

# Big Banana Cultivation: Agricultural Productivity and Return Analysis

Arus Kongrungchok<sup>a</sup>, Sarapee Chanatup<sup>b</sup>, Atcharawan Rattanaphan<sup>c</sup>,

<sup>a,b,c</sup>Faculty of Management Science, Suratthani Rajabhat University, Thailand,

Email: <sup>a</sup>[arus.kon@sru.ac.th](mailto:arus.kon@sru.ac.th),

<sup>b</sup>[sarapee.cha@sru.ac.th](mailto:sarapee.cha@sru.ac.th),

<sup>c</sup>[atcharawan.rat@sru.ac.th](mailto:atcharawan.rat@sru.ac.th)

This study aims to ascertain factors for enhancing productivity and analysing return in terms of big banana cultivation. The research asked how to obtain the sustainable return and productivity for big banana cultivation. Questionnaires were responded to by 157 Thai agricultural households including 33 volunteered agricultural households who were interviewed through semi-structured interviews for collecting data. Statistical techniques were used for analysing questionnaires while interview transcripts were analysed using content analysis with a phenomenological research approach. The result discovered that agriculturists' competency; appropriate cultivated processes; demand and supply equilibrium for agricultural products; selection for sustainable agricultural product market; investment for cultivation; and agriculturists' resources management approach, these crucial factors must be concentrated to enhance the productivity and economic return including reducing cultivated costs by Thai agricultural households especially agriculturist's competency which has been important, as partially transmitted from their ancestors, and impacted the agricultural productivity and the rate of cultivated returns on investment. Another result revealed all factors impacting cultivated operation have directly and positively influenced the successful big banana cultivation of agricultural households whether higher agricultural products targeted price and returns; increasable quantity and quality of target agricultural productivities; and their happily well-beings. This study can be used for assessing farmers' decision-making for cultivated investment.

**Key words:** *Productivity, Costs, Economic Return, Big Banana Cultivation.*

## Introduction

“Big Banana” is a fruit type that can be easily cultivated anywhere by people around the world. Regardless, agricultural productivity has certainly been quite different due to cultivated operation factors varying (Boonchouy, 2017; Prodhan et al., 2017; Suriya et al., 2017; Biswas & Kumar, 2010; ICTC-DA, 2008; Mindzie et al., 2001; Chetthamrongchai, Foosiri, & Jernsittiparsert, 2019; Saengchai, Pamornmast, & Jernsittiparsert, 2019). Big banana cultivation that is an agriculturist’s current principal occupation and they would especially like to obtain the achievement from their cultivated operation both a productive and an economic return (Panyarpisit, 2018; Prodhan et al., 2017; Lin et al., 2016). Whereas the farmer’s performance target aforementioned has not often been achieved. In particular in regard to the productivity target of cultivation that has always been left to less economic return than an expected target return. This especially true for Thai agriculturists who have now cultivated the big banana (Somkhumpa et al., 2018; Jiumpanyarach, 2017; Prodhan et al., 2017; Nujnetra & Pheratkul, 2013).

How to solve this problem and what the best solution is now being asked in relation to obtaining the agriculturist’s sustainable return and productivity for big banana cultivation. In this fact, the big banana fruit has always been needed in a large quantity for people around the World eating it with their breakfast and as a snack food (Prodhan et al., 2017; Wongwan et al., 2017; Guo, Yang, & Ku, 2016; Ngamkaroon, 2015; Thakarne & Siripanich, 2015; Tentammaroj, 2014). This popularity is an opportunity of farmers to cultivate the big banana specifically in Thailand in order to obtain the enhancement of their economic returns. Extensively cultivated around Thailand while the productivities of their cultivation must also be rapidly improved for their whole performance targets (Somkhumpa et al., 2018; Suriya et al., 2017; Ngamkaroon, 2015; Suthanukool, 2015). Factors that have generally impacted cultivated operation for the enhancement of productivities in terms of the agricultural condition comprise: Soil quality, water quality and quantity, accurate organic product standard, using agricultural biotechnology, appropriate cultivated processes, and using agricultural resources management approach (Ampawan et al., 2017; Jiumpanyarach, 2017; Guo, Yang, & Ku, 2016; Sukkasam, 2016; Li et al., 2015; Gurav & Jadhav, 2013; Chongworakijwattana, 2011; Biswas & Kumar, 2010). Likewise, the success of big banana cultivation has also been dependent on the economic factors consisting of demand and supply equilibrium for agricultural products, investment for cultivation, investment in agricultural equipment and machines, and selection for sustainable agricultural product market (Panyarpisit, 2018; Songsrirote, 2017; Torat, 2017; Suwannakit & Prempre, 2016; Ngamkaroon, 2015; Phok-Phong & Kaow-Eian, 2014; Chongworakijwattana, 2011; Biswas & Kumar, 2010). Similarly, time agriculturist’s competency (knowledge—skills—experiences) and household expenditures including governmental support on related knowledge and convenient and secure logistics for supporting cultivation could be the factors

