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Implementation of Sustainable Supply Chain Management in Organic Rhizome Supply Partnership

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Abstract. The purpose of this paper is to identify and evaluate the implementation of Sustainable SCM in organic rhizome supply partnerships which includes 7 aspects. The program developed multi-stakeholder partnership governance within a supply chain management (SCM) framework for organic rhizome agroindustry. Stakeholders involved in partnerships are grouped into 3 according to the components in SCM, namely 1) downstream SC who provide input needs for organic rhizome cultivation (producers of compost, cocopit and other planting media), 2) internal SC who carry out the cultivation process starting from the Organic Rhizome Learning Center (until the age of 4 months) and households rhizome cultivation, and 3) upstream SC, namely households (post-harvest and processing). The evaluation results show that of the seven aspects of SSCM, only the logistics aspect is optimized, and the transportation is sustainable, while the other 6 aspects are already running. The use of organic waste available for seedling and planting media meets the aspect of a sustainable source of raw materials, is able to reduce the risk of concentration in nature so as to reduce risks to occupational health and safety. Development of research and learning centers in each target village as a means of sharing in sustainable competency development. On the other hand, with tiered partnerships involving customers, suppliers, communities and community groups with government and university facilitation, the model built has a positive impact on local communities. Based on the three aspects of sustainable development, the development of a multi-stakeholder partnership model in this organic rhizome agroindustry can be a best practice for other commodities.

Keywords. multi-stakeholder, partnership, supply chain, rhyzome, sustainable

1. Introduction

The agribusiness sector is comprised of interrelated subsectors working in concert to provide goods and services to consumers around the world. With the need to accommodate economic, social, and environmental concerns, organizations and managers in the sector share many of the challenges that exist in other business value chains (Gunderson, 2014). Indonesia, as an agrarian country that has a very strategic position and role of agriculture to realize very competitive agriculture as the main vision of agricultural development, and become able to achieve self-reliance and food prosperity as well as energy (Faqih et al, 2020). The realization of a sustainable agriculture-bio industrial system that produces a variety of healthy food and

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high value-added products from biological resources and tropical marine. The vision of agricultural development based on this sustainable could be implemented by the bio refinery concept to optimizes the conversion of biomass and zero waste to produce food and non-food materials that have high economic values (Naz et al., 2019, Işıtan et al., 2016). Agrowaste is generally found in the agroindustry where collected materials is used to produce the absorbent, basically natural activated char, made from impregnated cellulose contents, composite materials, and food peels (Sen and Chattoraj, 2021).

Rhizome is modification of stem that grows below the surface of the soil and produce new bud and roots from its segments which, apart from being used as a cooking spice, is also used by the community as an ingredient in traditional medicines to treat various diseases (Indrani et.al, 2020). Plants belonging to herbs, especially the roots (rhizomes) are widely used by the community for cooking spices and herbs (herbal drinks) (Yuliani et all. 2009). Herbal drinks are one of the products from rhizome plants that are popular with the public because they can have a positive effect on health (Tasia and Widyaningsih, 2014; Pongsibenda, 2017). Ginger (Zingiber officinale) which belongs to the Zingiberaceae family, was first cultivated in Asia (Indonesia and Malaysia) and is one of the most commonly used herbal supplements taken by many patients to treat various conditions (Supu et all, 2018). Ginger (Zingiber officinale Rosc) is one of the spices and medicinal commodities which is also the main type of rhizome plant which has a delicious and distinctive taste and smell, functions as a medicine to improve digestion, increase appetite, strengthen the stomach and prevent infection (Yuliani et all, 2009). The most significant among all the nutraceutical attributes of ginger are its positive influence on gastrointestinal tract including digestive stimulant action, anti-inflammatory influence, and anticancer effect (Srinivasan, 2017).

