THE TWENTY-YEAR AGRICULTURE AND COOPERATIVE STRATEGY

(2017-2036)

AND

THE FIVE-YEAR AGRICULTURE DEVELOPMENT PLAN

UNDER

THE TWELFTH NATIONAL ECONOMIC AND SOCIAL DEVELOPMENT PLAN

(2017-2021)

Ministry of Agriculture and Cooperatives

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Foreword

The Cabinet on June 30, 2015 took note of the guidelines for the preparation of the 20–Year National Strategy (2017–2036). As a result, all concerned government agencies were requested to study the framework and guidelines used in the preparation and collect all the required data for future uses. Consequently the Ministry of Agriculture and Cooperatives has prepared the 20–Year Agriculture and Cooperatives Strategy for the years 2017–2036 as the outlines in preparing the country's long–term agricultural and cooperatives development in line with other major national development plan, namely, the 20–Year National Strategy, the Twelfth National Economic and Social Development Plan (2017–2021) and the country's Sustainable Development Goals (SDGs).

The timeframe for the 20–Year Agriculture and Cooperatives Strategy consists of four phases of the 5–Year Agricultural Development plan of the 20–Year National Strategy detailed in the National Economic and Social Development Plan prepared by Office of the National Economics and Social Development Board. For the first five years, the Ministry of Agriculture and Cooperatives has prepared the Agricultural Development Plan under the Twelfth National Economic and Social Development Plan (2017–2021) guided by the 20–Year Agriculture and Cooperatives Strategy (2017–2036) with the view to steering national agricultural development toward fulfilling the national targets of secure farmers, affluent farm sector, and sustainable agricultural resources, which will together serve as the significant mechanism in leading the country as a whole toward economic and social security, prosperity and sustainability.

Office of Agricultural Economics

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SECTION 1

THE 20-YEAR AGRICULTURE AND COOPERATIVES STRATEGY

(2017-2036)

SECTION 1

The 20–Year Agricultural and Cooperatives Strategy (2017–2036)

Long–term development framework in the form of the 20–year National Strategy has been initiated in Thailand to lead the country toward its security, prosperity and sustainability. The Principles of the Sufficiency Economy Philosophy have been followed to draw its developmental path toward the national interests of being a country of happy people, high income level, and developed economy with stability, equality, and fairness as well as economic competitiveness. The 20–Year National Strategy consists of six areas. These are: 1) National security; 2) Competitiveness enhancement; 3) Development and Empowerment of Human Capital; 4) Broadening Opportunity and Equality in social; 5) Environmental–friendly development and growth; and 6) Reforming and Improving Government Administration. The long–term 20–year National Strategy is divided into several 5–year operational plans, starting with the Twelfth National Economic and Social Development Plan (2017 – 2021) covering ten strategies, six to activate the National Strategy, and four to support their materialization. These ten strategies are: 1) Strengthening and Developing the Potential of Human Capital; 2) Creating a Just Society and Reducing Inequality; 3) Strengthening Sustainable Economic Development and Competitiveness; 4) Green Growth for Sustainable Development; 5) National Security for the Country's Development towards Prosperity and Sustainability; 6) Public Administration, Corruption Prevention, and Good Governance in Thai Society; 7) Advancing Infrastructure and Logistics; 8) Science, Technology, Research, and Innovation Development; 9) Regional, Urban, and Economic Zone Development; and 10) International Cooperation for Development.

The 20–Year Agricultural and Cooperatives Strategy (2017–2036)

Thailand's agriculture sector has consistently played a vital role as the major source of agricultural production for both domestic consumption and exports to other countries around the world. At the same time, it has also served as the employment hub of surplus labor during several economic crises in the past. This has blessed Thailand in terms of its food security and export earnings all along. Nevertheless, the Thai agriculture sector still faces a number of problems, namely, unstable prices of agricultural products, inappropriate use of farm inputs,

depleted natural resources, and large indebtedness. Despite all the directions and measures extended to them by the governments, most of the directions and measures were of short–term, inconsistent and immediate natures. To lay a foundation for long–term development leading to systematic growth and solutions to the problems, the Ministry of Agriculture and Cooperatives has prepared the 20–year Agriculture and Cooperatives Strategy (2017–2036) for use as an agenda for continuous and efficient operation of the development in the agriculture sector. The Ministry of Agriculture and Cooperatives Strategy is not only in consonant with the 20–year National Strategy and the Twelfth Plan (2017–2021), but also with the Reform Plan of the National Reform Steering Assembly (NRSA) and the UN Sustainable Development Goals (SDGs).

Based on an assessment of world population situation and trend, the present agricultural technology and innovations of global interest include substitution of farm machineries for farm labors; the use of technology and innovations in increasing crop yields, indoor control of environment for year–round production, and etc. Above when coupled with a review of past and present agricultural situations has led to the following points of consideration for preparing a long–term agricultural development plan for Thailand: **Assisting farmers and their associations** in accessing required data and in group organization; **increasing yields** under the constrains on the size of landholdings which is expected to become smaller in the future; **Farm input** dilemma in the forms of aging farm labor and decreasing number of new farmer generation; depleted quality of land and water resources due to their inappropriate practice in the past; the low potential irrigation land, the limitations of small farmers in mechanization, the need for technological development and innovations all through the supply chain, starting from supply of farm inputs, processing, packaging and logistical operations. In addition **the problems of farmers' indebtedness and landlessness** having emanated from their past performances are yet to be straightened. As to agricultural products, their **marketing qualities and standards** need to be emphasized and continuously improved to meet the ASEAN and the world standards. **Value addition** and high quality of agricultural products like organic farm products are needed to elevate them from the low–level markets and increase the competitiveness of the Thai agriculture sector. Since the agriculture sector still has to depend greatly on natural resources and the environment, **restoration and conservation of natural resources** and production of environmentally friendly products need to be promoted along with the Good Agriculture Practices (GAP) techniques. Presently, the agriculture sector is facing an increasing trend of environment destruction globally

known as the climate change. Research studies in search of solutions to the problems are therefore needed, especially on the required adaptation to mitigate the unavoidable effects. Increased budgets for research and development to build up new bodies of knowledge and to develop more agricultural technologies and innovations are thus required. All the aforementioned issues depend on **good and efficient governance** in respect of the government, especially on the improved organizational structures and missions of related organizations in the form of better, modern and relevant regulations and legislations.

The 20–year Agriculture and Cooperatives Strategy (2017–2036) aims to augment the strength being contributive to, and remove the weakness hindering, long–term agricultural development, the visions of which are "**Secured Farmers, Prosperous Agriculture Sector and Sustainable Agricultural Resources**". The aims are expected to be fulfilled by strengthening farmers and their institutions; increasing agricultural productivity and quality standards of farm products, promoting the competitiveness of the agriculture sector through technological improvement and innovation, balanced and sustainable management of agricultural resources and the environment, and development of governmental management administration system.

Key issues in the 20–year Agriculture and Cooperatives Strategy (2017–2036). Brainstorming of views from related agencies in the MOAC, along with challenges and environmental analysis, has yielded the following key issues in the Thai agriculture sector to be further tackled and developed under the following long–term directions:

1. Problems and Challenges

1.1 National

1) Most farmers have less access to required information which is reliable. They are also seriously indebted and landless. Their organizations are weak with low bargaining power, not to mention their entering into the ageing society with decreasing number of successors to take on their agriculture profession.

2) Their already low productivity and high production costs due to inappropriate use of production inputs are further hampered by the increasing trade barriers in the forms of product standardization, consumer safety, and environmental protection.

3) Limited agricultural researches, technological development and innovations, along with inadequate access to the latest information and data not yet made available to those who need them.

4) Increasing natural disasters and impact of climate change due to depleted natural resources arising out of inappropriate farming practice like repetitive mono–cropping with no rotations, planting of crops on unsuitable land areas, and crop growing on steep sloping landscape or hillside of encroached forest and watersheds.

5) Most of the state policies, programs and projects in the past were short term with no continuity. Often they were launched to solve immediate problems with no collaborations among concerned ministries.

2) Overseas

1) As forecast by the United Nations, the world population at the present trend of population growth will rise from 7,000 to 9,000 million in the next 20 years. This will substantially increase future world food demand. Nevertheless, the present rapid growth in food production technology and innovations at the global level is believed to blow the efficiency of world food production that matches its rising demand.

2) The world now is stepping into the ageing society. This will enhance the demand for health food. Consumers tend to use the more convenient channel of on–line purchase of commodities including that of food. This more efficient communication between consumers and food suppliers will also blow up international trade competition.

3) Regional regrouping of countries for economic and trade cooperation, along with the changes in the Great Power countries due to changes in their leaders will all lead to domestic policy changes which will affect the world economy.

4) Climate change is a major factor attracting the global interests in terms it its effects on world food production.

2. SWOT Analysis

Strengths

Thailand is a leading agricultural exporting country of the world in terms of rice, rubber and cassava. Thai farmers in different localities have inherited their local wisdoms in agricultural production from their forefathers. They have also adopted the Sufficiency Economy Philosophy and the New Theory Agriculture initiated by the Late King Rama IX as their self–immunity. Geographically, Thailand has gained its strength from being situated in the land of suitable environment for diversified agricultural production.

Weaknesses

Most of the agricultural land in Thailand (119 million rai or around 80% of its total agricultural land) is rain-fed. Among the crops grown in the rain-fed area include 8 million rai of paddy. Many crops are sold as raw produce at low prices. These are paddy, rubber, oil palm, and cassava. The majority of Thai farmers are small holders, many of whom are landless, poor and lack of technology in administering their production. Their institutional groupings are seen but most lack their bargaining power.

Opportunities

The increasing world population has given rise to exploding global demand for food, especially food safety, which Thailand has an ample potential to produce. Its research works, information technology and innovations are very much advancing and easily accessible throughout the country. These are useful to its agriculture sector in reducing production costs and adding value.

Threats

Fluctuations in the world economic situations, coupled with tougher market competition and trade barriers, rougher and more frequent natural disasters, have urged countries around the world to issue stronger protection of their agriculture sector.

3. Principles and Concepts

1) Farmers have up-to-date information, knowledge, and the ability to be self-reliant, while their associations serve as the major mechanism in mobilizing the agriculture sector on the basis of the Sufficiency Economy Philosophy and the Science of the King.

2) Marketing leads the production process toward quality products taking into consideration their safety standards under the stable growth of the agriculture sector made possible by research works and technology/innovations which are applicable to the local body of knowledge and wisdom.

3) Efficient management administration of the agricultural areas through appropriate adjustment of the production that matches with the potentials of the area using appropriate technology / innovations like Agri-Map and Application.

4. Vision

"Secured Farmers, Prosperous Agriculture Sector and Sustainable Agricultural Resources."

5. Goals is Thai farmers escape from the Middle Income trap by having the average National Income per head of more than 13,000 US$ or 390,000 baht in the year 2036.

1) Farmers specialize in their professions. (Smart Farmer)
2) Farmer institutions have an efficiency in management. (Smart Agricultural Group)
3) Quality of agricultural product serve customers need. (Smart Agricultural Product)
4) Agricultural area and sector have potential. (Smart Area / Agriculture)

6. Strategies

The 20–year Agriculture and Cooperatives Strategy (2017–2036) comprising the following five strategies:

Strategy 1: Strengthening the Farmers and Farmer Institutions.

Targets

1) Average farmer income of 390,000 baht per person.
2) All farmers become Smart Farmers.
3) 95% of farmer institutions are strong in the level 1 and 2.

Development Directions

1) Strengthening farmers and farmer institutions to become Smart Farmers, and Smart Groups with Smart Enterprises.
2) Promoting pride and security in the agricultural profession.
3) Applying innovations and technology in farm labor management.

Indicators

1) Farmer income (baht per person)
2) Percentage of farmers in the 18–64 age group becoming Smart Farmers.
3) Percentage of farmer institutions having standard strength.
   - For the cooperatives of levels 1 and 2
   - For all the community enterprises.

4) Number of farmers being members of agricultural institutions.

- Membership of agricultural cooperatives and farmer groups.
- Membership of agricultural enterprises (15 members/group on average)

5) The Farmer Happiness Index.

Strategy 2: Increasing the Productivity and Quality Standards of Agricultural Commodities.

Targets

1) An increase in the agricultural GDP of not less than 3% per year.
2) Standardized farms, factories and business establishments.
3) 14,600 large–scale farming (90 million rai)

Development Directions

1) Develop of product quality and production efficiency.
2) Promote agriculture throughout its supply chains with the requirements of the market.

Indicators

1) An increase in the Agricultural GDP (% per annum)
2) Percentages of farms, factories, and business establishments under the Ministry of Agriculture and Cooperatives applying for and granted the quality standard certificates.
   - Percentage of numbers of plots/farm : crops / fishing / livestock.
   - Percentage of factories/establishments (GMP/others) : crops / fishing / livestock.
3) Number of large–scale farms (field crops / horticultural crops / livestock / fisheries)
4) Number of plots having been adjusted along the Agri–Map.
5) Growth rate of export values of agricultural products and commodities.

Strategy 3: Increasing Competitiveness in the Agriculture Sector through Technology and Innovations.

Targets

1) 80% of completed research works, new technologies and innovations are implemented.

2) All farmers have access to and are able to apply research works, technologies, and innovations to their own benefits.

Development Directions

1) Develop technology and innovations to drive Agriculture 4.0 under the Thailand 4.0 Economic Model.

2) Manage the agricultural information technology for ready access and utilization of farmers.

3) Develop agricultural research works and information toward their commercialization.

Indicators

1) Proportions of research budget of the Ministry of Agriculture and Cooperatives to its overall annual budget.

2) Percentages of research works, technologies and innovations having been further developed for their application.

3) Percentages of farmers and transferees of new technologies and innovations who have applied them.

Strategy 4: Balanced and Sustainable Management of Agricultural Resources and the Environment.

Targets

1) 10 million rai of sustainable agricultural areas.

2) 2 million rai per year of conserved, improved and revived farm land.

3) 49.52 million rai of irrigated farm land.

Development Directions

1) Sustainably manage agricultural resources.

2) Balanced and sustainably revive and conserve agricultural resources.

Indicators

1) Acreages of sustainable agricultural land.

2) Acreages of conserved, improved and revived agricultural land.

3) Acreages of irrigated farm land.

4) Acreages of agricultural land nurtured by non–irrigation sources of water.

Strategy 5: Development of Public Administration System.

Targets

1) Every government officer is Smart Officer.

2) Improved and developed MOAC organizational structure.

3) Improved and developed legislation.

Development Directions

1) Develop all government personnel to become Smart Officers and Smart Researchers.

2) Link and integrate the works of all agencies in all sectors using the Civil State mechanism and modern administration system.

3) Improve and develop agriculture legislations to cope with the contextual changes.

Indicators

1) Percentage of MOAC officers being Smart Officers.

2) Number of agencies under the Ministry of Agriculture and Cooperatives having been organizationally restructured.

3) Number of legislations having been drafted, revised and improved.

- Number of newly enacted legislations.

- Number of legislations having reviewed, revised and improve.

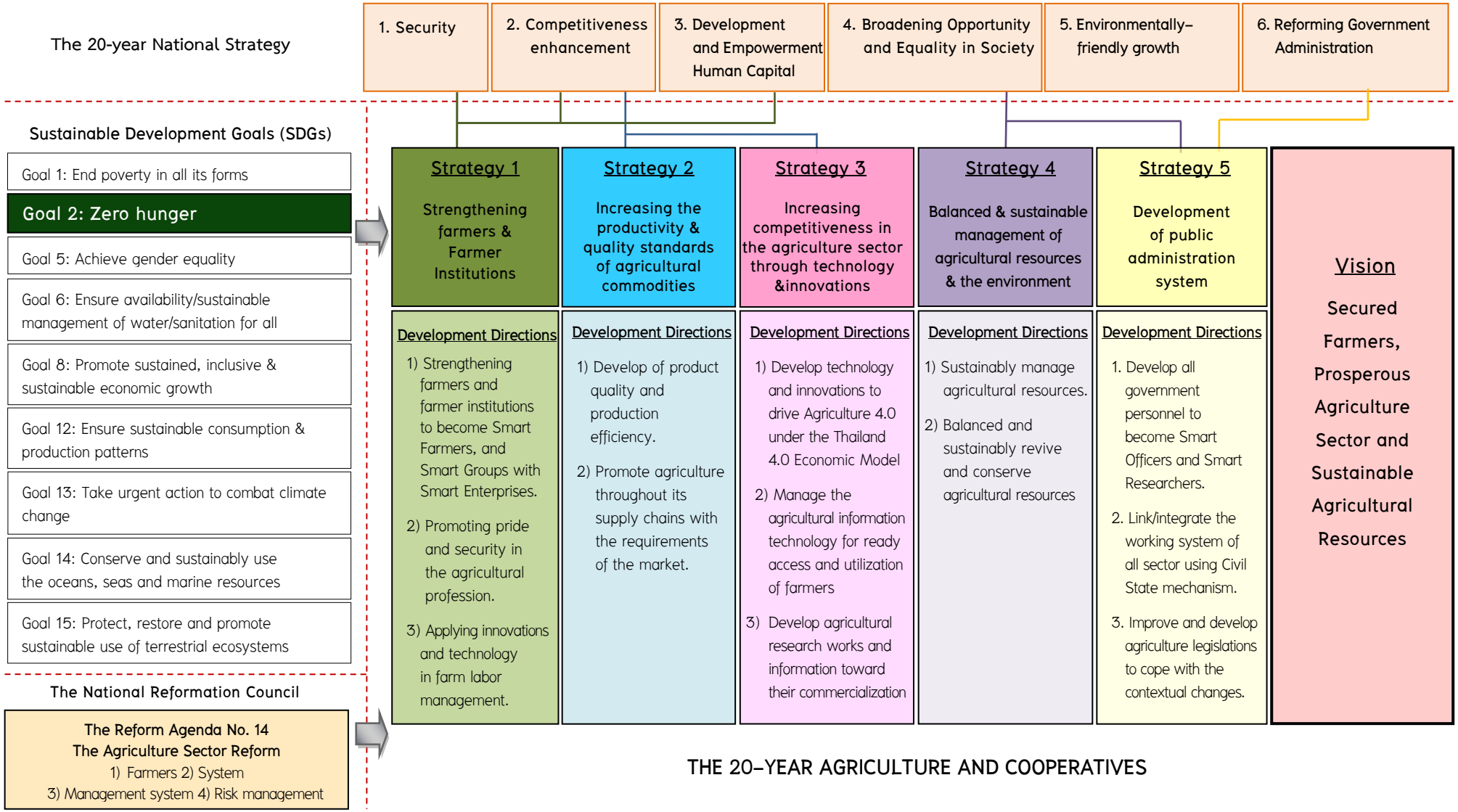

Figure 1: Linkages between the 20-year National Strategy (2017-2036) and its Key National and International Implementation Frameworks, with the 20-year Agriculture and Cooperatives Strategies (2017-2036)

Table 1: Developmental Directions, Indicators, and Targets of the 20-year Agriculture and Cooperatives Strategy

Development Directions	Indicators	Present Performance	Targets				
			2017-21	2022-26	2027-31	2032-36	At the 20th Yr
Strategy 1: Strengthening the Farmers and Farmer Institutions							
1) Strengthen farmers and farmer institutions to become Smart farmers & Smart Group with Smart Enterprises. 2) Promote prides and security in farming profession 3) Manage farm labor by replacing it with technology in support of the ageing society.	1) Farmers Happiness Index (level)	80	85	90	90	05	95
	2) Farmer per caput income. (baht/person)	56,450	59,460	x	x	x	390,000
	3) Percentage (%) of Smart Farmers in the entire farmer labor force. (18-64 years old) (%)	5 (0.87 million farmers)	15	40	70	100	100
	4) Percentage (%) of farmer institutions having the standard strength.						
	- For cooperatives of Levels 1 and 2	81	90	95	95	95	95
	- For community enterprises	25	25	30	35	40	40
	5) Membership of farmer institutions						
	- Membership of agricultural cooperatives/farmer groups. (million members)	7.1	7.35	7.60	7.85	8.10	8.10
	- Membership of community agricultural enterprises. (millions of 15-member groups)	0.30 (20,000 groups)	0.33 (22,000 groups)	0.39 (26,000 groups)	0.48 (32,000 groups)	0.60 (40,000 groups)	0.60 (40,000 groups)

Table 1: Developmental Directions, Indicators, and Targets of the 20-year Agriculture and Cooperatives Strategy (cont.)

