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CIRCULAR SUPPLY CHAIN: SITUATION AND IMPLEMENTATION SOLUTIONS FOR AGRICULTURAL PRODUCTS IN VIETNAM

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Circular supply chains are suitable for many economic sectors from agricultural to industrial products. Currently, some localities in Vietnam have initially applied the circular supply chain to agricultural products, thereby creating many value-added products. This paper uses qualitative approach and the desk research to review systematically theories and publications related to circular supply chain. In addition, interviews were conducted with farmers, firms and local authorities in agricultural farming areas in Vietnam such as Son La, Phu Tho, Ha Noi, Ha Nam, Can Tho, Tien Giang, Gia Lai for collecting information about current situation of agricultural supply chain according to fundamental components of a circular supply chain. Two case studies of Musa Pacta and Minh Tien were analyzed as representatives of current agricultural circular supply chain in Vietnam. Based on collected data and the two examples, the paper proposed recommendations to enhance circular supply chain management in various agricultural segments.

Keywords:*Agricultural products, Circular supply chain, Vietnam*

JEL Classifications: *M10, O13, Q01*

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1. Introduction

In the context when natural resources are at very high risk of depletion, there has been a rising concern about sustainability of raw materials sources. The increasing complexicity of supply chains most of which are geographically dispersed has brought about low efficiency and potential risk of disruption. In addition, factors causing market instability and external events (e.g. wars, COVID-19 pandemic) also pose a great threat to supply chain stability. In the current circumstance, circular supply chain has been introduced as one of feasible approaches to improve supply chain resilience compared to traditional mechanisms. Companies often use a circular approach to stimulate recycling, remanufacturing thus creating more on-site jobs to increase labor intensity. The social sustainability impacts of circular supply chains in general have significantly contribute to sustainable development.

Circular supply chains represent the fundamental building blocks for the transition to a circular economy and create new opportunities to improve the sustainability of supply chain processes. In a traditional supply chain, natural resources are often converted into products and delivered to the end customer for usage. After the end of the usage period, the products are often sent to landfills, creating a large amount of waste and ecological degradation problems. Meanwhile, circular supply chains focus on the regeneration and recovery aspects. Therefore, the interests of consumers when purchasing recycled products will be protected by developing

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appropriate standards, developing assurance policies and verifying certifications for recycled or remade products.

A circular supply chain applies 6R principles including Reuse, Recycle, Repair, Remanufacture, Reduce and Refurbish to create a closed loop system that minimizes resource input, waste, pollution and carbon emissions throughout the supply chain. This process can improve efficiency over the entire product lifecycle when value of used products is restored by the original manufacturer or a third party. Also thanks to this loop process, the integration of the circular economy and supply chain management can facilitate environmental sustainability. The circular supply chain explores the retained value of waste or unused resources, providing businesses with opportunities for a new vision. When waste can be mined as a resource, it is possible to discover the residual value of the waste or unused resource. In most cases, companies have seen economic improvements, mainly due to reduced material and energy use, maximum resource utilization and reduced disposal costs. Some companies have developed new revenue streams by selling waste and by-products.

The use of circular resources at the enterprise and supply chain level allows companies to conduct business without making significant investments in production equipment. This helps to reduce capital constraints and market entry barriers, which are especially important for SMEs. The increasing use of recycled products results in significant savings in production costs and reduced purchasing costs which can be optimized. Particularly, in the context that the demand for agricultural products with food safety requirements is in need, the urgency of a model of a circular supply chain is very important. Circular supply chains help develop a self-sustaining production system that protects the flow of resources from price fluctuations, seasonality and supply disruptions.

Stemming from the necessity of developing a circular supply chain for Vietnamese agricultural products, the paper focuses on researching the characteristics and components of a circular supply chain, analyzing the current situation of the agricultural supply chain in Vietnam according to the basic components of the circular supply chain, making some proposals to develop a circular supply chain for Vietnamese agricultural products in the next time. The paper organization includes: (1) Introduction, (2) Literature review of circular supply chain, (3) Methodology, (4) Current situation of circular supply chain in agricultural field of Vietnam, and (5) Recommendations.

2. Literature review of circular supply chain

In the most general way, supply chain is an economic term that simply describes the association of many businesses to provide goods and services to satisfy a certain customer demand in the market. A supply chain includes all activities conducted be entities which are directly or indirectly related to the process of meeting customer requirements for a specific commodity. Each supply chain is associated with a specific product type and a target market, and operated as an independent entity to meet market needs and bring overall benefits to all members in the chain. According to the Supply Chain Council (SCC, 2003), "supply chain management is the set of methods for effectively designing, planning, and implementing an integrated process between suppliers, manufacturers, warehouses and retailers, so that goods are produced and distributed to the right place, at the right time, with the right quality and right quantity requirements, with the aim of minimizing system-wide costs while satisfying customer service requirements." A supply chain network is understood as a complex interconnected system of businesses that synchronize a variety of related business processes such as procurement, production, distribution and retail to create value for consumers in the form of products and services. Supply chain activities are closely related to raw materials, natural resources and many factors to create a complete product, the process of transportation to the consumer is the final stage of the cycle.

