and April each year.

The size of drying areas ranges from 1 hectare to 3 hectares, with storage capacities between 500 tons and 4,000 tons of cassava. This storage capability allows these traders to accumulate significant quantities of cassava before selling. Cassava traders with drying areas also use moisture meters to assess the quality of cassava, unlike traders without drying areas who rely on experience to judge quality.

Most cassava traders with drying areas purchase dried chips directly from farmers or other traders, but some also buy fresh roots to process into dried chips themselves, although this is less common. Traders with drying areas buy cassava from farmers and traders and sell it to factories at USD 0.082 per kg for dried chips. They sell to exporters at USD 0.221 per kg for dried chips and USD 0.085 per kg for fresh roots.

#### 4.3.4. Exporters

Exporters collect cassava from farmers, traders, and traders with drying areas. Most exporters also own drying areas to facilitate their operations. These exporters include both private individuals and limited companies, with registered capital ranging from USD 10,000 to USD 120,000. They typically have over five years of experience in exporting, and their businesses range from micro-enterprises to small and medium-sized enterprises.

Most exporters do not have formal contracts with sellers or suppliers. Only one business reported having purchase contracts with farmers and sales contracts with buyers. Exporters' strategies vary widely: some are buying less cassava this year due to rising prices and increased competition, while others are maintaining or even increasing their purchasing volumes. This variability reflects the growing number of buyers, traders, and exporters, which has led to price conflicts and business uncertainty.

Exporters prefer to export dried chips rather than fresh roots because dried chips are less susceptible to pests and easier to control for quality. Most exporters primarily export cassava to Thailand, with only one business exporting 70% to Thailand and the remainder to



Vietnam. This focus on dried chips over fresh roots aligns with broader market demand and logistical considerations. The buying and selling prices of cassava vary daily and depend on each buyer. The final price is set by Thai buyers, and this initial price cascades down through the supply chain. Each actor in the chain, depending on their investment costs, then defines the buying price for their suppliers. Exporters sell fresh roots and dried chips to international buyers at USD 0.094 per kg and USD 0.235 per kg, respectively.

#### 4.3.5. Processing Factory

Champasak province currently has only one cassava processing factory, which exclusively processes fresh roots into cassava starch. This medium-sized factory has been in operation for 13 years. In addition to purchasing fresh roots from farmers, the factory also supports cassava cultivation by providing loans to farmers, thereby ensuring a steady supply of raw materials. The factory has an annual production capacity of 18,250 tons. However, it currently operates at only 39% of its capacity due to the insufficient year-round availability of raw cassava. This underutilization results in lost economic opportunities and higher production costs. The processing factory sells starch to international buyers for approximately 90% of its production at USD 0.421 per kg; while the rest is sold domestically at USD 0.352 per kg.

#### 4.3.6. Supporting Actors

Several supporting actors facilitate the flow of the cassava value chain, including agriculture equipment shops, government agencies, the cassava association, financial institutions, and transportation and logistics companies.

**Agriculture Equipment Shops:** These shops provide essential tools and equipment for cassava cultivation and processing. They sell fertilizers and herbicides to farmers and offer credit for these inputs, allowing repayment upon harvest.

**Government Agencies:** There are several government agencies supporting cassava value chain. The Provincial Industry and Commerce Office (PICO) supports traders, exporters and processing factories by facilitating trade, issuing export permits and monitoring

prices. The Provincial Agriculture and Forestry Office (PAFO) aids farmers with productive seeds, soil quality improvements, and pest and disease management. The Champasak Chamber of Commerce and Industry (CCCI) collaborates with PICO to support the trade sector. Cassava Association advocates for the interests of cassava farmers and traders, providing a platform for shared resources, knowledge and market information.

**Financial Institutions:** These institutions provide essential financial services, such as loans and credit facilities, to farmers and traders. Farmers often borrow money from village savings groups or microfinance institutions to fund their production activities, with interest rates not exceeding 3% per month. However, access to low-interest rates remains a significant challenge for farmers in Lao PDR<sup>[23]</sup>. Traders and exporters primarily borrow money from banks to use during the harvest season, which requires substantial cash flow. The interest rate for short-term loans ranges from 9–12% per annum, depending on the credit risk of the borrower.

**Transportation and Logistics Companies:** Traders and exporters handle domestic transportation but rely on transportation and logistics companies for facilitating export documentation and procedures at the Lao-Thai and Lao-Vietnam border checkpoints. These logistics companies also manage transportation logistics within Thailand and Vietnam, ensuring a smooth and efficient export process.

## 5. Discussion

The cassava value chain in Champasak province presents numerous opportunities that contribute significantly to the local economy, particularly in terms of income generation for farmers and laborers involved at various stages of the chain<sup>[16, 17, 19]</sup>. The increasing demand for cassava has been a key driver of rising prices year after year, offering financial benefits to those engaged in its production and trade<sup>[10]</sup>. The region's favorable volcanic soil provides an additional advantage by enhancing cassava yields, making it a competitive crop in both domestic and international markets.