The ginger is an erect perennial growing plant from one to three feet in height, consisting of thick scaly rhizomes (underground stems) which branch with thick thumb like protrusions, knows as “hands”. The rhizomes are 7-15 cm long and 1-1.5 cm broad and laterally compressed depending on cultivars and growing conditions, and the outer surface is buff coloured and longitudinally striated or fibrous in nature (Ghosh et al, 2011). Ginger is very important commercial crop grown for its aromatic rhizomes which is used both as a spices and medicine. Ginger is valued for the dried ginger spice and preserved, crystallised ginger. Ginger is a perennial plant but is usually grown as an annual for harvesting as a spice. Ginger is best grown in partial shade and can be incorporate as an intercrop in coconut, coffee and orange plantations. Ginger possesses a warm pungent taste and a pleasant odor, hence it has a wide use as a flavoring in numerous food preparation, beverages, ginger bread, soups, pickles and many soft drinks. There are two general types of ginger viz. fresh green ginger used for the preparation of candied ginger (in sugar syrup) and dried or cured ginger applied in the spice trade, for extracts, oleoresins and for the distillation of its volatile oil.

Based on the potential and advantages of the red ginger commodity, it is necessary to design a multi-stakeholder partnership model in a sustainable red ginger agroindustry. Agroindustry is based on a balance of three aspects of sustainable development, namely social, economic and environmental.

2. Method

This Stock Taking Study is part of Kedai Reka's Matching Fund program entitled “Organic Rhizome Supply Partnership” in collaboration between Jambi University and PT. Akar Emas Semesta. Research in 5 user partner villages namely Dataran Kempas, Meranti Baru, Pasar Senen, Ibru and Sukamaju involved 6 community business groups (4 Village Owned

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Enterprises and 2 Farmer Groups). The partnership development involves 4 stakeholder groups or multi-stakeholder partnerships, namely raw material suppliers, red ginger seed breeder groups, red ginger growing households and supplier partners for the health food industry as buyers of cultivated rhizomes. Supply Chain Management (SCM) approach is used in this study to analyze resource flows and potential value added chains in organic rhizome agroindustry. Descriptive method is used in the analysis of data and information from both field observation data and the results of a review of references related to the topic of discussion.

3. Result and Discussion

3.1. The Brief Description of ORSP Project

The organic rhizome supply partnership program or abbreviated as ORSP is one of the national competitive activities that passed funding after going through a selection process in the matching fund scheme. The matching fund program launched in 2021 is a tangible form of support from the Ministry of Education, Culture, Research and Technology of the Republic of Indonesia for the creation of collaboration and strategic synergy between Higher Education Personnel (Universities) and industry players. Matching Fund is one of the added values of collaboration between two parties through the Kedaireka platform. This Matching Fund support is prioritized for collaboration that contributes to the achievement of the 8 (eight) Main Higher Education Performance Indicators* that have been set by the Ministry of Education and Culture; a) graduates of higher education get decent jobs, b) students gain off-campus experience, c) lecturers are active outside the campus, d) Practitioners teach on campus, e) lecturer's work is useful for the community and is internationally recognized, f) campus study programs in collaboration with world-class partners, g) classes are collaborative and participatory, and h) international standard study program (KedaiReka, 2021).

The collaboration program between Jambi University and Akar Emas Semesta (AES) Ltd focuses on red ginger as one of the most popular rhizome medicinal plants in Indonesia. The collaboration between the two parties involves community groups as user partners who are farm start suppliers of rhizome products that will be distributed by AES Ltd to the food and beverage industry. Red ginger products from the farm start, both fresh and processed in powder, slabs and essential oils will be purchased by AES Ltd and then distributed to industrial users. The role of the industry in addition to being an intermediary trader is also a provider of ginger plant seeds and providing assistance in cultivation. The ORSP project was implemented in 5 villages spread over 3 districts, namely Dataran Kempas and Pasar Senen villages in Tanjung Jabung Barat district, Sukamaju and Ibru villages in Muaro Jambi district and Meranti village in Sarolangun district. User partners who become activity managers consist of 6 community business groups consisting of Village-Owned Enterprises (VoE) and Farmer Groups (FG) directed not only as red ginger seed breeding centers but also as learning centers, as follows:

Figure 1: Rural Business Partner Group Development Orientation

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1. Center for Research and Development of Organic Rhizomes managed by Cadets Farmer Groupu Lentera Kehidupan (Dataran Kempas) in collaborates with Agricultural and Rural Self-Help Training Center (P4S) Lentera Kehidupan.
2. Organic Rhyzome Teaching Farm and Factory, abbreviated as Ortefactory, managed by VoE Suka Makmur (Ibru) with collaborates with Al-Muttaqin Islamic Boarding School and Attariyah Agricultural Vocational High School.
3. The Organic Rhizome Learning Center is distributed on 4 business groups, namely VoE Pintu Nusantara (Dataran Kempas), VoE Usaha Bersama (Pasar Senen), VoE Mantab (Meranti), and FG Suka Rimpang (Sukamaju).