Development Directions	Indicators	Present Performance	Targets				
			2017–21	2022–26	2027–31	2032–36	At the 20th Yr
Strategy 2: Increasing the Productivity and Quality Standards of Agricultural Commodities							
1) Develop the production efficiency and qualities of agricultural commodities to the world standards using science, technology and holistic knowledge base. 2) Promote agriculture throughout its supply chains in accordance with market demands and high commodity values toward being Smart Farms.	1) Increases in the Agricultural GDP by not less than (% per year)	0.55	3	3	3	3	3
	2) Growth rate of export values of agricultural products and commodities	– 7.5 (in 2015)	2.5	2.5	3.0	3.5	3.5
	3) Percentages of farms/factories / establishments under the supervision of MOAC having been certified for their quality standards						
	– Percentage of plot/farm : Crops Fisheries Livestock	146.349/ 23,946/ 15,282	85	90	100	100	100
	– Percentage of factory / establishment (GMP/others) : field crops / horticultural crops / livestock / fish farm (million rai/plot)	687 / 313 / 683	40	60	80	100	100
	4) Number of big-plot (field crops / horticultural crops / livestock / fisheries in million rai/plot)	2 / 1,000	30 / 7,000	45 / 9,000	60 / 12,000	90 / 14,500	90
	5) Acreage of land adjusted based on Agri-map from S_3, N to S_1 (million rai)	n.a.	1.5	3.0	4.5	6.0	6.0

Table 1: Developmental Directions, Indicators, and Targets of the 20-year Agriculture and Cooperatives Strategy (cont.)

Development Directions	Indicators	Present Performance	Targets				
			2017–21	2022–26	2027–31	2032–36	At the 20th Yr
Strategy 3: Increasing Competitiveness in the Agriculture Sector through Technology and Innovations							
1) Develop technology and innovations to drive Agriculture 4.0 under the Thailand 4.0 economic model. 2) Manage the agricultural information technology for ready access and utilization among farmers. 3) Develop agricultural research works and information toward their commercialization, publication and linkage with global information network.	1) Percentage of MOAC annual research budget to its annual total budget (%)	3 (2,500 million bath)	3.5	4	4.5	5	5
	2) Percentage of research work, technology and innovations created to those applied (%)	30	50	60	70	80	80
	3) Percentages of farmers and beneficiaries disseminated with new technologies who applied them (%)	n.a.	60	80	100	100	100

Table 1: Developmental Directions, Indicators, and Targets of the 20-year Agriculture and Cooperatives Strategy (cont.)

Development Directions	Indicators	Present Performance	Targets				
			2017–21	2022–26	2027–31	2032–36	At the 20th Yr
Strategy 4: Balanced and Sustainable Management of Agricultural Resources and the Environment							
1) Sustainably manage agricultural resources in accordance with SDGs 2) Balanced and sustainably revive and conserve agricultural resources	1) Acreage of conserved, improved and reconstructed farm land (million rai)	2.34 (2017)	12.5	12.5	12.5	12.5	12.5
	2) Acreage of irrigation farm land (million rai)	31.83	35.92	39.37	45.02	49.52	49.52
	3) Acreage of non-irrigation farm land (million rai)	0.17	0.96	2.09	3.05	3.84	3.84
	4) Acreage of sustainable farm land (million rai)	0.81	2.5	5.0	7.5	10	10
Strategy 5: Development of Public Administration System							
1) Develop government personnel and researchers to become Smart officers and Smart researcher 2) Link and integrate the works of all agencies in all sectors using the Civil State mechanism and modern administrative system 3) Improve and develop agriculture legislations to cope with changes	1) Number of laws developed / revised / improved.	32	17	37	37	37	42
	– Number of new laws	–	5	–	–	–	5
	– Number of reviewed, revised and improved laws	–	12	37	37	37	37
	2) Number of agencies under MOAC restructured.	15	15	15	15	15	15
	3) Percentage of MOAC officers being Smart Officers and Smart Researchers (%)	–	20	50	80	100	100

SECTION 2

THE AGRICULTURAL DEVELOPMENT PLAN UNDER THE TWELFTH NATIONAL ECONOMIC AND SOCIAL DEVELOPMENT PLAN (2017–2021)

Section 2

The Agricultural Development Plan under the Twelfth National Economic and Social Development Plan (2017–2021)

Based on the framework of the 20-year Agriculture and Cooperatives Strategy (2017–2036), The Ministry of Agriculture and Cooperatives has prepared an Agricultural Development Plan under the Twelfth National Economic and Social Development Plan (2017–2021) to drive the 20-year strategic plan during its first five years. This Agricultural Development plan is linked to, and synchronizes with the Twelfth Plan (2017–2021) early prepared by the Office of the National Economic and Social Development Board. This Agricultural Development Plan emphasizes the participation of stakeholders from all related sectors. Agricultural situations and changed contexts were analyzed that led to the formation of the following agricultural conceptual framework under the Twelfth Plan (2017–2021).

1. The Agricultural Situations

The directions during the First Plan to the Third Plan (1961–1976) emphasized on infrastructure improvement, especially the sources of water for irrigation purpose as well as for transportation that linked the local and regional markets to the central ones. Credit markets were also developed to serve as a credit source for farmers. Furthermore the government also gave an importance to researches on and promotion of increased efficiency and quantity of agricultural production with an aim to boosting farmers' income and fulfilling international demand. The past development resulted in an agricultural economic growth, and the rapid acreage expansion of economic crops such as rice, maize, cassava, tobacco and rubber, which ironically destabilized their prices and farm income.

During the Fourth Plan to the Seventh Plan (1977–1996) the realization of agricultural land limitation urged the government to put emphasis on increasing land efficiency, conservation and development of agricultural resources, agricultural market expansion, enhanced competitiveness in the world market, and narrowing the income distribution gap. Three operational plans to promote the restructuring of agricultural production among the farmers were launched. These were

the Agricultural Restoring Plan, and the Farming System Adjustment Plan in the irrigation Areas of the Chao Phraya River Basin, and the Agricultural Restructuring and Production System Plan.

Later in the Eighth Plan to the Ninth Plan (1997–2006) the development concepts, directions and process were shifted from economic expansion to development of human resources and farmers organizations. Moreover, the plans were more focused on competitiveness through human development and restructuring agriculture, environmental preservation, and sustainable development.

During the Tenth Plan to the Eleventh Plan (2007–2016) put farmers in the center of development through employing the Sufficiency Economy Philosophy as the change factor that promoted production restructuring taking into consideration the entire supply chain along with higher–return production for international competitiveness. Being in the center of development as laid out in the Sufficiency Economy Philosophy, better quality of farmers' lives along with their ability in agricultural production, product management, food security, environmentally friendly production, and Thailand being the center of ASEAN agricultural production and trade were emphasized.

1.1 Agricultural Economic Data

1.1.1 Gross Domestic Products (GDP)

The GDP from agriculture (Volume Chain)[1] continued to rise from 0.401 trillion baht on average in the Seventh Plan to 0.643 trillion baht on average the Eleventh Plan. At the same time, that in annual prices rose from an average of 0.336 trillion baht during the Seventh Plan to an average of 1.321 trillion baht during the Eleventh Plan (Table 2) and in terms of GDP growth, it was found that the GDP from agriculture (in chain–weight quantity) during the Seventh Plan expanded at 3.94% per year, before dwindling down to 2.98%, 2.96% and 2.09% in the Eighth Plan, the Ninth Plan and the Tenth Plan respectively. That of the Eleventh Plan was at the lowest of 0.43% per year (Table 3). The major factors affecting the GDP growth in the Eleventh Plan was climate fluctuation and severe natural disasters in the form of persistent droughts and slackening rainfall from 2013–2015. The damages were found among several major

[1]Gross Domestic Product (GDP) in agricultural sector at Chain Volume Measures (CVM) is calculated by measuring agricultural output using the price level of the preceding year and then linking the statistics to give a reflection of actual agricultural output changes and excluding any monetary (inflationary) change. With a fixed weight method of calculating real GDP, the weighting of different goods can become outdated. A chain weighted measure tries to avoid this by always measuring the output of the particular year. However, additivity over aggregations is lost when these calculations are made for the chained periods. That is component series do not necessarily sum to totals.

crops, and the much lower production of cultured marine shrimps due to EMS disease. Moreover, economic depression in the countries which were the major trading partners of Thailand, coupled with strong competitions in the world market, affected Thailand's exports of agricultural products and other commodities in terms of their lower prices. The proportion of the Agricultural GDP to the overall GDP, however, was found increasing from 8.97 % in the Seventh Plan to 9.99% in the Eleventh Plan (Table 4).

Despite its slower development pace, the agriculture sector still maintains its key role and linkages with the various developmental dimensions, to viz, the economic, the social, and the environmental dimensions in the overall development. The reason was that the exports of agricultural products and commodities still fetched the county with huge foreign exchange earnings. Besides the Thai agriculture sector has also served as a strong base of Thailand's and world food security. It is also the upstream or the source of raw materials for the industrial sector such as the rubber industry, the food processing industry, and the animal feed industry, etc. Furthermore, the majority of the Thai people still earn their livings in the agriculture sector. Therefore, the agriculture sector has carried the nation's way of life and culture from the old days on to the present.

Table 2: Average GDPs, Agricultural GDPs and Non–agricultural GDPs during the 7th to the 11th

Unit: trillion baht

Plan / Sector	the 7th	the 8th	the 9th	the 10th	the 11th
In quantity chain*					
Agr. GDP	0.401	0.461	0.550	0.607	0.643
Non–agr. GDP	4.295	4.689	5.965	7.299	8.720
Overall GDP	4.690	5.148	6.513	7.896	9.318
At Annual Price					
Agr. GDP	0.336	0.445	0.647	1.044	1.321
Non–agr. GDP	3.413	4.478	6.364	9.068	11.982
Overall GDP	3.749	4.923	7.011	10.111	13.303

Source: Calculations from the base data of the Office of the National Economic and Social Development Board
Note: *Non–additive

Table 3: Growth Rates of GDPs by Sector during the 7th to the 11th

Unit: percent

Plan / Sector	the 7th	the 8th	the 9th	the 10th	the 11th
In quantity chain*					
Agr. GDP	3.94	2.96	2.96	2.09	–0.43
Non–agr. GDP	8.35	0.16	6.04	3.05	3.86
Overall GDP	7.94	0.42	5.76	2.96	3.41
At Annual Price					
Agr. GDP	10.24	2.08	11.56	10.98	–1.53
Non–agr. GDP	12,34	3.02	9.27	5.67	5.68
Overall GDP	12.43	2.90	9.47	6.20	4.92

Source: Calculations from the base data of the Office of the National Economic and Social Development Board

Table 4: Proportions (%) of GDPs by Sector to the Overall GDP during the 7th to the 11th

Unit: percent

Plan / Sector	the 7th	the 8th	the 9th	the 10th	the 11th
At Annual Price					
Agr. GDP	8.97	9.06	9.20	10.26	9.99
Non–agr. GDP	91.03	90.94	90.80	89.74	90.01
Overall GDP	100.00	100.00	100.00	100.00	100.00

Source: Calculations from the base data of the Office of the National Economic and Social Development Board

1.1.2 Total Factor Productivity (TFP)

During the Tenth Plan to the Eleventh Plan the developmental directions gave precedence to the development of agricultural innovations and technology, including investment in research and development. The objectives were to uplift agricultural productivity, add more value to agricultural products, promote processing of economic crops under the zero–waste concept, and encourage the development of organic agriculture. These developmental directions which emphasize on increasing agricultural productivity will help promote long–term sustainable growth of the country's agricultural economy since the Total Factor Productivity Growth (TFPG)

will help increase domestic production, and hence their market competitiveness. In other words, this is the increase in economic production, without depending on the increase of anything like production inputs or resources (labor, land and capital), but technological progress, and other factors like management administration, experiences, the quality of labor, and so on.

Table 5: Economic Growth Rate and Sources of Growth in the Agriculture Sector

Unit: Percent

Item	the 8th	the 9th	the 10th	the 11th*	the 10th					the 11th		
					2007	2008	2009	2010	2011	2012	2013	2014
GDP	2.04	2.90	1.64	2.10	0.96	4.20	1.30	-2.30	4.10	3.80	1.36	1.11
Labor	-0.07	0.08	0.07	-0.63	0.08	0.21	-0.00	-0.07	0.15	0.23	-0.03	-2.42
Land	0.06	0.14	0.05	0.00	0.26	0.60	-0.46	0.28	-0.44	0.02	0.00	0.00
Capital	3.34	3.19	3.55	1.89	4.09	3.72	2.88	4.87	2.19	3.93	1.25	0.96
TFP	-1.29	-0.51	-2.03	0.85	-3.53	-0.33	-1.25	-6.58	1.81	-0.18	0.14	2.58

Source: Office of the National Economic and Social Development Board

Note: Calculated the Agricultural GDP at the constant price of 1988

*The average of 2012-2014

Considering the source of growth in the agriculture sector comprising labor, land, capital and TFP, it was found that growth in the agriculture sector in the Eighth Plan to the Tenth Plan stemmed mostly from capital, followed by land, labor and TFP. In the Eleventh Plan (2012-2016) the average growth rate of 2.10% in the Agriculture Sector was again drawn mostly from capital 1.89%, followed by TFP 0.85% , land 0.00%, and labor -0.63%. The positive contribution of TSP after having been negative all along in the past, when compared with that of labor being positive in the Ninth Plan to the Tenth Plan and turning negative in the Eleventh Plan, as shown (Table 5), indicates more application of technology.

1.1.3 Important agricultural situations

1) The production of key agricultural products, namely, sugarcane, cassava, oil palm and rubber experienced an increasing trend in the Tenth Plan to the Eleventh Plan (Table 6) due significantly to the government policy on alternative source of energy, and market intervention. The decreasing trend of paddy production and hence its yields, both in and off-season, was mainly brought about by drought and slackening rainfall, as well as climate change. Livestock production

especially that of meat chicken and pigs continued to expand while that of cultured shrimps declined significantly due to severe diseases.

2) Prices of nearly all main agricultural products declined continuously in the Eleventh Plan (Table 6) due to depressed economic situations facing most of the Thai trading partners. Their gradual economic recoveries retarded their demands for Thai agricultural products, and hence the price downtrend. The affected Thai agricultural products were rice produced both in and off–season, sugarcane and rubber. Those with fluctuated world prices were maize, palm oil, pork, chicken meat and shrimp. Only that of tapioca increased.

3) The declining prices of most agricultural products of Thailand in the world market (Table 6) drew down the overall values of its agricultural production, especially those of rice and rubber. Thai of tapioca continued to rise as the result of increasing demand from China.