However, despite these opportunities, farmers face several challenges that could hinder the sustainability

and profitability of cassava cultivation. Droughts and pest infestations are among the most pressing issues, with the potential to reduce yields by 3% to 30%. These challenges are exacerbated by the effects of soil quality, which have been consistently documented in previous studies<sup>[7, 17]</sup>. To address these issues and boost productivity, farmers require technical support, including access to improved seed varieties, advanced planting techniques, and methods to maintain optimal humidity levels below 20%<sup>[3]</sup>. Effective pest management and strategies to mitigate market price pressures are also crucial in helping farmers avoid financial losses and enhancing their economic stability<sup>[8, 17]</sup>.

For traders, particularly those without drying facilities, the cassava value chain offers opportunities for business expansion through investment in drying infrastructure. Such investments would allow traders to collect and process larger quantities of cassava, increasing their market presence and profitability. However, these traders face several challenges, including intense competition, which makes it difficult for individual traders to secure sufficient supplies of cassava<sup>[19]</sup>. The presence of numerous traders operating without business licenses also leads to easy market entry, resulting in significant price competition. Additionally, rising fuel prices and toll fees further impact operational costs and reduce profit margins, a challenge that is consistent with other agricultural commodities<sup>[3, 9, 10]</sup>.

Traders who do possess drying facilities frequently encounter issues related to the moisture content and soil contamination of the cassava they purchase. These factors significantly affect the quality and marketability of the product. Since farmers often have multiple traders to whom they can sell their cassava, they may pay less attention to the quality of their harvest. This results in inconsistencies and additional costs for traders, who must re-dry the cassava chips to meet quality standards. The need to re-dry purchased cassava chips due to poor initial quality emphasizes the importance of improving overall quality control processes throughout the value chain.

Exporters within the cassava value chain also face a range of challenges, particularly related to the inconsistent fees and documentation requirements across differ-

ent provinces. Additionally, issues such as low-quality cassava produced by farmers, high fees at Dry Ports<sup>[10]</sup> and the intense competition to buy cassava at favorable prices further complicate the export process. The high costs associated with cassava exports, including both time and documentation expenses, pose significant barriers to profitability. Previous research confirms that ease of doing business is a critical factor influencing export costs, and cassava exports are no exception<sup>[2]</sup>.

To address these challenges, cassava exporters have proposed several key measures. These include the unification of document compilation and fee collection processes across provinces to avoid duplication and streamline operations<sup>[2]</sup>. Additionally, they advocate for the prioritization of cassava as a key agricultural product, which would involve supporting laboratories to produce high-quality cassava varieties. Exporters also emphasize the need to facilitate loans and financial support for farmers to expand cassava cultivation<sup>[23]</sup>. Furthermore, they call for the creation of specific policies aimed at promoting the production and processing of cassava, as well as reducing toll fees and service charges associated with transportation<sup>[10]</sup>.

By addressing these challenges and leveraging the opportunities within the cassava value chain, stakeholders in Champasak province can enhance the sector's competitiveness and sustainability. This would not only improve the livelihoods of those involved in cassava production and trade but also contribute to the overall economic development of the region.

## 6. Conclusions and Recommendations

The cassava sub-sector in Champasak Province has demonstrated significant potential in job creation, income generation, and economic development. Current policies have helped establish a foundation for growth; however, the dynamic nature of the sector necessitates continual policy adjustments to sustain its progress. Key challenges identified include land use management, infrastructure deficiencies, production inefficiencies, market access issues, and regulatory obstacles related to transportation and Dry Port services.

To support the continued development and sustainability of the cassava sub-sector, the following policy recommendations are proposed: (1) Develop and implement a comprehensive land use plan to efficiently manage the expansion of cassava plantations and address deforestation concerns by incorporating spatial planning techniques to optimize land use for plantations, processing factories, and drying yards; (2) Invest in infrastructure improvements to support the establishment of cassava processing factories, encourage public sector investment in infrastructure projects or provide incentives for private investment in these facilities and facilitate access to finance with favorable interest rates for investors in cassava processing; (3) Provide farmers with access to high-quality seeds, fertilizers and other necessary inputs, and implement extension services to educate farmers on modern production techniques such as intercropping, crop rotation and soil conservation; (4) Establish business-to-business networking opportunities to connect farmers with buyers, including traders, exporters and processing factories; (5) Update transportation legislation to align with current domestic and international conditions and address the concerns of high fees and lack of perceived benefits from Dry Port services by fostering dialogue between Dry Port service providers and users to create mutual understanding and improve service satisfaction.