that also lead to the accomplishment of big banana cultivation (Prodhan et al., 2017; Songsrirote, 2017; Torat, 2017; Suthanukool, 2015; Biswas & Kumar, 2010; ICTC-DA, 2008).

Meanwhile, the big banana fruit is a Thai crucial economic fruit and sold both in the domestic and foreign markets. It must be cared for as it has a fragile surface and bruises easily (Panyarpisit, 2018; Torat, 2017; Thakarne & Siripanich, 2015; Tentammaroj, 2014). Furthermore, Thai big banana is exported to foreign countries such as China, European Union, Japan, Switzerland, so on and that also impacts the gross domestic product (GDP) of Thailand amounting to a hundred million baht (Thakarne & Siripanich, 2015; Tentammaroj, 2014). Thus, Thailand is lucky that it can effectively cultivate the big banana fruit. There is appropriate weather atmosphere and an agricultural geography that is warm. A humid climate, Thailand is unavoidably impacted by the vegetable and fruits quality and quantity from cultivation (Ampawan et al., 2017; Suriya et al., 2017; Sukkasam, 2016; ICTC-DA, 2008). Similarly, the details of cultivated processes are also important to obtain the rate of return on cultivated investment such as putting organic fertilisers on soil, agricultural pests prevention through a natural organic method, watering the plants and so on (Ampawan et al., 2017; Suriya et al., 2017; Biswas & Kumar, 2010; ICTC-DA, 2008; Mindzie et al., 2001). All the cultivating processes certainly generate a cost that is a factor that has certainly impacted and must be appropriately controlled to obtain the farmer's maximum benefits in terms of the productivity and economic return (Panyarpisit, 2018; Boonchouy, 2017; Songsrirote, 2017; Nujnetra & Pheratkul, 2013). In the meantime, many Thai agriculturists are currently coming back to review in order to organically cultivate a number of big banana to enhance their productivity and economic return (Somkhumpa et al., 2018; Songsrirote, 2017), whereas we wonder, how can agriculturists obtain sustainable productivity and economic return that leads to high big banana cultivation, especially Thai agriculturists? The primary objective of this research is to investigate the factors influencing the success of big banana cultivation in terms of the enhancement of productivity and economic return. The objective of this study leads to the crucial questions: What do factors of cultivated operation influence? What is the enhancement of productivity and economic return leading to the accomplishment of big banana cultivation especially in Thailand? And also, how much is the rate of return on investments in agricultural households obtained from big banana cultivation? This study is looks here.

## **Literature Review**

This study was concerned with ascertaining the factors that impact the agricultural productivity and economic return analysis for big banana cultivation in Thailand. The literature of this study should be reviewed to expound the factors used for testing. The results received comprise the context of big banana cultivation, the enhancement of productivity as

expounded through factors impacting cultivated operation, and the theory of economic return, as the details show below.