4) The production costs of nearly all leading agricultural products of Thailand experienced an increasing trend during the Eleventh Plan to the Twelfth Plan. This caused the swelling of cost–price ratios for most of the Thai agricultural products (Table 6)

Table 6: Production, Yields per Rai, Farm Prices, Production Values and Production Costs of Selected Agricultural Products during the 10th to the 11th

Description			the 10th	the 11th			
			2011	2012	2013	2014	2015
In–season Paddy	Production	(1,000 tons)	25,867	27,234	27,090	26,270	23,478
	Yield	(kg.)	396	419	436	432	414
	Price	(฿/ton)	11,671	11,245	10,015	9,130	9,142
	Value	(Million ฿)	301,894	306,246	271,306	239,845	214,636
	Production cost	(฿/ton)	10,399	10,521	10,705	10,885	10,292
	Cost–price ratio	(%)	89.10	93.56	106.89	119.22	112.58
Off–season Paddy	Production	(1,000 tons)	10,261	12,235	10,766	9,672	5,347
	Yield	(kg.)	637	676	669	642	632
	Price	(฿/ton)	8,447	10,172	9,764	7,363	7,747
	Value	(Million ฿)	86,675	124,454	105,119	71.215	41,423
	Production cost	(฿/ton)	7,776	8,230	8,736	9,238	9,135
	Cost–price ratio	(%)	92.06	80.91	89.47	125.47	117.92

Table 6: Production, Yields per Rai, Farm Prices, Production Values and Production Costs of Selected Agricultural Products during the 10th to the 11th (cont.)

Description			the 10th	the 11th			
			2011	2012	2013	2014	2015
Maize	Production	(1,000 tons)	4,973	4,948	4,876	4,730	4,611
	Yield	(kg.)	672	657	657	654	644
	Price	(฿/kg)	7.63	9.34	7.01	7.31	7.73
	Value	(Million ฿)	37,944	46,214	34,181	34,576	35,643
	Production cost	(฿/kg.)	5.95	6.47	6.72	7.20	7.31
	Cost-price ratio	(%)	77.98	69.27	95.86	98.50	94.57
Sugarcane	Production	(1,000 tons)	95,950	98,400	100,096	103,697	106,327
	Yield	(tons)	12.19	12.28	12.12	12.26	11.09
	Price	(฿/ton.)	908	954	917	855	850
	Value	(Million ฿)	87,123	93,874	91,788	88,661	90,378
	Production cost	(฿/ton)	663	711	787	822	1,097
	Cost-price ratio	(%)	73.02	74.53	84.82	96.14	129.06
Cassava	Production	(1,000 tons)	21,912	29,848	30,228	30,022	32,358
	Yield	(kg.)	3,088	3,506	3,492	3,561	3,611
	Price	(฿/kg.)	2.68	2.09	2.12	2.13	2.22
	Value	(Million ฿)	58,724	62,382	64,083	63,947	71,435
	Production cost	(฿/kg.)	1.68	1.73	1.81	1.87	1.89
	Cost-price ratio	(%)	62.69	82.78	85.38	87.79	85.14
Palm Oil	Production	(1,000 tons)	10,760	11,312	12,435	12,473	11,016
	Yield	(kg.)	3,018	3,957	3,296	3,100	2,576
	Price	(฿/kg.)	5.34	4.91	3.54	4.27	4.04
	Value	(Million ฿)	57,458	55,542	44,020	53,260	44,505
	Production cost	(฿/kg.)	2.77	2.85	2.64	2.84	3.13
	Cost-price ratio	(%)	51.87	58.04	74.58	66.51	77.48
Rubber	Production	(1,000 tons)	3,349	4,139	4,305	4,566	4,466
	Yield	(kg.)	262	263	262	251	237
	Price	(฿/kg.)	124.16	87.15	74.75	53.93	44.17
	Value	(Million ฿)	415,812	360,714	321,799	246,244	197,263
	Production cost	(฿/kg.)	52.43	64.20	65.24	63.08	64.61
	Cost-price ratio	(%)	42.23	73.67	87.28	116.97	146.28

Table 6: Production, Yields per Rai, Farm Prices, Production Values and Production Costs of Selected Agricultural Products during the 10th to the 11th (cont.)

Description			the 10th	the 11th			
			2011	2012	2013	2014	2015
Pig	Production	(Mil. Pigs)	11.89	12.83	13.07	13.04	13.57
		(Mil. Tons.)	1.19	1.28	1.31	1.30	1.36
	Price	(฿/kg.)	65.54	56.67	65.35	75.08	66.08
	Value	(Million ฿)	77,993	72,538	85,609	97,604	89,869
	Production cost	(฿/kg.)	60.91	58.67	59.48	71.75	69.88
	Cost-price ratio	(%)	92.94	103.53	91.02	95.56	105.75
Meat Chicken	Production	(Mil. Chicks)	994.32	1,055.13	1,103.32	1,209.52	1,338.94
		(Mil. Tons.)	2,127.84	2,257.98	2,361.10	2,589.37	2,865.33
	Price	(฿/kg.)	46.81	42.03	43.25	42.34	38.34
	Value	(Million ฿)	99,604	94,903	102,118	109,592	109,857
	Production cost	(฿/kg.)	34.44	34.51	35.59	34.81	35.09
	Cost-price ratio	(%)	73.57	82.11	82.29	82.22	91.52
Vannamei White shrimp	Production	(Mil. tons)	0..601	0.587	0.308	0.262	0.273
	Yield	(kg./rai)	2,228	2,219	1,487	1,390	1,424
	Price	(฿/kg)	128.91	126.64	197.66	222.58	186.68
	Value	(Million ฿)	77,475	74,338	60,879	58,316	50,964
	Production cost	(฿/kg.)	99.35	102.54	105.58	108.46	110.74
	Cost-price ratio	(%)	77.07	80.97	53.41	48.73	59.32

Source: The Office of Agricultural Economics

1.1.4 Income, Expenses, Debts and Assets of Agricultural Households

1) There are two components of cash income for all farm households. These are Farm Cash Income and Non-farm Cash Income. The Total Cash Income of all farm households experienced a rising trend from 135,751 baht per household in the Eighth Plan (2001/2002) to 283,259 baht/household in the Eleventh Plan (2014/2015), more than half of which was from crop production. The remaining 30 % was from livestock, fisheries and other sources of income. During the period of the Eighth Plan to the Eleventh Plan, Farm Cash Income increased from 76,501 baht/household to 148,390 baht/household. Non-farm Cash Income derived from salaries, wages earned off-farm, leasing of equipment and transportation devices, remittances from family members working off-farm etc, rose from 59,250 baht/household to 134,869 baht/household during the period of the Eighth Plan to the Eleventh Plan (Table 7).

2) The total cash expense of a farm household is also composed of two components, Farm Cash Expense and Non–farm Cash Expense. Farm Cash Expense also had a rising trend like that of Farm Cash Income. It rose from 104,101 baht/household in the Eighth Plan (2001/2002) to 219,829 baht/household in the Eleventh Plan (2014/2015). The Farm Cash Expense component, which recorded a smaller proportion of the Total Cash Expense than that of the Non–farm Cash Expense, comprised the costs of crop planning, namely, seeds, farm chemicals, fertilizers, fuels, hired labor and so on representing around 70 % of total Farm Cash Expense. During the period of the Eighth Plan to the Eleventh Plan, the Farm Cash Expense increased from 44,392 baht/household to 91,327 baht/household. The Non–farm Cash Expense included that paid for food, beverage, clothes, daily amenities, public utilities, medical expenses, gambling / entertainment, children education, loan interests, installment payments, etc. The Non–farm Cash Expense of agricultural households during the Eighth Plan to the Eleventh Plan increased from 59,709 baht/household to 128,502 baht/household (Table 7).

3) The Net Cash Income of agricultural households is the sum of Net Farm Cash Income and Non–farm Cash Income. It increased from 91,359 bath/household in the Eighth Plan (2001/2002) to 191,932 baht/household in the Eleventh Plan (2014/2015). This caused a decline in the proportion of Net Farm Cash Income to Net Farm Income from 35.15% to 29.73%. It also indicated that Non–farm Cash Income had become a major source of income for farmers to spend more on the increasing trends of their household expenses and loan repayments (Table 7).

4) The agricultural households experienced a rising trend of their debts in all terms, be they short–term, medium–term, or long–term. Their year–end debts rose from 43,415 baht/household during the Eighth Plan (2001/2002) to 117,346 baht/household in the Eleventh Plan (2014/2015). Most of the loans were spent on investments in fixed assets, production inputs of higher prices, and repayment of loans for household consumption. To cope with the problem of informal credits, the Government had launched a policy and program that provide easy access of the farmers to formal credit sources. This included the provision of money to local communities for their income–generating purposes. Examples were the Village Fund Program, the One Million Baht Fund program, etc. For agricultural assets possessed as factors of production of a household such as land, equipment, machineries, money etc, their values also had an increasing trend, from 680,332 baht/household during the Eighth Plan (2001/2002) to 968,289 baht/household in the Eleventh Plan (2014/2015). (Table 7)

However, it was found that the proportion of farmer debts to the value of their assets rose from 6.38% in the Eighth Plan to 12.12% in the Eleventh Plan. This indicated the expansion of their debts beyond the value of their assets.

Table 7: Economic Status and Agricultural Investment of Agricultural Households

Unit: Baht/Household

Description	the 8th (2001/2002)	the 9th (2006/2007)	the 10th (2011/2012)	the 11th (2014/2015)
1. Total Cash Income	**135,751**	**193,497**	**242,365**	**283,259**
1.1 Gross Cash income	76,501	114,631	142,039	148,390
1) Cash income from crops	53,510	89,182	110,685	114,173
2) Cash income from Livestock	18,106	18,253	26,767	28,669
3) Cash income from other sources	4,885	7,196	4,578	5,550
1.2 Off–farm Cash income	59,250	78,866	100,326	134,869
1.3 Proportion of Gross Cash Income to Total Cash Income (%)	56.35	59.24	58.61	52.39
2. Total Cash Expense	**104,101**	**148,726**	**197,448**	**219,829**
2.1 Gross Cash Expense	44,392	64,261	83,781	91,327
1) Crop cash expense	26,659	42,825	59,775	64,231
2) Livestock cash expense	9,605	11,862	10,660	12,873
3) Other cash expense	8,128	9,574	13,346	14,223
2.2 Off–farm cash expense	59,709	84,465	113,667	128,502
2.3 Proportion of Gross Cash Expense to Total Cash Expense (%)	42.64	43.21	42.43	41.54
3. Net Cash Income				
3.1 Net Cash income[1]	32,109	50,370	58,258	57,063
3.2 Net Farm Income[2]	91,359	129,236	158,584	191,932
3.3 Cash balance before debt[3]	31,650	44,771	44,917	63,430
3.4 Proportion of Net Agricultural Cash Income to Net Farm Cash Income (%)	35.15	38.98	36.74	29.73
4. Year–end debts and assets (baht/household)				
4.1 Year–end debts	43,415	68,158	76,697	117,346
4.2 Year–end agricultural assets	680,332	941,485	1,029,218	968,298
4.3 Proportion of debt to agricultural asset (%)	6.38	7.24	7.45	12.12

Source: The Office of Agricultural Economics

Notes: 1/ Net Cash Income = Gross Cash Income – Gross Cash Expense

2/ Net Farm Income = Net Cash Income + Off–farm Cash Income

3/ Cash Balance before Debt = Net Farm Income – Off–farm cash expense

1.1.5 International Trade and Balance of Trade in the Agriculture Sector

1) As to its exportation, Thailand had a total export value of 4,930,194 million baht in the Ninth Plan (2006) which later increased to 7,220,348 million baht in the Eleventh Plan (2015). The figures indicated a rising trend of agricultural exports from 833,078 million baht in the Ninth Plan (2006) to 1,211,164 million baht in the Eleventh Plan (2015) as shown (Table 8). In fact the export value in the Eleventh Plan was quite fluctuating with the world economic situation and tougher competition. The major agricultural export items of Thailand are rubber, rice and its products, cassava and its products, fish and its products, as well as fruits and their products. These export items fetch Thailand with tremendous export earning every year (Table 9). Nevertheless, the proportion of the agricultural export value to the total export value experienced a declining trend from 16.90% in the Ninth Plan (2006) to 16.77% in the Eleventh Plan (2015) (Table 8).

2) For its importation, Thailand spent 4,942,923 million baht for its total imports in the Ninth Plan (2006). This increased to 6,906,118 million baht in the Eleventh Plan (2015). That of agricultural products and merchandises also had a rising trend from 243,056 million baht in the Ninth Plan (2006) to 465,002 million baht in the Eleventh Plan (2015) (Table 8). Most of the agricultural imports were used as raw materials in various processing industries, namely, food crops and products, fish and products, raw materials for feed production, oil crops, fruits and products, etc. (Table 10).

3) In terms of the Balance of Trade: Thailand recorded a trade deficit of 5.551 million baht in the Ninth Plan (2006) and 274,730 million baht in the Tenth Plan (2011). The figure turned positively to 321,809 million baht in the Eleventh Plan (2015). On the other hand, there was a trade surplus in its agricultural products and merchandises, from 590,319 million baht in the Ninth Plan (2006) to 746,802 million baht in the Eleventh Plan (2015) (Table 8).

Table 8: International Trade and Balance of Trade for Agricultural Products and Merchandises during the 9th to the 11th

Unit: Million Baht

Description		the 9th (2006)	the 10th (2011)	the 11th			
				2012	2013	2014	2015
Export Value	All	4,930,194	6,707,851	7,082,333	6,907,494	7,304,899	7,220,348
	Agriculture	833,078	1,444,996	1,341,826	1,268,217	1,308,707	1,211,164
	Non–agriculture	4,097,116	5,262,855	5,740,507	5,639,277	5,996,192	6,009,184
Value of Re–exports	All	7,178	138	158	2,247	8,167	7,579
	Agriculture	297	–	–	268	386	640
	Non–agriculture	6,881	138	158	1,979	7,781	6,939
Import Value	All	4,942,923	6,982,719	7,813,061	7,612,706	7,403,898	6,906,118
	Agriculture	243,056	379,704	433,841	430,542	447,167	465,002
	Non–agriculture	4,699,867	6,603,015	7,379,220	7,182,164	6,956,731	6,441,116
Balance of Trade	All	–5,551	–274,730	–730,570	–702,965	–90,832	321,809
	Agriculture	590,319	1,064,692	907,985	857,943	861,926	746,802
	Non–agriculture	–595,870	–1,340–022	–1,638,555	–1,540,908	–952,758	–424,993

Source: Office of Agricultural Economics in collaboration with the Department of Customs

Table 9: Export Values of Major Agricultural Products and Merchandises during the 9th to the 11th

Unit: Million Baht

Description	the 9th (2006)	the 10th (2011)	the 11th			
			2012	2013	2014	2015
Natural rubber	205,470	440,547	336,304	315,159	244,748	193,938
Rice and products	104,597	208,253	158,433	149,733	191,224	172,778
Cassava and products	43,494	77,689	84,322	95,692	113,719	115,889
Fish and products	83,572	112,179	131,369	122,481	120,657	109,792
Fruits and products	50,746	81,334	77,307	80.962	95,901	106,184
Others	345,199	524,994	554,091	504,190	542,458	512583
All	833,078	1,444,996	1,341,826	1,268,217	1,308,707	1.211.164

Source: Office of Agricultural Economics in collaboration with the Department of Customs

Table 10: Import Values of Major Agricultural Products and Merchandises during the 9th to the 11th

Unit: Million Baht

Description	the 9th (2006)	the 10th (2011)	the 11th			
			2012	2013	2014	2015
Food crops and products	24,755	41,659	57,230	49,239	46,807	69,695
Fish and products	49,766	73,369	85,369	81,081	70,682	67,343
Trash and wastes for feed	29,021	48,193	58,954	64,057	74,515	63,603
Oil crops	14,999	36,480	42,562	34,450	37,645	41,321
Fruits and products	8,435	19,731	24,663	26,039	26,497	33,237
Others	116,080	160,272	165,063	175,676	191,021	189,803
All	243,056	379,704	433,841	430,542	447,167	465,002

Source: Office of Agricultural Economics in collaboration with the Department of Customs

1.2 Agricultural Production Factors

1.2.1 Agricultural Land

Thailand is an agricultural country. Land resource is therefore one of its major factors of production. The increasing demand for agricultural and non–agricultural land in economic activities under the land constraint situation, has given rise to changes in land utilization. Development of technical and technological works to monitor land utilization, especially that in agricultural production, will help provide reliable and timely data for worthy and sustainable planning and utilization of land. At present, such technical and technological developments in the collection of agricultural land use data have advanced greatly. Collaboration among concerned agencies from various sectors in remote sensing through the use of aerial and satellite photos has enabled database development to be more modern, precise, and clearer. By doing this, the orthophotographs is being used to monitor the changes in annual land utilization.

The improved database on agricultural land use since 2002 has revealed that in 2014, the total agricultural land use in Thailand stood at 149.23 million rai or 46.53 % of the total land area of the country. This included 118.98 rai of non–irrigated land, 30.25 million rai of irrigated land representing 79.73% and 20.27 % of all agricultural land use in the country respectively. Most of the agricultural land was farmers own. In the Ninth Plan (2006) this was

107.83 million rai or 71.47%. That in the Eleventh Plan (2014) was drastically dragged down to only 71.66 million rai or 48.02%. The factors affecting this shift of landownership included the shift of landownership from farmers to the absentee landlords; mortgage loans in arrears with institutional and other creditors; the use of rental land for agricultural production; and the state issuance of legal documents for free use of land e.g. that of the Agricultural Land Reform Office, the Community Deeds, etc. The majority of land use was for paddy production, followed by that for the production of field crops, fruits and other trees, vegetable and ornamental gardens, and others like aquaculture, livestock ranches, and fallows. The size of landholdings had a receding trend from 26.08 rai/household in the Ninth Plan (2006) to 25.26 rai/household in the Eleventh Plan (2014). The main reason for the small size of landholdings was the general custom of dividing parental land among children (Table 11).