A circular supply chain is an integration of circular thinking into the management of a supply chain, the surrounding industrial and natural ecosystems. In a circular supply chain, materials are systematically processed and recylced, aiming for a zero-waste status quo (Figure 1), including innovating the entire supply chain system and function from product design to waste management, involving all parties in the product lifecycle. Generally, a circular

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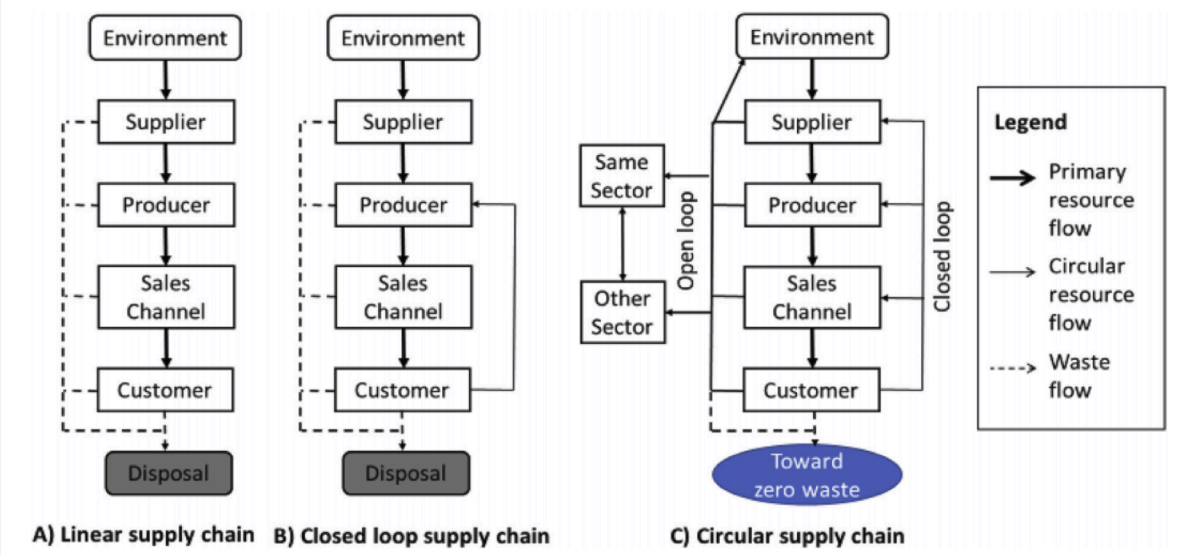
supply chain includes partners such as upstream material suppliers, product manufacturers, distributors, wholesalers, retailers, third parties for scraps and waste, re-manufacturer, recycler, etc. The circular supply chain focuses on highlighting the risks of ecological deterioration and degradation from an industrial perspective. A circular supply chain involves recovery and recycling through waste management and changing it into a product, which can be resold in the market, thus back into the economy. Circular supply chains can help reduce the need for new natural resources supporting the reuse of existing materials, working in a closed loop to optimize product life cycles and reduce scrap, waste and adverse ecological effects in supply chain practices by recycling.

supply chain. The designing phase must meet social, environmental and economic requirements, and must adopt holistic approaches to problem solving. Designers must transform design thinking and interpret the activities involved to lead to a transition to a circular supply chain. Furthermore, the role of technology in providing the foundation of innovative products (e.g. designing products for reuse, recycled or raw materials are naturally renewable) is very important for creating a waste-free world (Clark, J.H., Farmer, T.J., Herrero-Davila, L., Sherwood, J.,, 2016). Moreno et al 2016 argueed that there is an urgent need in a circular product design strategy to integrate to prolong product life cycles and move towards product reuse. Additionally, researchers have created and increased



Source: EMF (Ellen MacArthur, 2017)

Figure 1: *Linear, closed loop and circular supply chains*

Product/Service Design in Circular Supply Chain

A cicular supply chains requires a holistic approach to designs of product/service, processes and supply chain operations, and design for circularity is considered the cornerstone of circular supply chain management. Product/service design plays an important role in facilitating materials as well as for energy circulation, greatly influencing the entire value chain of products and services in the circular

adoption of Design for Deconstruction (DFD) across a variety of industries, resulting in cost savings and expansion of product liability regulations (Moreno, M., De los Rios, C., Rowe, Z., Charnley, F., 2016). DFD provides value to products not only at the end of their life but also throughout their use cycle, life cycle and maintenance. The DFD method leads to an easy separation and recycling by mechanical methods and also eliminates chemical separation methods.

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Procurement in Circular Supply Chain

Procurement in a circular supply chain will require redefining the principles of price, time, quality and associated value (Meehan, J., Bryde, D., 2011). Products in a circular supply chain require technically recovered or bio-renewable raw materials to have no negative environmental impacts. Based on the circular supply chain concept, a framework has been developed for procurement, including technical and non-technical specifications of products and services, providing guidelines to minimize the use of input raw materials and increase resource efficiency through waste recovery and reduction.

Not only the environmental advantages and disadvantages of the various options for industrial product purchasing should be put into consideration, but also the possibility of completely re-using used products' raw materials need to be concerned. Furthermore, procurement is one of the strategic functions of many organizations, playing an important role in improving the sustainability performance of the business. However, there is much less research on the concept of rotation in procurement than in other activities in the supply chain. As the circular supply chain focusing on products with higher requirements of reliability, reusability, durability, easy resource recovery and maximum waste avoidance. This will help reduce the environmental impact of products/services throughout their lifecycle. In addition, Gaustad et al. (2018) argue that circular strategies such as recycling, lean principles, dematerialization and diversification have significant potential in minimizing emerging vulnerabilities in the supply of input materials (Gaur, J., Mani, V., Banerjee, P., Amini, M., Gupta, R., 2018).

