

EXPERIENCE IN GREEN AGRICULTURE DEVELOPMENT AND LESSONS FOR VIETNAM

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ABSTRACT

Nowadays, facing the global challenges related to environmental degradation and climate change that have caused serious impacts on the economy and society, the green economy has opened a new approach to achieve sustainable development goals. The article reviews many experiences in developing green agriculture in many countries around the world, then draws lessons for green agriculture development in Vietnam in the coming time.

Keywords: Green agriculture; Sustainable agriculture; Vietnam

Introduction

Agriculture is one of the key economic sectors of the Vietnamese economy. Up to now, Vietnam's agriculture has made considerable strides and obtained many achievements. Vietnam has become a major exporter of agricultural products in the world with 10 types of agricultural exports (including rice, coffee, rubber, cashew, pepper, cassava, vegetables, shrimp, catfish, and forest products), restructuring in a positive direction, diversifying products, many products with high competitiveness and occupy an important position in the international market, participating in the global supply chain. Vietnam's agriculture has contributed to hunger eradication and poverty alleviation, improving people's lives and stabilizing the economy, and ensuring food security.

However, the development of Vietnam's agriculture in the recent period of quality growth is not high; excessive exploitation of resources; labor productivity in agriculture was low; unstable employment; abuse of chemicals and chemical fertilizers in the process of producing and consuming agricultural products has caused negative impacts on the environment; degradation of natural resources, and degradation of ecological systems; biodiversity decline, many products do not guarantee food quality and hygiene.

Therefore, leading to several of Vietnam's agricultural products of low value and competitiveness, losing both domestically and abroad markets, negatively affecting such products, future generations, and to develop agriculture in the future. This shows that the choice of a green economy will be the optimal plan for sustainable development and poverty reduction in Vietnam.

1. Overview of green agriculture

Agriculture is the main material production sector of the economy and it is one of the extremely important sectors for a country's socio-economic development. The agricultural development requirement is sustainable agricultural development: "Sustainable agriculture development based on management and conservation of natural resources, institutional and technological changes to ensure to maintain and satisfy both needs of present and future generations. Such sustainable development (including agriculture, forestry, and fisheries) ensures that it will not destroy the environment, with appropriate technology, economic efficiency, and social acceptance" [5, p.11]. It is the mobilization process of agriculture to change from manual production mainly to agricultural production towards industrialization and modernity; transform self-sufficient agriculture into commodity agriculture and higher than is commercial agriculture, and building clean, organic agriculture to meet the goals of sustainable development [6, p.35].

The goal of green agriculture is that applies farming techniques and methods to increase agricultural productivity and profitability while ensuring supply food for a foundation of sustainability. At the same time, minimizing negative impacts, creating beneficial impacts, and restoring ecological resources (such as soil, water, air, and biodiversity components) by minimizing pollution, and using resources properly and effectively (Hans R.Herren, 2011).

Green agriculture must comply the following principles: Using natural resources efficiently and economical; Safe for human health; Consider entire of the agricultural food chain; Review the value and price of products; Mobilizing the interest of stakeholders such as farmers, agricultural food processing facilities, enterprises, investors, a residential community...; Access to tools to promote sustainable production and consumption in agriculture; Focus on the needs of small-scale family farms; Invest and innovate foodservice chains.

To achieve the goals of green agriculture, the residents have to adapt to new agricultural techniques and methods and must know about the certificates, brands, market, organic agricultural products, GAP, eco-agriculture...etc. Therefore, green agriculture is an inevitable development trend of many countries in the world today, which helping countries to achieve greater economic value, increasing profits, and income for farmers, ensuring food security, and restrict environmental pollution.

2. Contents of green agriculture development

Ensuring green agricultural growth. Green growth in agriculture needs to become a process of shifting production and consumption structures, using natural resources properly. The products produced had to get the best quality, meeting the needs of the market, applying for modern scientific and technological advances but still protecting the ecological environment.

