
PROMOTING THE LINKAGE BETWEEN ENTERPRISES AND FARMERS TO DEVELOP HIGH-TECH AGRICULTURE IN VIETNAM IN THE CONTEXT OF THE FOURTH INDUSTRIAL REVOLUTION

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ABSTRACT

In the context of the fourth industrial revolution (Industry 4.0), the development of high-tech agriculture has become an indispensable development trend to address the challenges which the agriculture is facing. To develop the high-tech agriculture in the current context, promoting the linkage between enterprises and farmers plays an especially important role. Enterprises and farmers are two important links in the linkage among “the parties” in the development of high-tech agriculture and in the value chain of high-tech agricultural products. Among them, enterprises play a central role, and are the “motive force” to lead farmers and farmers’ representative organizations in the value chain of agricultural products. Farmers are the forces that directly produce high-tech agricultural products, especially produce in accordance with the standards to meet market requirements.

Based on the reference to experiences in high-tech agriculture development in some countries throughout the world and based on the current linkage between enterprises and farmers in high-tech agriculture development in Vietnam today, the author proposes some solutions to promote the linkage between enterprises and farmers to develop high-tech agriculture in Vietnam nowadays.

KEYWORDS: linkage between enterprises and farmers, high-tech agriculture, fourth industrial revolution

1. The inevitability of the linkage between enterprises and farmers in high-tech agriculture development

1.1. High-tech agriculture development, an inevitable trend in the context of the fourth industrial revolution

Agriculture is not only an important part of the national economy but also the main sector to create jobs and income for farmers. In the history, the development of industrial revolutions had a profound impact on production fields including agricultural production. The development of agricultural revolutions has been attached to the history of the development of industrial revolutions.

According to the European Agricultural Machinery Association (2017), Agriculture 4.0 started around 2011 until now, and was associated with the development of the fourth industrial revolution based on

the platform of Internet of Things (IoT), information technology, digital technology, optimal exploitation of biotechnology attached to ecological environment protection and climate change adaptation in order to produce agricultural products with optimum productivity, best quality, food hygiene and safety.

Agriculture 4.0 is now used relatively commonly to refer to the system of agricultural activities in the context of the fourth industrial revolution. Agriculture 4.0 also has many other names such as high-tech agriculture, smart agriculture, precision agriculture, digital agriculture, etc...

In Vietnam, the commonly-used term to refer to the development of agriculture in the context of the fourth industrial revolution is high-tech agriculture. According to the Department of Science and Technology directly under the Ministry of Agriculture and Rural Development, *high-tech agriculture is the agriculture which applies new technologies to production, including: agricultural industrialization (mechanization of stages of production process), automation, information technology, new materials technology, biotechnology, plant varieties and animal breeds with high yield and quality and high economic efficiency on a unit of land area as well as sustainable development on the basis of organic farming*¹.

In the context of the fourth industrial revolution, the development of high-tech agriculture is inevitable, which helps to solve the challenges faced by the agriculture: *Firstly*, the conditions for agricultural production are increasingly difficult (the area of agricultural land has been narrowed due to the increasingly strong industrialization and urbanization; the agricultural workforce tends to decrease due to economic restructuring and population aging, climate change makes traditional farming more and more difficult and precarious, etc...); *Secondly*, the consumers' income is increasing, so the demand for quality of agricultural products is increasingly high, shifting from quantity to quality, diversity, abundance and friendliness with the living environment.

The application of high technology in agricultural production has brought many great benefits such as: *Firstly, the development of high-tech agriculture contributes to improving the productivity, quality and price of agricultural products, thereby improving farmers' income and life.*

When applying high technologies to agricultural production, waste of land and water resources will be limited due to their advantages of these technologies such as biotechnology, gene technology, organic fertilizer production technology and production automation. In addition, compared with the old form of production, high-tech agriculture helps farmers minimize their labor power thanks to the mechanization and automation of machines. Saving costs such as water, fertilizer, pesticide and labor power will help to increase productivity of crops and animals, reduce product costs, improve economic efficiency for

¹ Nguyen Tuan (2014), "High-tech agriculture towards the sustainable agriculture development in Vietnam", *Journal of Industrial Economics*, pp.41-55.

agricultural producers, create safe and environmentally-friendly products to meet the increasing demands of consumers, and improve competitiveness in the domestic and foreign markets.