Production in Circular Supply Chain

Reducing resource consumption in the production process has become essential for manufacturing industries to remain competitive and survive in the current era of sustainability (Ridaura, G., Llorens-Cervera, S., Carrillo, C., Buj-Corral, I., Riba-Romeva, C.,, 2018). Manufacturers are constantly making efforts to apply sustainable production strategies to their supply chain to minimize negative impacts on the environment. In addition, this also helps to increase competitive advantage by reducing resource consumption in the context where production has become a crucial part of sustainable development. In that context, green production has become a widely accepted strategic model.

This model incorporates concepts such as resource and energy conservation, environmental protection, and waste minimization in the production. Increasing material efficiency in terms of minimizing industrial waste generation, resource extraction and consumption, energy demand and carbon emissions, has led to the development of many strategies in production (Shahbazi, S., Wiktorsson, M., Kurdve, M., Jo€nsson, C., Bjelkemyr, M.,, 2016). Several studies indicate that the adoption of green manufacturing improves brand image, regulatory compliance and investor interest while providing long-term cost savings (Dubey, R., Gunasekaran, A., Samar Ali, S., 2015). However, enterprises still face difficulties in implementing green production due to high investment costs. Improving the efficiency of raw materials to reduce industrial waste generation and resource consumption has led to the development of many strategies in the manufacturing sector. In the context of circular supply chains, green and cleaner production have been used to improve material efficiency, prevent the use of toxic and non-renewable inputs, increase efficiency economy and reduce damage to people and the environment.

Logistics in Circular Supply Chain

Under pressure from consumers and governments, companies have redesigned their logistics networks to ensure that they are both environmentally friendly and cost savings. Green logistics is the right solution to produce and distribute goods in a sustainable way, focusing on social and environmental criteria. Green logistics influences different distribution strategies, minimizing energy requirements in logistics-related operations, minimizing waste and disposing of residual waste. Traditional logistics and green logistics both include transportation, storage and inventory management from supplier to customer, but green logistics plays an important role for sustainable development (Huong,TTT,. Kiem,PV., Thao,VP., Huy,NK., Trang,PT., 2021). Circular supply chain management will have many implications for logistics management.

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Consumption in Circular Supply Chain

The idea of a circular supply chain has given impetus to the transition to a more sustainable consumption model in which valuable resources are reused and less waste is generated. In addition, the move to a circular supply chain requires changes in consumer behavior. That may require campaigns to educate and raise awareness of sustainabilit. In essence, product design must be modified to create optimal values.

Consumption demand in the context of products created in circular supply chains is rapidly becoming a research area drawing attention from scholars, particularly in the fields of operation management. Althought there had been early studies on sustainable consumption, there is still very little research on consumer attitudes towards products in the circular supply chain. In a publication of Wang and Hazen (2016) in the automotive industry in China, the result revealed that information about cost, quality and green attributes of remanufacturing influenced consumers' perceptions of risk and value, which in turn influenced their intention to purchase the remade products (Wang, Y., Hazen, B.T., 2015). Therefore, studies are required to find out what these products need to do to become more attractive to customers. For example, marketing strategies based on product reliability, improved service, warranty mechanisms and quality control can be developed to shape positive consumer attitudes towards products in a circular supply chain. It is important to discover and understand strategies and incentives to change consumer behavior to support product demand as many consumers do not want to return products that have been recycled.

Overall, there is a need for appropriate policy design and company-level measures to raise awareness of circular consumption. However, it should also be noted that cultural differences play an important role in shaping consumer attitudes towards products in the circular supply chain (Gaur, J., Mani, V., Banerjee, P., Amini, M., Gupta, R., 2018); (Lakatos, E.S., Cioca, L.I., Dan, V., Ciomos, A.O., Crisan, O.A., Barsan, G., 2018).

End of Life (EoL) and Waste Management in Circular Supply Chain

In circular supply chain management, product expiration and waste management are necessary to recover maximum residual value in a product. The recycling of used materials and components has important economic and environmental implications. However, there is still a skeptical view of the potential management of expired product in many industrial sectors. There are many different methods of recovering expired resources, namely relocating, remanufacturing, refurbishing and recycling. Refurbishment is a process to restore used products to good and satisfactory working condition without dismantling the product completely. Refurbishment can be used to regain value from used products and reduce waste. An effective refurbishment method makes it easy to maintain, restore, and modify the product. However, quality requirements also vary greatly, so it is necessary to develop guidelines and standards. In addition, the lack of consumer acceptance of remanufactured products worldwide prevents supply chains from unlocking their full remanufacturing potential (Hazen, B.T., Mollenkopf, D.A., Wang, Y., 2017); (Wang, P., Kuah, A.T.H., 2018). Repositioning is considered to be the identification of a new use for a product when the product is no longer used in its original form. The variety of product types, design features, and material construction pose serious policy and practice challenges.

