



**PROJECT «NETWORK FOR AGRICULTURE AND RURAL DEVELOPMENT  
THINK-TANKS FOR COUNTRIES IN MEKONG SUB-REGION (NARDT)»**



***Regional research***

***Agricultural innovations review in Sub-Mekong region countries***

**Large field model in the rice production in the Loc Troi Group – Viet Nam**

## **1. Introduction**

The policy of allocating agricultural production land from collective economic organizations (cooperatives) to households under Contracting Policy No. 10 boosted food and food production in the 1990s. This has helped Vietnam from a rice importer to become one of the world's leading rice exporters. However, the division of land among households has created a certain fragmentation in agricultural production in recent years. On average, each household can have up to 6-7 plots of fields cultivated with different rice varieties, which has caused many difficulties in applying the achievements of mechanization, chemistry, and automation in the future, especially in large rice-growing regions such as the Mekong Delta. These are also the factors that promote the birth of the "large field" model in recent years. The large sample field is a model of linkage between enterprises and farmers to produce large-scale rice, increasing competitiveness in the process of international economic integration of Vietnam's rice industry. One of the quite successful models in Vietnam is that of Loc Troi Group.

## **2. Model development**

Loc Troi Group - formerly known as An Giang Plant Protection Joint Stock Company (AGPPS) is a leading manufacturer and supplier of products and services in the Vietnamese market in the field of agriculture, with a sustainable value chain. sustainability from research, production, and sales of seed products, pesticides, bio-organic products, rice, and coffee. Notable milestones during the Group's 30 years of operation, starting in 1993:

- November 30, 1993: Established An Giang Plant Protection Service Company according to the decision of the People's Committee of An Giang province, with a very small initial facility and initial business capital of only 750 million VND and 23 employees. Starting with the field of supplying plant protection drugs, with reliable product quality and a breakthrough business strategy, the company gradually received the trust of farmers nationwide. Originating from a small province of the Mekong Delta, An Giang Plant Protection - AGPPS quickly opened a branch in Ho Chi Minh City in 1994 and expanded its business scope across the country, its scale and sales were unprecedented. stop increasing.

- 1996: Establishment of the Seed industry. With the Seed Research and Production Center put into operation, An Giang Plant Protection officially entered the potential field of seed research and business. Focusing on investing in technology and intelligence in the

field of research and rice breeding, An Giang Plant Protection gradually becomes a leading unit in the seed business in Vietnam. Also this year, An Giang Plant Protection boldly invested in building 02 agricultural chemical processing factories with a total capacity of over 5,000 tons per year with many types of products. Investing in factory construction has helped the company lower product prices, packaging designs are always improved to suit farmers' tastes, and product quality and output are always stable, helping the company be proactive in expanding distribution systems to serve farmers.

- 1999: after 6 years of operation, An Giang Plant Protection increased its capital 57 times, revenue reached 600 billion VND compared to 13 billion VND in the first years of establishment, and paid a total of 109.8 billions dong. Since the early 2000s, the company's Board of Directors has been determined to build the company into a large corporation with the world's leading sustainable agricultural value chain.

- 2000: the company was honored to be awarded the title Hero of Labor by the State for exceptionally outstanding achievements in production and social activities.

- 2002: Mr. Huynh Van Thon, General Director of the company, was honored to be awarded the title Hero of Labor by the state.

- 2004: Equitized after 15 years of operation, An Giang Plant Protection has made great strides in sustainability. The company was equitized in 2004 with a charter capital of 150 billion VND.

- 2006: The company started building the so-called “3 Together Force” and deployed a major program Together with farmers in the fields, creating a leap in access to modern farming techniques for farmers nationwide. From 12 member engineers, the 3 Together Force has now grown to nearly 1,200 engineers who go to the fields with farmers and become the largest force working with farmers in the fields in Vietnam.

- 2010: Establishment of the Food industry. The first large sample fields were built by the company throughout the Mekong Delta and Vietnam's first rice value chain was gradually shaped.