### ***The Context of Big Banana Cultivation***

Banana fruit can grow in a warm and humid climate. In particular, the big banana fruit can grow in a climate of more than 14 degree Celsius with soil that should be the silty clay loam that is well-drained and ventilated (Ampawan et al., 2017; Prodhan et al., 2017; Suriya et al., 2017; Biswas & Kumar, 2010). These environments were mostly appropriate to cultivating the big banana fruit when comparing Thai geography and weather atmosphere with other places (Panyarpisit, 2018; Jumphanyarach, 2017; Songsrirote, 2017; Sukkasam, 2016; ICTC-DA, 2008). Furthermore, agriculturists pursuing big banana cultivation must prepare the planting areas with a size of about two metres multiplied by two metres for putting the big banana bulbs in using about 350-400 bulbs per rai with the estimated price per bulb being about 8-10 baht (Panyarpisit, 2018; Suwannakit & Prempre, 2016; Suthanukool, 2015; ICTC-DA, 2008). Likewise, big banana bulb life should be a year complete and maintained through giving water and using the watercourses and irrigated dropping systems for controlling the amount of water and the humidity of the weather. Organic fertiliser must be given about 100-150 grams per tree when big banana trees are in the first month and then 200-300 grams per tree in the next three-four months as well as 200-300 grams per tree at five months (Ampawan et al., 2017; Prodhan et al., 2017; Guo, Yang, & Ku, 2016; Lin et al., 2016; Biswas & Kumar, 2010; ICTC-DA, 2008; Mindzie et al., 2001). Similarly, when those big banana trees have continually grown up until four months, then the big banana bulbs must be decorated by separating them out and cutting the banana leaf off until ten leaves remain in order to fully maintain those main big banana trees (Jumphanyarach, 2017; Suriya et al., 2017; Guo, Yang, & Ku, 2016; Sukkasam, 2016; Suthanukool, 2015; Biswas & Kumar, 2010). During the next six months, those big banana trees continually grow and produce banana flowers until they eventually become the complete big banana fruits. A fruitful big banana should take about 60-70 days, approximately (Prodhan et al., 2017; Songsrirote, 2017; Suwannakit & Prempre, 2016; Mindzie et al., 2001). After that, those big banana fruits should be sold to both the domestic and foreign markets and those must be cared for – they are fragile on the surface and they bruise easily (Panyarpisit, 2018; Torat, 2017; Tentammaroj, 2014). Furthermore, Thai big bananas have always been exported to foreign countries such as China, European Union, Japan, Switzerland, and so on and impacted by the gross domestic product (GDP) of Thailand amounting to many hundred million baht (Thakarne & Siripanich, 2015; Tentammaroj, 2014). From reviewing the guidelines of big banana cultivation as mentioned, this study is looking into how to do the appropriate cultivation operations, to enhance Thai agriculturists' productivity and economic return from cultivating the big banana.



### ***Factors Impacting Cultivated Operation as the Enhancement of Productivity***

Productivity is a concept of scientific management and a process to improve efficiency. Efficient manufacturing or working generates the necessary quality of the value added to products and services from suitably dealing with limited resources whether material, machine and equipment, capital or human resource over a period of time (Panyarpisit, 2018; Prodhan et al., 2017; Suriya et al., 2017; Thakarne & Siripanich, 2015; ICTC-DA, 2008). Similarly, the productivity based on the economic and social concepts emphasised, enhance the capability and potential of work procedures as well as a human's capability in order to obtain the maximum economic benefits, during a period of time (Songsrirote, 2017; Torat, 2017; Wongwan et al., 2017; Biswas & Kumar, 2010). Likewise, cultivated operation process is a process that must be performed to enhance agricultural productivity for big banana cultivation to receive the maximum economic return possible. Thus, factors impacting cultivated operation processes are being further expounded and used for testing in this study.

The big banana cultivation has always been a complex set of processes and step by step as above already expounded so that plant growth must be always maintained by agriculturists who could employ both labor-saving equipment and machines as well as human labour (Ampawan et al., 2017; Prodhan et al., 2017; Guo, Yang, & Ku, 2016). Plant maintenance has generally been linked with appropriate geography comprising weather atmosphere, soil quality, water quality, and water quantity, while weather condition is always difficult given it cannot be controlled. In particular, the temperature of seasonal fluctuation is unavoidable (Jiumpanyarach, 2017; ICTC-DA, 2008; Mindzie et al., 2001), however soil and water must be completely maintained to a particular quality and quantity to generate and deliver the related nutrient toward big banana trees, hence agriculturists must always operate for soil amendment through putting organic fertilisers and other related nutrients on soil. At the same time, water quality and quantity must be prepared sufficiently for watering the plants. In terms of managing agricultural pests, prevention must also be appropriately managed by using the natural organic methods. All the factors mentioned were basic cultivation processes that should be suitably used for dealing with big banana cultivation (Panyarpisit, 2018; Prodhan et al., 2017; Songsrirote, 2017; Suriya et al., 2017; Lin et al., 2016; Sukkasam, 2016; Biswas & Kumar, 2010; ICTC-DA, 2008; Mindzie et al., 2001). Furthermore, agricultural resources must be appropriately used in terms of efficiency, effectiveness, and economy for enhancing productivity and economic benefits, as there have been various methods for dealing with those agricultural resources whether value engineer approach, lean management, activity based costing and management (ABC/ABM), lean six sigma or total quality management (TQM) including productivity approach, those methods were used for controlling about time, quality, and costs of cultivated processes as well (Panyarpisit, 2018; Prodhan et al., 2017; Suriya et al., 2017; Suwannakit & Prempre, 2016; Suthanukool, 2015). At the same time, agricultural biotechnology must be used for enhancing agricultural