The study has some limitations, notably the small sample size. However, this limitation does not significantly impact the results, particularly regarding cost, price, and respondents' perceptions. The sample size might be considered modest, the diversity of the respondents—ranging from farmers to traders, exporters, and factory representatives—provides a broad perspective on the cassava value chain. This diversity helps mitigate the potential impact of the smaller sample size by capturing a wide range of experiences and insights from different stakeholders involved in the cassava industry.

The questionnaires were developed following widely-used guidelines in value chain analysis and with support from experts at the LCA, ensuring the reliability of the results. Moreover, the use of established guidelines for value chain analysis, supplemented by

expert input from the LCA, enhances the robustness of the study. These guidelines ensure that the questionnaires comprehensively cover all relevant aspects of the value chain, from production costs to market prices and the challenges faced by the stakeholders. The expert involvement not only validates the content of the questionnaires but also ensures that the data collected is pertinent and accurate.

## Author Contributions

The first author, as well as the corresponding author, Piya Wongpit, took the lead in the research design, analysis, interpretation as well as writing the manuscript; while co-authors including Thone Boungvatthana, Amphone Xaysombath, and Vilaphanh Chanthalangma, support the first author on collecting data and summarize the results from field survey.

## Funding

This research was funded by the United States Agency for International Development.

## Data Availability

The data are available upon request from the corresponding author.

## Acknowledgments

The success of this research project is attributed to the invaluable support received from numerous individuals and organizations. The authors would like to express their profound appreciation to the United States Agency for International Development for its grant support through the RTI project in Lao PDR. Special thanks extended to the Cassava Association for providing valuable data on cassava. Gratitude is also extended to the Ministry of Agriculture and Forestry and the Ministry of Industry and Commerce, processing companies, traders, exporters and cassava farmers for providing valuable insights and data.

## Conflict of Interest

The authors disclosed that they do not have any conflict of interest.

## References

- [1] Kyophilavong, P., Bin, X., Vanhnala, B., et al., 2017. The impact of Chinese FDI on economy and poverty of Lao PDR. *International Journal of China Studies*. 8(2), 259–276.
- [2] Sittibusaya, C., Nakviroj, C., Tummaphirom, D., (editors), 1988. *Cassava soils research in Thailand. Cassava Breeding and Agronomy Research in Asia*; Rayong, Thailand, 1987 October 26–28, pp. 145–156.
- [3] Souvannavong, P., 2021. Value chain analysis of cassava in Lao PDR. *Australasian Agribusiness Perspectives*. 24(13), 189–205. Available from: <https://bpb-ap-se2.wpmucdn.com/blog.une.edu.au/dist/4/1340/files/2021/11/AAP-Vol-24-Paper-13-Souvannavong.pdf> (cited 23 March 2024).
- [4] Smith, D., Newby, J., Cramb, R., 2018. Developing value-chain linkages to improve smallholder cassava production in Southeast Asia. The University of Queensland. Available from: <https://core.ac.uk/download/pdf/161534296.pdf> (cited 22 January 2024).
- [5] Howeler, R., 2014. Sustainable soil and crop management of cassava in Asia: A reference manual. Centro Internacional de Agricultura Tropical (CIAT): Cali, CO. pp. 280. Available from: <https://core.ac.uk/download/pdf/132662687.pdf> (cited 15 March 2024).
- [6] Delaquis, E., de Haan, S., Wyckhuys, K.A., 2018. On-farm diversity offsets environmental pressures in tropical agroecosystems: A synthetic review for cassava-based systems. *Agriculture, Ecosystems & Environment*. 251, 226–235. DOI: <https://doi.org/10.1016/j.agee.2017.09.037>
- [7] Nakviroj, C., Paisancharoen, K., Boonseng, O., et al., 2002. Cassava long-term fertility experiments in Thailand. In: Howeler, R.H. (ed). *Cassava Research and Development in Asia: Exploring New Opportunities for an Ancient Crop*. Love and Lip Press Co. Ltd., Bangkok, Thailand. pp. 212–223. Available from: <https://cgspace.cgiar.org/server/api/core/bitstreams/7ef9c0ef-2e87-4b07-bb6b-95d85fa57b4b/content?page=218> (cited 15 March 2024).
- [8] Wijanarko, A., Purwanto, B.H., 2018. Effect of long of land use and cropping system on soil fertility and cassava yield. *Journal of Degraded and Mining Lands Management*. 5(4), 1327–1334. DOI: <https://doi.org/10.15243/jdmlm.2018.054.1327>
- [9] Piya, W., Bounmy, I., Khuengkham, S., et al., 2023. Investigating the role of the cultivated banana value chain as a potential source of sustainable income for local communities in Lao PDR. *Research on World Agricultural Economy*. 4(3), 25–35. DOI: <https://doi.org/10.22004/ag.econ.337143>
- [10] Piya, W., Pakaiphone, S., Bounthom, S., et al., 2023. Mapping the coffee value chain in Lao PDR: Issues, insights, and strategies. *Research on World Agricultural Economy*. 4(4), 1–9. DOI: <https://doi.org/10.22004/ag.econ.338733>
- [11] Lee, S.C., 2013. Coffee middlemen in Dak Lak, Vietnam: A key stakeholder of coffee value chain as an intermediary of changes in local economies. *Journal of the Economic Geographical Society of Korea*. 16(3), 372–388. Available from: <https://koreascience.kr/article/JAKO201301442-489204.pdf> (cited 8 February 2024).
- [12] De Ligne, L., 2012. Participatory Value Chain Analysis of Organic Tea in Laos. Available from: [https://libstore.ugent.be/fulltxt/RUG01/002/27-5/097/RUG01-002275097\\_2016\\_0001\\_AC.pdf](https://libstore.ugent.be/fulltxt/RUG01/002/27-5/097/RUG01-002275097_2016_0001_AC.pdf) (cited 8 February 2024).
- [13] Thipphavong, V., Manolom, T., Soukhaseum, V., et al., 2022. Agricultural exports from Laos to China. In: Menon, J., Roth, V. (eds). *Agricultural Trade between China and the Greater Mekong Subregion Countries: A Value Chain Analysis*. ISEAS: Singapore. pp. 164–204.
- [14] The World Bank, 2022. Developing the Agribusiness Potential in the Lao-China Railway Corridor: Opportunities and Challenges. Available from: <https://documents1.worldbank.org/curated/en/099555008262242083/pdf/P1778530b6d1670-690826a036cf3037a8f8.pdf> (cited 15 January 2024).
- [15] Thanongsai, S., Grace, Y.W., 2016. Technical efficiency analysis of small-scale cassava farming in Lao PDR. *Asian Journal of Agriculture and Development*. 13(1), 21–40. DOI: <https://doi.org/10.22004/ag.econ.258972>
- [16] Onphanhdala, P., 2022. Food value chain inclusiveness in agriculture and rural development: The Case of Northern Laos. In: Shozo S. (ed). *Development of Inclusive Food Value Chain in the Mekong Region*. Bangkok Research Center, JETRO Bangkok/IDE-JETRO: Bangkok, Thailand. Available from: [https://www.ide.go.jp/library/English/Publish/Reports/Brc/pdf/30\\_01.pdf](https://www.ide.go.jp/library/English/Publish/Reports/Brc/pdf/30_01.pdf) (cited 12 January 2024).
- [17] Aye, T.M., Howeler, R.H., 2010. Improving the sustainability of cassava-based crop-