- 2012: put into operation Dinh Thanh Agricultural Research Center. This is the first large-scale agricultural research center under a private company in Vietnam. Through this center's technological research activities, the company establishes and maintains extensive and close strategic cooperation relationships with many international and domestic corporations, institutes, and schools in the field of agriculture.

- August 23, 2015: in Cao Lanh City, Dong Thap, An Giang Plant Protection Joint Stock Company officially changed its name to Loc Troi Group Joint Stock Company. The An Giang Plant Protection brand which has been known and trusted by farmers for the past 22 years is starting a historic transformation with a focus on serving farmers through the strategy of building a leading agricultural value chain. top of the world.

- 2017: Loc Troi Group was honored to become a National Brand and one of 12 typical enterprises celebrating the 30th anniversary of the country's innovation. Looking forward to a happy future, committed to bringing sustainable values, Loc Troi Group has been accompanying Vietnamese farmers to write a new story today and for future generations.

- 2019: Establishment of Loc Troi Agricultural Research Institute, based on the research and development fields of each individual industry under Loc Troi Group, opening a new phase.

Currently, with nearly 3,600 employees, 22 subsidiaries and affiliated companies, 1 research institute and 5 pillar industries, 27 factories (owned and affiliated) producing fertilizers, pesticides, and packaging, seeds, and food, Loc Troi Group is still making every effort to bring Loc Troi Group's sustainable agricultural value chain to new heights every day, contributing to bringing sustainable value to Vietnam's agriculture, farmers, and rural areas.

*a) Building the rice value chain into a sustainable agricultural ecosystem, ensuring the role and interaction between the components constituting the business ecosystem: transforming from agricultural production to agricultural economy; from single industry to industry integration; from agricultural supply chains to multi-industry value chains; from value to multi-value integration; from high output to high technology, ecology, responsibility, sustainability; From input support to combining input supply and output consumption, Loc Troi Group has reorganized the rice value chain into an agricultural ecosystem that takes scientific research as the starting point for an ecosystem that takes sustainable long-term goals.*

Loc Troi Agricultural Research Institute was established on the R&D foundation of industries throughout the value chain, shaping connectivity and unity right from the beginning of the chain. This is the department responsible for testing the correctness and suitability of all input materials of the value chain, including seeds, fertilizers, pesticides,

and farming processes. , through production processes, applications, and new technologies. With a team of scientists and investment in facilities for research, Loc Troi Agricultural Institute is the unit receiving and implementing the transfer of science and technology to the next industries in the value chain. before sending it to farmers for application.

Meanwhile, the Seed industry, the Agricultural Materials industry and the Agricultural Services industry are considered the three main units operating in linking farmers, organizing growing areas and ensuring profits for farmers, with the main basis being to apply measures to reduce production costs. This is a very new step for a business whose largest revenue comes from providing plant protection products. The gradual increase in the proportion of revenue from the Food industry also shows a transition from agricultural production to the agricultural economy. While strengthening the "Heaven's Pearl" brand in the domestic market, increasing export market share to demanding markets such as Europe, America, Japan, Australia,... is increasingly focused. Cultivation processes that ensure pesticide residue thresholds are tested, promulgated, and continuously updated by the Loc Troi Agricultural Institute according to each market's regulations. Inspection and monitoring of farmers' compliance levels are also strictly carried out from sowing to the end of the season.

All of the above activities are transparent and public through the SAP S/4HANA & IFRS management system, QR Code traceability system, and agricultural service digitalization software. This makes the process of traceability easy and is a solid foundation for trust from partners, customers as well as shareholders and agencies in the Group's overall business ecosystem. Loc Troi.