productivity when developing the new plant genetic that could prevent agricultural pests, resist plant diseases, endure several environments for plant growth, and produce plenty of increased products. Biotechnological techniques used for agricultural productivity comprise plant tissue culture as a propagation method as well as genetic engineering which involves moving a gene to generate a novel gene from. This changes the systemic heredity within the plant, especially applicable to big banana cultivation (Prodhan et al., 2017; Lin et al., 2016; Sukkasam, 2016; Li et al., 2015; Suthanukool, 2015; Gurav & Jadhav, 2013). Likewise, organic product standards were linked with a product quality standard that impacted the whole consumer's health. Those products have currently been sold both in domestic and foreign countries, in particular the big banana product. The organic product standard must accurately control for the appropriate proportion of organic nutrient and related fertilisers that is put on those big banana trees (Jumpanyarach, 2017; Lin et al., 2016; Li et al., 2015; Gurav & Jadhav, 2013; Biswas & Kumar, 2010). This will eventually obtain the maximum productivities and economic returns (Sukkasam, 2016; Suthanukool, 2015). Similarly, logistics throughout the processes of cultivated operation were a crucial factor since factor preparation was used for cultivation (upstream) and cultivation performance (production) until agricultural products sold out (downstream). This factor must be managed to provide the convenience and security needed for cultivating and delivering to suitable consumers as well as leading to the enhancement of productivity and economic return eventually (Torat, 2017; Suthanukool, 2015; Chongworakijwattana, 2011; Biswas & Kumar, 2010). The success of big banana cultivation involves both productivity and economic return. This could be completely generated when those agriculturists were supported by the body of cultivated knowledge from the government, accurately and sufficiently (Prodhan et al., 2017; Songsrirote, 2017; Lin et al., 2016; Suthanukool, 2015; Biswas & Kumar, 2010; ICTC-DA, 2008).

With cultivating the big banana, agriculturists must always prepare and invest the basic factors composing of working capital, materials, machine and equipment, agricultural staff, agricultural systems, and management approach. The many factors mentioned have been regularly concerned with the accomplishment of big banana cultivation (Somkhumpa et al., 2018; Songsrirote, 2017; Suriya et al., 2017; Suwannakit & Prempre, 2016; Phok-Phong & Kaow-Eian, 2014). Similarly, agricultural systems, equipment, and machines must also be invested in to have the efficiency and effectiveness of cultivation and harvesting included. This saves the labor, time, and cost. This investment could eventually lead to the enhancement of productivity and economic benefits as well (Panyarpisit, 2018; Boonchouy, 2017; Suriya et al., 2017; Torat, 2017; Suwannakit & Prempre, 2016; Nujnetra & Pheratkul, 2013). In addition, the competency of agriculturists, including skills, knowledge, and experience, was a factor that has always been crucial for making their decision for choosing all the things for their efficient and effective cultivation. This applies whether cultivating process and method; organic nutrient and fertiliser used; determining the number of products

needed; market selected for selling the product; and so on, in order to obtain the increase of their productivity and economic benefits, ultimately (Prodhan et al., 2017; Songsrirote, 2017; Torat, 2017; Suthanukool, 2015; Biswas & Kumar, 2010; ICTC-DA, 2008). Furthermore, agricultural products, in particular the big banana, must be assessed to consider in terms of demand and supply equilibrium. Thus, agriculturists should not cultivate over consumer demand and have too much safety stock. This is due to the selling price of agricultural products reducing potentially as the market force and price mechanism alters. This was also a cause that could not achieve the determined target of agriculturist's economic returns (Torat, 2017; Ngamkaroon, 2015; Thakarne & Siripanich, 2015; Chongworakijwattana, 2011). At the same time, the market force of agricultural products was unavoidably influenced for all agriculturists due to agricultural product markets both central and local that were directly used for trading those agricultural products. This meant that price negotiation and mechanism could be depended on. Traders including agriculturists, commission merchants, and related parties, hence agriculturists, needed to appropriately select the market for trading their products in order to obtain the maximum economic benefits as well (Wongwan et al., 2017; Tentammaroj, 2014; Chongworakijwattana, 2011; Biswas & Kumar, 2010; ICTC-DA, 2008).