Secondly, high-tech agriculture will help farmers be proactive in agricultural production, reduce their dependence on weather and climate, then expand production scale.

In the context of the fourth industrial revolution, the application of technology 4.0 in agriculture brings many benefits. *First*, billions of data are collected by intelligent agricultural sensor system, such as weather conditions, soil quality, seasonal growth rate in each region, or herd health in real time. *Second*, because of monitoring in real time, farmers can proactively make a plan of product distribution according to the growth rate. Also by closely monitoring the actual yield, farmers will avoid the situation of price squeeze by small traders for reasons such as crop failures, or agricultural products with poor quality. *Third*, labor productivity increases thanks to many automated processes such as irrigation, fertilization, pest control, etc... *Fourth*, product quality monitoring is carried out right from the time of not harvesting based on reports and comparisons year by year. From there, it will be easier for farmers to maintain higher standards of quality of crops and animals. *Fifth*, production wastes as well as costs of waste treatment are minimized because the output of one cycle can be used as input of another cycle.

Thirdly, the strong development of the fourth industrial revolution requires farmers to constantly improve their qualifications in all aspects to adapt, survive and develop (level of thinking, level of awareness, level of education, application of science and technology, ability of cooperation, linkage, market access capacity, information, etc...). Thereby, the farmers' role and position in society will be enhanced.

1.2. The inevitability of the linkage between enterprises and farmers in high-tech agriculture development

In agricultural production, the linkage between production and processing and consumption of agricultural products is not only an objectively inevitable process but also a key to develop a modern and sustainable agriculture, and ensure the benefits of stakeholders are harmonized.

The linkage between production, processing and consumption of agricultural products is the economic activities which are voluntary, mutually beneficial, but closely bound to each other under a prior agreement by the parties of production, processing and consumption of agricultural products; is one of the forms of coordination between production and processing and consumption of agricultural products, associated with forms of business organization in the agricultural sector, and is governed by institutional regulations to achieve the goal of activities in the linkage process. In this linkage, agricultural production is not only the starting point but also the first link in the linkage process; processing and consumption are the next processes that create the added value of agricultural products, sometimes make a difference many times higher than the original value.

Farmers are the subject of the production process of agricultural products while enterprises are the subject of the processing and consumption of agricultural products. In the value chain of agricultural

products, farmers are often the ones suffering disadvantages because agricultural production is highly seasonal, and agricultural products must be harvested in a short time and in large quantities. If not preserved well, the agricultural products will be damaged and quickly deteriorated in quality.

The linkage between enterprises and farmers in the value chain of agricultural products will bring the following specific benefits:

Firstly, contribute to ensuring the parties' mutual benefits in production of agricultural products.

In fact, if there is no unity of benefits, there is no unity of purpose and action. For the linkage between production and processing and consumption of agricultural products, ensuring mutual benefits is also considered the most basic principle and a prerequisite for the linkage. In the process of linkage, farmers receive supports of capital, science and technology, and consumption market of agricultural products; simultaneously, their production level has been improved through sessions of production experience sharing and training. Thereby, the linkage among farmers is strengthened in order to better meet the market demand. Thanks to this linkage, farmers are capable of building and managing collective trademark, progress to build brand for products, manage product quality to add value and meet the increasing demand of the market for products with clear origin, safety and quality assurance.

For enterprises, their linkage with farmers is to have a stable supply of input materials with good quality, etc... to create conditions to improve the rate of using machines, the quality of processed products, thereby enhance the added value and efficiency of agricultural processing and consumption activities. The linkage will contribute to ending the fact that agricultural production enterprises do not have a stable supply of raw materials with good quality, and modern processing equipment.

Secondly, increase the voluntariness and self-responsibility of the linked parties.

Voluntariness is understood to be that the parties participate actively and voluntarily in a cooperative relationship to bring into full play their strengths and at the same time compensate for their limitations. This is considered a necessary condition for the linkage.

Self-responsibility is considered a sufficient condition of the linkage process. Voluntariness will stipulate the responsibilities of all involved parties for implementing economic linkage, sharing both benefits and risks if any in the process of economic linkage. Since then, the activities of economic linkage between the participating parties have been carried out smoothly with high efficiency.