Applying high science and technology to build green agriculture models. High technology means technology with a high content of scientific knowledge and technological development that integrated from modern scientific and technological achievements; create products with superior quality and features, high added value, and friendly with the environment; plays an important role in developing new sectors or modernizing an existing manufacturing or service industry [7]. Requirements for high technology criteria applied in agriculture are: The technology must have a higher gray matter content than the current technology; The technology must suitable with natural, social and technical conditions of each locality; Products of that technology must meet the requirements of Vietnam and international quality standards, safety, and economical.

Changing agricultural structure towards green agriculture. The process of developing agriculture towards green agriculture would change the structure of the agricultural sector, the resources to create a reasonable structure to create a higher efficient economy and minimize the impact on the climate.

Ensuring the ability to reuse, recycle by-products and agricultural waste, improve environmental quality, ensure safety for human health. In the process of agricultural production or processing, besides the main products, we also create a huge amount of other by-products. Therefore, the development of green agriculture must be associated with the reuse of agricultural by-products and minimize waste so as not to cause pollution and environmental degradation. Especially, to develop green agriculture, ensuring safety for human health, environmental quality had to be at the top of concern

Develop green agriculture based on rational, economical and efficient use of natural resources, and maintenance of biodiversity. Agricultural development towards the green economy must be based on rational, economical and efficient use of natural resources such as land, water, and forests. To develop green agriculture, besides the goal of economic development, it is necessary to pay attention to maintain the current natural resources, conserve biodiversity, and not losing the balance of the inherent biology of nature. By the way, it will create a stable and sustainable development for agriculture.

3. Experiences in developing green agriculture of many countries

3.1. Experience of China

China is a country that has a very strong agricultural economic structural change associated along with economic reform. They implement agricultural reform policies such as contracted households, separating between land ownership from trading rights, implementing a two-price policy, eliminating the monopoly in agricultural product purchase, and legal reforms for the market economy develops... In China since the 1970s, there have been forms of production units in the form of farm households and non-farm households (collectives, farms, farmer groups, etc.). In urban, the form of farm households plays an important role; uses more intensive labor and has non-agricultural activities intermingled, so the product value per hectare of urban areas is 60% higher than in rural In the context of China joining WTO, the comparative advantage of China will be labor-intensive industries such as vegetables, aquaculture, and net-house activities. Fruit trees are thriving in areas around the city, creating green belts for the ecological city. On the outskirts of big cities, there are no farms raising buffaloes, cows, and sheep because of environmental pollution, but there are many small pig farms, with

a maximum size of 10heads/household. Scientific and technical advances in animal husbandry are widely applied, especially among farmers and private companies

3.2. Experience of The United State of America (USA)

The USA is a country with the most advanced and modern agriculture in the world. The USA has an advantage, with an area of more than 9 million km², in which agricultural land area accounting for 18.1%, but the cultivated area just only is less than 0.4%.

The USA government has paid attention and invested in developing eco-agriculture in urban areas to solve the problem of urbanization (such as taking advantage of vacant land; land in the back yards of schools, hospitals, parks to produce vegetables). According to a 2003 Agricultural Commission survey, California's "garden for the poor" project has contributed 55% of urban farm produce and successfully managed the production of fresh flowers by organic french. Municipal waste is recycled into fertilizer for gardens and animal feed. The system of trees creates a green belt that regulates the city's air and the main products are grown and produced in urban and peri-urban areas are flowers, vegetables, butter, and milk.

The USA is one of the leading countries in the world that applied high technology in agriculture such as biotechnology to increase productivity with genetically modified (GMC) technology. This is a method of altering the DNA of plants, by adding one or more selected genes using modern biotechnology, to create plants that have new traits according to people's wishes. The difference is that the process of forming new traits in plants naturally takes a long time, sometimes hundreds of years, while creating a new trait for plants, thanks to modern genetic engineering techniques, only took a few years.

In 2012, the USA had 69.5 million hectares of genetically modified crops, including soybeans, corn, cotton, sugar beets, papayas, and other crops. Currently, the percentage of land for genetically modified crops accounts for a very large proportion, 98% for beets, 91% for soybeans, 88% for cotton, and 85% for corn. It is estimated that between 1996 and 2012, thanks to the adoption of GMC, income increased by \$ 117 billion, of which 58% was due to reduced production costs, 42% due to increased productivity [7]. Genetically modified techniques not only help increase productivity and quality of crops but also improve the environment (reducing the use of pesticides, reducing the amount of chemical fertilizer ...) and protecting human health.