In particular, a number of economic, policy and technological barriers impede the recycling and reuse of certain materials, typically metals. Due to the recyclability of steel raw materials, steel scrap is an important resource that can be used in steelmaking and also recovered from the products. On the other hand, tax regulations, establishing producer liability systems and encouraging research and development in metals are some of the measures designed to overcome barriers. In addition, recycling systems of used plastic packaging have great potential to contribute positively to circulation. Therefore, expired products and the waste management must strive to address the following issues: hazardous substances used in production; liability due to poor materials management during the product life cycle and manufacturer's liability for product failure.

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3. Methodology

Circular supply chain is a concept that has not been studied much in Vietnam, therefor, qualitative approach is applied with desk research to review systematically theories and publications related to circular supply chain. Certainly, secondary data from reports and current literatures was used for analysing characteristics and components of circular supply chain. Addtitionally, nearly 100 interviews were conducted with farmers, enterprises and local government in big agricultural farming areas in Vietnam such as Son La, Phu Tho, Ha Noi, Ha Nam, Can Tho, Tien Giang, Gia Lai for collecting primary information. The interview method is considered suitable to explore the circular supply chain for agricultural products in Vietnam because this is a relatively new concept. First, interviews with authorities of the Departments of Agriculture and Rural Development in these provinces were conducted to learn about the orientations of circular agricultural models in each province. Then, with the introduction and supportation of local authorities, interviews with typical enterprises and farmers who are implementing circular agricultural models were conducted. As the results, an overview picture of current situation of agricultural supply chains according to fundamental components of a circular supply chain was revealed and two case studies were analyzed as representatives of current agricultural supply chain managemed toward a cicular pattern in Vietnam.

4. Current situation of circular supply chain in agricultural field of Vietnam

In the recent 5 years, the agricultural industry of Vietnam has gained major achievements, continuing to assert dominance in the economy and better reinforce the national food security, creating job opportunities and decent income for the farmers, while contributing major role for the national development. In 2021, the valuation of all agricultural industry seemed to have witnessed 2.9% increase compared to that of last year, the export turnover reached 48,6 billion USD, in which there were 10 commodity groups with the export turnover of over 1 billion USD and 6 items with export turnover of over 3 billion USD (wood and wood products, shrimp, vegetables, cashew nuts, rice, rubber). These figures showed that in the agricultural industry of Vietnam seemed to have witnessed exponential growth over other manufacturing and processing industries. This can be considered to be impeccable achievements in the context of the worldwide COVID-19 pandemic. However, the agricultural industry of Vietnam still has to come in for a lot of challenges regarding the the ever-complex of climate change, serious consequences of abnormal weather patterns, epidemics and integration trends in all life areas.

Although the circular economy model in agriculture has existed since the early 80s of the twentieth century, the term "circular supply chain for agricultural products" is only mentioned. The circular supply chain for agricultural products is a closed-loop production process through the application of scientific and technical advances, biotechnology, physico-chemical technology to recycle wastes, waste products and by-products as input materials for the production and processing of agricultural, forestry and fishery products; whereas applying symbiotic and mutualistic models in farming, forestry and aquaculture (Mien, 2021). Thereby, not only creating safe and high-quality products, but also minimizing waste, contributing to raising people's awareness about the reuse of by-products and waste products in agricultural production associated with environmental protection. Thus, a circular supply chain will be the key to effective management of agricultural resources through focusing on minimizing the use of external inputs, closing the nutrient cycle, regenerating the soil and mitigate the risk of impacting on the environment. If implemented on a large scale, circular agriculture can reduce the resource requirements and ecological impact of the agricultural sector.

4.1. Current status of circular agricultural production model in Vietnam

Through the actual survey in a number of provinces in both the South and the North, the authors discovered that many provinces and cities across the country have been interested in developing circular agricultural production models. However, most of these models are few in numbers and single-family sizes. Very few enterprises have built large-scale circular agricultural product supply chains, supplying products to domestic and foreign

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markets. However, the development of these circular agricultural production models will be a critical link, creating opportunities for the formation of circular agricultural product supply chains in the future. Typical models are:

The Garden - Pond - Barn model (VAC): The VAC model has been popularly applied in Vietnam since the 80s of the last century and is considered to be the earliest circular agricultural model in our country (1). VAC has created a closed, integrated agricultural production model, linking cultivation in the garden with aquaculture in the pond and raising livestock and poultry in cages; thereby creating an agricultural model that reduces waste, completely eco-friendly and is in complete alignment with the principles of the circular economy. Along with the development level of agricultural production and the specific ecological conditions of each region, VAC has been improved into similar models such as: Garden - Pond - Barn - Forest (VACR) in mountainous provinces; Garden - Pond - Lake (VAH) in the central provinces and Garden - Pond - Barn - Bioga (VACB) in the majority of provinces across whole country. Implementing this agricultural model has helped farmers to process waste, agricultural by-products, and by-products to make fertilizer to improve soil fertility, safely treat animal waste, and generate energy. regenerated for daily life and production, reducing environmental pollution and greenhouse gas emissions. After many years of development on a small scale in smallholder farmers, now, the VAC model has been flexibly applied in the production and business process at many farms, cooperatives, enterprises, and business groups, big economic group.