- ping systems for smallholder farmers in the uplands of Lao PDR. International Center for Tropical Agriculture. Available from: <https://cgspace.cgiar.org/server/api/core/bitstreams/0805564c-fe0b-4bc9-bc25-35ee0f4de358/content> (cited 12 January 2024).
- [18] Nguyen, A.T., van Huellen, S., Newby, J., 2023. Price volatility across scales and farmer maneuvering in Lao cassava markets. *Journal of Land Use Science*. 18(1), 374–394. DOI: <https://doi.org/10.1080/1747423X.2023.2264874>
- [19] Bellù, L.G., 2013. Value chain analysis for policy making: Methodological guidelines and country cases for a quantitative approach. EASYPol Series 129, FAO.
- [20] Ministry of Agriculture and Forestry, 2023. Agriculture Statistics Yearbook 2022. Available from: <https://lao44.org/content/4246/%E0%BA%9B%E0%BA%B6%E0%BB%89%E0%BA%A1%E0%BA%AA%E0%BA%B0%E0%BA%96%E0%BA%B4%E0%BA%B5%E0%BA%95%E0%BA%B4%E0%BA%81%E0%BA%B0%E0%BA%AA%E0%BA%B4%E0%BA%81%E0%BA%B3%E0%BA%9B%E0%BA%B0%E0%BA%88%E0%BA%B3%E0%BA%9B%E0%BA%B5-2022> (cited 25 April 2024).
- [21] International Trade Centre, 2023. Trade Map: Export of Cassava from Lao PDR. Available from: <https://www.trademap.org/Index.aspx> (cited 23 April 2024).
- [22] Wamuchi, S., 2023. Laos Cassava Prices. Available from: <https://www.selinawamucii.com/insights/prices/lao/cassava/#retail-prices> (cited 23 April 2024).
- [23] Wongpit, P., Sisengnam, K., 2022. Determinants of farmers' access to credit in the Lao People's Democratic Republic. *Applied Economics Journal*. 29(2), 124–138. DOI: <https://doi.org/10.22004/ag.econ.334654>