This principle also comes from the role of the linkage-participating parties in the value chain of agricultural products, and from the linkage of benefits of each member in that value chain. Therefore, within the linkage scope, each party must perform well and ensure honesty in the line of production, processing and consumption of agricultural products. Not coincidentally, the requirement of origin of products in the linkage is considered as the verification of responsibility of each organization and individual in the agricultural product industry.

Thirdly, contribute to increase efficiency in production of agricultural products

Implementing the linkages for production under the value chain is one of the most important breakthroughs in agricultural restructuring for three reasons: *First*, it allows the concentration of resources on the production of advantageous agricultural products; *Second*, chain production will reorganize production in the direction of equally sharing benefits and risks among the parties participating in the chain, thereby create incentives for production, help all parties promote to the best of their ability; *Third*, chain production allows controlling quality, safety and hygiene, and technical standards for products and goods, thereby maintaining the brand, increasing competitiveness, putting goods into the market.

Thus, the organic linkage between farmers and enterprises is considered an important condition determining the success or failure of the value chain of agricultural products. Whether the value chain is sustainable or not depends on the relationship of these two parties. In this linkage, farmers urgently need their representatives which are agricultural cooperatives. Cooperative is an organization that gathers and links agricultural households to each other. When joining cooperatives, farmers are instructed to produce, supply input materials, perform services for agricultural production, and sign agricultural product consumption contracts. The cooperatives play a good role in linking agricultural households in order to transform from small, fragmented production to centralized, large-scale and highly efficient production. As a result, farmers not only avoid price squeeze, but also increase product value, profit and production efficiency. In addition, cooperatives are the bridge between enterprises and farmers. Previously, enterprises had many difficulties when they had to sign contracts with thousands of small farmers. Currently, agricultural cooperatives act as an important bridge between enterprises and farmers in the production, processing and consumption of agricultural products.

In summary, enterprises and farmers are two important links in the linkage of “4 parties”, “5 parties”, in the development of high-tech agriculture, in the value chain of high-tech agricultural products. In which, enterprises play a central role, is the “motive force” to lead farmers and their representative organizations in the value chain of agricultural products. At the same time, enterprises are also the pioneer to penetrate and open domestic and foreign markets, bring Vietnamese agricultural products to the international stature. In the chain of linkage, the role of farmers is also very important. Farmers are the forces that directly produce high-tech agricultural products, especially produce in accordance with the standards to meet the market requirements. Farmers who are not aware of this will face many difficulties. Farmers are the subjects of chain of linkage between agricultural production and consumption. Therefore, the proactivity and activeness of farmers when participating in building linkage chains are particularly important. However, to have such proactivity, in addition to equipping with knowledge, it is necessary to have impacts for farmers to see and gain benefits from chain production.

2. The current situation of the linkage between enterprises and farmers in high-tech agriculture development in Vietnam today

2.1. Basic achievements

According to the Department of Cooperatives and Rural Development (Ministry of Agriculture and Rural Development), at present, 56 localities in the country have issued the policies to encourage linking the production and consumption of agricultural products; 48 localities have issued a list of key categories and products that need to be linked; 35 localities have issued the approval decentralization for linkage support, 16 localities have approved the linkage projects and programs with 359 approved projects.

In 2017, the Department of Cooperatives and Rural Development held the signing ceremony of the cooperation agreement on the development of a value chain model linking the production, consumption and export of safe agricultural products between enterprises - cooperatives and related subjects. According to the cooperation agreement, the Department of Cooperatives and Rural Development together with 5 enterprises: The Vietnam Union of Safe Agricultural Products Consumption Cooperatives; Vietnam National Seed Group; Toan Xuan Company Limited; Lam Son Sugar Cane Joint Stock Corporation, and Thanh Thanh Cong Gia Lai One Member Company Limited, has piloted the implementation of a plan on coordinating construction of cooperatives, forming a model of linkage between enterprises - cooperatives and agricultural households in some fields of production and consumption of sugar cane, rice and safe agricultural products.