- The "rice, shrimp" or "rice, fish" model: The "rice, shrimp model" was applied in the early 2000s in the provinces of the Mekong Delta. The "rice and fish" model has been deployed in low-lying, or flooded provinces in the Red River Delta. In these models, when raising shrimp or fish in rice fields, the manure of shrimp and fish and the leftover food (of shrimp and fish) will be used as nutritional supplement for rice plants; On the contrary, when the rice is harvested, shrimps (fishs) are released into the field. Furthermore, the scattered rice becomes the source of food for shrimps and fishes. This model of crop rotation helps to reduce diseases, reduce environmental pollution, create safe products by not having to use pesticides for rice and antibiotics for shrimps and fishes; especially helping farmers to increase their income by 5-10 times per unit area compared to just growing rice. On an industrial scale, when the shrimp farming area is linked to the shrimp processing plant, the shrimp shells are utilized to produce chitin (a substance that helps prolong the preservation time of vegetables, fruits and meat; additives used in the processing of some beverages), both bringing high economic efficiency and minimizing negative impacts on the environment and ecosystems.

During an in-depth interview with Mr. N. H. Q (Ha Nam), he said: "After accumulating land into a large field, I put over 80,000 fish of all kinds and 30,000 fingerlings of giant freshwater shrimp into the rice field. The model does not use chemical pesticides and inorganic fertilizers at all. Therefore, rice grows quite well, fish and shrimp grow quickly. In the spring crop of 2022, the rice of other farmers was severely affected by cotton-neck blast, but my family's rice was free of disease. There was only one stage when borers and brown planthoppers appeared, I pumped water to flood the rice, beat the lime, and stir the fan well and after a few hours, the worms died. Even when yellow snails appear, instead of spraying insecticides, I raised black carp to destroy this natural enemy." With a larger production scale, according to information from L.N. Agricultural and General Services Cooperative, in the first harvest when applying the "rice and fish" model, a profit of over 300 million dong was obtained thanks to the high yield of 5 tons/ha and fish sales of about 40 tons.

The model of rice cultivation - mushroom cultivation - organic fertilizer production - fruit tree planting: This model grows popularity in almost all farmer households in the country. In this model, farmers have used materials from rice straw by-products to grow mushrooms. Straw residue after harvesting mushrooms is used to fertilize crops (fruit trees, vegetables). In fact, the amount of straw from one hectare of rice cultivation can produce 200m of mushroom tissue and after 25-30 days of mushroom cultivation, 250-300kg of fresh mush-

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rooms can be obtained. With the selling price of 25,000-27,000 VND/kg fresh mushrooms, a hectare in this model, in addition to rice money, farmers can earn from 6 million to 8 million VND. Typically, according to the Department of Agriculture and Rural Development of Tien Giang province, currently, it is estimated that 100% of corn stalks, 85% of straw, 31% of by-products on perennial crops and 32% of by-products on vegetables have been reused for animal noursishment, mushroom cultivation, organic composting, moisturizing root composting and so on Additionally, a part of weeds is also reused for other agricultural activities, through which , help to increase economic efficiency (people can earn from 500,000 - 700,000 VND/ha from straw), reducing environmental pollution.

The model of organic fertilizer production from agricultural waste. This model has been intergrated by many localities across the country (Anh,ĐT và công sự, 2020). The model utilized by-products from cultivation (straw, corn, beans...), domestic waste, livestock scraps (pig manure, chicken manure, cow dung) through the composting process (mixing in more manure, phosphate fertilizer), decomposed into organic fertilizer in order to improve degraded or nutrient-deficient soil, return soil fertility, cultivate organic vegetables and safe vegetables. As a result, the amount of agricultural waste is reused as a stable source of fertilizer, simultaniously taking advantage of the available raw materials to meet the demand for cleaner production process as well as cutting down emissions and greenhouse gases. Mr. P.V.L (Son La) said: "The farm cultivates 200 longan roots, saving more than 100 million VND in fertilizer costs each year by making use of crop residues and straw post-harvesting to get ashes as fertilizer for the plants. Additionally, to make full use of the closed-loop model, I also raise geese to clear weeds in the garden, saving an additional 40 million VND in weed removal service. With this model, the total income of the family is about 500-600 million VND per year, while also contributes to reducing environmental pollution in villages and hamlets."

The model of integrated production of cows - earthworms - grass/maize - cattle, poultry - fish: Model employ the use of livestock by-products (manure) in order to raise earthworms; vermicompost is then use to fertilize grass/corn; while earthworms are used as nourishment for livestock, poultry and fish, creating high economic efficiency, at the same time reducing greenhouse gas emissions, and protecting the environment.

4.2. Situation of some circular agricultural product supply chains in Vietnam

Developed at a higher level, on a larger scale and operated more professionally and methodically compared to the circular agricultural economy model in households, which are complete supply chains of agricultural products from input to produce, process and distribute products to the market, including the export market. Here are two of the few successful circular agricultural supply chains in Vietnam that the authors have had the opportunity to research.

4.2.1. The Banana Circular Supply Chain of Musa Pacta

Musa Pacta is a enterprise specializing in production and trading of banana yarn and products from natural yarn made from banana stems. Musa Pacta's circular supply chain model is a closed-loop, circular, zero-waste agricultural model, starting from planting, cultivating, raw materials procurement, producing to distributing products from the banana stems to domestic and foreign customers, also including reverse logistics for agricultural waste.

In order to provide farmers with clean and strong banana seedlings, Musa Pacta established the Organic Agriculture Research Institute to study and integrate technology in nurturing banana tissues and support transferring the intensive cultivation process toward green and clean production associated with environmental protection, minimizing fertilizers and chemical plant protection products. Currently, Musa Pacta has created a banana growing area with a spinning factory of 6,867 hectares through an association model with 10,000 banana farming households, yielding 1,890 tons of fresh banana stems after harvesting.

