Effectiveness of Safe Vegetables Production in Thai Binh Province, Vietnam

Van Tuyen Dinh[1], Quang Hien Truong[2], and Junbiao Zhang[3]
[1,3](College of Economics and Management, Huazhong Agricultural University,China)
[1](Thai Binh Department of Science and Technology, Vietnam)
[2](Faculty of Geography - Land Administration, Quy Nhon University, Vietnam)

Abstract: *Thai Binh is a key province for agricultural production of Red River Delta and Vietnam, it has favorable natural conditions for agricultural development and sustainable development of vegetable industry in general and safe vegetables in particular. In this article, based on data collected from agricultural agencies, combined with field surveys, we processed data to analyze the changes in productivity and quality of safe vegetables, at the same time, we use economic indicators to evaluate the effectiveness of safe vegetable production in the province in the period of 2006 - 2016. The results showed that in this period, the area, productivity and quality of safe vegetables in Thai Binh province has increased constantly over the years; In terms of economic performance in 2016, the profit per hectare of safe vegetable production in Thai Binh is about 2 times higher than the national average (30-40 million Vietnam dong/hectare/year). In order to achieve long-term effectiveness for the development of safe vegetable production, appropriate policies are needed to create a sustainable environment for the development of this model. This is a very necessary and meaningful issue, both in science and practice not only in the immediate future but also in the long run in the process of economic development, environmental protection, public health protection.*

Keywords: *Thai Binh, safe vegetables, economic efficiency, environmental protection.*

I. INTRODUCTION

Vegetables are one of the indispensable foods in people's daily meals. Vegetable farming in Vietnam is a long-standing profession, giving higher economic efficiency than rice farming and some other crops. However, food safety is now an urgent issue that needs to be addressed to protect human health. Facing the requirements of sustainably agricultural development and legitimate needs of the people on food hygiene and safety, in the past years, the program of food hygiene and safety in general and the development of safe vegetable production in particular has been implemented in Vietnam, in which Thai Binh is a typical province.

Thai Binh is an agricultural province, located in area of tropical monsoon climate with a four distinct seasons. Therefore, Thai Binh province has a large vegetable farming area and vegetable types are diverse and rich. The program of safe vegetable production in Thai Binh province has been carried out from 1998 to now, and achieved some important results, the safe vegetable products have confirmed their position and have changed the consumers' perception. Farmers' productivity has improved step by step. The average income from vegetable production according to the guideline is 90 - 120 million VND/hectare/year. However, the program of safe vegetable production has not met the target, the output only meets nearly 20% of the consumers' need in the province and cannot be sold according to the price of safe vegetables, supervision capacity of functional agencies and communities are limited; consumers are worried about the origin and quality of safe vegetables.

In this article, we will focus on assessing the status of safe vegetable production in Thai Binh province in the period of 2006 - 2016 on the basis of analysis of changes in area, productivity, yield and quality of safe vegetables; Evaluate the economic efficiency of safe vegetable production over periods based on specific economic indicators; finally, we propose some main feasible solutions for the sustainable development of safe vegetables in Thai Binh province.

II. RESEARCH METHODS

Research Methods

The following research methods are used:

- *Information and data collection method:* Collect data from agricultural agencies such as: Thai Binh Department of Agriculture, Division of Agriculture of districts in Thai Binh province, and we also collect documents and data on the natural and socio-economic conditions, the development of agriculture in Thai Binh province over the past years and from the reports of Thai Binh People's Committee in order to know the orientation of agricultural development in the province in the period 2010-2020 and the master plan for socio-economic development of the commune in the period 2010-2020.

- *Field survey, investigation and interview method:* In addition to study, investigation and interview of farmers on the situation of safe vegetable production (area, output, investment ...), we also go directly to the field to have an overview of the distribution of production models, forms of land use and land use status of the province. From that, we have additional basis for comment on the suitability of this form for provincial agricultural development.
- The interview and survey process was conducted with the following scale: Survey 200 households (200 votes) by a prepared questionnaire. Results of the survey will provide the basis for analysis, synthesis and evaluation of effectiveness of safe vegetables production in the province.
- *Synthesis and analysis method:* Data processing consists of two steps: processing of primary data and processing of secondary data. The data after processing will be aggregated in form of statistics, charts ... on the Microsoft Exel software.