Table 11: Agricultural Landholdings and Land Use in the 9th to the 11th

Description	the 9th (2006)		the 10th (2011)		the 11th (2014)	
	Mil. Rai	%	Mil. Rai	%	Mil. Rai	%
Agricultural Land Use	**150.47**	**–**	**149.25**	**–**	**149.23**	**–**
- Irrigation areas	23.63	15.66	29.60	19.83	30.25	20.27
- Non–irrigation areas	127.24	84.34	119.65	80.17	118.98	79.73
Farm size (rai/household)	**26.08**	**–**	**25.43**	**–**	**25.26**	**–**
Agricultural Landholdings	**150.87**	**100.00**	**149.25**	**100.00**	**149.23**	**100.00**
- Own	107.83	71.47	71.58	47.96	71.66	48.02
+ Non Mortgage	81.58	54.07	41.75	27.97	41.81	28.02
+ Mortgage	26.05	17.40	29.83	19.99	29.85	20.00
- Land owned by others	43.04	28.53	77.67	52.04	77.57	51.98
+ Rent	27.86	18.47	29.27	19.61	29.24	19.59
+ Free use	13.99	9.27	47.64	31.92	47.57	31.88
+ Mortgaged by others	1.19	0.79	0.76	0.51	0.76	0.51
Proportion of Land Use	**150.87**	**100.00**	**149.25**	**100.00**	**149.23**	**100.00**
- Paddy	71.11	47.13	69.99	46.90	69.96	46.88
- Field crops	32.20	21.34	31.15	20.87	31.15	20.87
- Orchards and trees	32.79	21.74	34.91	23.39	34.92	23.40
- Vegetable/ornamentals	1.50	0.99	1.39	0.93	1.40	0.94
- Other uses	13.27	8.80	11.81	7.91	11.80	7.91

Source: Office of Agricultural Economics

1.2.2 Water Sources for Agricultural Production

Based on the data from the Meteorological Department the annual precipitation of Thailand in 2015 was recorded as 733,955 million cubic meters, an 8.93% down from 805,929 million cubic meters in the previous year. The 200,973 million cubic meters of the annual average amount of natural water in 2015 could be divided into 175,345 million cubic meters (87.25%) of that in the rainy season, and 35,628 million cubic meters (12.75%) in the dry season.

The irrigation area in the Eleventh Plan (2015) increased by 225,621 rai of the total irrigation area of 30,483,167 rai. Include; Large & medium irrigation projects; Small irrigation, electrical water pumps, and Monkey Cheeks projects. The demand for water is likely to increase continuously. Thailand may be short of water shortage. (Table 12).

Table 12: Irrigation Land, Detention and Irrigation Water Management Areas in the 11th

Description	Unit	the 11th			
		2012	2013	2014	2015
1. Increased acreage of irrigation areas	**Rai**	**178,751**	**206,952**	**317,811**	**225,621**
1.1 Large & medium irrigation projects	Rai	86,000	34,510	124,600	27,300
1.2 Small irrigation, electrical water pumps, and Monkey Cheeks projects	Rai	92,351	172,442	193,211	198,321
2. Increased detention areas	**Mil. Cm.**	**100.39**	**16.67**	**107.70**	**19.70**
2.1 Large & medium irrigation projects	Mil. Cm.	97.03	16.67	107.70	19.70
2.2 Small irrigation, electrical water pumps, and Monkey Cheeks projects	Mil. Cm.	3.36	–	–	–
3. Previous irrigation areas	**Rai**	**29,732,783**	**29,939,735**	**30,257,546**	**30,483,167**
3.1 Large & medium irrigation projects	Rai	24,348,230	24,382,740	24,507,340	24,534,640
3.2 Small irrigation, electrical water pumps, and Monkey Cheeks projects	Rai	5,384,553	5,556,995	5,750,260	5,948,527

Source: Royal Irrigation Department 2015 Annual Report

1.2.3 Agricultural Population and Labor Force

The agricultural population in Thailand experienced an ever decreasing trend of 25.04 million people or 40.19% of the entire population in the Eighth Plan (2001) to 24.76 million people or 38.02 % of the overall population in the Eleventh Plan (2014). Its labor force (15–64 years of age) also had a declining trend from 19.32 million workers or 52.73% of all workers in the Eighth Plan (2001) to 17.78 million workers or 46.09% of all workers in the Eleventh Plan (2014). This was due to the increasing demand for non–agricultural labor put forth by economic development, along with the rising trend of the over 64 years–old farm population, who are no longer included in the agricultural labor force. The size of this senior farm population rose from 6.99% of the overall agricultural population in the Eighth Plan (2001) to 10.99% in the Eleventh Plan. The data indicate the same direction of change in the entire population toward the Senior Society. The proportion of the agricultural population of the 15–64 age group grew from 69.01% in the Eighth Plan (2001) to 71.95% in the Eleventh Plan (2014) (Table 13).

The fact that most agricultural employments are seasonal in nature without sufficient labor welfare and protection has been responsible for the migration of agricultural labor to the non–farm sector. This has been both temporary and permanent. Coupled with the present high wage rates in the non–farm sector, the migration tends to increase. The out–migration of some farm labors has been due to the unrest political situations in the South.

As to the educational levels of the farm household heads, most farm household heads (65.65%) in the Eighth Plan (2001) completed their junior and senior elementary school education. Later, this declined to 48.31 % in the Eleventh Plan (2014). At the same time, the average educational levels completed by leaders of the agricultural farm households in the Eleventh Plan (2014) were 11.8% from secondary schools, 06.50% from vocational schools, and 6.80 % from colleges. These were very well in accordance with the Basic Educational Development Plan aimed at higher basic educational levels of the people. What the government had introduced in the past were programs and projects to attract the interests of farm family members with higher education to remain in the agriculture sector, partly to cope with the labor shortage problem in the sector. The programs and projects involved vocational training for and technological transfer to farmers with the view to fulfilling their skill demand for increasing their income and opportunity to become more secured in their agricultural profession.

Table 13: Labor in the Agriculture Sector and Their Educational Levels in the 8th to the 11th

Description	the 8th (2001)	the 9th (2006)	the 10th (2011)	the 11th (2014)
Population (million people)[1/]				
Total population (million people)	62.31	62.83	64.08	65.13
Farm population (million people)[3/]	25.04	22.72	23.69	24.76
(%)	40.19	36.16	36.97	38.02
Non-farm population (million people)[3/]	37.27	40.11	40.39	40.37
(%)	59.81	63.84	63.03	61.98
Labor force (million workers)[2/]				
Total labor force (million workers)	36.64	36.24	38.92	38.58
Farm labor force (million workers)[3/]	19.32	15.84	16.98	17.78
(%)	52.73	43.71	43.62	46.09
Non-farm labor force (m. workers)[3/]	17.32	20.40	21.94	20.79
(%)	47.27	56.29	56.38	53.91
Farm family members (%)[3/]				
- < 15 years of age	24.00	21.15	18.68	17.06
- 15-64 years of age	69.01	69.75	71.38	71.95
- > 64 years of age	6.99	9.10	9.94	10.99
Educational completion (%)[3/]				
- Illiterate	9.03	8.75	6.80	5.25
- Junior & senior elementary	65.65	60.77	57.44	48.31
- Junior secondary	11.15	11.76	12.32	12.62
- Senior secondary	5.85	8.05	10.29	11.80
- Vocational	3.36	4.59	5.69	6.50
- College	2.05	3.42	5.07	6.80
- Others	2.90	2.76	2.39	8.72

Sources: [1/] Department of Provincial Administration Ministry of Interior

[2/] The National Statistical Office

[3/] The Office of Agricultural Economics

1.2.4 Sources of Farmers Capital

At present there are 3 major sources of capital or credits for farmers in Thailand. These are; 1) the Bank for Agriculture and Agricultural Cooperatives (BAAC); 2) agricultural cooperatives; and 3) the various funds most of which are from BAAC. BAAC has played a vital role in promoting governmental policies in selected projects like the Farmers Income Guarantee Project, and the project to solve the non–institutional lenders problems. BAAC provides agricultural credit services both directly to farmers and farmers institute. Its objectives are to financially assist farmers and farmers institutions in increasing their income through the introduction of other agricultural related activities that can help generate more income to their families. In the Eleventh Plan (2014), the average beginning–of–the–year credit of the farmers was 100,977 baht/household, most of which (62.24%) was borrowed from BAAC, followed by that from the Village Fund and the various Agricultural Cooperatives averaging 13.16% and 10.99% respectively (Table 14).

Regarding the provision of agricultural credits which has been carried out by all governments in the past, MOAC, has assisted the farmers in various aspects. Examples are providing low–interest credits, debt moratorium and debt reduction for small–scale farmers, and the transfers of non–institution debts to the institutional ones. All these operations of the Ministry of Agriculture and Cooperatives have been implemented through BAAC and the 13 credit funds under the Ministry of Agriculture and Cooperatives. These Credit funds are; 1) The Irrigation Revolving Fund; 2) The Agricultural Land Reform Fund; 3) The Land Consolidation Fund; 4) The Cooperatives Development Fund; 5) The Farmers Aid Fund; 6) The Revolving Fund for Purchasing Rhizobium; 7) The Revolving Fund for Producing Fish Shrimp and other Aquatic Animal Breeds; 8) The Para Rubber Revolving Fund; 9) The Revolving Fund for Producing Commercial Vaccines; 10) The Soybean Development Fund; 11) The Revolving Fund for Plant Production and Multiplication; 12) The Fund for Structural Adjustment of Production in the Thai Agriculture Sector to Enable Its Competitiveness; and 13) The Revolving Fund for Credit Provision to Farmers and the Poor.

Table 14: Sizes of Farmers Beginning–of–the–Year Debts and their Credit Sources

Description	the 8th (2001/02)	the 9th (2006/07)	the 10th (2011/12)	the 11th (2014/15)
Beginning of the Year Credit (baht/household)	34,818.65	47,672.00	59.808.00	100,977.00
Credit Sources (%)				
BAAC	65.47	56.18	63.41	62.24
Village Fund	1.37	13.95	10.39	13.16
Agricultural cooperatives	12.39	10.80	9.21	10.99
Financial companies	0.50	1.67	3.41	2.59
Government Savings Bank	0.16	1.60	1.70	2.47
Commercial banks	4.79	4.38	2.16	1.42
Others	15.32	11.42	9.72	7.13

Sources: Office of Agricultural Economics

1.2.5 Chemical and Organic Fertilizers

Thailand demands a large number of chemical and organic fertilizers for its crop production every year. In 2015, its demand for chemical fertilizers was 6.17 million tons, 1.70 million tons for in–season paddy, 0.44 million tons for off–season paddy, 0.31 million tons for maize; 0.35 million tons for cassava, 0.53 million tons for sugarcane, 1.54 million tons for Para rubber, 0.55 million tons for oil palm and 0.75 million tons for other crops. In the same year its demand for organic fertilizers, which grew along the call for environmentally friendly agricultural extension, amounted to 0.58 million tons. This was all domestically produced. Since Thailand still could not produce enough chemical fertilizers to meet its demand, its immense foreign exchanges had to be spent on imports of chemical fertilizers every year. In 2015 the value of its imports of chemical fertilizers was 60,557 million baht (Table15). Its distribution was 17.55% from China, 17.00% from Saudi Arabia, 14.18% from Russia, 6.26% from Qatar, 6.09% from Canada, and 38.94% from other exporters. In fact Thailand has raw potassium in the provinces of Udontani, Sakonakorn and Nakorn Ratchasima, which can be used for the commercial production of chemical fertilizers. But the inability to come up with an environmental protection system against possible negative impact from the potassium mining has forced Thailand to still depend on imports of elemental chemical fertilizers. At the same time Thailand's chemical exports, mostly to Lao PDR, followed by those to Cambodia, Myanmar, Japan and Australia, amounted to 4,472 million baht in 2015

Table 15: Import and Export Values of Chemical Fertilizers in 2011–2015

Unit: Million Baht

Plan	Year	Imports	Exports
the 10th	2011	83,168	3,772
the 11th	2012	85,135	4,120
	2013	75,901	3,529
	2014	68,334	4,753
	2015	60,557	4,472
Growth rate (%)		-10.73	4.81

Source: Department of Custom

The import value of chemical fertilizers in the Eleventh Plan had a successive downtrend of 60,557 million baht in 2015, representing an average reduction of 10.73% per year from 85,135 million baht in 2012. This was partly attributed to the more intense campaigns on environmental friendly agricultural production. Thailand's export of chemical fertilizers, on the other hand, increased on an annual average of 4.81% per year from 4,120 million baht in 2012 to 4,472 million baht in 2015 (Table 15).

Table 16: Import and Export Values of Organic Fertilizers in 2011–2015

Unit/Million Baht

Plan	Year	Imports	Exports
the 10th	2011	268	206
the 11th	2012	1,415	193
	2013	1,378	212
	2014	258	384
	2015	154	463
Growth rate (%)		-41.40	37.18

Source: Department of Custom

The importation of organic fertilizers in the Eleventh Plan also had a downward trend like that of chemical fertilizers. Their import value in 2015 the importation of 154 million baht indicated an average reduction of 41.40% per year from 1,415 million baht in 2012. Their export value of 193 million baht in 2012 increased on an average of 37.18% per year to 463 million baht in 2015 (Table 16).

1.2.6 Farm Chemicals

The import value of farm chemicals increased on an annual average of 3.13 % per year from 18,966 million baht in 2012 to 19,939 million baht in 2015. Most of the farm chemical import was from China, followed by that from India, Malaysia, Indonesia and Israel. Their export value also increased on an average rate of 12.75 % per year, from 4,671 million baht in 2012 to 6,547 million baht in 2015. The majority of farm chemical export from Thailand went to Vietnam, followed by that to China, Malaysia, the Philippines and India (Table 17)

Table 17: Import and Export Values of Farm Chemicals in 2011–2015

Unit: Million Baht

NESDPs	Year	Imports	Exports
the 10th	2011	20,875	4,287
the 11th	2012	18,966	4,671
	2013	24,315	5,253
	2014	22,681	6,812
	2015	19,939	6,547
Growth rate (%)		3.13	12.75

Source: Department of Custom

1.2.7 Farm machineries

The Thai agriculture has shifted from the traditional practice in the past to becoming more commercialized and mechanized at present. This has been due to shortage of farm labor, higher rate of agricultural wages, and the rising trend of elderlies in the agriculture sector, not to mention the climate change problems. All these have given rise to the adjustment of agricultural production system in terms of its timing and management. In order to lessen the problems of farm labor shortage, policies on promoting the development and use of farm machineries and implements have been required. Moreover, community production planning

based on market demand, and appropriate area zoning have been activated. The ultimate goals of these policies are the lower production costs and higher production efficiency.

Table 18: Import and Export Values of Farm Machineries and Their Accessories in 2011–2015

Unit: Million Baht

Plan	Year	Imports	Exports
the 10th	2011	17,524	7,748
the 11th	2012	22,119	11,822
	2013	19,979	13,319
	2014	17,355	15,676
	2015	16,984	20,327
Growth rate (%)		-8.31	20.01

Source: Department of Custom

The import values of farm machineries and their accessories in the Eleventh Plan (2014) had a declining trend of 8.31% per year from 22,119 million baht in 2012 to 16,984 million baht in 2015. At the same time, their export values increased on an average of 20.01 % per year from 11,822 million baht in 2012 to 20,327 million baht in 2015 (Table 18)

1.3 Results of Midterm Development of the Eleventh Plan (2012–2014)

The triple goals and indicators of agricultural development under the Eleventh Plan (2012–2016) are farmers' happiness, economic growth in the agriculture sector and agricultural areas management. The midterm evaluation results of which from 2012–2014 are as follows.

1.3.1 Farmers' Happiness

The Farmers' Happiness Index in the Eleventh Plan (2014) was 78.28 which was higher than 76.97 in the Tenth Plan (2014), but still lower than the targeted index of 80 in 2016. The index was measured in 5 different dimensions: economic, health, education, social and environment, each of which has its own indicator that reflects its developmental level. During the half–plan period of 2012–2014, the Farmers Happiness Indices in all aspects slightly increased with that in health topping all others, followed in numerical order by the social dimension, and those in environment, economic and education. The indices indicated the needs

to improve the environment and the economic dimensions, and to urgently improve that in education. Therefore, to elevate the farmers' happiness in the forthcoming periods, more care must be given to developing the indices in education, i.e. farm family members should be given higher educational level than the present compulsory one; more technological trainings for farmers, etc. In the environmental dimension, farmers' happiness may be enhanced through reconstruction and conservation of land and water resources, and increased proportion of forest lands. Smaller debt–to–family–asset proportion, and higher employment rate of farm labor are some examples of measures to increase the economic happiness of the farmers (Table 19).

1.3.2 Economic growth in the agriculture sector

The average growth of Agricultural GDP (in chain volume measures: cvm) in the Eleventh Plan (2012–2014) was 1.4% per annum, which was much lower than the targeted 3.0% per annum Office of the National Economics and Social Development Board with its mission to measure the country's National Income, has changed its method of calculating National Income from basing it on Constant Prices to Chained Volume Measures (CVM). This has created a new series of National Income and Growth Rates which are different from the previous ones. Had the constant price method been used, the growth of GDP in agriculture during 2012–2014 would have been 2.10%). It was found that the result of half–plan development in terms of GDP in agricultural growth rate from 2012–2014 had a continuous downtrend. This was due to drought, slackening rainfall, the shrimp early mortality syndrome (EMS), and the world economic slow–down.

1.3.3 Suitability of agricultural resources to agricultural production

The evaluation results during the first half of the Eleventh Plan in 2012–2014 indicated the following:

- The expanded irrigation area during 2012–2014 was only 1.03 million rai from the 3.35 million rai by 2016 target.

- The land resources having been managed amounted to 1.22, 1.12 and 1.10 million rai respectively from 2012 to 2014 which were altogether less than the 2.15 million rai target.

- The fishing areas and habitats having been managed from 2012 to 2014 were 8.90 for both years, which were higher than the targeted 8.80 million rai (Table 19).

The risk factors and limitations barring the Agricultural Development Plans to achieve their goals were:

1. The continuous uses of agricultural natural resources without conservation led to their depletion and impaired environment.

2. Natural disasters especially floods and droughts, which broke out more often and more severe, had directly affected agricultural production.

3. The increasing environmental problems resulting from economic growth and expanding urban population e.g. wastes, air pollution, the quality of water, and greenhouse gas emission.