Procurement of banana stems

After harvesting, farmers cut down the banana trees and sell them to spinning factories at the rate of 250,000 - 300,000 VND/ton of banana stems for

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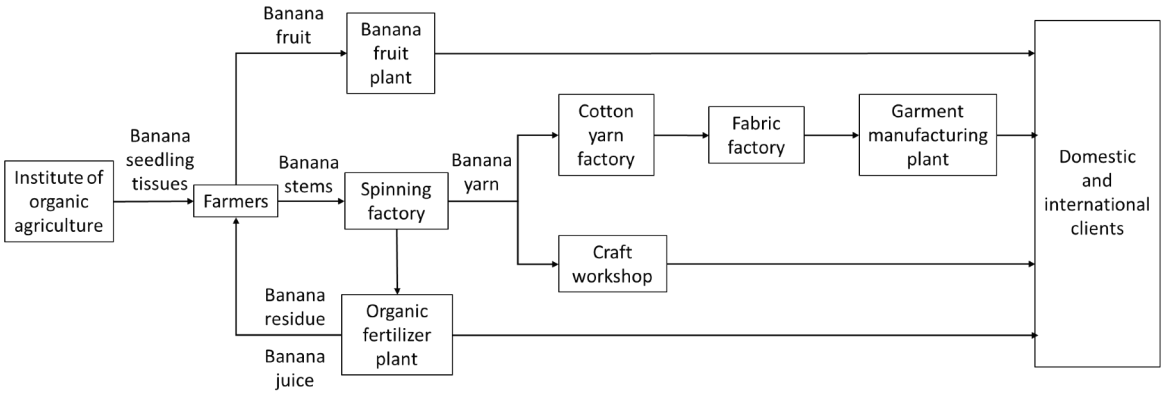

Source: Author created from interviewed data

Figure 2: *The Banana Circular Supply Chain of Musa Pacta Planting and cultivating*

their household income. With an output of 2,000 stems/ha and an average weight of 20kg/stem along and 2 harvests/year, Musa Pacta's raw material area can supply 80,000 tons of banana stems annually.

Production of banana fibers and products from banana stems

Musa Pacta advises and supports spinning factories in terms of constructing facilities, investing in machines (patent protected by the Ministry of Science and Technology), guiding the operational process and transferring processing technologies to handle by-products such as banana residue, banana juice. Currently, Musa Pacta has set up 9 banana spinning factories, including 4 factories in Hanoi, 1 factory in Lai Chau, Son La, Phu Tho, Ninh Thuan provinces with a total capacity of 1,890 tons of banana stems/month. Currently, the employees in these 9 spinning factories are 9,450 local people.

Products of the spinning factories include banana yarn, banana residue (accounting for 1% of the banana stem) and banana juice (90%). Musa Pacta commits to purchase all yarn and dried banana residue from spinning factories at the price of 80,000 VND/kg of yarn and 2,000 VND/kg of residue. Musa Pacta banana yarn is supplied to handicraft workshops and creates jobs for about 500 workers in these craft villages. Banana residue (fresh and dried) is used as a growing medium for edible mushrooms and medicinal mushrooms (straw mushrooms, oyster mushrooms, lingzhi mushroom). The post-harvest mushrooms residue continues to be used to raise earthworms (a type of red worm that is rich in protein). The mixture of mushroom residue, banana residue and vermi-compost is used to produce organic fertilizer for general crops, including the banana farms of Musa Pacta farmers. Banana juice is also used to produce nutrient solution for plants, flowers, vegetables and ornamental plants with high nutritional value.

To perfect the ecosystem from banana trees, Musa Pacta is investing in constructing a system of factories producing banana products including: banana fruit plant; banana fruit and corm starch plant, banana residue and banana nutrition liquid plant; especially banana yarn and fabric plant, banana yarn garment plant. Thus, with the model of Musa Pacta, banana tree development is a closed-loop, creating high added value.

Product distribution

90% of Musa Pacta's banana yarn and banana stem products are currently being consumed in the domestic market; the remaining 10% are mainly handicrafts which are exported to Canada, the UK, France, the USA and so on.

4.2.2. Circular supply chain of Minh Tien coffee beans

Minh Tien Coffee Group was established in 2000 in Son La - known as the largest Arabica coffee growing area in Vietnam with a value of 1.5-2 times higher than that of Robuta coffee. According to the statistics of the Department of Agriculture and Rural Development of Son La province, by 2021 Son La