Up to now, the country has built 26 models of linkage chain between agricultural households - cooperatives - enterprises in the production and consumption of agricultural products. In which, there are 18 models of cooperatives linking production and consumption of sugar cane, and 8 models of cooperatives linking rice production and consumption. In order to promote linkages in the production of some key products, from 2018 up to now, the localities have supported: to consult and build 74 chains; to hold 2,048 training classes; to build 357 agricultural extension models; to transfer scientific and technical applications, to synchronously apply technical processes and quality management for 93 chains; to confirm and certify safe products, to build brand and promote 257 products, etc... Currently, the country has 271 scientific organizations, nearly 587,000 agricultural households, 4,028 agricultural cooperatives participating in the linkage with 1,867 enterprises in production, harvesting, processing and consumption of agricultural products. There are 1,621 certified chains of safe agricultural products with 2,346 products, etc...²

In terms of high-tech agriculture enterprises: According to the data newly compiled by the Ministry of Agriculture and Rural Development, from 2012 up to now, there have been 44 enterprises recognized as high-tech agriculture enterprises, in which: 15 enterprises in the cultivation sector; 19 enterprises in the fisheries sector; 10 enterprises in the livestock sector³. Regarding the criteria for

² <https://nhandan.com.vn/chuyen-lam-an/lien-ket-san-xuat-gan-voi-tieu-thu-nong-san-636242/>, accessed on 23-02-2021.

³ <http://thoibaotaichinhvietnam.vn/pages/kinh-doanh/2019-10-13/ca-nuoc-co-44-doanh-nghiep-nong-nghiep-ung-dung-cong-nghe-cao-77587.aspx>.

high-tech enterprises, the Prime Minister issued the Decision No. 19/2018/QĐ-TTg on defining criteria, competence, order and procedures for recognition of high-tech agriculture enterprises. Famous enterprises with high-tech agriculture include: Vingroup, TH True Milk, Hoa Phat, Truong Hai Auto, FPT, Elcom, Vinaseed, Thaco, Lam Son Sugar Cane, etc...

In 2011, TH True Milk became one of the first enterprises in Vietnam to participate in the field of high-tech agriculture when investing about VND 670 billion in the model of high-tech clean vegetable production at International Fresh Vegetables and Fruits Production and Supply Joint Stock Company (FVF) in Nghia Dan district (Nghe An province).

In March 2015, Vingroup announced its participation in investing in high-tech agriculture on a large scale. After 3 years of establishment and development, VinEco has had 14 modern farms in the provinces across the country with a total area of over 3,000 hectares stretching from the North to the South, contributing to supplying the market with about 200 types of vegetables, tubers and fruits with total average yield of 2,500 tons/ month.

Also in 2015, Hoa Phat Group officially participated in the agriculture sector by establishing Hoa Phat Hung Yen Feeds Limited Liability Company with a charter capital of VND 300 billion, investing in the first animal feed factory with a capacity of 300,000 ton/ year in Pho Noi A industrial zone - Hung Yen.

With the plan by 2018, Hoang Anh Gia Lai has had 20,000 hectares to grow fruit trees, over 100,000 beef cattles and 20,000 dairy cows. PAN Group has exported its agricultural products to more than 20 countries around the world and continued to invest more than VND 2,000 billion in agriculture through M&A deals. GFS Group has invested in developing the Institute of Technology specializing in research, transfer and application of technology in the agricultural sector with the task of science and technology connection and integration to implement organic agriculture projects with high-tech applications. In 2017, NutiFood also recently invested more than VND 1,000 billion to develop coffee in Dak Lak. Loc Troi Company with agricultural value chain from plant seeds, pesticides, bio-organic nutrition products, rice products, and packaging has created a closed life cycle for products. Recently, Loc Troi has signed to invest VND 7,800 billion in operating a closed chain on a land area of 2,000 hectares in Thai Binh.

Some typical models in economic linkage between agro-product processing enterprises and farmers have appeared in the country.

The linkage model of Lam Son Sugar Cane Joint Stock Corporation: Lam Son Sugar Cane is one of the leading brands in the sugar industry in Vietnam. The company has been with sugarcane farmers for several decades. Implementing the linkage of large production and consumption of farmers' products, in 2018, Lam Son Sugar Cane Joint Stock Corporation, Lam Son Sugar Cane Association held a signing ceremony of cooperation contract of production and consumption of agricultural

products with Lam Son sugar cane cooperatives. Accordingly, at the beginning of the crop, the factory and farmers set the price according to a reasonable mechanism, and after selling sugar, if the sugar price is higher than the original price, the factory must share the profit with farmers. However, if the original price is high but the selling price of sugar is low, the company must bear that loss.