Table 19: Results of Agricultural Development during the First Half of the 11th (2012–2014)

Goals	Indicator	the 10th	the 11th			Goal Accomplishment
		2011	2012	2013	2014	
1. Farmers' happiness increased to the level of 80 in 2016	1) Farmers Happiness Indices in:	76.97	78.26	78.27	78.28	Not accomplished
	– Economics	68.92	67.05	66.17	66.02	
	– Health	98.85	98.11	98.33	99.00	
	– Education	55.45	56.06	59.87	59.67	
	– Social	85.56	86.43	86.96	86.12	
	– Environment	57.51	69.03	65.80	66.13	
2. Farm economy grew by an average of 3.0 per year	1) Percentage growth of GDP in agriculture in chain volume measures (%)	06.30	02.71	00.81	00.68	Not accomplished
3. Agricultural resources are more suitable to agricultural production	1) Irrigation land expanded to 3.35 million rai in 2016	–	1.03 million rai			Not accomplished
	2) Land resources were managed not less than 2.15 million rai/year	–	1.22	1.12	1.10	Not accomplished
	3) Fishing areas and habitats were managed not less than 8.8 million rai	–	n/a	8.90	8.90	Accomplished in 2013 and 2014

Source: Office of Agricultural Economics

Note: n/a No data collection organized.

2. The Contextual Changes that Affect Agricultural

Thailand is facing a number of challenges, both from the changing contexts at the global level, and those at the national levels. These are expected to affect the following determinants of its agricultural development in the next five years.

2.1 Changes at the Global Level

2.1.1 The world economy has become more unstable

Thailand depends on and economically ties to countries around the world especially its key trading partners like the U.S., the E.U., Japan, and China. Changes in the world economy would affect its exports and imports of goods and services as well as its overall economic standing. Nowadays, the world is facing the following four risk factors: 1) The economic slow-down of China which is affecting every country's economy, especially the ASEAN countries; 2) The continuous weakness of world trade situation; 3) The effect from lower oil prices on the OPEC countries; and 4) The fluctuating money markets due to the interest rate policies of economically influential countries, particularly the U.S. Thailand, being a world leading agricultural and food exporting country, therefore, needs to focus on its preparedness to cope with such global economic and monetary changes. Planning to minimize the severity of such changes on its agricultural production and marketing, farmers' income and the country's agricultural development is also needed.

2.1.2 Changes in the global trade and investment rules and regulations

1) Changes in vital global trade and investment rules and regulations have caused countries around the world to adjust their roles and increase their capacities in production. The developed economies tend to use the multi-frame economic policies e.g. multilateralism and generalization in determining their trade and investment rules and regulations. At present the expansion of free trade under the multilateralism and bilateralism systems has led to tougher competition in international trade and investment. The oneness of the collided economy and society has allowed freer flows of labor, goods and services, technology and capital across the borders. Countries around the world have sought to negotiate on free trade between and among them to remove trade barriers, and increase their income from exports. Entering into the ASEAN Economic Community (AEC) has opened an opportunity for Thailand to enlarge the market for its

agricultural products and to expand its agricultural production base through investments in ASEAN countries.

2) As to measures on trade barriers, despite continuous negotiations on opening free trade to reduce tariff trade barriers, several member countries of ASEAN still maintain some trade barring conditions. These are the wide–ranging non–tariff trade barriers on agricultural and agro–industrial goods, the use of social issues in determining international trade standards, and the drive of the developed countries for the adoption of some new standards as the world standards. Examples are some unnecessary sanitary and environmental measures; the EU Regulations on Food Safety, the Illegal, Unreported and Unregulated Fishing (IUU), etc. Hence there is a need for farmers and agri–business entrepreneurs to raise the standards of their production according to the tougher trade rules and regulations to be more competitive. Likewise, adding more values to the exports of quality products should also be conducted. At the same time, the government needs to come up with the policies, and measures to support the establishment of agricultural production system and strengthen the enforcement of agricultural legislations.

2.1.3 Climate change and the increasing severity of natural threats

Climate change is a global problem stemming from the emission of the Greenhouse Gas in the process of economic development among countries around the world, more so in the developed economies. Its effects on the agricultural sector have been in the form of droughts, floods, insect and disease outbreaks, and seasonal fluctuations. All these effects end up with lower agricultural production. The incapability of crops to adjust themselves to the climate change, coupled with the inexperience of the farmers to deal with such catastrophe, has brought about losses in farm production, and increased production costs from the use of water pumps. Despite all the past progresses in agricultural production technology, most still depends primarily on Mother Nature. According to the Intergovernmental Panel on Climate Change (IPCC) in 2014, world production in the year 2050 of major agricultural production, namely, wheat, rice and maize in both the tropical and the temperate zones would drop by 25% from that in the 20th Century. This will surely affect world food security. The effect will be more severe on rice production. The resulting heat wave will raise the sea level which affects more on tropical zone, especially on the South Asian countries. At the same time the unseasonal turbulent climate will obstruct or retard the flowering process while urging the outbreaks of new plant diseases and insects. The agriculture sector will be affected the most from climate change.

Thailand has been ranked number 14 of all the 170 countries around the world to be most affected by the climate change in the next 30 years. Those in the recent past were the 2011 rushed flood that damaged 10 million rai of paddy fields, 2.5 million tons of rice production, and the socio–economic wellbeing of more than 1 million farmers. Others included the wide spread of aphid in 2008–2010 damaging 4–5 million rai of paddy field and that of the pink sugarcane mealy bugs in 2009–2010 which destroyed 1.0 million rai of cassava resulting in 30% reduction of its production. Besides, research studies have also pointed out that higher temperature beyond 35 degree Celsius could reduce rice production and quality from infertile stamen and pollens of rice flowers.

Above indicates the urgent need to promote the adjustability of the agriculture sector, especially in research and development, transfer of knowledge, and the application of adaptation technology, namely, improvement of plant varieties to be resistant to bionic and abiotic stresses, and to reduce the risk or loss of production.

2.1.4 Technological advancement and the digital society

Technology has generated many changes in the world. Nowadays the various fields of technology like Nanotechnology, biotechnology, mechanical technology, information and communication technology play more vital socio–economic roles. The information and communication technology has enabled world–wide linkages of information through several networking systems and various forms of electrical media like radio, television, telephone and internet. This has generated the digital society. Technological advancement and digital society have opened door to national economic and social development through the use of websites in dissemination of information, e–commerce marketing, higher production of quality products, and replacement of labor with machines.

To drive forward the Thai agriculture sector at a continuous and stable growth pace in the digital world, all stakeholders in the agriculture sector need to catch up with the future global technological changes. Its body of knowledge in innovations, as well as information technology and communication must be tied up with the local wisdoms. This will allow the agriculture sector to elevate to the level of sustainable development, which will benefit all other actors in the supply chain, through producing products of quality standards, environmental friendly, being safe to both the producers and the consumers, having systematic management administration, and meeting

the world market demand. Finally, value addition of agricultural products, stable farm income, and the stability of all other related economic sectors are expected.

2.1.5 Advancement in modern agricultural bio–technology

Modern agricultural bio–technology can be applied to improve the genes of plants and other living things in a more specific and efficient manner than the traditional technology. Some examples of the modern agricultural bio–technology products are the Genetically Modified Organism (GMO) plants. In 2014, the global acreage of GMO plants was 1,134 million rai (181.5 million hectares) or 12 % of the overall global crop area. Six of the 28 countries that grew 90% of the GMO plant acreage (9,375 million rai) were the US, Argentina, Brazil, India, Canada and China (Source: International Service for the Acquisition of Agri–biotech Applications). In Asia GMO plants are allowed to be researched on and expanded to the level of commercial production in India, China, Bangladesh, Malaysia, Vietnam and Indonesia. Japan does not allow GMO plants to be produced in the country. The GMO agricultural and food products, however, are allowed by the Japanese law to be imported with clear labels on their traceable GMO origins or components. A policy on the appropriate standing of Thailand on this issue is required.

2.1.6 Rising population trend has caused rising demands for food and energy

According to a United Nations report, the world population was estimated to rise to 9,000 billion people in 2050, most of which would be in the developing countries in Asia and Africa. If it will be so, the global demand for food and energy would cause famine and struggles for food. Limitation in arable land, depletion of natural resources, and shortcomings in the present production technology would retard the global ability to sufficiently increase agricultural production. Climate change would cause damages to agricultural productions and hence their rising prices. The shift to alternative source of energy, especially that from plants, like sugarcane, maize, cassava, and oil palm, to cope with the increasing demand for energy has challenged the world in keeping the food–energy balance in global demands for food, industrial production and energy.

2.2 Changes at the National Level

2.2.1 Changes in government policies

Governmental operations in the past were to fulfill what were promised to the people during the election campaign, through the actual operations of responsible agencies. Since farmers are the major voters in the ballot, most agricultural policies have been based on political reasons, which are short–term by nature. For a more sustainable agricultural development and quality of farmers' lives, the following three developmental dimensions: urgency, continuity and sustainability, have been incorporated into the future agricultural policy. Deviations among farmers from different geographical areas, synchronism with other policies and constraints in natural resources, capital standing, technology, and management ability are taken into consideration in developing their production potential and productiveness in accordance with market demands and the efforts to promote value–addition innovations and technology. Based on the 20–Year National Strategy (2017–2036) laid out by the present government under the Prime Minister of General Prayuth Chan–o–cha, the MOAC, along with other ministries, has prepared the 20–Year Agriculture and Cooperatives Strategy for use as the developmental framework that would reduce the discontinuity of developmental policies in the future.

2.2.2 Income gaps among people in the agriculture sector

The insecure profession and income sources of most farmers or farm labors have made them people with lower average income and lower quality of life compared with those in the other sectors. Despite past efforts of the government to solve this income disparity problem, severe natural disasters and fluctuated prices of their farm products, along with the current trend of lavish consumption behavior have widen the income gap with higher indebtedness.

2.2.3 Lack of agricultural labor and the stepping into the ageing society

Thailand is stepping into the ageing society. This has been due to the lower reproductive age of the Thai population, and that the Thai people live longer. It was estimated that in 2040 the number of Thai people having more than 60 years of age would be 20.5 million people, representing 32.1% of the entire population. This will not only affect the economic and social stability of the country, but also obstruct the sustainable development of the country in the long term. This will specifically affect the agriculture sector more due to their large demand for agricultural labor. The downtrend of agricultural labor has been due to the unmatched replacement of the middle and the old aged farmers by the younger ones, whose higher

education as well as the low and insecure farm incomes distract them from farming to working in the industrial and service sectors. If this situation persists, it is expected that agricultural production, and hence the related manufacturing and export industries will eventually be affected.

2.2.4 Depletion of natural resources

The depletion of natural resources stems from 2 major causes, the natural depletion, and the man–made one. Repetitive cultivation on the same plots of land, deforestation, sprawling cities and/or industrial areas, inappropriate use of farm chemicals, extensive use of agricultural resources without due conservations and cautions on future impacts, and rising population have all rapidly depleted the natural resources, and despaired the ecological balance and bio–diversity. Moreover, these effects of climate change will heighten their negative effects further with more severe drought, greater loss of plant and animal diversity, and coastal environment.

3. The Conceptual Framework and Directions of the Agricultural Development Plan

Thailand still faces the risks arising from the fragility and fluctuation of the world economy, which affects its agriculture sector. This, along with some domestic problems, was the major limitation of its agricultural development in barring the Eleventh Plan (2012–2016) from fully achieving its goals. The drawing up of the conceptual framework and directions for agricultural development under the Twelfth Plan (2017–2021) is therefore emphasized on the continuity with the Eleventh Plan (2012–2016) by putting "the farmers" at the center of development in the form of community participation. This Twelfth Plan (2017–2021) gives precedence to farmers grouping toward their ability to be engaged in agri–business. The Plan also emphasized on their application of the Sufficiency Economy Philosophy of His Majesty King Bhumibol Adulyadej, in extending and applying the results of the previous Plan (the Eleventh Plan) toward their self–dependence. All these are required to drive the country to be security, prosperity and sustainability, taking into consideration the following issues.

3.1 The Sufficiency Economy and agricultural development. Having applied the Sufficiency Economy Philosophy in the Ninth Plan to the Eleventh Plan, it was found in the Eleventh Plan (2012–2016) that consumption of farm produce not only reduced farm

household expenses, but also increased farm household income from selling farm produce. Nevertheless, most Thai farmers still possess small landholdings of not beyond 15 rai. Besides, the diseconomy of scale of separate farms has left farmers with low pay–off investment in mechanization, fertilizer application, and purchases of seeds and other farm inputs. The landless and tenant farmers do not have enough incentives to increase their production efficiency, many of whom turn to be farm laborers. These problems may be alleviated by applying the Sufficiency Economy Philosophy in their daily lives. Of the three principles of the Philosophy, Moderation concerns a farming system with enough production to meet home consumption and to reduce household expenses, and to generate an income from selling the surplus production. Reasonableness is associated with production planning by the farmers to start with truck crop production to earn enough income to invest in the longer duration of livestock farming. Lastly, building of Self Immunity requires government supports in terms of transfers of knowledge in crop, fish and livestock production, which will lead to farmers grouping and agribusiness.

3.2 The Downtrend of Farm Labor and the Growth of the Ageing Society. The overall picture of national development has depicted the transition of the production structure from the agriculture sector to the industry and the service sectors. This has directly affected the agriculture sector in terms of the outmigration of its labor force to other sectors. The outmigration of the agricultural labor force to other sectors, mostly to the services sector, namely, wholesale, retail, hotels/restaurants, transportation, etc., reduced the agricultural labor from 19.32 million people in the ADP of the Eighth Plan (2011) to 17.78 million people in that of the Eleventh Plan (2013). The growth of the ageing society, on the other hand, has continuously reduced the proportions of the population in the working and the children classes. This has caused by the continuous reduction in the birth and the death rates of the Thai people, causing their average age to rise. The higher economic growth and expansion of other sectors, along with the negative attitudes of the farmers on the hard work and low pay–off of the agriculture profession, has discouraged the new generations to pay attention to farming. All these have caused the downtrend of agricultural population, and the resulting shortage of farm labor. The rising trend of ageing farm population has worsened the problem by decreasing agricultural productivity. All these problems need a systematic approach as well as good management administration of the influx of foreign labors into the agriculture sector, promotion of farm

mechanization, skill development of farm labor, and the protection as well as the social welfare guarantee system for farm labors.

3.3 The tuning of farmers into Smart Farmers. Most farmers are still constrained by their limited knowledge base on how to link their agricultural production to its processing and marketing. Lack of correct understanding about the application of farm inputs, especially chemical fertilizers and other farm chemicals, has caused their overuse, which is not only costly but also affects their health and that of the consumers in the long term, not to mention the depleted soil nutrients and biodiversity. Sustainable growth of agricultural development requires putting the farmers in the center of development. The tuning of farmers is therefore a key factor toward achieving the agricultural development goal of the country. The Ministry of Agriculture and Cooperatives has given priority to developing the farmers to be Smart Farmers, who are well prepared in terms of their knowledge base on production and marketing, and the application of new technology, their local wisdom, Good Agricultural Practice and new appropriate knowledge body in agricultural development, taking into consideration market demand for the products, their quality standards, consumption safety and environmental friendliness.

3.4 Promotion of cooperative farming through development of farmer networks, associations and institutions. Thailand is facing the low competitiveness problem brought about by lower agricultural production costs in its neighboring countries, and their increasing international market shares. Being small in their production scale, most Thai farmers are restrained to producing products of high quality standards. Despite long years of development, their collectivization is still too weak to form themselves into clusters. Most farmers still cannot set the prices of their farm products, not to mention their having been taken advantage by the middlemen. Strengthening the farmers through their grouping and the development of their networks, associations and institutions would help increase their potentials in being sustainably self–reliant. Cooperatives have a key role in strengthening the farmers in collecting and purchasing products and production inputs, development of product qualities and their marketing channels, and development of cooperatives to serve as a key instrument in agri–business.

3.5 Management of Agricultural Commodities. The agriculture sector is more sensitive and delicate than other sectors. Its production is seasonal and depends on the uncontrollable nature, namely, the amount of water, climatic conditions, and soil nutrient

depletion. As to their marketing, agricultural products are perishable and cannot be stored for a long period of time. They require higher transportation costs compared with those of other products. Their prices are sensitive to those in the world market and highly fluctuating causing unstable farm income. In general, prices of agricultural products are determined by their buyers. Despite government policies and measures with annual budgets of several million baht allocated to them, the problems persist in every year, be they relating to production efficiency, higher production costs, gluts and low farm prices. Good management administration of agricultural commodities will be able to solve the problems all through the system. Emphasis should therefore be given to planning on the demand for and supply of agricultural products at the provincial level. To provide information for the management administration system of the entire agriculture sector, registration of all farmers in the country is needed to collect information on their production of key agricultural products, as well as other production and marketing data, and linkage between the government and the business sectors. These will facilitate the overall management administration of the agricultural commodities, the promotion of agro–processing for value addition, and the trade between agribusiness entrepreneurs and farmers institutions.

3.6 Agricultural Product Standards has been given primacy since when Thailand joined other 80 founding members of the World Trade Organization (WTO) in the enforcement of the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS), as well as the measures on food standards and food safety for agriculture and food exports. Presently Thailand is more progressive than its neighboring countries in agricultural product standards. It, however, still needs a comprehensive development of the knowledge base and the understanding of farmers and their institutions on agricultural product standard. The development of agricultural products and their packaging to prolong products lives helps add more value to agricultural products and increase their attractiveness to the consumers in meeting their diversified demands. Nevertheless, the development of agricultural product standard requires a close cooperation between the government and the private sectors to manage the linkage between the domestic and the overseas information and data. Besides, there is also a need to urge other producing countries to also recognize the importance of GAP, GMP, HACCP, the organic farming standard, and traceability all through the supply chain. These are to avoid mistakes in every stage of the production process, and to guarantee that the products are of good quality standard, safe, environmentally friendly, and giving better quality of lives as required by trading partners.

