High - Tech Agriculture Development in Bac Giang Province, Viet Nam

Nguyen T. Dung, Tran T. Ly, Phung T. M. Hanh, Luong Q. Ngoc, and Nguyen T. Oanh

ABSTRACT

Through analysis of high-tech agriculture development, the research shows that the high-tech agriculture in Bac Giang province, Vietnam are in the stage of rapid development, along with the emergence high-tech agricultural areas in the field of crop production, these models in the province increases and agricultural model applying high technology to produce vegetables in greenhouses. Along with the results of collection and analysis from secondary data sources, the high-tech agriculture shows some shortcomings and limitations.

Keywords: Bac Giang Province, Crop Production, Development, High-Tech Agriculture, Viet Nam

I. INTRODUCTION

Agriculture plays a key role in Vietnam’s economy. However, at present, the land area is increasingly shrinking due to urbanization, climate change and population growth, so the demand for food is constantly increasing... are huge challenges for Agriculture production. Therefore, the development of high-tech agriculture is an inevitable trend, the answer to the development of the country's agriculture. With agriculture 4.0, farmers can use the minimum quantities of water, fertilizers, and pesticides across entire fields (Clercq et al., 2018).

In Western countries, high-tech agriculture is defined as advanced agriculture by employing modern technology, biotechnology, environment, and ecology in order to develop agriculture in a safe and sustainable orientation such as green agriculture, organic agriculture, and ecological agriculture. The main purpose of high-tech agriculture is to produce and supply enough agricultural products to the society in addition to protecting the natural environment (Duong, 2012).

In Vietnam, high-tech agriculture is identified as modern farming methods that reduce the costs of inputs and increase the value of agricultural products in addition to making them safe and environmental-friendly (Duong, 2012; Luu & Nguyen, 2017).

Bac Giang - a province in the Northern Midlands and Mountains has a favorable position because it is located in the transitional position from the mountainous provinces, the Northern Midlands to the Red River Delta provinces and on the Southern Economic - Nam Ninh (China) - Lang Son - Hanoi - Hai Phong - Quang Ninh with agricultural land accounted for 77.5% of the total natural area (about 301,626.7 ha) (Bac Giang Statistical Office, 2020). So agriculture is an advantage location of the province. Although the agricultural sector in Bac Giang province has experienced high and stable growth for a long time, diversifying and moving in a positive direction towards the application of high technology, the average crop yield is still low versus potential. There have been many large, specialized farming areas with key products but only raw products, not yet interested in investing in processing. Agricultural and rural infrastructure has not yet met production needs, the form of production organization is slow to innovate, and the participation of enterprises is still limited. The land fund for agricultural production...
tends to decrease gradually. Along with the trend of industrialization, the movement of labor between industries causes the labor force in agriculture to decrease gradually. In addition, the changes of market demand for agricultural and forestry products are directly affecting people's production activities. These factors have had a significant impact on the development of high-tech agriculture in the field of crop production.

The article studies the current situation of high-tech agriculture development in Bac Giang province, from which, proposes appropriate information, contributing to the academic literature and contributing to the province's socio-economic development.

II. EMPIRICAL ANALYSIS AND DISCUSSION OF RESULTS

A. High-Tech Development Agricultural Areas in the Field Of Crop Production in Bac Giang Province

According to the decision No. 439/QD-UBND dated July 27, 2017 of the People's Committee of Bac Giang province approving the planning of high-tech agriculture area in Bac Giang province to 2025, with orientation to 2030. In which, the field of crop production is planned. High-tech agriculture areas include 14 regions with a total area of 2,665 hectares, with 07 vegetable areas, 02 flower growing areas, 01 tea production area, 02 lychees production areas, 01 citrus fruit production area and 01 production mushroom production. The information about the Agricultural production areas applying high technology in the field of crop production according to planning in Bac Giang has illustrated as table I:

<table>
<thead>
<tr>
<th>No.</th>
<th>Production</th>
<th>Quantity area</th>
<th>Locality</th>
<th>Planned area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vegetables</td>
<td>07</td>
<td>Lang Giang district, Yen Dung district, Tan Yen district, Hiep Hoa district</td>
<td>710</td>
</tr>
<tr>
<td>2</td>
<td>Flowers</td>
<td>02</td>
<td>Bac Giang city, Hiep Hoa district</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>Teas</td>
<td>01</td>
<td>Yen The district</td>
<td>300</td>
</tr>
<tr>
<td>4</td>
<td>Lychees</td>
<td>02</td>
<td>Tan Yen district, Luc Ngan district</td>
<td>800</td>
</tr>
<tr>
<td>5</td>
<td>Citrus fruit trees</td>
<td>01</td>
<td>Luc Ngan district</td>
<td>300</td>
</tr>
<tr>
<td>6</td>
<td>Mushrooms</td>
<td>01</td>
<td>Lang Giang district</td>
<td>05</td>
</tr>
</tbody>
</table>

Source: Bac Giang Department of Agriculture and Rural Development.

Bac Giang has formed many models of land accumulation for concentrated production, specializing in vegetable cultivation, linking production, and consuming products that are formed, operate stably, and have high economic efficiency such as: produce Can vegetables with an area of over 150 hectares in Hoang Luong commune, Hiep Hoa district, with an income of about 400 million VND/ha; safe vegetable production model of Yen Dung clean vegetable cooperative with an area of 30 ha in Tien Dung commune - Yen Dung district with an income of over 500 million VND/ha; model of agricultural cooperative Hung Thinh in Dong Lo commune - Hiep Hoa district with a scale of 30 ha; safe vegetable production model of clean vegetable cooperative Da Mai, Song Mai - Bac Giang city with a scale of over 18.0 ha, generating an income of over 300 million VND/ha. Besides, other organizations In addition, individuals also rent or borrow land from farmers producing processed vegetables in the winter crop with a scale of 5 ha to several hundred ha, through joint production contracts and post-harvest product consumption. Up to now, the province has over 250 models of greenhouses, net houses, and high-tech application models.

B. Agricultural Models Applying High Technology in the Field of Crop Cultivation in Bac Giang Province, Vietnam

1) Production model of safe vegetables and processed vegetables:

The total implementation area is 141 ha (Yen Dung 98 ha, Lang Giang 5 ha, Hiep Hoa 33 ha, Luc Nam 5 ha), reaching 352.5% of the plan. Models have applied technology of net house, membrane house; sprinkler and drip irrigation systems; mechanization of tillage, planting and harvesting; using new varieties, fertilizers and pesticides of biological origin; production according to Viet GAP process, having a contract to associate product consumption with enterprises and cooperatives (cooperatives) for production efficiency to increase by 2-3 times compared to conventional production, typically such as: Model of Yen Dung clean vegetable cooperative, Dong Tam 3 agricultural cooperative in Hiep Hoa district.

The success of the model has had a spillover effect on scaling up production, bringing the total area of safe vegetables and processed vegetables in the province to about 10,724 hectares (in which: Safe vegetables 8,200 hectares, processed vegetables 2,524 hectares), accounting for about 43% of the province's vegetable area, the average income value is from 500-800 million VND/ha/year, an increase of 30-50% compared to 2016; established a number of safe vegetable production areas, concentrated
vegetable processing in districts such as Luc Nam, Viet Yen, Yen Dung, Tan Yen, Hiep Hoa, Lang Giang and Bac Giang city.

2) Production model of flowers:

Deployed in Bac Giang city (Song Mai, Da Mai, Dinh Tri, Tan My) with a scale of 5.5 ha, reaching 275% of the plan. The model used high-quality flower varieties (including: orchid, cymbidium, lily, gerbera, sunflower...), produced in net houses, greenhouses with sprinkler, drip irrigation systems and systems. electric lighting system to regulate temperature and light; products are preserved in cold storage, have product consumption association contracts with businesses and cooperatives inside and outside the province, generating revenue from 3-5 billion VND/ha/year, 2-3 times higher than with conventional production; flower quality is durable, suitable to the tastes of consumers. The model is being deployed and replicated in Bac Giang city and some districts such as Hiep Hoa, Lang Giang, Viet Yen, and Tan Yen.