Recording the accomplishment of an agriculturist's cultivation could measure and evaluate in terms of financial and non-financial (Panyarpisit, 2018; Prodhan et al., 2017; Songsrirote, 2017; Biswas & Kumar, 2010). For financial success to be demonstrated in terms of higher agricultural product price an increase in product is needed in the market; as well as receiving on target economic returns; receiving on continually increasable revenues; and saving the costs of cultivation (Somkhumpa et al., 2018; Boonchouy, 2017; Torat, 2017; Suwannakit & Prempre, 2016; Nujnetra & Pheratkul, 2013). At the same time, the measurement of non-financial success could be demonstrated in terms of fertile farmland environment; happily well-being of agriculturists; quality of target agricultural productivity; resources used worthily; and receiving on target agricultural productivity (Songsrirote, 2017; Suriya et al., 2017; Phok-Phong & Kaow-Eian, 2014).

All factors mentioned above have been tested in this study to ascertain factors impacting cultivated operation leading to the accomplishment of big banana cultivation in terms of the enhancement of productivity and economic return, ultimately.

### ***Theory and Concept of Costs and Economic Returns***

Two elements consisting of costs and returns will be certainly used for expounding the financial success of agriculturist's investment (Panyarpisit, 2018; Somkhumpa et al., 2018; Biswas & Kumar, 2010). A cost was an expense type that generated a product whether goods and services, so that manufacturing costs were coming from operating expenses on manufacturing activities. These were for obtaining quality products and services while those

costs were crucial factors in determining a selling price of products or services as three components. They were used to calculate the costs comprising material, labour, and factory overhead (Panyarpisit, 2018; Boonchouy, 2017; Torat, 2017; Suwannakit & Prempre, 2016; Biswas & Kumar, 2010). Similarly, those costs needed to be managed for reducing and controlling the whole cost leading to the increase of organisational benefits and the efficiency of marketing competition (Somkhumpa et al., 2018; Nujnetra & Pheratkul, 2013; Chongworakijwattana, 2011). As a material cost comprising two types, direct and indirect materials will be used following the manufacturing quantity while a labour cost also consisted of two types: direct and indirect labour. They will be employed to efficiently control the transformation of those materials within manufacturing processes as eventually, for a part of a factory's overhead cost. It was an indirect manufacturing cost and continually supported the manufacturing processes until the finished goods and services were complete (Torat, 2017; Suwannakit & Prempre, 2016; Phok-Phong & Kaow-Eian, 2014; Nujnetra & Pheratkul, 2013). Furthermore, the costs could be classified in terms of fixed, variable, and mixed costs, depending on the activity behaviours while the activity-based costing (ABC) system should be applied to indicate and calculate those costs correctly, in particular, big banana cultivation (Panyarpisit, 2018; Nujnetra & Pheratkul, 2013). Similarly, the costs of marketing, administration, general, and finance, were also a component that impacted on an increase or a decrease of operating costs and business's net income. These costs should be also controlled in order to have a proportion of a business's net income increasingly lead to the highest rate of return on investment (Boonchouy, 2017; Torat, 2017; Phok-Phong & Kaow-Eian, 2014).

Likewise, a return or revenue was an amount of money and cash inflow obtained from selling goods and services while those economic returns could be generally measured from several methods either payback period (PBP), net present value (NPV), internal rate of return (IRR), economic value added (EVA) and so on (Panyarpisit, 2018; Torat, 2017; Nujnetra & Pheratkul, 2013). Nevertheless, this study is using the rate of return on investment (ROI) as calculated through the formula about net income, dividing all investments and then multiplying one hundred to measure the economic returns obtained from agriculturist's investment for big banana cultivation as well as using their decision-making further for big banana cultivation (Panyarpisit, 2018; Somkhumpa et al., 2018; Nujnetra & Pheratkul, 2013). Data collection in this part is performed through in-depth interviewing of those agricultural households who volunteered to contribute to the research of this study.