*b) Bringing technical and scientific advances to solve problems in rice farming, helping farmers reduce the use of pesticides and chemical fertilizers and increase profits in a sustainable way*

Established in 1996, Loc Troi Group's Seed industry is increasingly developing and creating a certain reputation in the seed market, especially its strength in certified seeds on the basis of having a KCS department to control seed quality. from field to processing, packaging, and distribution to farmers. The exclusive purchase or sharing of the scope of exploitation and business of rice varieties comes from the long-term partnership between the company and units such as the Mekong Delta Rice Institute, the Corn Institute, the Genetics Institute, the University of Can Tho University, ... In 2012, the company put into operation Dinh Thanh Agricultural Research Center, the first large-scale agricultural

research center under a private company in Vietnam at that time. that point. More than 30 key professional personnel in the field of genetics and rice breeding, along with modern facilities, have diligently researched and created exclusive and highly characteristic rice varieties such as Loc Troi 18. , Loc Troi 28, Loc Troi 88, varieties that are universal, suitable for many ecological regions, and easy to cultivate such as Loc Troi 1, 2, 3, 4, 5, ... These new rice varieties are all registered. Protecting and achieving national seed certification after the survey period has created independence and increased competitiveness in the market in terms of rice varieties, while also creating convenience in determining growing areas and selling products. output products for farmers in the linked chain.

### **New equipment's introduced in the large rice field**



*Source: Loc Troi Group.*

In addition, farming processes are also methodically researched and officially promulgated. Stemming from the market demand for quality and health-safe goods, Loc Troi Group has continuously improved its operating methods to create a difference for the business itself. Taking science as the foundation, transferring science and technology internally and externally is carried out on the basis of formal research and testing activities. Loc Troi Agricultural Research Institute has standardized and promulgated rice cultivation processes, meeting standards on pesticide residues and other food safety and hygiene

standards of strict markets. Europe, America, Japan, Australia, Korea, common markets in Africa, Philippines, China, etc. These processes are officially promulgated throughout the Group's digital system and are supported by forces. Quantity 3 Transform into training exercises that are lively, beautiful, easy to receive, and convey to farmers linked in the Group's value chain. In addition, these standards are continuously updated according to changes in markets, ensuring that the Group's organization of high-quality raw material areas always meets market needs. When farmers apply these standards, using the group's products in the right dosage, at the right time, and for the right target is the top priority to ensure pesticide residues in the product. Final. This contributes to the goal of reducing chemicals in Vietnamese fields, protecting rural living environments, protecting consumer health, and protecting land and water resources.

Typical of this model is the direction to focus on developing high-quality rice varieties and products, promoting scientific research on organic products to reduce pesticides, and especially the enterprise has deployed the "3 together" force. (Engineers eat, live, and work together with farmers). The "three forces" are present directly in the fields to listen to the thoughts, aspirations, and production requirements of farmers and transfer to their advances, science, and advanced farming techniques. Loc Troi Group began building the 3 Cung force and implemented the major program Together with farmers in the fields in 2006. To date, the 3 Cung force has reached 1,325 agricultural engineers. In addition, the 3 Together force also serves the Group to build a large raw material area and a rice production value chain, with 5 modern rice processing factories in the Mekong Delta, more than 25,000 households. farmers engaged in high quality rice production.

*c) Sustainable rice cultivation according to SRP standards*

As climate change increasingly impacts crops, especially rice, the risk of global food shortages is increasing, and shifting farming methods from a central goal to productivity to the goal of ensuring profits for farmers along with environmental protection is the top concern. From this goal, in 2016, Loc Troi Group and farmers in 3 provinces of An Giang, Kien Giang and Dong Thap tested sustainable rice farming standards, including 46 requirements, from the beginning of the crop to the end. crop of a rice crop cycle. This experimental process receives great attention and support from local departments and international organizations. Through 4 implementation seasons, the results show that when applying this standard, farmers save 12% of plant protection drug costs on the principle of IPM integrated pest management, reducing 1 to 2 times to Water floods the fields thanks to

the alternating wet and dry irrigation technique, thereby reducing the cost of producing one kilogram of rice, and farmers' profits increase by about 15% compared to farmers who produce using conventional methods. Furthermore, this farming method helps farmers reduce about 1/3 of the greenhouse gas emissions generated during a rice crop, thanks to reducing the number of times the fields are flooded and having proper straw treatment methods, returning them organically back into the soil with Trichoderma products that decompose straw. This also reduces the amount of straw burned each season in the Mekong Delta.