Group of indicators to assess the economic efficiency of safe vegetable production

- Land use efficiency

  Production value = $\frac{Q}{S}$

  In which: Q is the value of goods and services
  S is the area of farming

- Capital use efficiency (H_V)

  $H_V = \frac{Q}{V}$

  In which: Q is the value of goods and services
  V is the total investment capital for production in that year

- Investment costs efficiency (H_D)

  $H_D = \frac{A}{V}$

  In which: A is the profit earned in a production year

III. RESULTS AND DISCUSSION

Overview of studied area

Thai Binh is a coastal delta province, located in the Southern part of the Red River Delta, with three sides abutting on the river and one abutting on the sea; the natural area is 1,647.7 km2 with a total population of 1.7899 million people. Currently, Thai Binh has 1 city, 7 districts, (including 267 communes, 10 wards and 9 towns) (General Statistics Office Of Vietnam, 2016). Be an agricultural province in the Red River Delta (agricultural land occupies 59.5% of the total area), the Province has favorable natural conditions for agricultural development, sustainable development of vegetable industry in general and safe vegetables in particular, including: Geographical location, climate, weather, terrain, soil, rivers, streams, underground water ...

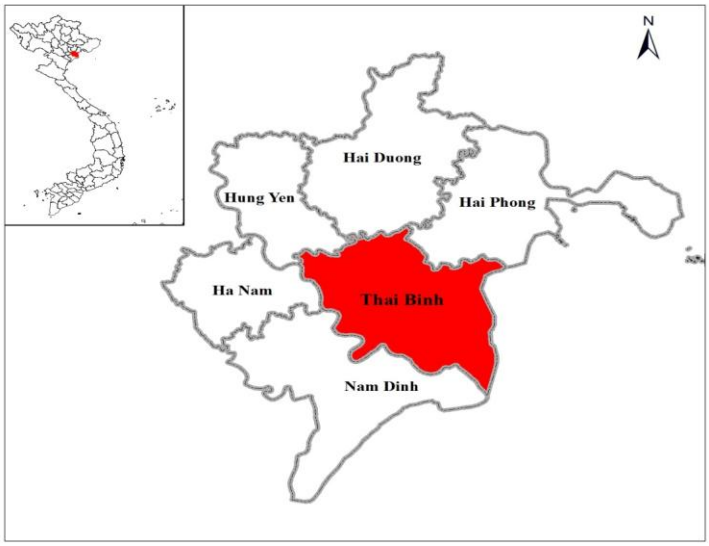

Figure1: Site map of the study area

Thai Binh is located in the area affected by the economic growth triangle: Hanoi - Hai Phong - Quang Ninh; corridor: Hai Phong - Hanoi - Lang Son - Nam Dinh and economic belt along the Gulf of Tonkin, and has the sea way and river systems favorable for economic exchanges. With such geographical position, Thai Binh

has favorable conditions to develop large-scale commodity production and expand economic and social exchanges with other provinces in the region, in the country and foreign countries.

Situation of developing safe vegetable production in Thai Binh province

❖ *Situation of the area, productivity, output of vegetables and safe vegetables*

Table1: Situation of the area, productivity, output of vegetables and safe vegetables of Thai Binh province

Year	Area			Productivity			Output		
	Ve (ha)	SVe(ha)	SVe/Ve (%)	Ve (ha)	SVe(ha)	SVe/Ve (%)	Ve (ha)	SVe(ha)	SVe/Ve (%)
2006	24035	250.20	1.04	24.146	20.25	83.86	580349.11	5066.55	0.87
2007	24716	347.30	1.41	24.336	19.27	79.18	601488.58	6692.47	1.11
2008	25042	362.70	1.45	23.085	19.52	84.56	578094.57	7079.90	1.22
2009	25 192	458.20	1.82	25.161	19.27	76.59	633855.91	8829.51	1.39
2010	27 645	695.70	2.52	25.440	20.35	79.99	703288.80	14157.50	2.01
2011	28 248	893.00	3.16	25.503	20.15	79.01	720408.74	17993.95	2.50
2012	32 745	917.30	2.80	25.249	20.35	80.60	826778.51	18667.06	2.26
2013	31 612	1253.30	3.96	24.827	19.85	79.95	784831.12	24878.01	3.17
2014	38 315	1420.50	3.71	24.896	20.53	82.46	953890.24	29162.87	3.06
2015	37 049	1507.50	4.07	25.200	20.45	81.15	933634.80	30828.38	3.30
2016	38 241	2103.50	5.50	24.813	21.16	85.28	948873.93	44510.06	4.69