The difficulties in the development of peri-urban ecological agriculture include land ownership and land use; lack of funds; search and market access; lack of knowledge and production skills... To solve these difficulties, the USA Agricultural Commission has recommended some policies to ensure long-term commitments for farmers to be assured of production, support the development of production and processing infrastructure, marketing, land planning, giving priority to developing fruit trees and green trees; implementing production technology training programs for farmers and training to raise environmental awareness for farmers. Particularly encourages the important role of awareness education about ecological agriculture and considers it is an important part of regional and urban development plans.

3.3. Experience of Israel

Israel is a country with territory just over 20,000 km², of which 60% is desert, and an annual rainfall of about 50mm, equal to 1/30 of Vietnam, but it is one of the countries with the most developed green agriculture in the world. Israelis produced agriculture with 95% scientific and only 5% labor. With only 2.5% of the population of nearly 8 million people working in agriculture, every year Israel not only provides enough food and high-quality food for themselves but also exports about 3 billion USD of agricultural products. Now they are becoming the world-leading exporters.

Thanks to the application of modern technology, an Israeli farmer provided enough food for 17 people (in 1950), now it has reached 90 people. Thanks to greenhouse cultivation, the tomato yield reached 500 tons/ha/crop, 3 million roses/ha, or 500 tons tomatoes/crop [5]. Israel cultivates in unfavorable natural conditions but it also can supply high quality and output through the application of information technology to effectively manage water resources for agricultural development. Farmers can manage themselves all of the stages from farming, harvesting, storage, and consumption without having to work directly in the field, thanks to the application of information technology. With the harsh natural conditions and water shortage, the government managed the water by promulgating a law to measure water consumption, control the exploitation of underground water, and prevent water pollution. Israel's water treatment technology is one of the most modern in the world, with a recycling rate of up to 75%. Israel's drip irrigation technology has brought surprising effects. It helps to save irrigation water, fertilizer, and increased crop yields.

Agricultural output is constantly growing thanks to research and development, and bold policies and government support. Israel has the largest investment in research in the world, with nearly 100 million USD per year, accounting for about 3% of the national agricultural output. These resources come from the budget and the community, local and national agricultural organizations, and the private sector. Despite its small acreage, Israel has become a major exporter, thanks to applying a new technology model, good governance, and the link between the state, scientists, businesses, and farmers. The scientist is very close to the field and many of them are farmers or direct consultation to farmers. Large agricultural centers, even "agricultural villages" have the presence of research laboratories or representatives of scientific institutions.

Israel's land is strictly controlled by the state. Residential houses are built on rocky slopes or difficult to renovate into agricultural land. While plain land is used for cultivation and farming. Israel is a pioneer in the conversion of the desert into fertile agricultural land. About ecologically, in the 21st century, Israel is the only country in the world that has expanded its forest area and agricultural land.

3.4. Experience of Thailand

Thailand is a country with fairly developed agriculture, with advanced agriculture applying high technology in production. The booming growth of the Thai economy during the 70s and 80s was due to urbanization and suburban agriculture development in Bangkok. Industrial and service activities flourish and are concentrated in the Bangkok area and its periphery. Agricultural activities were pushed to the outer areas and formed concentrated and specialized production areas with the main products of export rice and vegetables to serve the consumption needs of urban residents. Due to the limited agricultural land, Thailand develops agriculture in the direction of promoting the application of advanced scientific and technical and mechanization to renovate the land and hybridize new plant varieties capable of adapting to infertile, dryland areas. So the land fund is effectively used by Thai farmers, both reducing fertilizer imports and improving the export of clean organic agricultural products.