Orientation considers the effectiveness and sustainability of the transfer of technological innovation by selecting young people who are in the learning process. They are expected not only to be able to absorb new technology from universities but also to be able to spread it to the wider community. The academic argument that the development of strong intermediate institutions is likely to improve technology and knowledge policy and practice is explicated and so confirm by expert perceptions of the industry's inteand. Their views confirm, but also develop and nuance academic research by suggesting that certain types of intermediate institutions have a more significant role to play than others (Osabutey et al, 2018). Technology transfer generates learning and capabilities that introduce and stimulate innovation on the part of the recipient (Van Zwanenberg and Arza, 2013). The strategy adopted by many developing economies generally follows that of developed countries, though often with little appreciation of how inappropriate this is (Preciado et al, 2016). The transfer of technology temporarily in the community (during the project runs) also involves student participation in the "Merdeka Belajar Kampus Merdeka" program, abbreviated as MBKM. The MBKM program is an integrated, multi-disciplinary and multi-stakeholder field experience-based learning facility so that it can be followed by students from various study programs within the Jambi University. The program is intended to improve the ability of participating students in solving various problems faced in managing the relationship between various development actors based on an analysis of the socio-economic environmental conditions of the community (Novra et al, 2021).

3.2. Competitiveness and Utilization of Local Resources

The duties and responsibilities of the Jambi University Team are to provide guidance and strengthening of cultivation and institutional governance through intervention and introduction of science and technology. Management business groups are intermediary agents in the transfer of environmentally friendly organic cultivation technology innovations by prioritizing the use of local waste in the development of organic red ginger. For the enrichment and application of technology, applied tests were carried out on various research technologies, including the use of plant waste and agricultural industry as raw material for seedling and planting media, biological growth promoting materials, natural pesticides for controlling pests and diseases of red ginger plants, compost and liquid fertilizer from cow kennel liquid waste. This liquid fertilizer with the main raw material of cow urine is called Biourine A Plus which is the result of processing biological fertilizers by means of aeration in order to improve the performance of urine to become clearer in color and not have a pungent smell. Briefly, the Biourine A Plus production process starts from filling fermented “baby tanks” from pure urine into a special liquid waste collection tank in cattle housing using the first water pump (Novra and Suparjo, 2019). The compost used in this activity is the result of its own production using waste raw materials with the composition of palm oil industry waste (30% empty fruit bunches

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and 25% boiler ash), oil palm plant waste (15% chopped palm fronds) and solid waste cowshed (30% mixture of feces and cow feed residue) (Novra et al, 2021).

The types of red ginger seedling media used either single or in a mixture were cocopeat (CCP), empty fruit bunches (EFB) and chopped palm midrib (CPM), compost (COMP), cowshed solid waste (CSW), boiler ash (VAS), burning peat soil (BPS), rice husks (RCH) and Cowshed Solid Waste (CSW). Field trials at research and development centers on the effect of using various compositions of organic waste (Table 1) as seedling media are presented in Figure 2.

Table 1: Treatment of Red Ginger Seedling Media Composition at Center for Organic Rhyzome R and D *Lentera Kehidupan* in *Dataran Kempas* Village

No	Treatment	Material type and composition (%)			Total
		CCP	EFB	CPM	
1	A	100	0	0	100
2	B	50	50	0	100
3	C	50	0	50	100
4	D	50	25	25	100

Cocopeat is a waste from coconut coir processing that has not been used optimally and in Indonesia with an average coconut production of 15.5 billion per year, around 1.8 million tons of fiber and 3.3 million tons of cocopeat can be obtained (Arbintarso, 2009). The availability of abundant cocopeat raw materials to produce various economical and environmentally friendly products is still dominantly used by farmers as planting media (Setyawan, 2020).

