Managerial Accounting Information Competencies of Sugarcane Planting in Thailand

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Abstract
This study investigated the consequences of managerial accounting information competencies (MAICs) on agricultural innovation that consists of decision making accuracy, effectiveness of productivity, improvement of cost management enhance to sustainability competitive advantage of Thai sugarcane farmers. The information elicited from the participants was tested against sustainability competitive advantage. A sample of 306 sugarcane farmers who are chief sugarcane quotas in Kamphaeng Phet province, Thailand were chosen and data were collected through questionnaires. Ordinary least squares regression analysis revealed that the accounting information competencies were positively related to decision making accuracy, effectiveness of productivity, and improvement of cost management. In addition, these factors were found to have a positive effect on sustainability competitive advantages. Moreover, managerial accounting information competencies had also a positive effect on sustainability competitive advantages. This implied that the MAICs and the factors that are consequences of MAICs raise performance to better sector their MAICs activities. In the eve of the ASEAN treaty, MAICs can help Thai farmers improve their sustainability competitive advantages.
Keywords: Managerial Accounting Information Competencies, Decision Making Accuracy, Effectiveness of Productivity, Improvement of Cost Management, Sustainability Competitive Advantages

Introduction
Thailand is an agricultural country; therefore, farmers in Thailand are important in driving the country's manufacturing sector. The government has recognized the importance of assisting farmers in all dimensions. As a result, there is contribution to provide methods and solutions for sustainable agriculture. The government also promotes agricultural technologies and new innovation to increase productivity, quality, and safety. For Thailand's agricultural revenue, sugarcane planting industry is a business vital to the economy of Thailand. Back in 2013/14, 103.67 million tons of sugarcane could produce approximately 11.29 million tons of sugar. Domestic consumption was 2.5 million tons while the remainder with total value of approximately 180,000 million baht was exported to foreign countries. Yet, revenue from privatization of other industries such as the production of ethanol, alcohol, soy sauce, MSG, feed and fertilizer, paper, plywood, fuel and electricity might be able to earn additional hundreds of million baht. (Office of the Cane and Sugar Board, Ministry of Industry, 2018). The government of Thailand has designated the year of sustainable agriculture standard since 2017 to elevate the national sustainable agriculture. Sustainable agriculture is an agricultural system that covers lifestyle of farmers and all forms of production in order to balance economic, social and ecological environment. Consequently, it will lead to self-reliance and

improve lives of farmers and consumers. (Office of the National Economic and Social Development Board, 2018). The procedure includes raising large agricultural plots, optimizing certification, and raising awareness about farm safety in all organic sectors. The farms, as manufacturers for consumers, focus on safety, cost reduction, and increase in productivity of agricultural sector to propel Thailand's stable, prosperous, and sustainable agriculture unceasingly.

As a branch of the economy, accounting has a significant role in the society. Accounting provides information on the financial statements of an entity that allows users to make decisions on resource allocation. If the information reported is reliable and useful, resources that are limited can be allocated in a proper and appropriate manner. In addition, the accounting information quality can surely reflect economic events and send alarms to the user account information, that said the account is "the language of business". Whether anyone in the organization, business or individual should have knowledge and understanding of accounting information as well for anyone can make decisions on matters related to business activities more effectively, add value to the organization and create a competitive advantage for business. Anyway, the managerial accounting is the science of key accounts, which provide useful data, the needs of the user for decision-making process for planning, directing, control and evaluation. So, managerial accounting has a very important role to play in business. Hardly competitive situation in business including information on costs is critical to the operation in all organizations. Cost represents the value of the resources that are measured in units of currency to pay for the acquisition of raw materials, products or services. By raw materials, goods or services acquired to do this will lead to business benefits or return on current and future possible. Costs incurred include expired costs and unexpired costs (Ditkaew, 2017). However, the agricultural sector in order to survive must adapt to keep up with changes in circumstances that arise and through to result is satisfying and has a role in helping society. Managerial Accounting as a tool to help promotes the agricultural sector for achieving the goals.