3) Production model of mushroom:

Deployed in Lang Giang district with a scale of 0.6 ha, reaching 120% of the plan. Mushrooms are produced in cold houses, greenhouses, branded products, trademarks and contracts for consumption. This production model has helped control diseases, improve productivity and product quality, and increase production efficiency by 30-40% compared to conventional production; The model's revenue is from 500-1,500 million VND/year, typically: High-end production model of Toan Cuong Trading and Construction Consultant Joint Stock Company and Anh Tu Mushroom Cooperative... spread over the province (Tan Yen, Viet Yen, Hiep Hoa, Luc Nam, Son Dong) with many new species of mushrooms (Chicken drumstick, Lingzhi, Cordyceps, Son Dong reishi mushroom) put into production. production, is opening new opportunities for the development of the province's mushroom industry in the coming time.

4) Production model of citrus (orange, grapefruit):

Implemented in Luc Ngan district (Kien Thanh, Hong Giang, Thanh Hai, Tan Quang and Tan Moc) with a scale of 35 hectares has reached 116.6% of the plan. Model of using sweet oranges, yellow oranges (high yield, good quality and disease free), fertilizers and pesticides of biological origin, semi-automatic drip irrigation system. applying production processes towards Viet GAP; have product consumption links; Productivity, quality and production efficiency of the model increase by 30-50% compared to conventional production.

The model is being deployed and replicated in the districts of: Luc Ngan, Luc Nam, Hiep Hoa, Tan Yen, Lang Giang, contributing to bringing the area of citrus trees in the province to 9,980 hectares, an increase of 3,682 hectares compared to 2016. , the output in 2019 reached nearly 90 thousand tons, the value reached over 1,500 billion dong.

5) Production model of tea:

Implemented in Yen The district (Xuan Luong, Tam Tien, Canh Nau, Dong Tam) with a scale of 41.32 ha has reached 206.6% of the plan. The model of applying drip irrigation system, new varieties, fertilizers and biological pesticides, produced according to Viet GAP process, associated production with processing and product consumption; increased productivity, quality and efficiency; 20-30% compared to conventional production. The success of the model is the premise to replicate the scale of tea growing in the district up to now to 530 hectares (Production meets Viet GAP standards 17 hectares), the output is over 4,300 tons, becoming a key commodity crop with strengths of the district.

| TABLE II: AGRICULTURAL MODEL APPLYING HIGH TECHNOLOGY TO PRODUCE VEGETABLES IN GREENHOUSES IN BAC GIANGE PROVINCE, VIETNAM |
|---|---|---|---|
| No. | Unit | Year 2018 | Year 2019 | Year 2020 |
| - The number of model | 71 | 126 | 184 |
| - Area (ha) | 15.70 | 27.33 | 40.7 |
| - Average area/model (m²) | 2.210 | 2.168 | 2.213 |

Source: Bac Giang Department of Agriculture and Rural Development.
The models have used new varieties with high quality, productivity and economic value in production, food safety and hygiene products. As a result, every year with a scale of about 2,000m², the revenue is about 600-700 million VND/model, the profit is from 200-300 million VND/model. This has promoted the development of the household economy, contributed to the spillover in production and raised the awareness of farmers in the production of high-tech agricultural products. This is very meaningful in the development of agricultural production and economic development of farmers in particular and the economy of Bac Giang province in general. The table 2 has shown that the agricultural model applying high technology to produce vegetables in greenhouses.

The State has implemented policies to support the construction of net houses and greenhouses, many model owners have boldly put reciprocal capital to invest tens or hundreds of billions of dong to rent land and contribute land to accumulate land to create land for the future, into a large-scale concentrated production area; construction of infrastructure (roads, infield canals, drip irrigation systems, preliminary processing houses, cold storage, power lines...), purchase of seeds, fertilizer materials, hire experts and labor local season.

Production in greenhouses nets minimizes pests and diseases, overcomes adverse weather conditions, plants grow and develop well, with stable high yields; uniform products, beautiful designs, products that ensure food safety meet quality standards, suitable for crops of high economic value such as: cantaloupe, Korean melon, asparagus, tall flowers level (lily, Ho Diep orchid, forest orchid...).