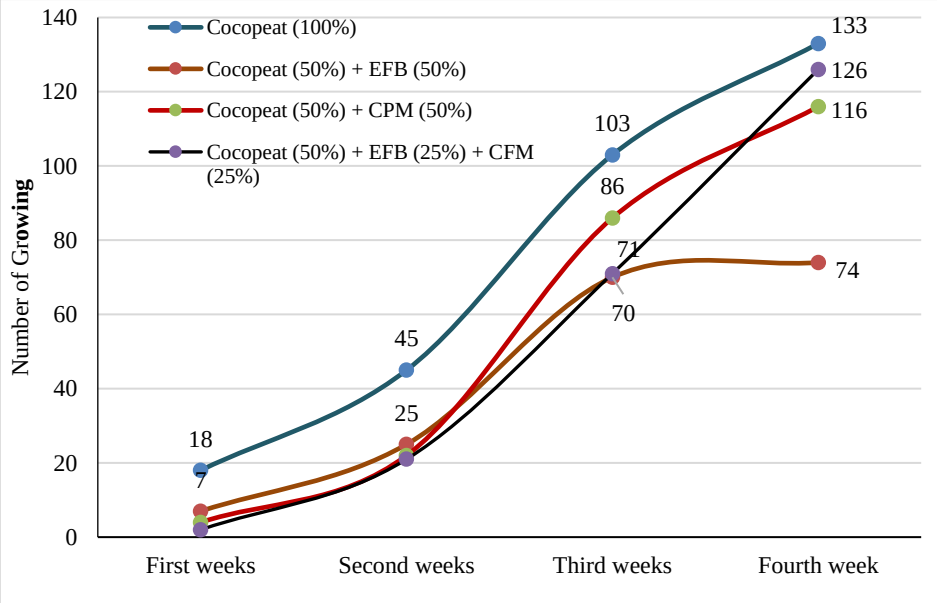

Figure 2. Number of Red Ginger Shoots Growing During 1 Month of Sowing

The seeding of 5 kg of red ginger seeds for each composition showed that a single use of Cocopeat resulted in the highest number of shoots growing. The growth in the number of shoots from the beginning in the Cocopeat single treatment was more but if viewed from the growth pattern it had the same pattern as replacing half of the cocopeat with empty fruit bunches (EFB) and chopped palm midrib (CPM).

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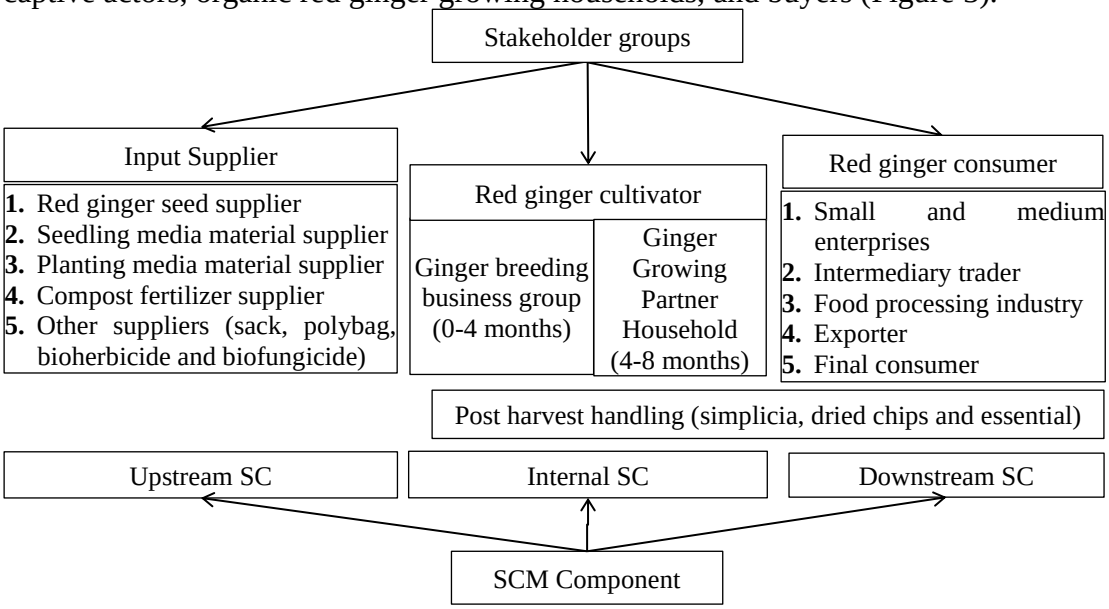
3.3. Partnership and Expansion of Program Benefits