The Thai government has successful policies in supporting agriculture, farmers such as agricultural subsidy policy (such as rice, rubber, fruit, ...). They also buy fertilizer at low prices, free transportation of fertilizers, are provided with new high-yield seeds, and can borrow low-interest loans from agricultural banks. The Thai government has implemented many incentives in terms of capital and increased insurance for farmers, and agricultural taxes have been abolished. The Government supports marketing programs, seeking export addresses of post-harvest and processed products to create the best conditions for the consumption of agricultural products through promoting the form of government contracts with the government. The Thai government has had an initial subsidy policy for processing plants and invested directly in infrastructures such as ports, cold storage, auction floors, and investment in research and development; promote small and medium enterprise development.

Besides, Thailand also pays great attention to technical training, raising awareness for farmers through on-the-job training courses on farming techniques and technology transfer to attract and improve qualifications of agricultural human resources.

4. Lessons for Vietnam

From the practical development of agriculture towards green agriculture of countries in the world, we can draw lessons from the following experiences

Firstly, on the issue of planning, agricultural land use plans. Because this is a huge resource, to effectively exploit the land fund, it is necessary to review and restructure agricultural land to have a detailed plan for each region based on maximizing the potential and benefits. In each place, create specialized land areas, avoid the situation of following the movement so that the farmers fall into the state of being harvested and devalued.

Secondly, high technology decides the efficiency of agricultural production towards green agriculture. Farming today should not only rely on traditional experience but also must rely heavily on technology, on the knowledge of science, researching the needs of the market... By applying information technology, farmers can take the initiative in every stage of agricultural production to find markets, bringing science and technology deeply into all processes from production to harvesting, preservation, processing, and consumption.

The experience of Thailand showed that science and technology not only help to save time but also improve production efficiency. It is modern and contemporary science and technology in stages as well as localities in the country that have helped Thailand to strongly develop many agricultural production industries, freeing labor of farmers, and improving incomes for farmers. In the context of growing population in developing countries and agricultural land being increasingly narrowed, the introduction of modern models and technologies

renovates land to increase productivity is a smart way, plays a key role in ensuring national food security and increasing exports, helping to save energy and water in the production process.

Thirdly, pay attention to the output market for clean, safe, and environmentally friendly agricultural products. Learning from Thailand's experiences, Vietnam needs to develop a comprehensive program for output products; develop a labeling system, logos for clean agricultural products according to VietGap and GlobalGap standards to distinguish them from other common products.

Fourthly, the development of the agricultural economy must be associated with the preservation of natural resources, the environment, and the protection of farmers' livelihoods. The model of organic agriculture in Thailand is worth learning and disseminate experience to farmers to change their production practices in a progressive, environmentally friendly.

Fifthly, promulgate, supplement, and finalize the policies for developing green agriculture. To ensure food security, encourage trade between regions, the state needs to set priority policies for the development of cultivation and husbandry, land policy, support for infrastructure development, land planning. Experience from Thailand, Israel shows that the government always has institutional support, financial and technical assistance, so farmers always have guaranteed income when participating in green agricultural production programs. Because agricultural production is always risky by the impacts of weather and climate factors, so it is necessary for agricultural insurance policies to reduce the risk. In Thailand, agricultural insurance products are open to all farmers and compulsory for borrowers. Compensation for many types of plants, animals from 60% -90% of the average output in previous years. Vietnam can consider implementing agricultural insurance for farmers, especially in situations of crop failure, natural disasters.

Sixthly, the government needs to strengthen its capacity, attach importance to investment in professional training, and scientific research development to support the transition to green agriculture. Experiences from Israel showed that the government has set up a committee for innovation and creation, which has also been realized to schools, research institutes, and enterprises. Farmers or scientists, just need to have innovative ideas, the agencies will support that idea to be actualized into valuable products.

It is necessary to flexibly apply indigenous knowledge to the improvement of methods and structures in the development of green agriculture. For example, knowledge of combining planting with the grazing of ethnic minorities is improving the sustainability of the livestock industry, and increasing income for farmers. Encouraging community participation in the development of green agriculture, Vietnam can learn from experience in building an eco-city, enhances social and cultural responsibilities as well as environmental landscapes.

Developing green agriculture is becoming one of the priorities of many countries in the world. Many models of green agriculture development in the world have been implemented on an increasingly extensive scale and brought about environmental and social efficiency and policy improvement. These successful lessons will be valuable experiences for Vietnam in the process of building green agriculture.

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