Source: Thai Binh Statistical Yearbook and survey data

Note: Vegetables (Ve); Safe vegetables (SVe)

According to the above table, the area of safe vegetables farming in the whole province tends to increase rapidly in recent years with stable growth rate. Thai Binh City with fast characteristics of information, scientific and technological level and consumers' demand, so safe vegetable production is developed soon. In recent years, with the development and expansion of urban areas, agricultural land has been rapidly decreasing, the area of safe vegetable farming tends to level off, accounting for over 20% of the area of common vegetable farming.

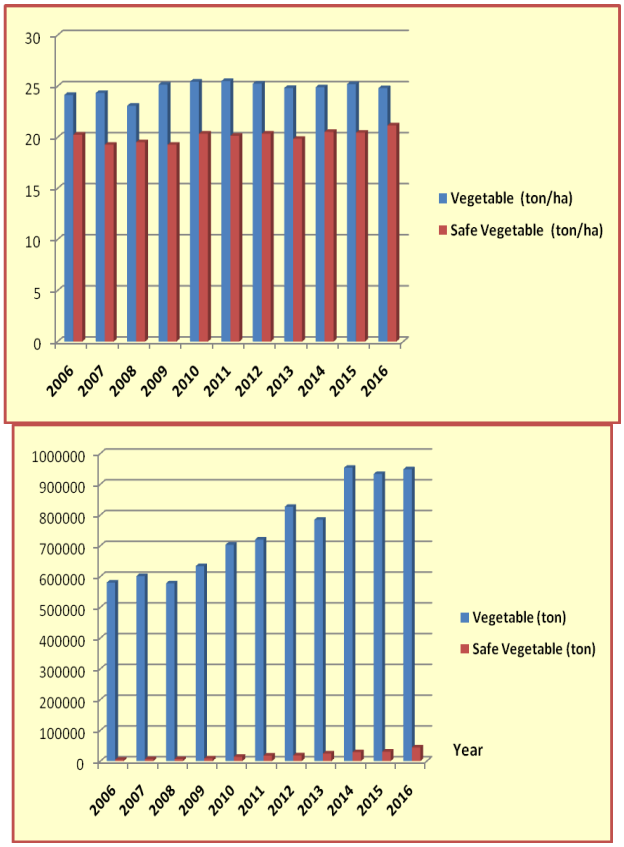

Figure2. Graph of productivity and output of vegetables and safe vegetables

In general, safe vegetable yield of the province is lower than normal vegetable yield, only about 80% of normal vegetable yield. The reason is that the process of safe vegetable production of the city invested equipment, conditions of production, level of farming is better than the other districts.

Along with the increasing trend of area and productivity, the yield of province's safe vegetable production has tended to increase rapidly, in 2006 the yield of safe vegetable production in Thai Binh reached only 5066.55 tons, but in 2016 reached 44510.06 tons. Thus, within 10 years, yield of safe vegetables has increased nearly 9 times. However, it only occupies 4.69% of normal vegetable yield. Therefore, along with the development of society and the increasing demand for safe vegetables, the potential for safe vegetable production is still great.

Quality of safe vegetables in Thai Binh

From 2006 to 2016, Thai Binh province organized interdisciplinary inspection teams, inspectorate of Department of Agriculture and Rural Development, Department of Health to inspect and check. However, the province has not been able to appoint technicians to guide and supervise the technical procedures in the vegetable production areas as well as safe vegetables in the province. In 2010, the Certificate of Eligibility for safe vegetable production was issued to organizations and individuals in need. Sampling activity for analysis of pesticide residues and heavy metals, nitrate content, harmful microorganisms on safe vegetables in the above areas has not been conducted in a relatively uniform manner. In these areas, the number of vegetable samples that do not meet food hygiene and safety standards also fluctuates greatly.

❖ *Pesticide residues in safe vegetables*

Along with the development of science and technology and production, the market as well as types of pesticides are abundant and diverse. The authorities also have many difficulties in controlling this item. Moreover, the producers also use a very arbitrary, rampant way. Therefore, if it does not follow the technical procedures in production and consumption, it will lead to excess pesticide residue in vegetables, affect the quality of vegetables, directly affect the health of consumers.