Based on the success from 2016, by 2020, Loc Troi Group has organized farmers to produce rice that meets 100% SRP standards. The publication at this time is no longer self-assessment and self-announcement but is carried out by a third party, authorized by the SRP organization. For the first time in Vietnam, Loc Troi Group achieved SRP certification of 100 points, meeting the expectations of the Group's board of directors, the trust in farming techniques, and the ability of farmers to accept advanced farming methods. Vietnam in general and Mekong Delta farmers in particular. Achieving 100% of the SRP standard requires absolute compliance with the requirements of the standard, which has been successfully maintained and re-certified in 2021 and 2022. This once again demonstrates the commitment of Loc Troi Group's companionship with farmers on the path of sustainable development.

*d) Building raw material areas, associated with the role of Cooperatives and Cooperative Unions*

Loc Troi Group has built its operations on the foundation of cooperation with Cooperatives/Cooperative Unions. God's fortune aims for a cooperation scale of 30 to 100 thousand hectares for each cooperative/cooperative union. From there, we can take advantage of the economy of scale to help reduce rice growing costs and thereby increase farmers' income. Up to now, Loc Troi Group has participated in and organized the activities of 5 Cooperatives in the provinces of An Giang, Kien Giang, Long An and Bac Lieu, with an average scale of 12 Cooperatives/cooperative unions. This creates many advantages for Loc Troi Group in organizing concentrated growing areas, applying for planting area codes, and facilitating warehousing arrangements, transportation vehicles, and synchronous mechanization. In addition, policy support for cooperatives/unions is also a significant advantage for member units when participating in this agricultural system.



*e) Carry out cooperation in the field of applied research from the field to the factory to help reduce post-harvest losses, reduce labor use in the field, and ensure post-harvest rice grain quality.*

In addition to strengthening self-research, research cooperation, and technology transfer in the field of seeds and crop solutions, activities related to high-tech applications in farming, harvesting and post-harvest are always being carried out. Focus on and constantly improve. Since 2019, Loc Troi Group has boldly invested in drone technology and unmanned spraying aircraft, with thorough training for the group's technical staff in combining knowledge and crop experience with drone control to achieve the highest efficiency in each spraying session. Starting from the first 15 drones, up to now, the Group has over 150 drones with nearly 300 skilled personnel operating the drones, trusted and used by farmers. In addition, this drone operation team is also organizing experiments on the application capabilities of drones beyond spraying, such as sowing and fertilizing. If these trials are successful, farming in the farmers' fields will be almost completely mechanized, reducing the need for unskilled labor and minimizing the possibility and time of exposure to drugs. Plant protection of labor in agriculture.

In 2020, Loc Troi Agricultural Research Institute cooperated with the International Rice Research Institute (IRRI), piloted the use of the EasyHarvest program, locating and status of boats carrying rice from related raw material areas. linked to the milling factory. This application allows to manage, arrange and arrange transportation vehicles on time, ensuring rice is transported to the factory within 12 hours after harvest, to maintain the best quality of finished rice products. This application is especially effective when at peak harvest time, transport vehicles must operate at full capacity. Ensuring the order and smoothness of hundreds of ships at that time helps greatly reduce post-harvest losses. large, in terms of rice grain quality including taste and head rice recovery rate.

Similar to transportation vehicles, combined harvesters, as well as labor during the harvest season, are also headaches for farmers. The lack of machinery and labor leads to rice paddy hanging, waiting for arrangement and from there, farmers are dependent on traders and the "contract" to increase labor prices. Understanding the difficulties of that time, Loc Troi Group boldly invested in more than 120 combine harvesters and straw rolling machines, providing harvesting services and organizing straw collection according to the needs of farmers. In addition, the group's mechanization department has organized research and manufactured machines to transport rice from fields to canals and dikes,

automatically weigh rice to the boat and return weighing slips to farmers each day. Weighing trips helps farmers monitor and control the output of their fields. This proves that transparency in the connection process, from the supply of agricultural materials, machinery, equipment to field staff, is essential for farmers, helping farmers manage expenses. and calculate and consider the necessary level of pest treatment. From there, farmers have a basis to convert from agricultural production to agricultural economics, where the focus is profit, not productivity. This helps farmers confidently follow the path of sustainable production, the inevitable path for agriculture, as climate change increasingly impacts production.