Amidst the number of studies on sustainable purchasing and supply management (PSM), we have yet to learn how sustainability becomes a logic for organisations and their stakeholders. Stakeholders can be differentiated by three attributes: power, legitimacy, and urgency but the other studies distinguish stakeholders according to their relationship to a specific company (Mitchell et al. 1997 in Menke et, al, 2021). According to Clarkson (1995) that stakeholders can be grouped between primary and secondary stakeholders. For primary stakeholders, companies themselves "can be defined as a system of primary stakeholder groups, a complex set of relationships between and among interest groups with different rights, objectives, expectations and responsibilities". Secondary stakeholder groups can be defined as those who influence or affect a company or are influenced or affected by a company but are not engaged in transactions with the company and are not essential for its survival. In the context of organic rhizome agro-industry, especially organic red ginger, based on the flow of resources and components in SCM, they are grouped into 4, namely input suppliers, red ginger seed captive actors, organic red ginger growing households, and buyers (Figure 3).



Fgure 3. Stakeholders in each component of SCM agroindustry rhizome

The organizational learning, especially learning with external stakeholders such as suppliers, an operational definition of socioecological sustainability among stakeholders, and procedural support for the cocreation of strategic plans for change are vital for achieving a truly sustainable supply chain (Bratt et al, 2021). Three distinct trajectories of an insitutional logic (ILS) emerged from the literature and their application to sustainable PSM is illustrated using realworld examples. The trajectories rely upon the evolution of (1) institutional entrepreneurs or (2) PSM structures, but also can happen through (3) the co-evolution of both.

3.4. Integrated Sustainabilty Supply Chain on Rhizome Agoindustry

Making a product to sell in large quantities takes orchestration, collaboration, foresight, and preparation organized with understanding the basics of how a successful supply chain works are the first steps to scaling up production (Hindsman, 2020). Supply chain management is handling the flow of how your product is made and all the processes that

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transform the raw material into the finished product (Silva and Nunes, 2021). Despite increasing business interest in sustainability in general and in sustainable supply chain management (SSCM), the ability to increase suppliers' ecological and social performance is generally insufficient for many companies. SSCM has been defined as integrating systems thinking, strategy, and action into supply chain management, including financial, ecological, and social performance (Sroufe and Melnyk, 2017) and has been defined as integrating systems thinking, strategy, and action into supply chain management, including financial, ecological, and social performance (Bratt et.al, 2021).

The successful implementation of SSCM requires sustainability to be anchored in a company's vision and integrated into all functions (Bratt et.al, 2021). Implementing sustainable policies in supply chains is a significant challenge for businesses. Recent evidence has shown that failure to manage supply chains responsibly can have significant impacts on firms' reputation and financial performance (Oelze et al., 2014). The long-term objectives were co-developed, among which the scholars identified the following as relevant for SSCM: a) sustainable raw material sourcing, b) optimized logistics and sustainable transports, c) a positive impact on the local communities, d) no scarce materials or substances that risk increasing in concentration in nature, e) no health and safety risks, f) sharing and developing competence in sustainability, g) developing partnerships with customers, suppliers, communities, non-governmental organizations, universities, and governments (Bratt et.al, 2021).