The “large field” model in the Mekong Delta.

The Mekong Delta is the largest rice granary in the country, contributing to ensuring food security and helping Vietnam rank in the top of rice exporting countries. In recent years, the situation of linking production, building large fields in rice production in the region has achieved many positive results. The movement to build large fields launched by the Ministry of Agriculture and Rural Development in Can Tho on March 26, 2011 received a positive response from many localities, enterprises and farmers. By 2013, the Prime Minister issued the Decision No. 62/2013/QĐ-TTg on policies to encourage the development of cooperation, linkage of production associated with agricultural product consumption, and building of large fields. At the same time, in the field of rice production, the Government has also issued many policies, such as: Policy on protecting rice land fund, ensuring that farmers have a profit of at least 30%; credit subsidy policy for purchase and temporary storage; policies on regulating conditions for rice exporting enterprises, etc...

Implementing the policy on building large fields, especially since the issuance of Decision 62, the provinces in the Mekong Delta have actively implemented linkages with agricultural product consumption, large field building. Many provinces have paid attention to directing and planning the concentrated production areas, directing and guiding farmers to produce and participate in solving problems in the contract performance process. Up to now, the number of large field models in the region has increased markedly, both in the quantity and in the area of model building.

According to the Department of Cooperatives and Rural Development, the total area of large fields in the Mekong Delta in 2015 was 196,000 ha. Some provinces with large field areas increasing rapidly include: Can Tho: 39,000 ha, Soc Trang: 22,000 ha, Bac Lieu: 17,000 ha, etc... Big enterprises such as: An Giang Plant Protection Joint Stock Company, Vietnam Southern Food Corporation have built specific projects to develop large fields in the period of 2015 - 2020. In fact, large field models are clearly effective, with the large cultivation scale, convenient in bringing mechanization into production, helping to save costs and time for farmers. On average, with each hectare of rice in the large field model, farmers can reduce production costs by 10 - 15%, increase yield value by 20-25%, and earn an additional profit of 2.2 - 7.5 million VND/ ha. On the other hand, when participating in the large field, farmers are entitled to sign stable product consumption contracts, receive technical support; and in some models, they are also provided input materials without interest by the linked company. Therefore, farmers feel secure to invest in production, implement well technical measures and bravely invest and produce according to the farm model, create a large volume of products, reduce costs and increase income. Building a large field model, enterprises have had stable materials zone with guaranteed quality, and save purchasing and transportation costs. As a result, products ensure

even quality for processing, consumption and export. On the other hand, enterprises are proactive in production and business plans, and efficiently use their equipment and machines. That traders mix rice types to sell to enterprises, affecting the quality of exported rice has decreased significantly when enterprises and farmers join the large field model.

Linkage model with farmers in the high-tech agricultural production chain of TH True Milk.

TH True Milk is the first clean and fresh milk producer based on the centralized breeding model with a large industrial scale and application of high technology in agriculture in Vietnam; is the unit with the largest cluster of high-tech dairy farms in Asia; is the first unit in the dairy industry certified as a high-tech agricultural enterprise by the Ministry of Agriculture and Rural Development; is a pioneer enterprise in implementing European and American organic standards applicable to the production and processing of TH True Milk clean fresh milk.

Affiliated companies of TH Group have created job opportunities for thousands of employees, stimulated local economic growth when consuming agricultural products such as corn, sugarcane, straw, etc... and forest-based materials for farmers in order to contribute to the restructuring of agriculture and rural economy. TH Group is very interested in attracting farmers to join the production chain. In particular, training is the most important issue for farmers to coordinate production in accordance with suitable standards of agricultural products. TH Group has implemented the methodical training policies as follows: *Firstly*, have a support policy such as giving priority to recruiting the children of farmers in the project area who are studying at universities and colleges with good academic achievements or more, and arranging stable jobs at the company; *Secondly*, organize technical instructions and production standards for the elderly farmers so that they can become personal production units for TH in order to provide standard corn and grass for dairy cows.

Along with the dairy project, TH Group is implementing two product groups in the food and beverage industry. With the method of building farms and producing in chain, attracting farmers to join the chain through cooperatives, TH Group has also considered supporting human resource training in this area. Recently, TH group has cooperated with the University of Business Administration to train cooperative directors in order to build a team of leaders that is competent and knowledgeable enough to develop rural economy. The cooperatives are expected to join TH's production chain and provide input materials for production.