Many past studies merely emphasized direct effects of accounting information on performance in business while omitting agricultural sector. A number of researches such as Eikebrokk and Olsen (2007); Butler and Ghosh (2015); Marius, Denisa, and Florina (2012); Yang et al. (2011), have studied the role of competencies for achieving and sustaining competitive advantages in many organizations or private sector. On the contrary, few researches have explored about agricultural sector and sugarcane planting. Therefore, the purposes of this study are to provide some new managerial information perspectives indicating that MAICs are needed in agricultural sector and employing MAICs can create sustainable competitive advantages for agricultural sector including sugarcane planting through agricultural innovation. Agricultural innovation consists of decision making accuracy, effectiveness of productivity, and improvement of cost management. Furthermore, the work develops the concept of MAICs from the literature, proposes how MAICs influence agricultural innovation in sugarcane planting, and discusses impacts of sustainable competitive advantages.

Literature Review and Conceptual Model

As depicted in figure 1, a conceptual model was constructed to identify how MAICs affect agricultural innovation, consisting of decision making accuracy, effectiveness of productivity, and cost management improvement, and then explain how agricultural innovation affects the sustainability competitive advantages. The conceptual model was delineated by a resource-based view of the firm, logically linking the variables of the model.

Resource-Based View (RBV) of the firms: The resource-based view of the firms or the RBV of the firms is a prominent theory (Jensen et al., 2016) stating that resources are capable of providing such an advantage and constituting a potential source of competitive advantages (Barney, 1991; Wernerfelt, 1984). According to Barney (1991) and Barney et al. (2011, p. 1304), the resource-based view of the firm was defined as firms competing on the basis of unique firm resources that are unique, rare, valuable, and not easily imitable or substitutable (Barney, 1991; Conner, 1991). The RBV can be both tangible assets and intangible assets, such as skills, experiences of individual employees, and patents (Barney, 1991; Grant, 1991). In an empirical research regarding the RBV of the firm, Newbert (2007) said that firm capabilities or resources were the primary driver of explaining outcomes of competitive advantage. The competitive advantage of Porter (2008) has the advantage of managerial information strategy to the planning process and the potential to contribute to the operating business, know the reliable information and share earnings increased under conditions that have always changed. Managerial accounting information represents the value of the resources that are measured in monetary units paid to obtain raw materials, products or services. Finished goods or services acquired to do these will lead to business benefits or return on current and future possibilities.