3.7 Logistic and Infrastructural Development in Agriculture. This is a continuing operation from that in the Eleventh Plan (2012–2016). Government personnel, farmers and farmer institutions have been capacitated to increase the competitiveness and the logistical management capability at the farm level, promote and develop the activities in the agricultural value chains, and establish networks of the farmers and their institutions. These were for them to take a new role in administering the input supply and the large–scale production processes in the supply chains, and accord priority to logistical requirement from the stage of production planning, acquisition of production inputs, product collection, processing, storing, transportation and exportation. The traceability of both the primary and the processed products is meant to link the production source (farmers) to the consumers/customers or the chain agroindustry using the information technology and innovations in administering the agricultural logistics data at the national level. To facilitate the management administration of agricultural logistics, emphasis should be given to developing, supporting, and increasing the use of infrastructure, logistics facilities, National Single Window (NSW), and improved laws and regulations. The three dimensions of the developmental guidelines to improve the efficiency and effectiveness of logistics and supply chains for agricultural products are cost, time, and reliability. Logistics and infrastructural development will result in increased efficiency, reduction in production costs, waste during transportation, steps in operation, and product delivery time, while enlarging the marketing opportunity through linking the information technology with the data base on agricultural production and marketing.

3.8 Security in Food and Energy. The rising trend of the global use of energy has urged many countries including Thailand to continuously turn more to the alternate source of energy. This has increased the demand for energy crops. The combined acreage of oil palm, sugarcane and cassava has risen by 34%, and that of rice, 12%, to meet both the rising domestic and the export demands. Food and energy securities are vital to agricultural development. Food security was accorded high priority in the Agricultural Development Plan under the Eleventh Plan (2012–2016). Emphasis was given to food availability, food utilization, and food accessibility. Food crops were also utilized as an alternate source of energy. This helped reduce problems from their surplus supply while partly mitigating those from high oil prices. With the expectation that future demand for alternate source of energy will grow, the government should plan and estimate the balanced situation in the production of, and demand for food and energy crops in short,

medium and long runs. This can be done by setting joint targets between the agriculture, the industry and the energy sectors, giving first priority to the country's food security.

3.9 Environmentally Friendly Agriculture. Development of the agriculture sector depends basically on natural resources and climatic conditions. Its rapid growth in the past directly and indirectly exploited natural resources extravagantly and carelessly. This has caused the ecological loss of strength and rapid depletion of natural resources and the environment, which reflected the imbalanced and unsustainable development in the past. The Green Economy being the major agenda discussed and adopted in the 2012 Rio+20 Conference indicated the global preference over the new concept of Green Growth and Low Carbon Development. Its emphasis was the maintenance of the present level of environmentally friendly economic growth for the living security of the people, while preparing for the adjustment against the increasing severity of the climate change in the future. Laying down the measures and directions for the preparedness and supports on the environmentally friendly production is therefore important to the development of the Thai agriculture sector.

3.10 Research and Development in Agriculture including Agricultural Innovation and Technology. Research and technological development in agriculture are the key economic and social driving forces. In the past, new technology was used in varietal development of plants for increasing their productivity and unsuitable environmental adaptation. Examples were the breeding for drought and flooding tolerant, and the insect and pest resistant. Biotechnological knowledge development has brought about agricultural commodities of high quality and value addition such as rice fragrance, hybrids with required dominant characters from parental stocks, and tissue culture. In addition there were also researches on beneficial development of innovations in agricultural commodities, and the manufacturing of agricultural machines for use in different farming activities. What have retarded the growth of researches in agricultural development have been the shortage of researchers, low incentives for governmental researchers to move up the ladders in their profession, insufficient research budgets compared to those in other countries and the lack of farmers and local communities' participation in determining the research topics that truly benefit them. Moreover, the insufficient number of innovation–oriented research and value addition ideas has restricted the government from disseminating their results for wide applications. The discontinuity of research projects due to their budget shortage, and the lack of systematic assembling of research works in different

fields, be they scientific, social, economic and environmental, etc. Requires a more systematic and continual approach.

3.11 Agricultural Development Related Regulations and Legislations. Globalization in the form of borderless communication has rapidly linked the world, and created new contexts in agriculture. This has outdated some of the present rules and legislations while searching for the inexistent ones to cope with the issues not yet covered, namely, ways to tackle the global warming problems, and be responsible agricultural investment. It is therefore a vital mission of the MOAC to supervise, observe, examine and assess their policy impacts, such that new legislations or regulations, that will correctly, appropriately and justly serve the interest of the farmers, may be prepared and proposed for use in the future. In addition, existing laws also need to be updated and amended to support the efficient operations of related officials.

3.12 International Cooperation and Agreements. During the period of the past agricultural development plan, there were several international groupings and agreements as well as obligations organized at the regional, bilateral, sub–regional, multilateral, and cooperation with country groups like the Association of South East Asian Nations (ASEAN). Ayeyawadi–Chao Phraya–Mekong Economic Cooperation Strategy (ACMECS), Greater Mekong Sub–region (GMS), lower Mekong Initiative (LMI) and Bay of Bengal Initiative Multi–Sectoral Technical and Economic Cooperation (BIMSTEC). The key issues that require further development are the study on regulation and legislations of Thailand's trading partners which may affect agricultural trade, the import–export measures for efficient adjustment and preparedness. Moreover, proactive measures should be provided for the best benefits of Thailand in international groupings and agreements.

3.13 Management of agricultural commodities for the border trade and the special economic zones. Border trades between Thailand and its neighboring countries are significantly vital to the Thai economy. The rising trend of these border trades has fetched Thailand several hundred thousand million baths yearly. This has led the National Council for Peace and Order and the government to step in to help develop the business firms in the border areas that use local raw products or that from the neighboring countries in their production process. The objectives are to increase the income–generating opportunity of the local

communities, as well as their employment and better quality of life. In the first phase the first five border provinces (in 6 border areas) designated to be Special Economic Zone are Tak, Mukdahan, Sa Kaew, Trat and Songkhla. Another five provinces designated in the second phase are Kanchanaburi, Chiang rai, Nong khai, Nakhorn phanom and Narathiwat. The program aims to build a production base linked to that of ASEAN, develop the border provinces to be attractive to foreign investment, enhance the country's competitiveness, contribute to regional development, narrow the income gap and uplift the quality of lives, and mitigate the national security problems. For border agricultural products, agricultural cooperatives in collaboration with the private sector take action in buying primary agricultural products from neighboring countries and processing and value adding products in Thailand for domestic consumption or exports. There will also be quarantine for crops, fish and livestock, modern import and export checkpoints, and National Single Window (NSW) at all border trade areas. Personnel and infrastructural development of the border trade offices and product examination and release counters, for instance, need to be continuously developed in order to facilitate the One–stop services.

4. Agricultural Development Strategy in the Twelfth National Economic and Social Development Plan (2017–2021)

4.1 Vision

"The agriculture sector moves forward through technology and innovations, market–led production, the quality of life of farmers, balanced and sustainable natural resources"

4.2 Mission

1) Developing and securing the quality of life of farmer.

2) Developing the agricultural economy toward its sustainable growth.

3) Promoting the production of quality agricultural products throughout their supply chains and in synchronism with their market demands, as well as research, technology and innovations for benefit uses.

4) Promoting sustainable and balanced management of agricultural resources and the environment

4.3 Objectives

1) To establish pride in the agriculture profession for being self–sustained, through continuous transfer of technology, farmers' groupings, strong linkages with external networks, and narrowing income gap.

2) To promote among the farmers and their institutions the upgrade of their productivity, efficiency, and standards, as well as value added agriculture in response to market demands.

3) To build up the competitiveness of agricultural products as well as develop applicable researches, technology and innovations.

4) To perform efficient management of agricultural resources toward their adjustability and immunity in dealing with the climate change.

4.4 Targets

1) Increased farmer happiness to the level of 85 in 2021.

2) Higher farm income of 59,460 baht per household in 2021.

3) Economic growth in the agriculture sector of 3% per annum.

4) An increase in the utilization of agricultural researches, technology and innovations by at least 5% per year.

5) Restored agricultural resources and their more balanced and sustainable uses.

4.5 Indicators

1) Farmer happiness index.

2) Agricultural net cash income.

3) Agricultural GDP.

4) Numbers of the researches, technology and innovations applied.

5) Natural resources having been efficiently managed.

4.6 Strategies and Developmental Directions comprise the following 5 strategies and 23 developmental directions.

Strategy 1: Strengthening the Farmers and Their Institutions

Objectives

1) To make farmers more secure and able to generate income and pride from their agricultural profession.
2) To provide supports to farmers and their institutions to becom professional entrepreneurs.
3) To develop and connect the networks of agricultural profession.

Targets

1. Agricultural net cash income increases to 59,460 baht per household in 2021.
2. The acreage of farm land for sustainable agriculture increases to 5,000,000 rai in 2021.
3. The strength standard of farmers institutions with high potential is maintained with the increase in their business by 3% per annum.

Indicators

1) Agricultural net cash income.
2) Acreage of farm land for sustainable agriculture.
3) Number of strong agricultural organizations and their net income.

The Five Development Directions

1) Intensifying the results of faming in accordance with the Sufficiency Economy Philosophy by creating the consciousness of all levels of farm communities including households groups, organizations, networks and institutions in applying the principles of the Sufficiency Economy Philosophy in their farming. The principals are modesty, reasonableness, self–immunity and self–reliance which will lead to doing business, commercial farming and exporting.

2) Building up pride and security in agricultural profession by:

2.1) Organizing and develop new generations of farmers by joining academies with agriculture curriculum in transferring to them, farmers' children, and other people destined to be engaged in agricultural production, new technology in agricultural production, business administration, marketing, and access to credit sources. In addition, required capital for the new generations to be engaged in agri–business, and farm land are provided along with training

programs for them to transfer farming knowledge to the communities, and scholarships for them to further their studies and inherit their forefathers' farming.

2.2) Rerouting new farmers' attitudes through providing them with incentives and prides for their farming inheritance in the form of awards for best farmers in selected fields, and the publicity of their achievements. Their mindsets in protecting and passing their farmland and profession on to their successors should be further cultivated by adding them into the curricula from the kindergarten level onward.

2.3) Developing a welfare system for farmers, through promoting the creation of a farmers' welfare fund to ensure their occupational and living securities, while elevating their economic and social status.

2.4) Carrying out a continuous long–term agricultural debt adjustment program, especially for the debts under the supervision of The Ministry of Agriculture and Cooperatives or other credit institutions including informal debts to prevent farmer from their land loss. Establishing a center that provides advice and assistance to the farmers to deal with their lawsuit problems, and promotes credit disciplines among the farmers.

3) Promoting the effectiveness of sustainable agriculture through using appropriate agricultural production techniques, namely, integrated farming, natural farming, agro–forestry, the New Theory and inorganic farming that assist the farmers with limited resources and the rural society by:

3.1) Accelerating the implementation of the National Organic Farming Strategy (2017–2021) to achieve its targets in increasing the organic farm acreage by not less than 600,000 rai], the number of organic farms by not less than 30,000 farms, and the proportion of organic product consumed domestically to that exported to 40:60. In addition the traditional or folk organic farming should be upgraded through research promotion, the building and dissemination of knowledge body on organic farming; the development of organic products and services to increase its production potential and sustainability, the development of its markets and services; the certification of organic products, and the driving of organic farming toward its practical implementation and integration with other sectors.

3.2) Promoting as well as extending the results, and developing the production under sustainable agriculture in various farming system such as the New Theory, integrated

agriculture, agro–forestry, and natural farming by supporting the role of local wise men in driving and adjusting necessary infrastructural mechanism for sustainable agriculture, e.g. ; the development of information system on sustainable agriculture, the building of related knowledge body, the provision of capital support in the form of green credit for production incentives and market promotion, and so on.

3.3) Providing knowledge, understanding and thoughts on sustainable agriculture to the new generation farmers by working with the Ministry of Education in developing a curriculum containing knowledge on sustainable agriculture like organic farming, integrated farming, the New Theory agriculture with emphasis on food security, farm income, food safety, agro–industrial development, and the management of natural resources and the environment.

3.4) Developing the market places of safe agricultural products as an alternative for the consumers by separating them from the general markets to clearly distinguish the GAP for agricultural products and for common products including providing new marketing channel in both the domestic and overseas markets to the farmers and farmers institutions.

4) Developing farmers' knowledge toward being Smart Farmers by:

4.1 Augmenting the knowledge base of the farmers and farmers associations on the production of safety agricultural products, organic farming, soil improvement, products of good varieties (crops, fisheries, livestock), correct application of organic and chemical fertilizers based on soil analysis, the technical ways of plant pest control and prevention, production planning, commodity management, management of production costs, farm bookkeeping, ways to increase the production efficiency of key agricultural products, the production of quality agricultural products, the application of local wisdoms in agricultural product development, and marketing management for the farmers to eventually become Smart Entrepreneur.

4.2 Developing the thinking process of the farmers toward becoming professional farmers by emphasizing on the application of the knowledge leant from training in processing raw agricultural products into primary processed products for their value addition; the improvement of quality standards of agricultural products and goods to meet market demands; the management of markets at the community, provincial, and overseas level, in collaboration with academic institutions; the application of the lessons learnt, and supporting visits to success farms for possible replications.

5) Strengthening and linking farmer networks and institutions

5.1 Developing a model of successful production of high quality standard agricultural products throughout the supply chain of each product. This may be done based on the domestic or overseas success stories of farmers and their institutions, for further development and applications at the communities with appropriate social and economic conditions at the sub–district level, before expanding it to the district, provincial and national levels.

5.2 Promoting close collaboration between large and small–scale farmers for further development into production groups before linking them to the agro–industry level in the form of promoted agro–business and technology transfer network, agricultural and commercial facilitations, as well as agricultural marketing at the domestic and overseas levels.

5.3 Developing a network of farmers and their institutions using an information system through supporting the online network and information exchange among them.

5.4 Promoting grouping of farmers to strengthen them by:

(1) Conducting surveys on what the farmers need to do as farmer groups by telling them the benefits from so–doing in terms of cooperation and exchange of knowledge all through the supply chain; processing their applications to become group members, and transferring to them knowledge especially that on farmer groups management.

(2) Promoting groupings in various forms from the local level of production to that of industry level to benefit from economies of scale, extended customer base, and strong upstream industry. An example is the cross grouping among groups of farmers engaged in growing different crops, or other related activities in the same supply chain, e.g. paddy farmer groups and fertilizers producing groups who use rice husks and hay in making organic fertilizers, grouping of new generation farmers who are youth farmers and those who are youth cooperators, and that of single–owner entrepreneurs into cooperatives, partnerships, and companies.

(3) Supporting social business in the forms of cooperatives, community corporations, or other types of community–based business to serve as the key mechanism in developing production, marketing and services in agricultural commodities and products in order to create careers for local farmers and bring back the profit to the society in a variety of forms such as social welfare, education and public health.

5.5 Strengthening farmer institutions toward further development into agricultural entrepreneurs.

(1) Providing the farmers with farm inputs through their institutions in order that they can produce agricultural products of standard quality, and quality farm inputs such as good seeds on their own.

(2) Assisting the farmers and their institutions to become professional entrepreneurs through giving them an access to information on production, marketing management, finance and accounting, agricultural technology, credit sources, economic and agricultural situations both in-country and overseas, from the official and other sources of information. Recording the information and data on production and marketing activities for use as a database in planning and managing the production in accordance with the market demands, and in making decision on investment is also promoted.

(3) Promoting the development of the production and marketing potentials of farmers institutions by providing them with low-interest credit sources, higher accessibility to production inputs, more marketing channels for agri-business, production and marketing linkage, barter trade, strong management of farmers institution to be able to do their business with both the local and overseas private sectors.

5.6 Linking and integrating all related sectors together for systematic approach toward seeking solutions to agricultural problems by:

(1) Preparing an integrated plan for all related sectors, namely, farmers, farmer groups, the farmers council, the governmental sector, the private sector, academies, non-profit organizations, and consumers using the 4M (Men, Money, Material, and Management) Principles, and harmonized problem solving. Some examples are research studies on farming pattern suitable for small landholders; close linkage between the Ministry of Agriculture and Cooperatives, and the Ministry of Commerce in getting the information on the market demanded quantities and qualities.

(2) Promoting close cooperation in agricultural development among the government sector, the private sector, farmers, and consumers by combining their strengths in problem solving, activation of agricultural development and managing the upstream, midstream and downstream industries of agricultural commodities, taking into consideration their mutual benefits.

(3) Performing any actions that would help solve agricultural problems, namely, improving rules and regulations in contract farming to be more appropriate and fair, passing laws to control contracting between farmers and the private sector and issuing measures to assist the farmers having conflicts with the private sector.

Strategy 2: Enhancing the Management Efficiency of Agricultural Commodities all through Their Supply Chains

Objectives

1) To make Thailand the center of production, trade and processing of agricultural products which are important to the ASEAN region.
2) To promote the production process, processing and marketing of agricultural commodities of high quality and safe standards.
3) To increase the efficiency of supply chain management.

Targets

1) A not less than 2.5% growth of the export values of agricultural products.
2) Higher production efficiency and quality of agricultural products and commodities.

Indicators

1) Growth rate of the export values of agricultural products and commodities.
2) Numbers of farms / factories having been certified in terms of their qualities.

The Eight Development Directions

1) To promote the production of market standard agricultural products to enhance their qualities and standards, value addition, and competitiveness by:

1.1) Developing the pre–harvest process that reduces the production costs of agricultural products, while yielding their international quality standards through promoting the development and distribution of good breeds (of plants, fisheries and livestock), as well as promoting the groupings of small farmers to gain the benefits of the economies of scale of large–plot cropping in terms of production management and mechanization.

1.2) Promoting the adjustment in production based on the appropriate potential of the area and market demand (zoning by Agri–map) through special measures extended to

the production adjusted farmers such as support of input supply, providing sources of low-cost credits, etc.