Table2: Analysis results of pesticide residues in safe vegetables

Year	Some samples were taken	Samples do not meet	
		Quantity	Percentage (%)
2006	24	4	16.67
2007	38	2	5.26
2008	12	0	0.00
2009	150	9	6.00
2010	130	2	1.54
2011	158	25	15.82
2012	86	4	4.65
2013	55	5	9.09
2014	145	8	5.52
2015	430	25	5.81
2016	240	15	6.25

Source: Thai Binh Plant Protection Division

The above table shows the analysis results of pesticide residues in tested safe vegetable samples from 2006 to 2016. Although the number of unsatisfactory samples has been decreasing over the years. However, some samples did not meet the permitted standards. It shows that a small number of producers still do not comply with the requirements of the production process.

❖ *Development of heavy metals in safe vegetables*

Residual heavy metals in food in general as well as safe vegetables in particular can cause acute or chronic toxic effects on humans. There are many ways to lead to the presence of heavy metals that exceeds the allowable limit in vegetables such as: land contaminated with heavy metals, water for watering vegetables contaminated with heavy metals, water for washing vegetables after harvesting contaminated with heavy metals, fertilizers containing heavy metals, residual heavy metals in seeds, ...

Table 3. Results of sample analysis of heavy metals content in safe vegetables

Year	Some samples were taken	Samples do not meet	
		Quantity	Percentage (%)
2006	30	3	10.0
2007	28	2	7.14
2008	40	3	7.5
2009	120	6	5.00
2010	160	2	1.25
2011	130	4	3.08
2012	56	2	3.57
2013	75	3	4.00
2014	120	3	2.50
2015	250	6	2.40

Year	Some samples were taken	Samples do not meet	
		Quantity	Percentage (%)
2016	180	1	0.56

Sources: departments of food safety Thai Binh province

According to the above results of table, the number of safe vegetable samples contaminated with heavy metal content exceeding the allowable limit is very low and decreases through the years of research. Moreover, land and water used for safe vegetables in Thai Binh do not contaminate with heavy metals. It is therefore necessary to further enhance the awareness of the producers as well as distributors of technical compliance in production and distribution of safe vegetables.

❖ *Development of Nitrate content (NO3-) in safe vegetables*

Nitrate (NO3-) is one of the most dangerous chemical pollution risks with human health that so far little known. If Nitrate accumulated in the body exceeds the tolerance of humans, it will produce cancer. Through the process of local sample survey, we synthesized and analyzed the following results:

Table 4. Results of sample analysis of Nitrate content (NO3-) in safe vegetables

Year	Some samples were taken	Samples do not meet	
		Quantity	Percentage (%)
2006	50	11	22.00
2007	24	3	12.50
2008	33	4	12.12
2009	163	11	6.75
2010	137	23	16.79
2011	142	27	19.01
2012	70	5	7.14
2013	45	2	4.44
2014	160	12	7.50
2015	305	23	7.54
2016	256	16	6.25

Sources: Departments of food safety Thai Binh province

Based on the synthesized results of the above analysis, there are still a number of producers who do not fully comply with the technical procedures for safe vegetables. It led to the residue of Nitrate (NO3-) in safe vegetables in samples analyzed in Thai Binh province.

Currently, people use too much chemical fertilizers in their production, especially nitrogenous fertilizer because it helps to make vegetables greener and more eye-catching and improve yield. So vegetable growners must use nitrogenous fertilizer, they think that nitrogenous fertilizer is a very important factor. The arbitrary use of nitrogenous fertilizer without balance with other fertilizers make the accumulated nitrate content high in vegetables affecting consumers' health. Thus, it is necessary to change perceptions of producer, direct for them a new direction and encourage people to use organic fertilizers, bio-fertilizers to limit to use the nitrogenous fertilizer but still obtain high efficiency of farming. In addition, it is necessary to focus on communicating to producers as well as consumers to comply strictly with technical procedures in production and how to realize the unsafe vegetables for consumers.

Economic efficiency of safe vegetable production in Thai Binh province

Compare the economic efficiency of 1 hectare for safe vegetable production and 1 hectare for normal vegetable production in farmer households. Compared results shows that: Added value obtained between safe and normal vegetable production is not significantly different, especially in case yield of safe vegetables only consumes from 20-30% with higher price than normal vegetables of about 10%. If safe vegetables may be sold with the desired price, the safe vegetable production will create the higher economic efficieny than normal vegetable production of about 4.8%.