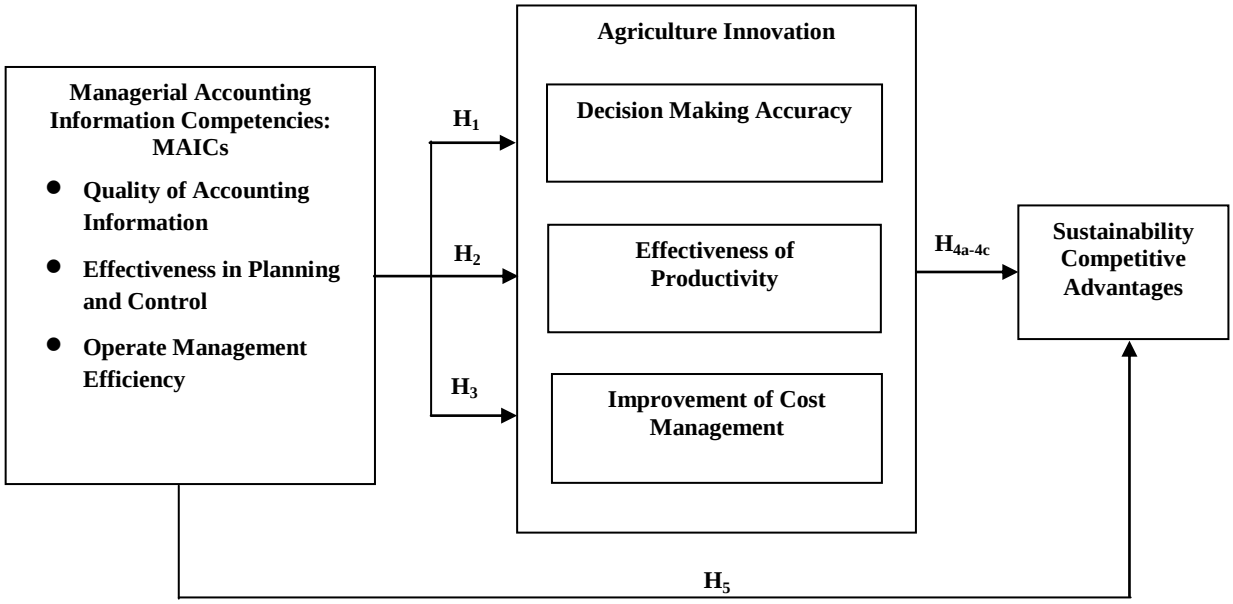

Figure 1 Conceptual Model of Managerial Accounting Information Competencies (MAICs) in Sugarcane Planting

Competencies of managerial accounting information are hard to imitate and regarded as intangible assets for farmers planting sugarcane because they can enhance sustainability of competitive advantages. Managerial accounting information competencies in this study, thus, are resources and capability to produce quality of information, planning and control, and operational management efficiency. MAICs encourage agricultural innovation that consists of decision making accuracy, effectiveness of productivity, and improvement of cost management. As a result, these factors enhance sustainable competitive advantages. Apart from MAICs, the RBV of the firms was confirmed by various researches in many disciplines showing that the resources and capability were related to competitive advantages under a variety of configurations, such as human resource management, e-commerce, economics and finance, marketing, international business, strategic orientation, and strategic management

(Barney, 2001; Finney et.al., 2008; Campbell and Park, 2017; Bowman and Toms, 2010; Jensen et al., 2016).

Managerial Accounting Information Competencies (MAIC): Generally, management accounting practices (MAPs) can improve current operation of firm, both financial and non-financial information (Azudin & Mansor, 2018). In previous many papers suggest about management accounting literature that management accounting practices (MAPs) can improving business sustainability. Also, provide various tools, techniques and valuable internal information including for budgeting, profit planning and performance evaluation. However, this paper looks at other of management accounting information in firm. Many previous researches refer to competencies as a set of knowledge, methods, practical skills, values, and behaviors that enhance performance and solve problems. Additionally, competencies are the integration of knowledge, skills, and attitudes (Trencher et al., 2018; Rieckmemm, 2012; Ploum et al., 2017). The study of Lara and Salas-Vallina (2017) said that managerial competencies were defined as characteristics that lead to better performance which can be evaluated on the basis of behavioral measures. Moreover, in management accounting research of Armitage et al. (2016), small and medium-sized enterprises (SMEs) represented a large and important part of developed economy. However, little is known about the extent to which SMEs use contemporary management accounting (MA) techniques such as costing systems, budgets, responsibility center reporting, and analysis for decision making. Therefore, Armitage et al. (2016) found that manufacturing companies in their study are more likely to use a broader set of techniques such as costing systems, operating budgets, and variance analysis and that smaller, early-stage SMEs are the lightest users of all MA tools. In addition, a managerial competencies research indicates that there are commonly held human value and reflecting behavior. However, this research demonstrated that competencies are important mainly for the perspective on performance improvement that occurred when combinations of resources are applied to create specific organizational abilities. Resource and core competency are important in the successful utilization of perspective in managerial accounting. This paper added a new managerial information competency perspective to Managerial Accounting Information Competencies (MAICs) because managerial accounting is a tool that supports the company's management in planning, decision making, control, and analysis (Mihãilã, 2014). Managerial accounting will ensure growth profit and business stability. In addition, managerial accounting provides information to managers, people within the organizations, leaders, creditors, or others outside the organizations. Ibarrondo-Dávila et al. (2015) and Tappura et al. (2015) said that management accounting is an essential factor in managerial decision making which provides information for investment to enable safety of work investment, performance (Esmaeili and Hallowell, 2012), and practices of cost effectiveness in managerial accounting (Ibarrondo-Dávila et al., 2015; Hinze et al., 2013). Accordingly, Managerial Accounting Information Competencies (MAICs) in this study are defined as abilities as a tool to provide quality of accounting information used for increasing effectiveness of planning and control and operational management efficiency. Quality of accounting information has been analyzed based on characteristics of quality information comprising value added, completeness, objectivity, reliability, security, timeliness, availability, latency, and response time (Naumann and Rolker, 2000). Marinagi et al. (2015) claimed that according to United States Patent and Trademark office (USPTO), quality consists of objectivity, utility, and integrity. Value added of information to support decision analysis is predicated on the ability of information reducing uncertainty (Quigley et al., 2018). Quality of accounting information in this paper, thus, refers to value of information produced by MAICs to ensure reliability composed of accuracy, relevance, timeliness, value added, and completeness. Also, quality of accounting information is integrated information to help users improve strategic cost management and strategic decision making. Reliability