1.3) Developing the postharvest process that helps maintain the qualities of the produce and reduce their harvest loss until they reach the hands of the consumers or factories; as well as the packaging designs that meet the market demand for value addition and an efficient traceability process to gain the consumers' confidence.

1.4) Creating the body of knowledge and the safe food consciousness among the producers and consumers starting from their childhoods; and developing further the body of knowledge and understanding on the quality standards of agricultural products among farmers, their institutions, and the public, such that they will be aware of the importance of GAP, GMP, HACCP throughout the supply chains of crop, fishery and livestock products, while being well publicized on the difference between general products and those of quality standards.

1.5) Define the standards of agricultural products and food at all levels, from on-farm, processing factory, abattoir and ready-to-eat, up to the ASEAN level to serve as the regional standards for Thailand to become the center of the regional hub.

1.6) Support the suitable transfer to the private sector the authority for farm examination, product analysis, and farm certification.

2) To promote the management administration of the supply chains of agricultural products by:

2.1) Constantly transferring the body of knowledge on agricultural logistics, and supply chain to farmers, farmers institutions, and agribusiness entrepreneurs especially that on supply chain management, value chain creation, logistics management from farm to forks such that market demanded products will be produced. Besides, they are convinced on the importance of applying these knowledge and management capability in their own business.

2.2) Promoting cluster farming and contract farming among farmers, their institutions and agri-business entrepreneurs to enter into agro-processing industry both in and outside of the country, especially with the neighboring countries for exporting processed agricultural products to the third countries.

2.3) Supporting the development of locations, areas, or cooperative distribution centers (CDC) to serve as collection points for grading and distribution of products and commodities among different levels of markets and consumers, starting from local, community, provincial, inter–provincial, to the national levels.

2.4) Supporting the establishment of communal service centers to provide rental services in collecting, distributing, and transporting agricultural products such as renting of agricultural machineries, cold storages, drying platforms, and warehouses by focusing on farmer institutions serving as service providers.

2.5) Supporting the networking of logistics management among the farmers, their institutions and the private business entrepreneurs to provoke their exchanges of knowledge, technology and innovations on supply chain management through their joint planning in agricultural production and transportation.

2.6) Applying cool chain to preserve the quality of vegetables, fruits, dairy products, meats, and fishes, and to increase the logistical efficiency of perishable products, while developing a process to reduce food losses throughout the supply chain, from cultivating, harvesting, processing, packaging, transporting, storing and distribution to the hands of the consumers.

2.7) Promoting among the farmers and their institutions the three dimensions of improved efficiency in farm–to–fork logistics, e.g. cost, lead time, and reliability, giving precedence to the following key logistical activities; (1) forecast of the demands for agricultural products prior to their production; (2) customers servicing before, during and after receiving the purchase orders; (3) inputs purchases; (4) logistical communication for correct delivery of the ordered products; (5) transportation of agricultural products; (6) storage management; (7) stock management; (8) harvesting, grading and packaging and (9) traceability and returns of agricultural products.

3) To add more value to the products by:

3.1) Promoting the production of high quality, unique and high value products to meet the demand of niche markets, where their prices can be escalated through branding them as safe, organic, and halal foods, for which special trade centers are built, like the herb shops, and Thai silk shops, aiming at customers of high purchasing power and foreign tourists.

The products may be legally protected with the GI or Geographical Indication sign and more value added through online trade in the present digital economy.

3.2) Promoting the use of local wisdoms in processing to increase the value of agricultural products, which are publicized under the One–Tambon–One–Product (OTOP) program to boost the competitiveness and the uniqueness of local communities.

3.3) Adding more values to the agricultural products through initiatives or intensive farming all through their supply chains, from their cultivation to their processing into various commodities. This can be done by applying supporting and developmental technology like the packaging innovations to conserve the freshness of agricultural produce, to change their shape, and to create their uniqueness or origins. Also included are the complete cycle of value addition such as that of silk products, which do not only add value but also build reliability among both the domestic and overseas consumers.

3.4) Promoting and supporting agro–tourism by turning agricultural areas into tourist attractions, where tourists can join the rural communities in rural activities like paddy transplanting, cloth weaving, etc. In addition, local wise men centers may be developed into one–stop tourist spots with agriculture and health tours provided, such as the natural therapies center, herbal spas, health restaurants, and so on. A network and a standard system of agro–tourism may be developed along with their publicity under close collaboration of the government sector, the private sector, and the communities aiming at additional income to the communities.

4) To establish an agricultural marketing center and develop the agricultural marketing system under the supports and cooperation of the government and the private sectors, and the farmers to serve as the center for production, processing, product management, marketing, and trading. Also the center is to determine the marketing margins all through the supply chain of each agricultural product by:

4.1) Supporting the establishment of quality seed and animal breed centers for the ASEAN region aiming at the development and researches on varieties/breeds of high quality, and which are adaptable to environmental changes, to provide their sufficient and ready access among the farmers, as well as to serve as community learning and training centers on seed/breed production.

4.2) Promoting the establishment of centers for food production, as well as exports of agricultural, food and health products; the production of safe agricultural products and halal food for exporting to overseas niche markets, while serving as the Southeast Asian main logistical and distributional center for agricultural and food products.

4.3) Supporting the establishment of the Center for the Management of Agricultural Products or Agricultural Markets to manage the agricultural production in all areas according to their market demands, and to serve as the center for marketing and exchange of agricultural products, that is linked to the community/local, provincial, national and international markets, taking into consideration fare trade and an additional marketing channel through farmers institutions.

4.4) Building, improving and developing the marketing infrastructures and facilities of farmers institutions, like central markets, cold storages, and modern technological systems, to be perfectly ready and sufficient for uses and service provision at all major economic and trade corridors, or the spots and checkpoints where there are loading and reloading of commodities.

5) To build up sustainable food security by managing food emergency caused by catastrophes (floods, droughts, earthquakes, and storms) through ready access to food sources, both physically and economically, for sufficient supply of safe and nutritious food required for good and healthy lives, including the production of seeds to be reserved to meet their shortages.

6) To promote the public private partnership by:

6.1) Supporting the participation of private agribusiness entrepreneurs or the private sector in an investment, or in a Public Private Partnership (PPP), on the provision of agricultural infrastructures or facilities, like a center for the collection and distribution of agricultural products for display, marketing and distribution within the province or in tourist areas.

6.2) Motivating the adoption of Responsible Agriculture Investment (RAI) through issuing basic laws on RAI practice in the agriculture sector to prevent land grabbling and large–scale land acquisitions taking into consideration the following 10–point Principles for RAI adopted by UNCTAD, FAO, IFAD, and the World Bank in 2013 by; 1) Contribute to food security and nutrition; 2) Contribute to sustainable and inclusive economic development; 3) Foster gender equality and

women's empowerment; 4) Engage and empower youths; 5) Respect tenure of land, fisheries, forests and water; 6) Conserve natural resources and contribute to climate change adaptation and mitigation; 7) Respect for cultural heritage and traditional knowledge; 8) Promote safe and healthy production system; 9) Incorporate inclusive, and accessible governance structure, processes and grievance mechanism and 10) Review impacts and ensure accountability and transparency.

7) To support the management of risks affecting agricultural produce from climate change, natural calamities, and price fluctuations through providing a risk assurance mechanism and an early warning system in advance for the preparedness to cope with the future risks by:

7.1) Establishing an insurance system for crops, fishery and livestock products by giving primacy to studies and research on the forms of agricultural risks and appropriate insurance system that would help reduce farmers' risks, taking into consideration the benefits to the farmers and their capability to pay for the insurance premiums.

7.2) Building knowledge and understanding on crop insurance like the assessment of insurance premium, damages, and compensations as well as other insurance benefits for the farmers for publicity through the various media.

7.3) Motivating the farmers to participate in the crop insurance program by subsidizing part of the insurance premium in the beginning.

7.4) Providing measures necessary for alleviating agricultural risks, namely, the use of new technology in weather forecasts, and the promotion of diversified farming.

8) To promote border trades, special economic zones and international cooperation with emphasis on initiating the cooperation from the production process, investment, and international trade among the various economic regions in the form of Government–to–Government before expanding it to Government–to–Private Sector by:

8.1) Providing facilitations in the border trades between Thailand and its neighboring countries by establishing the National Single Window (NSW) and One–Stop Service for crop, fishery and livestock products trade. In addition, there will also be a promotion for the production of raw materials in the neighboring countries where there are shortages in the domestic supply of some agricultural production. The products may be processed along the border

and special economic areas for exporting to the third countries thus resulting in job creation, income generation and solving insecurity problems along the borders.

8.2) Promoting joint investment and agricultural development under the various sub–regional agreements, in particular the ASEAN Economic Community (AEC), to form a single market and production base, where there are exchanges in technology, knowledge base, researches and development.

8.3) Promoting the exchange of marketing network with foreign markets in order to expand the production and marketing bases, and hence widen marketing channels for agricultural products which will lead to joint venture among governments and between the government and the private sector, as well as that between the Thai and the overseas private sectors;

8.4) Promoting the publicity of the value of Thai agricultural products the world over.

Strategy 3: Increasing the Competitiveness of the Agriculture Sector with Technology and Innovations

Objectives

1) To promote research, and develop integrated agricultural technology and innovations among the government sector, the private sector, and the farmers.
2) To encourage the application of agricultural researches, technology and innovations.
3) To develop the information system of wide application.

Targets

1) Increases in the budgets for agricultural research, as well as technological and innovation development by 5% per annum.
2) Increases in the utilization of agricultural researches, technology and innovations by 5% per annum.
3) Increases in the transfers and application of agricultural technology and innovations by 5% per annum.
4) Increase in the numbers of farmers and service receivers having access to the information in the agricultural information system by not less than 10% per annum.

Indicators

1) The proportion of the annual budget of the Ministry of Agriculture and Cooperatives spent on agricultural research, technological development and innovations.
2) Numbers of agricultural research, technology and innovation having been utilized.
3) Numbers of farmers and other having been transferred with technology and innovations, who have successfully applied them.
4) Numbers of users in the agricultural information system.

The Three Development Directions

1) **To promote and support agricultural research, technology and innovations** by:

1.1) Promoting and supporting agricultural research, technological development and innovations from their production to processing and marketing in close integration with related agencies like farmers institutions, governmental units, the private sector or academies. This can be done by employing the various fields of knowledge to support the research and development works, namely, the biological process, biomolecules, modern technology, solar cells, microbiological research including the productivity increasing process, value addition of agricultural commodities, and other value–addition processes that serve the consumers demands. All of these will be useful to practical applications for better competitiveness in the world market, not to mention the importance of their application in agricultural economic studies toward mitigating poverty and social inequality.

1.2) Providing budgetary supports to agricultural research, technological development and innovations in production, processing and marketing with priority given to research on innovations and creativeness, new technology and biotechnology that are helpful to food and non–food agricultural production according to their market demand. Examples are the research, technological development and innovation to replace agricultural labors, innovations that help the aged farmers to continue working on their farms, innovations and farm machines for postharvest management, production of herbal medicines and etc.

1.3) Creating new generations of agricultural researchers while enhancing the capability of the present ones through providing them with fellowships for further studies, trainings, and researches both in and outside of the country. In addition the incentive system for

governmental research workers and their career path will also be improved to solve the problem of their shortage.

1.4) Supporting the research and development on strengthening the agriculture sector in collaboration with other ASEAN member countries. This will be done along with building a network of the various sectors to create partnership and common interests among them, especially researches on the ASEAN key agricultural products like rice, rubber, oil palm, etc.

1.5) Supporting the framing of research works and innovations based on local market demands, and the extension of local wisdoms to be practically applied wider. Registration of copy rights and intellectual properties of farmers own initiatives and innovations will also be promoted.

1.6) Promoting and developing the potentials of the local wise men/researchers to participate in agricultural research works and innovation creativeness, as well as joining the youths, the new farmers generation and academies in conducting action research.

1.7) Supporting researches on biotechnology to improve plant varieties and animal breeds according to market demands, that is, to have high yields and to be resistant to unsuitable environmental conditions like acid soils, droughts, and floods. Besides, researches on the environmental conditions affecting agricultural production are also supported.

2) To systematically develop the agricultural information technology and its data linkage by:

2.1) Managing the agricultural database to become more systematic, thorough, timely, storable and retrievable all the time. An example is the management of the Agri–map.

2.2) Supporting and developing the Agricultural Information Service to provide updated information and data on the marketing of and demand for agricultural products, which flow freely among all farmers. The purpose is for the farmers to make use of the information and data in planning their agricultural production based on the demand driven approach.

2.3) Managing the information channels to allow easy and quick access of the farmers to the correct and updated information and data. Examples are the development of

an application for e-learning, TV broadcast programs on agriculture, dissemination of information through village volunteers, agricultural economics operation centers, and social network.

2.4) Supporting the transfer of technology on e-commerce of agricultural products to provide the farmers, farmers institutions, as well as small and medium entrepreneurs with advice and recommendations on the efficient business operation through e-commerce. Pilot projects on the operation of e-commerce will also be initiated to demonstrate its effectiveness.

3) To promote the application of agricultural research, technology and innovations by:

3.1) Initiate collaborations with agencies at the provincial and regional levels, and with the various academies in collecting agricultural research studies, technology and innovations for dissemination in appropriate places where farmers and other interested persons can learn and apply them.

3.2) Supporting the collaboration with the private sector in manufacturing the end products of research, technology and innovations for selling to the farmers and the interested goers at appropriate prices to reduce their production costs and the country's imports of agricultural machineries.

3.3) Supporting the development of farmers, local wise men, model communities, and farmers institutions to use own discoveries in agricultural technology and innovations for leaning purpose, as well as applying them in large-scale farm plots for cost reduction purpose. Also included is the development of hi-tech and innovative farming system toward precision farming, in which production costs, resource uses and marketing are confined by applying technology in controlling the use of water, fertilizer application, insect and disease controls, breeding, and harvesting.

Strategy 4: Balanced and Sustainable Management of Agricultural Resources and the Environment

Objectives

To initiate the balanced and sustainable management of agricultural resources and the environment resources in the utilization and conservation of natural resources and the environment.

Targets

1) 12,500,000 rai of farm land is managed and rehabilitated in 2021.
2) Not less than 45,000 on–farm water sources, and 300 water sources for land and water conservation are developed and rehabilitated per year.
3) Increase in the irrigable land by 350,000 rai per year.

Indicators

1) The acreage of land having been managed and rehabilitated;
2) Numbers of on–farm water sources and those for land and water conservation having been developed and rehabilitated;
3) The acreage of irrigable land

The Five Development Directions

1) To rehabilitate and conserve agricultural resources by:

1.1) Improving, rehabilitating and conserving agricultural resources, such as soils, water and marine resources, as well as promoting their worthy and efficient utilization taking into consideration their limitations and appropriateness. Sustainable farming activities or conservative agriculture to maintain natural balance is also promoted.

1.2) Promoting the conservation of plant and animal species, both in the conservation and other areas for their sustainable survival and bio–diversification, including sustainable fisheries, coastal resource management and freshwater fisheries.

1.3) Creating farmers' awareness about the values of agricultural resources rehabilitation and conservation.

2) To promote environmental friendly agriculture by:

2.1) Promoting environmental friendly agriculture using the on–farm waste management system, production system, and processing of agricultural products and food; building awareness of the farmers and other related persons in farming with responsibility to the environment and the society, by using the production techniques which neither create pollution nor damage the environment. Provision of technical knowledge to the farmers and their institutions is also included.

2.2) Promoting and transferring of sustainable and environmental friendly technology, namely, green agriculture, low–carbon farming, and Good Agriculture Practice (GAP) to the farmers, their institutions and agribusiness entrepreneurs.

2.3) Building knowledge and understanding of the farmers to reduce their use of farm chemicals; promoting among them chemical–free agriculture; controlling and supervising the application of farm chemicals in preventing and controlling pests; and accelerating research and development on natural substances to replace chemicals for their wide commercialization among the farmers.

2.4) Promoting the use of agricultural wastes like rice husks and seeds for processing into alternate/bio energy at the household and community levels, or into other commodities like furnishers, ornamentals, etc., for value–addition, waste reduction, and environmental purposes.

2.5) Promoting and supporting the engagement of farmers, their institutions and agribusiness entrepreneurs in environmental friendly agribusiness using the Green Principles in the supply chain which comprise Green Material, Green Purchasing, Green Production, Green Packing, Green Markets, Green Branding, and Green Logistics.

3) To manage water resource by:

3.1) Developing Irrigation Area Management by:

(1) Increasing the volume of irrigation water and agricultural water sources by developing a thorough water management system based on the conditions of the areas covered, including agricultural areas; building a complete irrigation network as well as studying the possibility of diverting water from the international sources like the Mekong River and the Sarawin River for use in domestic irrigation.

(2) Increasing the efficiency in the management of the entire river basin, from the existing stock of water, building of monkey cheeks, pipe irrigation system, the use of irrigation water, and rate of water loss, through the participation of communities and stakeholders.

(3) Improving, repairing and maintaining the available water sources and irrigation areas to ensure their full capacities, and managing to maintain the stable flow of irrigation water in order to reduce its loss.

3.2) Increasing and improving the small on–farm and community water sources by:

(1) Promoting and supporting the management of on–farm water source in accordance with the physical structures of the soils, geography and land area to ensure the availability of water all year round;

(2) Building community water sources and the participatory water management system for the community as well as promoting community tree planting and community forests.

3.3) Increasing the efficiency of the Royal Rainmaking operations to mitigate the problems and damages from droughts, while humidifying farmlands and forests by:

(1) Increasing the number of the Royal Rainmaking units.

(2) Initiating integration with related agencies while promoting a network of volunteers to assist and support the royal rainmaking operations.

(3) Conducting research and development in converting the climatic conditions toward increasing the efficiency of the rainmaking operation in mitigating the problems and damages from droughts.