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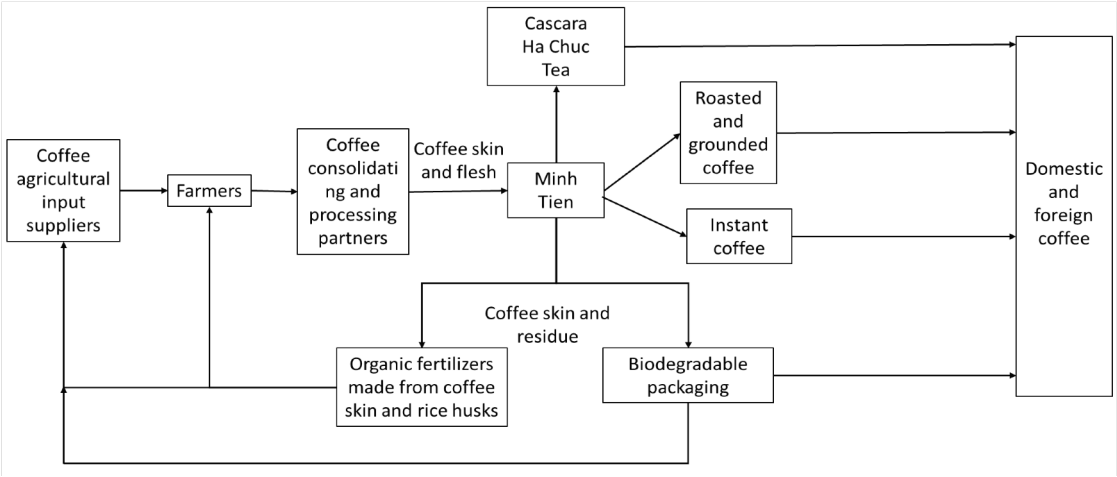
has a coffee growing area of 17,759.66 ha; the harvested area is 15,174.5 ha, the output of green coffee is estimated at 29,881 tons and the total output of processed fruit is over 90,000 tons of fresh fruit/year. Furthermore, Minh Tien also set up material areas in other Northwest provinces and Quang Tri. Up to now, Minh Tien Group has been associated with more than 5,000 coffee farming households. Minh Tien has promised to pursue the journey of building sustainable coffee through ensuring special coffee purchasing policies for farmers such as supporting farmers, setting up management teams, and engineers by region to facilitate supervision, support training, distribution of seedlings and inputs for organic agriculture.

Minh Tien coffee beans is an organic fertilizer product made from rice husks, coffee husks and some non-recyclable ingredients. The coffee trees on the farmer's farm are grown by the nutrients from this organic fertilizer, creating a natural cycle of farming."

Mr. D.Q.H (Son La) - one of the farmers who cooperated with Minh Tien said in an interview with the research team: "In the past, we let coffee grow naturally, but the yield was very low. When being directly guided by the engineers of Minh Tien Coffee Group on the process of planting and caring for Arabica coffee trees according to 4C and UTZ standards, the yield is higher. The Group also supports a part of capital to invest in machinery to



Source: Author created from interviewed data

Figure 3: *Circular supply chain of Minh Tien coffee beans*

Ms. Nguyen Thi Hong Minh, Chairman of the Board of Directors of Minh Tien Coffee Group said: "In the Minh Tien coffee ecosystem, no part of the coffee tree is wasted. Specifically, after peeling, the skin and flesh of the coffee fruit are kept and processed into Cascara Ha Chuc tea - an herbal tea certified by the Central Institute of Traditional Medicine to be beneficial to health. Rice husks and coffee grounds are used as raw materials for biopackaging production by combining them with corn starch, potatoes, cassava, rice husks and bioplastics. Minh Tien's biological packaging can be completely decomposed in water or composted to grow plants. Closing the circular supply chain of process fresh coffee berries. "The production, processing and quality control process is guaranteed by Minh Tien through a team of artisan roasters to preserve 100% of the original coffee flavor. With this circular supply chain model, Minh Tien not only limits coffee waste into the environment but also "exploites the full essence of the product", creating high-quality coffee products. and safe for the health of the user. Thanks to their international quality products, Minh Tien have appeared on store shelves in the US, Japan, and Europe, which are markets that are notoriously strict about imported goods, while also becoming a prestigious supplier of coffee for leading corporations in the world and in the

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region such as: Neumann Group, Atlantic Group, Mitsui & Co. and Marubeni Corp.

5. Recommendations

The goal of Vietnam is "Develop smart agriculture, international integration, adaptation to climate change, efficient use of natural resources; enhancing added value and sustainable development". Achieving this goal requires coordinating solutions between state management agencies and local authorities - playing a role in creating a favorable environment through policies to develop circular economy in agriculture, with the central and core role of production and processing of enterprises in building a circular agricultural product supply chain. Specifically, the recommended solutions are:

- The State and relevant ministries and branches need to develop a transparent, stable and favorable legal corridor, and policíe for the development of clean technology, technology for reuse and recycling of agricultural waste; especially priority policies, capital support and market technology for enterprises investing in a system of collecting and classifying agricultural by-products and waste or recycling technology for some high-value agricultural by-products.

- Improve capacity to recycle and reuse agricultural by-products and wastes through investment in research and transfer of science and technology in agricultural waste treatment, especially in localities with cultivated areas. and large scale farming.

- Learn from experiences from countries that have successfully implemented the circular economy model in agriculture; at the same time, summarize and evaluate the circular agriculture models that have been implemented in localities in the country. On that basis, develop criterias and adjust the circular agriculture model in accordance with the reality in Vietnam.

- Promote the training and fostering of research and development workers, and the deployment of technology for the treatment of agricultural by-products and waste products through agricultural training courses and agricultural extension programs.

- It is necessary to develop a communication strategy on the circular economy model in agriculture and the supply chain of circular agricultural products, including: roles, benefits, nature, content, criteria, and implementation method to increase awareness among stakeholders and the general population.