During the production process, most of the owners of the models applied the correct production process according to Viet GAP standards; using plant varieties with high yield and good quality, fertilizers and pesticides of biological and herbal origin; have contracts to associate and sell products with enterprises and cooperatives along the value chain.

Thanks to the synchronous application of greenhouse nets with the use of new varieties, sprinkler and drip irrigation systems, application of Viet GAP production process, and product sales contracts, the yield increased from 30-50% compared to normal production, thereby increasing production value accordingly.

C. Discussion of the results

Along with the results of collection and analysis from secondary data sources, the high-tech agriculture shows some shortcomings and limitations as follows:

Firstly, the growth rate of the agricultural sector is unstable, depending on factors such as weather, climate, epidemics, and consumption market and tends to slow down. Agricultural development is still less sustainable and has not brought into full play the potential and advantages of the locality.

Secondly, the work of strategic planning, planning and development in the agricultural sector is still limited; some forecasting plans are not close to actual production; there are many shortcomings in the management and organization of the implementation of the plan, and production has not closely followed the planning.

Thirdly, the scale of agricultural production is still small and scattered, mainly in the household economy; the rate of mechanization is still low; there are not many concentrated agricultural commodity production areas on a large scale.

Fourthly, productivity, product quality, production efficiency, and competitiveness of many agricultural products are still low; issues of food safety and hygiene, pollution of the production environment in general have not been given due attention; research, application and transfer of science and technology have been paid attention, but the application and replication of effective models is still slow and ineffective; post-harvest preservation and processing is still underdeveloped, most agricultural products are consumed and exported in the form of preliminary processing, so the added value is low; Brand building, product traceability labels have been paid attention, but the maintenance, development, promotion and branding for new products is still limited.

Finally, the forms of production organization in agriculture and rural areas have been slowly reformed; the models of linking production and consumption of products along the value chain are not many, the linkage is not close and unsustainable; production has not been linked with processing, consumption and export.

III. CONCLUSIONS AND RECOMMENDATION

The models have applied and transferred advanced technologies to production, preliminary processing, preservation and consumption of products such as: Using new superior varieties with high economic value; application of advanced water-saving net house, membrane and irrigation technology combined with semi-automatic fertilizer application, soilless production technology (substrate, aeroponics, hydroponics), use of fertilizers, pesticides biological pests in cultivation; application of production management software according to Viet GAP standards, QR Code to trace the origin of agricultural products... A number of high-tech agricultural production areas have been formed from tens of hectares of...
production areas. Products with the province’s strengths such as: vegetable production areas in the communes of Tien Dung, Canh Thuy, Tri Yen, Dong Phuc, and Dong Viet, Yen Dung district; vegetable production area in Hoang Luong commune, vegetable production area in communes: Thuong Thang, Dong Lo, Doan Bai, Hiep Hou district; vegetable production areas in communes: Bao Dai, Tam Di, Luc Nam district...

Along with promoting the application of scientific and technological advances, the reform of the form of production organization in the direction of strengthening joint ventures and associations, associating production development with building brands, consuming products in a chain, stable value is increasingly interested.

Developing high-tech agriculture with farmers as the subject, enterprises and cooperatives as the locomotive - this is a key stage, therefore, it is necessary to plan in a fundamental way in association with building agriculture commodity, modern and sustainable agriculture. Therefore, it is necessary to emphasize the conditions and directions to solve agricultural problems in a radical way, both to ensure the immediate requirements and to meet the long-term development strategy. Bac Giang is an agricultural locality that plays a supporting role for economic development, and at the same time, Bac Giang’s agriculture has its own characteristics. Therefore, the development of agriculture in Bac Giang in the direction of high-tech agriculture is an urgent matter, in accordance with the law of economic development.

CONFLICT OF INTEREST

Authors declare that they do not have any conflict of interest.

REFERENCES

People's Committee of Bac Giang province (2017). Decision No. 439/QD-UBND dated July 27, 2017 of the approving the planning of high-tech agriculture area in Bac Giang province to 2025, with orientation to 2030. Bac Giang, Vietnam.