Value of working day of normal vegetable growners is usually higher than safe vegetable growners. This is a big obstacle in safe vegetable development under small scale because the farmers still make a profit by the sale of their own work. Apparently, ecomonic efficiency is a big obstacle for sustainable development of safe vegetables if people do it at small and separate scale

Based on the specific formulas of the indicators of economic efficiency in agriculture presented in the research methods, we have summarized the following data:

Table5: Effectiveness of normal and safe vegetable production on 1 hectare of studied objects

Indicators	Unit	Safe vegetable growners	Normal vegetable growners
Production value	Thousand VND	126,821.00	131,503.00
Intermediate costs	Thousand VND	33,415.00	39,872.00
Total costs	Thousand VND	42,538.00	46,317.00

Added value	Thousand VND	93,406.00	91,631.00
Average gross income	Thousand VND	84,283.00	85,186.00
Production value/intermediate costs	Time	3.79	3.39
Added value/average intermediate costs	Time	2.79	2.29
Gross income/average intermediate costs	Time	2.52	2.16
Production value/average labor fee	Time	497.33	865.15
Added value/average labor fee	Time	366.29	602,83
Gross income/average labor fee	Time	330.52	560.43

Source: Compiled from the survey data in 2016

In general, the farmers have effectively utilized their existing land area for production and business and have generated a significant increase in profit, compared to the whole country, earned profit per one hectare of vegetable production in Thai Binh province is relatively high. According to statistical analysis, at present, the average profit/ha of safe vegetable production models is 30-40 million VND/ha/year throughout the country. Thus, the profit per hectare of safe vegetable production in Thai Binh is about 2 times higher than the national average.

The causes of the sharp increase of efficiency of safe vegetable production in Thai Binh in recent years is that the Vietnamese Government was issued policies to strengthen and develop of safe vegetable production in 2010 and there are measures to support capital, techniques for this activity, at the same time, people aslo pay attention to investing in safe vegetable production to create high economic efficiency.

According to some experts, if only 20 - 30% of safe vegetables is sold at safe vegetable prices, the enterprises will not be profitable and will even suffer losses and will not attract businesses participating in the safe vegetable development program; If 100% of vegetable yield is sold at safe vegetable price, the businesses will be profitable, economic efficiency is higher than normal vegetable of over 55%; interest rates are over 12% and are eligible for asset depreciation and reinvestment of production.

Some main solutions for sustainable development of safe vegetables in Thai Binh area

To provide solutions for improving the efficiency of safe vegetable production in Thai Binh province, we have based on the survey results of the production and consumption of safe vegetables in the province in the recent years, also we have based on the socio-economic development orientation and agricultural development orientation of Thai Binh province in the period 2010-2020. Some solutions for sustainable development of safe vegetables in Thai Binh province are as follows:

1. It is necessary to develop and implement the regulations and policies to encourage the development of safe vegetable production and consumption, helping farmers feel secure in producing vegetables and output of products.
2. Plan properly the safe vegetable areas, invest in infrastructure for production and consumption of safe vegetables to create a modern and professional production model.
3. Support techniques for the production and consumption of safe vegetables such as: support to improve production skills and active thinking of advanced application; support to promote the rapid expansion of safe vegetable production under VietGAP and GAP; raise awareness of people's self-awareness through propaganda, community supervision ...
4. Complete types of organizations producing and consuming safe vegetables: Support from the State, specifically from Thai Binh Provincial People's Committee and local authorities, promote internal strength and self-awareness of organizations and individuals involved in safe vegetable production and trading; in addition, it links to expand the area of safe vegetable production.
5. Promote consumption of safe vegetables such as: Encourage the development of safe vegetable distribution channels, support the creation, maintenance and development of the safe vegetable brand, conduct marketing activities, promote joint ventures and linkages in safe vegetable consumption, review and study the issuance of penalties for handling violations.
6. Promote the management and supervision of the quality of safe vegetables: Enhance the effectiveness of State management in the field of safe vegetable production and trading, consolidate and maintain effective operation of monitoring forms
7. Communication and propaganda about safe vegetables: It is necessary to develop the website, special subjects to convey information to farmers and interested persons; recommend consumers, producers to actively support to develop the program; enhance the awareness of producers and consumers on quality of safe vegetables.