- For enterprises producing and processing agricultural products, in order to develop a circular supply chain model, it is necessary to follow a process consisting of the following steps:

* *Step 1- Clearly define partners' requirements*: The first but very fundamental step in building a successful circular supply chain is to determine the quality requirements of the product from the buyer. Different partners will have different requirements for the quality of agricultural products, but in general, they have high requirements for food safety, agricultural product standards and certification methods. Fastidious markets such as Europe or Japan have very strict requirements on the quality of agricultural products and the index of residues of pesticides. To export to the Japanese market, agricultural products need to meet the criteria in JAS (Japanese Agricultural Standards) certification.

* *Step 2 - Build a production management system*: After clearly defining regulations on food safety from partners, companies and production facilities need to build a production management system to meet those standards. This requires a lot of knowledge and skills from authority agencies to farmers. Businesses and facilities in the supply chain need help, support and skills training to meet customer requirements. In addition, it is necessary to accelerate the restructuring of agricultural production, renew the growth model, improve competitiveness and create added value in the chain. Besides harvesting, processing and distribution, preservation also plays a very important role. Production facilities need to register to meet food safety conditions or must achieve ISO 22000:2018 international certification. To preserve agricultural products after harvest, infractructure and facilities need to be invested and upgraded, equipment for preliminary processing, synchronous processing, etc. For the cooperative production model, the competent authorities should create favorable conditions for farmers to transform their structure to organic agriculture, strictly control quality, and disseminate standards on food safety, increase competitiveness in both price and quality, and find solutions to

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reduce risks of natural disasters, climate change and possible epidemics, threats, and reduce risks in circular supply chain production.

** Step 3 - Sign product purchase and sale contracts in the circular supply chain according to customer requirements*: Contracts between companies participating in the circular supply chain must be complied with, ensuring compliance with customer quality requirements for food safety.

** Step 4 - Build a brand and information system for product traceability of the chain*: For local agricultural products, community brands can be selected such as Geographical Indications, Certification Marks or Collective Marks. In addition, each locality can also register for the program "One commune, one product". For agricultural products of enterprises, they can choose the newly registered trademarks granted by the National Office of Intellectual Property of Vietnam.

** Step 5 - Product marketing and promotion*: Through propaganda and marketing activities in the form of direct or social networks, television, newspapers, etc., the product will be easily accessible to retail distribution businesses and consumers, then trust and recognition of agricultural products can be built. Along with the increasing development trend of technology, it is necessary to introduce measures so that consumers can buy agricultural products on e-commerce platforms, promote the digital economy so that agricultural products can be easily accessed consumers, connecting buyers and sellers. The digital economy also helps manufacturers capture market information, promote brands and help create trust for consumers when buying online. In short, to help agricultural products in the chain increase consumption and create trust from consumers, it is necessary to create a development plan suitable for each item. In addition, state policies play an important role, helping to strengthen operational capacity in local cooperatives and small businesses.

6. Conclusion

According to today's trend, the agricultural industry needs to focus on developing in the direction of a circular supply chain to minimize waste and insufficient impacts on the environment. Traditional supply chains need to be gradually replaced with circular supply chains to better meet consumers' increasingly demanding needs. At the same time, it is also necessary to improve the productivity and quality of agricultural products and reduce the need for natural resources. However, building a circular supply chain takes much time and close cooperation with members and stages to overcome the limitations in the construction and development fruit and vegetable supply chain. When the above solutions are implemented synchronously, the Vietnamese fruit and vegetable brand will succeed in the world market and the domestic market.

Localities and businesses need to include the content of circular supply chain development in developing policies to create conditions for the development of stages in the chain. By applying this model, businesses and the whole economy can make better use of resources and energy at business, local, regional and world levels to operate sustainably. Besides, the circular supply chain also helps trace the origin and control the stages of raw materials, production, processing and consumption. At the same time, it contributes to the development of social infrastructure and enhances the social responsibility of the business community and the economy.◆

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Summary

Chuỗi cung ứng tuần hoàn phù hợp với nhiều ngành kinh tế, từ sản phẩm nông nghiệp đến sản phẩm công nghiệp. Hiện nay, một số địa phương tại Việt Nam đã bước đầu áp dụng mô hình chuỗi cung ứng tuần hoàn đối với nông sản, từ đó tạo ra nhiều giá trị gia tăng cho sản phẩm. Bài báo này sử dụng phương pháp nghiên cứu định tính và nghiên cứu tại bàn để tổng quan một cách có hệ thống các lý thuyết và nghiên cứu đã công bố liên quan đến chuỗi cung ứng tuần hoàn. Ngoài ra, các cuộc phỏng vấn đã được thực hiện với nông dân, doanh nghiệp và chính quyền địa phương tại các vùng canh tác nông nghiệp của Việt Nam như Sơn La, Phú Thọ, Hà Nội, Hà Nam, Cần Thơ, Tiền Giang, Gia Lai để thu thập thông tin về thực trạng chuỗi cung ứng nông sản theo các thành phần cơ bản của chuỗi cung ứng tuần hoàn. Hai nghiên cứu điển hình tại công ty Musa Pacta và công ty Minh Tiến được phân tích với tư cách là đại diện cho chuỗi cung ứng nông sản tuần hoàn ở Việt Nam. Dựa trên dữ liệu thu thập được và hai nghiên cứu điển hình này, bài viết đã đề xuất các khuyến nghị nhằm tăng cường quản lý chuỗi cung ứng tuần hoàn trong các phân khúc nông nghiệp khác nhau.