3.4) Studying the possibility of joint investments between the government sector and the overseas private sector, and encouraging joint investment in the water management system, such as the management of the existing stock of water, the technology in developing new water sources, dripping irrigation, etc.

4) To manage agricultural land by:

4.1) Managing the use of agricultural areas in cropping, livestock raising and aquaculture based on their suitability to the conditions of soils, water, weather, temperature, and sunlight, or zoning.

4.2) Promoting agricultural land consolidation to provide the farmers with production potential, access to water sources, and public utilities for the transportation of their production inputs, and of their produce to the consumers.

4.3) Providing land to the landless farmers, and enforcing fare distribution of land among them by giving them landownership under the Agricultural Land Reform program, which acquires idle land and that under inefficient land use, from both the government and the private sectors, and distribute it to the poor farmers and people for more economical and wider uses.

4.4) Supporting the enactment of laws to protect agricultural land, and reduce the loss of its ownership through implementing the concept of land banks and using the community land deeds as a tool in land reform and distribution of landownership. In this way the farmers will have land of their own while their communities serve the key function of looking after and developing it in joint cooperation with the government.

5) To build immunity in agriculture against climate change by:

5.1) Preparing maps on the risks from climate change that show the agricultural areas affected by the climate change for the community to jointly solve the problems, that show the vulnerable areas to floods, droughts, landslides, problems from saltwater intrusion, transmission of plant and animal diseases, etc. Vulnerability assessments of agricultural land and coastal areas are needed to update their risks and vulnerability for use in the preparation of the adaptation plan for the agriculture sector.

5.2) Developing a warning system on the use of irrigation water, and an early warning system on climate fluctuations for a close watch of their effects, and for drawing contingency plans by giving priority to studies, researches, development of models and seasonal weather forecasts, required in planning of agricultural production and water resource management. Impact assessment, the Geographical Information Service (GIS), a decision making supporting system, and the information management that allows the sending of information from the early warning system to the farmers, entrepreneurs, related governmental agencies and other stakeholders for their adaptation and mitigation of the climate change effects are also given equal precedence.

5.3) Supporting the development and transfers of technology on the improved plant varieties and animal breeds in terms of their resistance to climate fluctuations, such as

the plant varieties that can stand drought and flood, and the disease resistant ones. These are the immunity which can alleviate the effects of climate change.

5.4) Promoting the development and transfers of the agricultural management technology and innovations to help mitigate the effects of climate change and climate fluctuations. Examples are the agricultural technology for precision farming, remote sensing, geographical information system, and on–farm water management. Also included are the transfer of technology on farming with immunity against climate change, and conservation of agricultural resources, such as agriculture based on the sufficiency philosophy, integrated farming system, intercropping, rotational cropping, agroforestry, the 3–way and 4–benefit reforestation, and agriculture with low water of using less water, and the efficient and effective uses of appropriate Thai wisdom in the decision making process of cropping and livestock raising planning under the climate change variation.

5.5) Building a mechanism and measure to mitigate the effects of climate change through the distribution of the risks from climate change through insurance against agricultural geo–climate disasters, risk management against geo–climate on agricultural production and marketing, future agricultural market, etc.

Strategy 5: Development of Public Sector Management System

Objectives

1) To increase the efficiency of the integrated public sector management both on agricultural personnel and the working process toward successive development with good governance, transparency and traceability;
2) To develop and improve the legislations and regulations to be ever up–to–date, correct, and just according to the changing economic and social conditions.

Targets

1) Fifteen restructured agencies under the Ministry of Agriculture and Cooperatives in 2021.
2) Five improved new and 12 existing laws in 2021.

Indicators

1) Number of agencies under the Ministry of Agriculture and Cooperatives having been restructured.
2) Number of laws having been enacted, revised and improved.

The Two Development Directions

1) Developing the public agricultural personnel, restructuring their organizations and working process by:

1.1) Developing the public agricultural personnel from ordinary into smart officers/smart researchers, who are ready to manage changes from inside and outside of the country, by promoting and implanting in them awareness, values, morality, ethics and disciplinary, as well as supporting trainings, learning of working skills, role adjustment of the government sector from being planners and implementers to becoming supporters of the agriculture sector. Those who work closely with the farmers need to be knowledgeable enough to provide the farmers with correct and appropriate advice, and transfer to them provable technical knowledge. A plan to recruit new personnel to replace the retired ones is also needed.

1.2) Developing the working process by providing incentives to the officers and restructuring their overlapped assignments; improving the internal supervision according to the standard criteria; conducting efficient analysis of budget allocation; supporting participation and integration at the working level; promoting decentralized decision making process at the local level; linking with other ministries; increasing private investments, and enhancing the role of the National Farmers Council.

2) Improving and revising agriculture related laws and regulations to become up–to–date, correct and just in accordance with the changing economic and social conditions by:

2.1) Enacting new laws and improving the existing laws to suit and go along with the economic, social and environmental conditions, while rightly and justly protecting the stakeholders, especially the rights of the farmers in accordance with the new laws. The essential new laws to be enacted include those on farmers' welfare, farm land protection, contract farming, and sales on consignment which have been the main cause of farmers' land loss. Also included are the revisions of laws in accordance with international standards to promote and support international trade and investment, namely, those obstructing trade and

investment in and outside of the country like those on Illegal, Unreported and Unregulated fishing (IUU), and Responsible Agriculture Investment (RAI).

2.2) Enforcing the laws in a thorough and fair manner, supporting strict enforcement of laws like those on quality standards, and quality control of production factors, along with the adoption of the Rules of Origin (ROO) for use in referring to the origins of the commodities.

5. Driving Process of the Agricultural Development Plan

5.1 At the Policy Level

The efficient and effective drive of the agricultural development plan as a whole requires a mechanism at the policy level through the Agriculture and Cooperatives Planning Board under the Twelfth Plan (2017–2021), having the Ministry of Agriculture and Cooperatives Permanent Secretary as its President. Other Board members include 4 Deputy Permanent Secretaries the Ministry of Agriculture and Cooperatives serving as the Board's Vice Presidents; representatives from agencies outside of the Ministry of Agriculture and Cooperatives, the private sector, the National Farmers Council, and heads of agencies under the Ministry of Agriculture and Cooperatives as Board members; Secretary General of the Office of Agricultural Economics as Board Member and Secretary; and Director, Bureau of Agricultural Development Policy and Planning as Board Member and Assistant Secretary. The duties of the Board are to set up strategies, measures, guidelines and directions for agricultural and cooperatives development under the Twelfth Plan (2017–2021) such that it can be effectively implemented to foster stable and sustainable growth in the agriculture sector; and to determine and provide recommendations on the drafting of the Agricultural Development Plan under the Twelfth Plan (2017–2021), as well as appointing sub–committees or working groups as it may see fit.

5.2 At the Working Level

As authorized by the Agriculture and Cooperatives Planning Board under the Twelfth Plan (2017–2021), the Sub–committee on the Driving of Agricultural Development Strategies under the Agricultural Development Plan in the Twelfth Plan (2017–2021) was appointed having the designated Deputy Permanent Secretary for the Ministry of Agriculture and Cooperatives as its Chairman; the Head of the Ministry of Agriculture and Cooperatives Inspector Generals as its vice–chairman; representatives of agencies in and outside of

the Ministry of Agriculture and Cooperatives, the National Farmers Council, and concerned personnel of the private sector as its members; and Office of Agricultural Economics representative as its member and secretary. The duties of the Sub–committee are to develop work plans; conduct annual review of programs and projects in an integrated manner and in accordance with the objectives, targets and indicators of the strategies and the agricultural development plan; submit the said programs and projects to be motivated by the field offices of the concerned agencies under the single command (SC) of the sub–committee through its mechanism at the provincial level.

5.3 Translating the Agricultural Development Plan into Action

To translate the Agricultural Development Plan into action, all agencies at the departmental level under the Ministry of Agriculture and Cooperatives and other concerned ministries are to conduct detailed analysis of the strategies and development directions to come up with key programs and projects that will lead to the targets of each strategy (Table 20). The required annual budgets for the said programs and projects will then be prepared and made available for implementation at the field level. To fulfill this, the key programs and projects must follow the following two dimensions of annual budget requests:

1) **The Function–based programs / projects** are those to be implemented according to the basic duties legally assigned to the requesting agency which are of continuing nature.

2) **The agenda–based programs / projects** are those to be implemented according to the policy assignment in a specific period of time, based on the given issue, which requires integration among several related sectors working toward the same goal.

The programs and projects determined in this Agricultural Development Plan are based on the strategies used in preparing the Agricultural Development Plan under the Twelfth Plan (2017–2021).

Table 20: Key Strategies Programs / Projects

Strategies	Key Programs / Projects	Targets	Responsible Agencies
Strategy 1: Strengthening farmers and their institutions	1. Development of farmers using the Sufficiency Economy Philosophy principles. 2. Engagement of farmers in agribusiness. 3. Development of sustainable agriculture. 4. Organic agriculture. 5. Develop and promote farmers institutions network. 6. Learning centers on increasing agricultural productivity. 7. Agricultural commodities bank.	1. Farmers apply the Sufficiency Philosophy in their agriculture profession. 2. There will be 75,300 smart farmers. 3. At least 2.5 million rai of farmland are sustainable. 4. Increases of at least 600,000 rai of organic farm land, and 30,000 organic farmers by 2021. 5. Ninety percent of cooperatives are of levels 1 and 2 strength. 6. At least 882 learning centers and networks are created. 7. At least 739 banks for agricultural commodities are established.	MOAC / MOE / MOC / MOPH / National Farmers Council / Board of Trade of Thailand / The Federation of Thai Industries
Strategy 2: Enhancing the Management Efficiency of Agricultural Commodities all through Their Supply Chains	1. Develop quality standards for agricultural commodities 2. Administer the management of agricultural commodities throughout the supply chain.	1. 85% of plots/farms under crop/fish/livestock farming have been certified. 2. Agricultural GDP increases not less than 3%.	MOAC / MOTS / MOI / MOC / MOPH / MOE

Table 20: Key Strategies Programs / Projects (cont.)

Strategies	Key Programs / Projects	Targets	Responsible Agencies
	3. Promote large–scale farming. 4. Promote mechanization in place of agricultural labor. 5. Create value added for agricultural products. 6. Strengthen Thailand Seed Center. 7. Manage risks affecting agricultural commodities. 8. Conduct agricultural management in special economic zones.	3. Number of 30 million rai. 4. All modern civil–state large plots are mechanized. 5. Agricultural GDP increases at least 3%. 6. The establishment of Thailand Seed Center. 7. More farmers participate in the agricultural insurance system. 8. Ten special economic zones	
Strategy 3: Increasing the Competitiveness of the Agriculture Sector with Technology and Innovations	1. Srengthen the research and development system in agriculture. 2. Improve crop varieties and livestock breeds. 3. Integrate the different information technology architectures to be more systematically useful.	1. Development of not less than 50% of the study results in technology and innovation. 2. The yields of crops and livestock production increase. 3. By 60% of the farmers apply what they have learnt on the technology and innovations transferred to them.	MOAC / MOST / Educational–Institution*

Table 20: Key Strategies Programs / Projects (cont.)

Strategies	Key Programs / Projects	Targets	Responsible Agencies
Strategy 4: Balanced and Sustainable Management of Agricultural Resources and the Environment	1. Sustainably managing the agricultural and environmental resources. 2. Holistic management of the farm chemical application. 3. Administering water and irrigation area management. 4. Administering the land management problems. 5. Building farmers immunity to climate change; 6. Solving the problems of illegal fishing. 7. Administering agricultural zoning.	1. Conservation, improvement and rehabilitation of 12.5 million rai of agricultural land. 2. About 5% of farmers use less chemicals. 3. About 34.92 million rai of farmland are irrigated. 4. There will be 8 large consolidated plots in the agricultural land reform area. 5. The number of farmers who stop burning their land while having research results in adapting themselves amounts to 76,900 person. 6. Inspection of at lease744 fishing gears. 7. The improver farming activities of at least 100,000 rai of farmland have been corrected.	MOAC / MOE / MNRE / MOST

Table 20: Key Strategies Programs / Projects (cont.)

Strategies	Key Programs / Projects	Targets	Responsible Agencies
Strategy 5: Developing the management system in the governmental sector	1. Adjusting the structure of MOAC. 2. Developing the governmental personnel. 3. Improving legislations.	1. All the 15 departments have been restructured. 2. Not less than 20% of government personnel become smart officers. 3. All 17 laws have been improved.	MOAC / MOJ

Note: The important projects may be added or adjusted in order to suitably match with the goal of national agricultural development plan and conform to current situation.

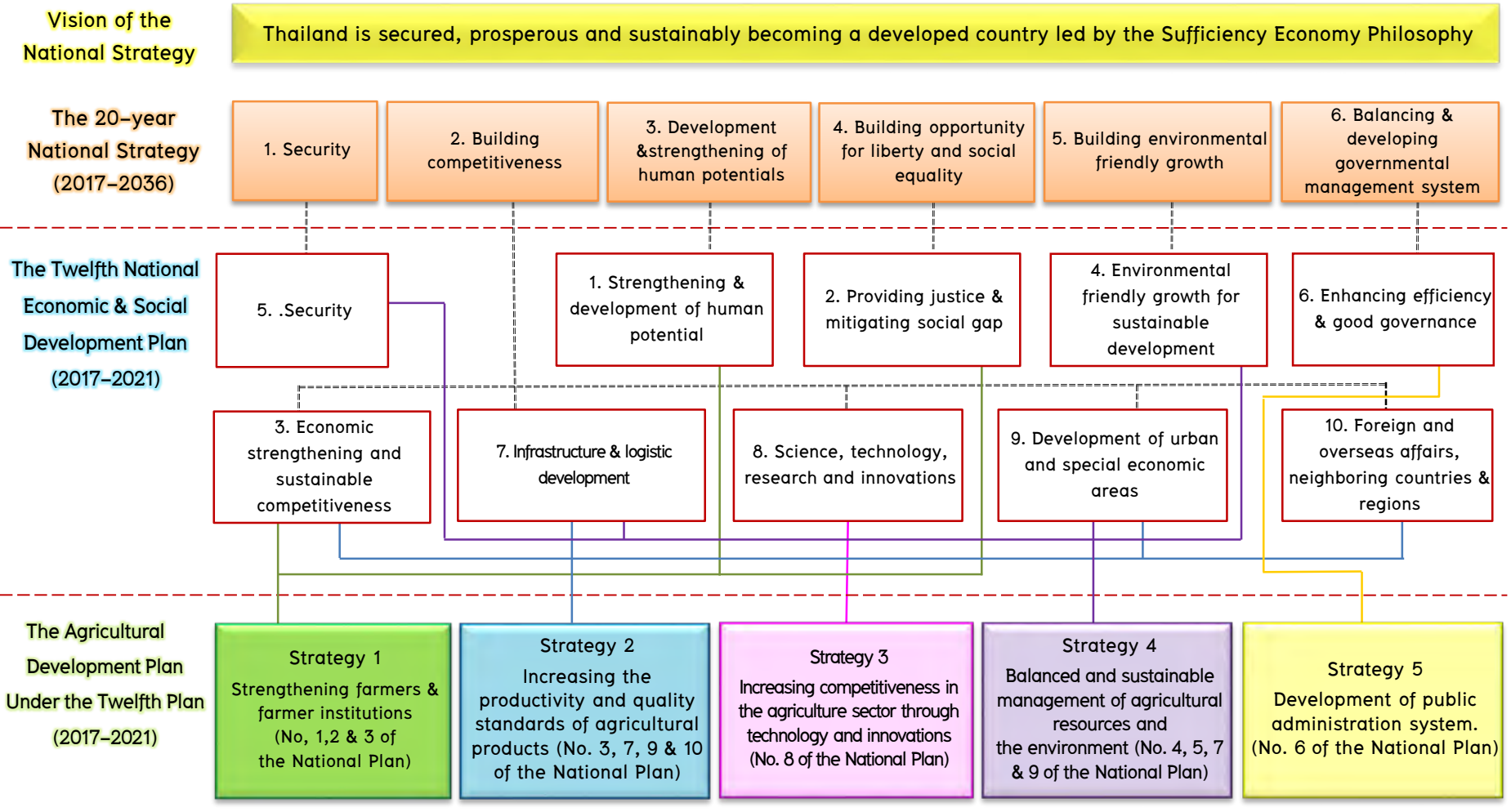

Figure 2: Linkages between the 20-year National Strategy (2017-2036), the Twelfth National Economic and Social Development Plan, and the Agricultural Development Plan under the Twelfth Plan (2017-2021)

5.4 Monitoring and Evaluation

The monitoring and evaluation of the implementation under the Agricultural Development Strategy with its clear targets and indicators will be of the following 3 levels:

1) Monitoring the implementation is to collect information on, and follow up the progress of programs / projects / activities by budget item at the beginning of the fiscal year to report the progress of implementation to the executives and stakeholders.

2) Monitoring and evaluation of the results of implementation is to follow up the results in the annual work plan to learn the results of operations of related agencies in the integration both in and outside of the Ministry of Agriculture and Cooperatives to be done at the end of a fiscal year, along with organizing the meetings of the Sub-committee on the Activation of the Development Strategy to report on the results of the annual works done, and preparing the programs / projects / activities in the forthcoming year.

3) Mid-term monitoring and evaluation of the agricultural development plan involves the use of governmental inspection or activation mechanisms to closely follow up the project for use in suggesting any improvement and revision of the plan as well as next year budgeting.

Glossary of Terms

MOTS	The Ministry of Tourism and Sports
MOAC	The Ministry of Agriculture and Cooperatives
MNRE	The Ministry of Natural Resources and Environment
MOE	The Ministry of Energy
MOC	The Ministry of Commerce
MOJ	The Ministry of Justice
MOST	The Ministry of Science and Technology
MOE	The Ministry of Education
MOPH	The Ministry of Public Health
MOI	The Ministry of Industry

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