### **Research Methodology**

There were two stages to the research—an anonymous survey and interviews with Thai agricultural households who have been cultivating the big banana. A questionnaire survey focused on factors impacting cultivated operation, leading to the success of big banana



cultivation in order to ascertain how agriculturists obtain sustainable productivity and economic return especially in Thailand. Purposive sampling was used for selecting the sample of study in each region. 157 selected Thai agricultural households responded the questionnaires while 33 volunteered agricultural households were independently interviewed with one of the researchers using semi-structured interview questions for collecting data. Interviews comprised two questions. The first question related to general agricultural households and the second question was concerned with the revenues obtained and costs paid for big banana cultivation. Statistical techniques were used for analysing questionnaires while interview transcripts were analysed using content analysis with a phenomenological research approach.

The questionnaire was created and already checked reliability and validity before performing the actual data collection. Data was coded and checked for accuracy by an independent researcher and then analysed using SPSS both basic and inferential statistics in terms of descriptive, factor analysis, multiple regression analysis and Pearson's correlation coefficient. Interview data was analysed using N'VIVO program while transcripts were thematically analysed through content analysis and further expounded using a phenomenological research approach to explain a situation as perceived by individuals in that situation (Berg, 2007). This approach abstracts out the themes and key issues. Commonly, two types of themes were found: Those that occurred across the group of participants, and individual themes that were unique to a few individual participants. In particular, the result could be guided to make an agricultural household's decisions for the success of big banana cultivation in terms of the enhancement of productivity and economic return as well.

## **Research Results**

As 157 selected Thai agricultural households responded to the questionnaires and also 33 volunteer respondents revealed more information about the big banana cultivation. The results discovered that Thai agriculturists for big banana cultivation were mostly males (91.08%), for 40-49 years old (87.90%), mostly graduated during primary to secondary education (90.45%), and also invested by their private capital (100%) due to less investments.

**Table 1:** Thai Agricultural Households' Opinion to the Related Factors Impacting Cultivated Operation for the Accomplishment of Big Banana Cultivation

The Related Factors Impacting Cultivated Operation	Mean	Standard Deviation	Eigen Value	% of Variance	Agricultural Household's Opinion to the Levels of Importance
X <sub>1</sub> : Agriculturists' Competency	4.86	0.4263	5.2670	12.893%	Strongly Agree
X <sub>2</sub> : Appropriate Cultivated Processes	4.83	0.4897	4.6150	11.985%	Strongly Agree
X <sub>3</sub> : Investment for Cultivation	4.72	0.5778	4.1730	10.456%	Strongly Agree
X <sub>4</sub> : Demand and Supply Equilibrium for Agricultural Products	4.57	0.6712	3.7310	8.894%	Strongly Agree
X <sub>5</sub> : Selection for Sustainable Agricultural Product Market	4.52	0.4936	3.4540	8.668%	Strongly Agree
X <sub>6</sub> : Agriculturists' Resources Management Approach	4.48	0.5886	3.1280	8.359%	Strongly Agree
X <sub>7</sub> : Government Supports on Related Cultivated Knowledge	4.14	0.6484	2.5420	7.495%	Agree
X <sub>8</sub> : Convenient and Secure Logistics for Supporting Cultivated Processes	4.09	0.5325	2.4160	6.264%	Agree
X <sub>9</sub> : Accurate Organic Product Standard	4.05	0.3681	1.8250	5.762%	Agree
X <sub>10</sub> : Using Agricultural Biotechnology	3.81	0.7954	1.6740	4.894%	Agree
OVERALL	4.41				Strongly Agree

The findings (see Table 1) discovered the 10 grouped key factors impacting cultivated operation could be used for expounding the enhancement of productivity and economic return leading to the accomplishment of agriculturist's big banana cultivation especially in Thailand. With 85.67 percent of the variance and eigenvalues of more than one, all factors had a relationship with each other. The remaining percentage (14.33%) might have come from other factors underlying the conditions of big banana cultivation. In the meantime, findings concerned with the attitudinal mean values must be interpreted through a measurable benchmark of attitudinal scales due to each factor having more than one question. Each question has an equal value so that all questions for each factor will be combined to calculate attitudinal mean values as mid-range of five between strongly disagree (1) and strongly agree (5). This all indicating the strength of a respondent's agreement (Likert, 1932) leading to the

result of this study which demonstrated overall that the related factors concerning with cultivated operation had much importance (4.41) and strongly impacted the enhancement of productivity and economic return. This lead to the achievement of agricultural household's big banana cultivation composing of, sequencing from most to least respective: agriculturists' competency (4.86); appropriate cultivated processes (4.83); investment for cultivation (4.72); demand and supply equilibrium for agricultural products (4.57); selection for sustainable agricultural product market (4.52); agriculturists' resources management approach (4.48); government supports on related cultivated knowledge (4.14); convenient and secure logistics for supporting cultivated processes (4.09); accurate organic product standard (4.05); and using agricultural biotechnology (3.81) while the six first and foremost factors impacting cultivated operation for increasing Thai agriculturists' productivity in order to obtain the maximum economic return of them. Especially, the competency of agricultural households that could conduct appropriately cultivated processes on their techniques of big banana cultivation although their education was less. As some interviewees said, the same meaning about