*f) Research into intensive processing areas, utilizing straw by-products and rice husk ash, turning them into valuable products, and increasing gross profits from rice cultivation.*

According to the Department of Crop Production, Ministry of Agriculture and Rural Development, each year 43 - 44 million tons of straw are produced from rice growing activities in Vietnam. In the past, farmers' practice was to burn straw after harvest, which not only polluted the air but also lost a significant amount of organic matter from the fields and increased greenhouse gas emissions. Loc Troi Agricultural Research Institute (LTI) has been conducting many studies to improve the efficiency of post-harvest straw treatment. These projects focus on methods to take advantage of the abundant straw resources in the Mekong Delta:

**Animal feed:** LTI is collaborating with partners to research a method of fermenting rice straw into silage for livestock, meeting the demand for food sources for cows and calves in the Mekong Delta.

**Organic supplements for the soil:** LTI is continuing to perfect the solution of chopping straw after harvest, spraying the biological product Tricoderma DHCT to promote straw decomposition, and creating an organic source to help improve soil structure, retain moisture and nutrients, while promoting healthy growth of microflora in the soil, reducing greenhouse gas emissions in the field.

**Mushroom growing:** In 2022, LTI organizes a mushroom growing competition on straw substrates, to create a sustainable mushroom farming process, helping restore the large-scale mushroom growing industry in the Mekong Delta to serve the domestic market and export.

Producing biochar from rice husks: project associated with organizations and universities from countries such as the US, Australia, Japan in the program to support the Mekong Delta to adapt to climate change, reduce greenhouse gas emissions, and establish Carbon credits, commercialize biochar, and Carbon credits are also the premise to help businesses contribute to improving the value of by-products, minimizing negative impacts on the environment.

*g) Apply information technology to support farmers*

Rice Hospital: remote rice health care: Developed and put into use in 2020, the Rice Hospital application is the first digital platform that combines farmers' field information and agricultural knowledge. The 3 together Force has been helping to quickly solve problems related to pests and diseases in rice farming. With the goal of transferring knowledge - answering questions - and providing solutions through a digital platform, convenient for farmers to access information, the application has attracted thousands of farmers to participate and ask questions. This is also a means for farmers to receive news about weather, agricultural crops, and early pest warnings, helping farmers make accurate decisions about spraying, harvest time, and so on.

In addition, the system of plant doctors - the Force of 3 Together - is increasingly being strengthened and properly trained in both expertise and how to answer questions so that it is easy to understand and closest to the actual local situation. This digital platform was really effective when the Covid epidemic occurred, when the production areas were isolated and the Group's technical staff could not come to the area, the answers provided through this application were somewhat helpful. limit risks and risks of pest outbreaks at that time.

*h) Agricultural Production Linkage Management System - Cashless model*

Focus on a series of features to help manage big data including farmer information, production contracts, sowing area, farming progress, harvest time, supply orders for agricultural supplies/services, and debt to help Loc Troi implement its commitment to rice and agricultural production areas with partners, develop raw material areas to serve domestic and foreign markets, the "Agricultural Production Linkage Management System" contributes to solving the problem to resolve bottlenecks in managing large-scale agricultural production. The solution has helped reduce production costs, increase productivity, increase the quality of agricultural products, ensure crop efficiency and aim

to improve the lives of farmers affiliated with Loc Troi. This digital transformation solution is the initial result of the efforts of the Group's Information Technology Department and the Agricultural Service Company in building and developing an agricultural information system capable of managing quantity. Huge task, serving activities of organizing joint production on a scale of 1 million hectares of crops linking Loc Troi with hundreds of thousands of farming households.