2.2. Basic limitations

Currently, it cannot be denied that the number of enterprises investing in agriculture in general and in high-tech agriculture in particular is still small. According to the set target, by 2020, the country should have 10 high-tech agricultural zones and 200 high-tech agricultural enterprises. However, at present, there are only 44 enterprises recognized as high-tech agricultural enterprises throughout the country. According to the survey data of the Vietnam Chamber of Commerce and Industry, in 2017, the whole country only had 1% of the total number of enterprises investing in agriculture with the capital

accounting for only about 3% of the total investment capital of enterprises in production and business. The reason for this situation is that investment in high-tech agriculture development requires large capital investment but has high levels of risks. In addition, enterprises still face many difficulties in capital, high-quality human resources, land accumulation and concentration, technology transfer and research, consumer markets, infrastructure, etc ...

Most of the linkage between enterprises and farmers is still loose. Economic linkage contracts still have many shortcomings, sanctions for breaches of contracts are weak, legality and binding are not high and tight; therefore, the parties are easy to violate the contract. In addition, most farmers are still familiar with small, fragmented production methods, slow to access market information, and they do not completely dismiss the idea of “greedy of small gain”. At the same time, a part of farmers are still limited in awareness of responsibility for complying with the law, so they are easy to violate the contract in the linkage process of production and consumption of agricultural products. Although a lot of agricultural households sign a contract to receive advance investment from an enterprise, they are willing to sell agricultural products to individual traders or other enterprises to get higher price when the price of agricultural products on the market goes up.

In addition, the role of agricultural cooperatives in linking small farming households is weak; the institutions and policies to support enterprises and farmers in the development of high-tech agriculture still have many shortcomings.

Logistics services for export of Vietnam’s agricultural products are limited, directly affecting the spoilage rate and quality of agricultural products. In fact, agricultural enterprises and logistics companies are not yet closely linked. Too high logistics costs have indirectly reduced the competitiveness of Vietnam’s agricultural products in the world market.

Brand building has not been adequately invested. A lot of Vietnam’s agricultural products have not built their brands on the world market. This has made Vietnam’s trade promotion activities ineffective. Moreover, that there are not enough services of information supply and forecast about world agricultural markets have limited the market access of Vietnam's agricultural products. And these factors make Vietnam’s agriculture become very vulnerable and less competitive.

3. Some solutions proposed to strengthen the linkages between enterprises and farmers in order to develop high-tech agriculture in the context of the fourth industrial revolution.

On the basis of reference to the experience of high-tech agriculture development of some countries in the world and on the basis of the current situation of linkage between enterprises and farmers in high-tech agriculture development in Vietnam today, the author proposes the following solutions:

Firstly, promote scientific research, propaganda and education to raise awareness of the team of managers, and raise ethical awareness of enterprises and farmers.

The main contents, which theoretical research on economic linkage between agro-processing enterprises and farmers needs to focus on answering, are: the role and position of the institution of economic linkage between agro-processing enterprises and farmers in relation to the market and the State's management; the conditions for formation and model, content and form of the linkage; main solutions of the State which enterprises and farmers need to be implemented to improve the efficiency of the linkage.

Propaganda work should focus on the following key topics: raising awareness of the inevitable and objective trend of enterprise-farmer linkage in the process of rural industrialization and modernization. However, it is important to realize that the economic linkage between enterprises and farmers is only a method to support the market relationship and can only be successfully implemented under certain objective and subjective conditions. Therefore, it is necessary to actively implement this linkage, but should not rush, follow the movement, apply the same method of linkage for all plants and animals, or formulate the forms of organization and implementation.

Secondly, select appropriate fields of linkage and perfect forms of organization of linkage between agro-processing enterprises and farmers.

From the perspective of the field of linkage, there are 6 types of linkage contracts as follows: contract for production and sale of agricultural products; contract for production, investment and sale of agricultural products; contract for production and processing of agricultural products; contract for cooperation or joint venture for production and distribution of products; contract for agricultural product production and farmers participating in enterprise equitization; consignment contract with price fixing later⁴. Each type has its different role, necessity and application situation which need to have appropriate choice and use for each case.