*"I graduated my education not too high ... but I always learnt from my parents relating to the big banana cultivation including I attempt to absorb experiences from my parents as well either weather, water or soil ... I try it out until I certainly ensure about cultivated methods for having the good productivity and money received. ...But each farmer is different one because their ancestors give the different experiences of cultivation leading to different agricultural products as well either quantity, quality, or flavour"* [IV006; IV0018; IV0024; IV0031].

Briefly agriculturists strongly confirmed that the different techniques of cultivation in each agricultural household including skills, knowledge, and experiences, were transmitted from their ancestors to the next generations leading to the unique competency of each agriculturist. These impacted the different productivities whether quantity, quality, and flavour of product, as well as net economic benefits.

At the same time, another result revealed the whole Thai agricultural household for big banana cultivation confirmed that the crucial components of cultivated operation processes and resources certainly impacted the enhancement of productivity and economic return comprising the preparation of cultivated area; the appropriate big banana bulbs; the watercourses and irrigated dropping systems for giving and controlling the humid weather atmosphere; the organic fertiliser and natural pesticides; the preparation of farm places for supporting big banana products excised; the casual agricultural employees for preparing cultivated area; the cultivated big banana bulbs; fertilising on the schedules set up; putting the natural pesticides; decorating and caring of the big banana trees; separating the big banana bulbs; cutting the banana leaf; collecting the big banana products; checking the quality and

perfection of big banana products; and cleaning, wrapping, packing, and delivering big banana products. Furthermore, those components above were being used for further calculating the worthwhileness of big banana cultivation demonstrated in terms of the rate of return on investment. As 33 volunteered agricultural households in Thailand were interviewed, they gave more information in terms of their costs and revenues from cultivating the big banana trees so that the cost and revenue analysis of agriculturist's big banana cultivation was based on using 400 big banana bulbs cultivated per year per 1,600 m<sup>2</sup>. From comparing between minimum and maximum costs paid as well as revenues obtained, the results revealed that most of the cash inflow (revenues) came from selling big banana products; big banana bulbs; and big banana leaf while the most of cash outflow (costs) came from investments paid comprising appropriate big banana bulb costs; organic fertiliser and natural pesticides costs; watercourses and irrigated dropping systems costs; depreciation-equipment and farm place; casual farm employees and others mentioned above, therefore the analysis of costs and revenues here was not concerned with the corporate or individual tax rate. This study could calculate the agricultural households' revenues received and costs paid as divided into two groups: minimum and maximum. For the minimum group, agricultural households obtained their total revenues of approximately 65,800 Thai baht and roughly paid their total costs of about 41,400 Thai baht, hence their net income received was around 24,400.00 Thai baht per year per 1,600 m<sup>2</sup>. This could also obtain the rate of return on investment (ROI) which was 58.94 percent per year per 1,600 m<sup>2</sup>. For maximum group, agricultural households approximately obtained their total revenues about 73,400 Thai baht and also roughly paid their total costs about 41,400 Thai baht, thus their net income received was 32,000.00 Thai baht per year per 1,600 m<sup>2</sup> that could obtain the rate of return on investment (ROI) was 77.30 percentage per year per 1,600 m<sup>2</sup> as well.

The research hypothesis was examined using Pearson's correlation coefficient. The result disclosed that the 10 related factors impacting cultivated operations (X<sub>1</sub> to X<sub>10</sub>) have influenced and had direct positive relationships on the achievement of agriculturist's big banana cultivation (Y) concerning the enhancement of productivity and economic return, in particular in Thailand, at the level of significance 0.01. The values of Pearson's correlation coefficient in each independent variable comprised sequencing relationships from most to least respectively, with agriculturists' competency (X<sub>1</sub>=.865); appropriate cultivated processes (X<sub>2</sub>=.847); investment for cultivation (X<sub>3</sub>=.829); demand and supply equilibrium for agricultural products (X<sub>4</sub>=.784); selection for a sustainable agricultural product market (X<sub>5</sub>=.766); agriculturists' resources management approach (X<sub>6</sub>=.748); government supports on related cultivated knowledge (X<sub>7</sub>=.685); convenient and secure logistics for supporting cultivated processes (X<sub>8</sub>=.658); accurate organic product standards (X<sub>9</sub>=.639); and using agricultural biotechnology (X<sub>10</sub>=.592). Moreover, the equation of multiple regression analysis found and demonstrated the following,  $Y = 23.85 + .87X_1 + 0.81X_2 + 0.74X_3 + 0.59X_4 + 0.53X_5 + 0.48X_6 + 0.42X_7 + 0.34X_8 + 0.26X_9 + 0.19X_{10}$ , at the level of