These are specific solutions to promote the potential of human resources, land potential and market demand for the development of safe vegetable production in Thai Binh province. In order to do that, there should be participation of authorities, technical staff, businesses and farmers. This will create a good environment for safe vegetable production, ensure sustainability on economic, social and environmental issues, provide a high and stable source of income for farmers in the area.

IV. CONCLUSION

Based on the research on the development of safe vegetable production in Thai Binh province, we see, from 2006 to 2016, the area, yield and quality of safe vegetables tended to increase but not stable, infrastructure for production is poor, it only meets the requirements of production, technical support for production is scattered, after support cannot expand. The economic efficiency of safe vegetables production in the province has achieved high results compared to the whole country, but still low, the content of plant protection substances, content of Nitrate and heavy metal residues in vegetables are guaranteed to the permissible limit. In order to achieve sustainable development for safe vegetable production, appropriate policies are needed to create a sustainable environment for the development of this type. This is a very necessary and meaningful issue both in science and practice not only in the immediate future but also in the long run in the process of economic development, environmental protection, public health protection.

V. REFERENCES

[1] Dinh Van Dan, Duong Van Hieu and CS; Production economics curriculum, Hanoi University of Agriculture, Financial Publishing House 2010

[2] General Statistics Office of Vietnam in Thai Binh, Thai Binh Statistical Yearbook. Statistical Publishing House, 2006-2016.

[3] Hoang Bang An (2008), Research on production and consumption of green vegetables in Hanoi. Master's dissertation on Economics, Hanoi University of Agriculture.

[4] Ministry of Agriculture & Rural Development (2007), Decision no.: 106/2007/QD - BNN, dated 28/12/2007, Regulations on production management and trading in safe vegetables.

[5] Ministry of Agriculture & Rural Development (2008), Regulations on production management and trading in safe vegetables and fruits promulgated together with Decision no.: 99/2008/QD-BNN, dated 15/10/2008.

[6] Ministry of Agriculture & Rural Development (1998), Decision no.: 67/1998/QD-BNN - KHKT dated 22/4/1998 of Ministry of Agriculture & Rural Development on "Temporary regulations on safe vegetable production".

[7] Ministry of Agriculture & Rural Development (2007), Decision no.: 04/2007/QD-BNN, dated 29/01/2007 on promulgating: Regulations on production management and certification of safe vegetables

[8] Ministry of Agriculture & Rural Development (2010). Regulations on production management and trading in safe vegetables.

[9] Ministry of Agriculture & Rural Development, 2009, Circular no. 59/2009/TT-BNNPTNT, dated 09/9/2009 on: Guiding the implementation of a number of articles of Decision no.: 107/2008/QD-TTg dated 30/7/2008 of the Prime Minister on some policies to support production, processing and consumption of safe vegetables, fruits and tea until 2015.

[10] Nguyen Hong Anh (2009), Study on improving the safe vegetable production techniques for some main vegetables in Hanoi, Scientific Research Topic, Plant Protection Division, Hanoi.

[11] Nguyen Tan Loc (2015), Development of the consumption channels through Markets and supermarkets system in Hanoi; Doctor's dissertation in Agricultural Economics.

[12] Nguyen The Hung (2008), Research for risks in production and consumption of vegetable producers in Gia Lam district - Hanoi, Master's dissertation of Economics, Hanoi University of Agriculture.

[13] Nguyen Thi Minh Hien, Dinh Van Dan (2010), International trade of vegetables and fruits industry, landscapes, Agricultural Publishing House, Hanoi.

[14] Pham Bao Duong (2012), Study and propose solutions to improve the feasibility of a number of agricultural development policies in Hanoi, Hanoi University of Agriculture

[15] Statistical yearbook of Thai Binh province from 2012 to 2016.

[16] Ta Thu Cuc (2007). Textbook of vegetables. Agricultural Publishing House, Hanoi.

[17] Thai Binh People's Committee (2015) Decision no.: 3312/QD-UBND dated 29/12/2015 of Thai Binh People's Committee on approval of the project of restructure Thai Binh Agriculture to 2020, vision to 2030.

[18] Tran Khac Thi (2003), Growing techniques and preservation and processing technologies of some vegetables and flowers for export. Final report on scientific research topic at ministerial level.