5 models that have been applied in the real linkage include: centralized model, intermediary model, multipartite model, nucleus estate model, and informal model⁵. Each model has its different role, necessity and application situation, so we should not absoluteize any form.

Thirdly, perfect the contract binding rules suitable for each specific linkage case.

It is necessary to complete the contract binding rules in accordance with the principle of sharing management rights, benefits and risks, whereby with highly specialized, new, exclusive agricultural products, the form of monopoly sales is necessary and feasible. For agricultural products with competitive market and relatively stable yield, the fixed yield clause will be more appropriate. For

⁴ Ho Que Hau (2012), Economic linkage between agro-processing enterprises and farmers, National Economics University Publishing House, Hanoi.

⁵ Eaton, Charles and Andrew W. Shepherd (2001), "Contract Farming Partnership for Growth", FAO Agricultural Services, bulletin 145.

agricultural products with strongly competitive market and unstable yield, the minimum yield clause is the most feasible. Enterprises can set a minimum quality level to buy agricultural products from farmers and undertake the sorting process by themselves or, if sorting is required, it is necessary to minimize the number of grades needed. For highly specialized agricultural products with high discrimination of quality, strong brand and trademark, stable market and their price definitely higher than the market price, or for processing contract, the fixed price form is appropriate. For agricultural products with competitive market and enterprises' investment, the form of price floor (insurance) but buying at the price at each moment in the market is suitable. For agricultural products with competitive market and no investment of enterprises, the price at each moment is appropriate.

Bonuses and penalties are very important to improve the legality of contract. However, bonuses and penalties in the contract must be fair to both parties, transparent, specific, timely and accurate to increase the contract validity. In case of natural disasters, epidemics or crop failures, processing enterprises should share to support farmers in accordance with a certain rate of damage in the forms of: reducing investment debt, extending time to recover investment debt or increasing the buying price for farmers to motivate them to have a long-term commitment to enterprises and also to increase the contract performance ability.

Fourthly, improve legal environment, enhance contract validity and perfect the State policies to create a macro environment, direct support policies to facilitate development of linkage.

Legal education for farmers and enterprises should be strengthened. The State and Farmer's Union should provide free legal advice for farmers. Promote the role of Farmer's Union and mass organizations in protecting interests as well as fulfilling farmers' obligations to the contracts signed with enterprises. Promote the role of the district, commune and village authorities in the inspection and supervision to actively detect contract breaches and have appropriate solutions under their competence.

In the centralized materials zones that have been invested and purchased by local authorities or industry associations for an exclusive processing enterprise with State protection, the local authorities of province, district, commune need to retain the right to participate in planning and controlling the performance of contract articles especially in terms of price, product quality and debt payment.

The State stipulates agro-processing enterprises as a conditional business line. Accordingly, an investment license is only granted when there is a commitment and investment in developing raw materials in the assigned scope and the State protects that investment for enterprises not to let other enterprises compete to buy and sell with the enterprises with investment permission. In case the State does not need direct intervention, industry associations are encouraged to implement a horizontal linkage between members to protect investment for each other. Accordingly, conduct zoning of raw materials for each member based on the capacity and traditional areas of each member. The State should have strict regulations and controls on the origin, ensure food safety and hygiene standards,

quarantine, and concentrated processing (such as slaughtering of pigs, chickens), protection of trade rights, trademarks, brands and geographical indications for the domestic market; incentive policies to export agricultural products processed into finished products, restrict the export of raw agricultural products; incentive policies to facilitate the formation of supply chains and value chains within the country and foreign countries. The State should have a strong credit policy for farmers to expand production; reasonable policy on limiting the area of agricultural land to increase production scale; strongly develop farm economy; expand and improve the quality of cooperatives and other forms of cooperative economy. The State has policies to directly support for processing enterprises to participate in linkage with farmers such as: Preferential credit policy for contract enterprises; policy on scientific research, agricultural extension, and agricultural vocational training through contract enterprises; policy to support processing enterprises to invest in building technical infrastructure for agricultural production through contract enterprises; implementing poverty reduction projects through the processing enterprises investing in the areas with poor farmers and ethnic minorities; implementing agricultural production projects with the participation of the processing enterprises linked. Invest funds to build economic linkage models between enterprises and farmers.

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