From this foundation, the "Cashless" model was initially formed, providing maximum support for farmers in accessing loans from banks to serve production activities. Data on partnership contracts, agricultural input orders, seeding plans, cutting dates, estimated prices, between Loc Troi and the Cooperative, are extremely important data for systematization. The system of banks in the chain linked with Loc Troi disburses loans from time to time and from activity to farmer. This helps farmers have proactive cash flow, without having to bear interest rates from purchasing agricultural supplies, with a commitment to fully invest from the beginning of the crop to the end of the crop and cover output consumption. At the same time, this platform also helps businesses control the entire supply process of the unit and farmers' field activities, making the management of pesticide residues according to market standards more convenient.

### **3. Opportunities and challenges of the model**

The large field model has created many opportunities for Vietnam's agriculture and rural development in the process of regional and world economic integration.

- First of all, with this model, it is possible to create large specialized cultivation areas for rice, coffee, tea, sugar cane, or other fruit trees in the process of building large material areas for processing and export.

- Promote the application of science and technology to production in terms of mechanization, chemistry, and high-tech agriculture (4.0 devices such as drones, disease monitoring equipment, etc.).

- Create products that are uniform in size, design, and quality that meet international standards and trace the product's origin.

- Effectively exploiting the advantages of economies of scale, reducing costs, and increasing the incomes of participants in the product value chain.

However, in fact, the development of the large sample field model in recent years has revealed a few challenges that make the cultivated area under this model not expand but tend to decrease.

Contracts between businesses and rice farmers with a fixed price already exist, but they are only contracts based on "trust" between the two parties, not legally binding. This leads to the situation that, at times, when the market price of rice increases, farmers "break the contract" to sell outside to traders. Enterprises participating in large fields cannot buy rice from farmers as committed and do not have enough goods to deliver to partners ... leading to businesses and farmers losing trust and not daring to "cooperate" in the long term. On the contrary, many times, businesses do not have enough capital to purchase, making prices lower and surplus increased, so the cooperation is often relatively loose.

Although it is a very effective production model, linking stakeholders along the value chain, the capital level of participating enterprises is limited, banks do not lend or lend very little, so they must be limited to their own scope. At first, the company's large field area was about 8,000 hectares, but now it is only about 5,000 hectares. Although his company has the ability to associate rice production with about 23,000 hectares, it still lacks the capital to do so.

Thus, the main challenge of this model is that increasing scale (farming area) depends heavily on investment (domestic and export markets), capital capacity of rice processing and exporting enterprises, and people's trust. on the partners, the effectiveness of the activities of the participating partners (cooperatives, local authorities, etc.)

#### **4. Conclusion**

The model of large fields in the Loc Troi Group has overcome the limitations created by the household economy for many years such as fragmentation, small size, and difficulty in applying science and technology, especially 4.0 technologies. Therefore, it has been participated by farmers and businesses in many localities to create great achievements in Vietnam's rice exports in recent years, although for this model to develop sustainably, it is necessary to have policies in place. stronger improvement in land law, credit capital, or infrastructure investment in rice-growing regions.

Increasing participation of businesses should be encouraged by supporting policies on building transport infrastructure, processing, and trading rice in the region. On the other

hand, it is necessary to study and summarize practices to diversify consumption methods including some modern methods such as farmers participating in shares in rice trading enterprises and bidding to consume large fields in Vietnam. During the ripening stage of rice, a part of farmers in large fields can become traders who provide rice transportation services to the enterprise's factory.

It is necessary to strengthen the training of core farmers so that they can operate and manage large fields as well as build cooperative economic organizations such as cooperatives, guilds, etc.

Focus on investing in infrastructure for large fields, especially redesigning fields to facilitate mechanization, completing in-field irrigation, electric pumping stations, upgrading traffic to fields, supporting farmers to buy machinery and equipment for production and harvesting, giving priority to agricultural insurance as well as encouraging enterprises to invest in large fields to build large areas of raw materials for processing and export according to the policy of development. development of 1 million hectares of rice for export by the Ministry of Agriculture and Rural Development in the Mekong Delta.

This is a new production method that replaces the traditional production method based on individual farmers for many years, so the expansion requires step-by-step confirmation along with practical drawing, experience, and connection. closely with training farmers and building new countryside. Although it is a model of the rice industry, the Large Field can be applied to crops with similar farming conditions such as coffee, sugarcane, tea, etc.