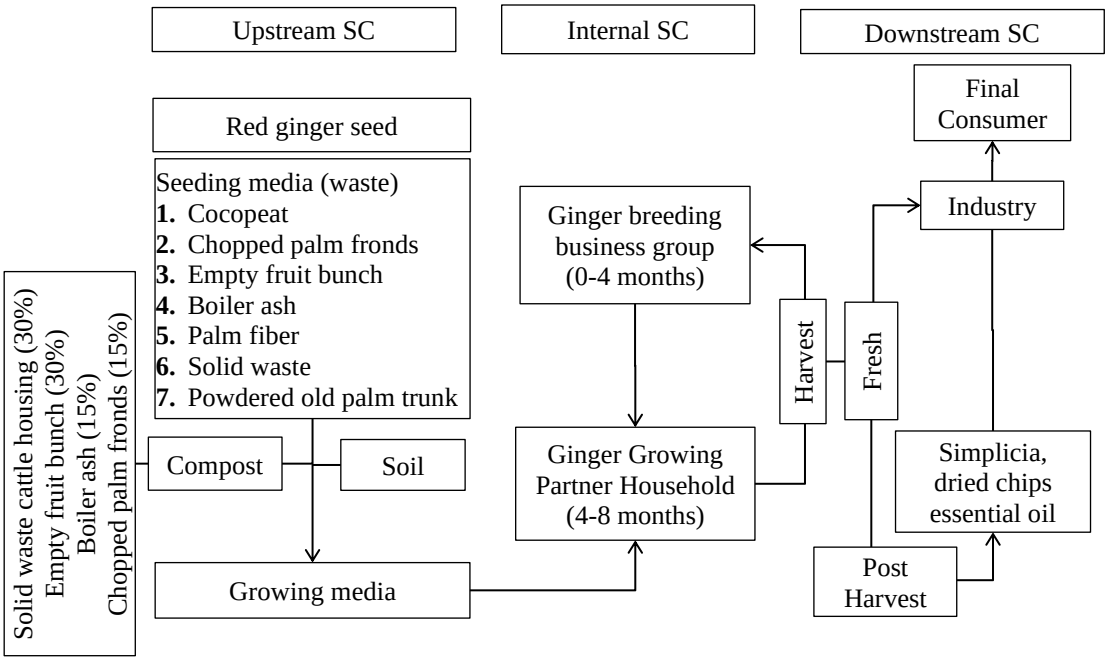

Figure 4. Red-Ginger Supply Chain Component

In the dowstream component, the main focus of activities is post-harvest handling in order to improve marketing efficiency and reduce transportation risks. Marketing of cultivated red ginger is still in the form of fresh ginger, so that its voluminious nature and small volume cause the transportation cost of the unit to be expensive. This marketing inefficiency is also caused by the high risk during the marketing process of fresh red ginger. Fresh red ginger is not only susceptible to the risk of quality degradation and weight loss when it reaches the final consumer. To reduce the risk of losses imposed on producers (cultivators), intermediary

partners offer post-harvest processing products in the form of simplicia, dried ginger chips and essential oils. Meanwhile, efforts to increase added value are carried out independently by household scale industries by processing red ginger into health foods and drinks such as in the form of ginger wedang (traditional drinks), red ginger candy, red ginger powder, either pure or added with other ingredients such as sugar. Ginger is used in three forms namely, fresh or green ginger, whole dry ginger and split dry ginger. Fresh ginger are sometimes unsuitable for converting to the dry spice, due to its initial high moisture content causing difficulty in drying and thus a heavy wrinkled product is obtained with low volatile oil content (Balakrishnan, 2005). Fresh ginger suffers from weight loss, shrinkage, sprouting and rotting during storage after 3 to 4 weeks of harvesting. This spoilage can be overcome by processing fresh produce to some value added products (Nath et al, 2013). Fresh ginger are perishable in nature and are spoiled due to improper handling, growth of spoilage microorganisms, susceptibility to rhizome rot, wilting and sprouting, action of naturally occurring enzymes, chemical reactions and structural changes during storage (Khausal et al, 2017). The various value added products prepared from ginger are ginger oil, oleoresin, ginger candy, ginger preserve, ginger puree, ginger powder, ginger beer and ginger paste (Camacho and Brescia, 2009).

4. Conclusion

Conceptually, the application of sustainable SCM principles has been well designed in the organic rhizome supply partnership program, but in the field implementation there are still various problems. As with the long-term goal of SSCM, several things have been fulfilled, namely having a positive impact on local communities, guaranteeing the availability of waste raw materials for planting media, without the use of chemicals so there is no risk to health, learning centers as a place to share experiences and knowledge, and multilevel partnerships and multiple parties. Meanwhile, what is still in the process of improvement is optimizing the logistics function and sustainable transportation.

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