significance 0.05. This equation (R-Square) could be used for reliably forecasting the success of an agriculturist's big banana cultivation in terms of the enhancement of productivity and economic return especially in Thailand at 87.46%.

## Discussions and Conclusions

The big banana cultivation for Thai agricultural households was mostly males. They were invested by their own private capital as less investments, and also had less formal education learning by doing on the job in terms of trial and error (Proadhan et al., 2017; Songsrirote, 2017; Biswas & Kumar, 2010; ICTC-DA, 2008). Likewise, all factors aforementioned impacted those cultivated operation processes leading to the accomplishment of agricultural household's big banana cultivation (Panyarpisit, 2018; Somkhumpa et al., 2018; Ampawan et al., 2017; Suriya et al., 2017; Lin et al., 2016; Gurav & Jadhav, 2013). In particular, the enhancement of an agriculturist's productivity and economic return was explicitly influenced and directly related to six factors: Agriculturist competency, appropriate cultivated processes, investment for cultivation, demand and supply equilibrium for agricultural products, selection for sustainable agricultural product market, and agriculturists' resources management approach (Proadhan et al., 2017; Suriya et al., 2017; Wongwan et al., 2017; Lin et al., 2016; ICTC-DA, 2008), especially the difference of agriculturist's competency and cultivated operation processes transmitted from one to the next generation leading to the explicit difference of productivity in each agricultural household whether quality, quantity, flavor, and net income (Panyarpisit, 2018; Songsrirote, 2017; Torat, 2017; Suthanukool, 2015; Biswas & Kumar, 2010; ICTC-DA, 2008). With the analysis of costs and economic returns for big banana cultivation per year based on 400 big banana bulbs, the rate of return on investment per year as agricultural household obtained was approximately, from minimum value, 58.94%, to maximum value, 77.30%. This result conformed with other research in the same direction and could also be used to make the decision for agriculturist's big banana cultivation in the future (Panyarpisit, 2018; Somkhumpa et al., 2018; Biswas & Kumar, 2010).

This research aimed to ascertain, how do factors impacting cultivated operations process and enhance the productivity and economic return of agricultural households leading to the accomplishment of big banana cultivation? As 157 Thai agricultural households responded, the questionnaires and 33 volunteered agricultural households were independently interviewed for collecting data. The result of this study revealed Thai agricultural households for big banana cultivation were mostly males, middle adulthoods, graduated during primary to secondary education, and invested from using their private capital due to less investments. Furthermore, all factors impacted the processes of cultivated operation until leading to the accomplishment of agriculturist's big banana cultivation in terms of the enhancement of productivity and economic return comprising of sequencing from most to least respectively,



agriculturists' competency, appropriate cultivated processes, investment for cultivation, demand and supply equilibrium for agricultural products, selection for sustainable agricultural product market, agriculturists' resources management approach, government supports on related cultivated knowledge, convenient and secure logistics for supporting cultivated processes, accurate organic product standard, and using agricultural biotechnology. Moreover, the 10 related factors have influenced and positively had direct relationships to the accomplishment of big banana cultivation in Thailand in terms of the enhancement of productivity and economic return at the level of significance 0.01 while the Linear regression equation was  $Y = 23.85 + .87X_1 + 0.81X_2 + 0.74X_3 + 0.59X_4 + 0.53X_5 + 0.48X_6 + 0.42X_7 + 0.34X_8 + 0.26X_9 + 0.19X_{10}$  at the significant level 0.05. This could be used to forecast the accomplishment of an agriculturist's big banana cultivation at 87.46%. Finally, Thai agricultural household's big banana cultivation approximately obtained the rate of return on investment per year based on 400 big banana bulbs between a 58.94 percentage to a 77.30 percentage.



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