means that users perceive value of information as being accurate, relevant, timely, and complete. The information is used in management functions (Schwartz and Mayne, 2005). Reliability of accounting information is important to improve efficiency and effectiveness of an assessment (Krishnan et. al., 2005). Relevance of information is the content of reports or documents that serve a purpose. Furthermore, it can support decision making of users in all levels of the firms. Timeliness means information is up-to-date and has the capacity to be reported fast for productivity under managerial accounting support. Accuracy refers to information which contains no material error, decreases risks, and increases competitive advantages (Parssian, 2006). Moreover, value added of information is a managerial improvement of value through managerial accounting information that increases growth in productivity under uncertainty. Completeness is an important characteristic of information as previous researches confirmed that complete and accurate information is beneficial for operation and maintenance while poor information causes significant costs and rework for operation (Zadeh et al., 2017). Effectiveness in planning and control is efficiency in planning and control of the operation which can improve the ability of capacity planning, cost estimation, and inventory control as well as reduction in the informal system for materials management, inventory, and production control (Nah et. al., 2007). The strategic planning process is concerned with defining, determining, and implementing the strategic initiatives of the firm (Jarzabkowski & Balogun, 2009). The results of higher effectiveness and efficiency in planning and control are important factors for improving the decision-making process by the provision of appropriate and timely information. Control of management is an important mechanism responsible for the design and implementation of strategies and management accounting structure concerns with planning process development (Frezatti et al., 2011). According to Glawar et al. (2018), a concept of integrated maintenance strategies within a production planning and control increases facility's complexity and decreases lead time in production. Lastly, operational management efficiency focuses on two matters to improve and increase capability of operational management. The first matter is that when sugarcane farmers invest in uncertain environment, their decisions involve maximizing wealth and firm value to obtain profit from investment in the long run. Also, decisions regarding capital investment have influences on the firm's survival and sustainability (Shaffie and Jaaman, 2016). Decisions about goal management by using a technique of reducing future cash flows of the net present value represents a process of discounting by using the discount rate (Karanovic and Gjosevska, 2012). According to Indian corporate sector, in terms of capital budgeting, it was found that reducing cash flow of net present value, internal rate of return, and risk adjusted sensitivity analysis are the most popular (Batra and Verma, 2017). Moreover, Shaffie and Jaaman (2016) studied the Monte Carto method in the NPV model in order to achieve reliable cash flows estimation and found that Monte Carto is a proper tool in the NPV model. The other matter is the relationship between cost, volume, and profit for the farmers that further creates sustainable competitive advantages. The classification of costs by function can be divided into two categories: manufacturing costs and non-manufacturing costs. Manufacturing costs include direct materials, direct labor, and manufacturing overhead. Non-manufacturing costs are costs that are not related to production including operating expenses and other expenses. The classification of costs is related to behavior and its activity is classified as cost behavior that consists of variable cost, fixed cost, semi-fixed cost, and mixed cost. When we know the nature and meaning of the cost, success in business and interest can be achieved by profit planning. Moreover, production of information and sales volume of products can make profit by setting business goals. The analysis above is called "analysis of the relationship between the cost-volume-profit" (CVP) that helps with short-term decision making of the farmers on the issues related correctly. The CVP, also known as "break-even point analysis," is the point at the operational level, the volume of sales, and

total revenue that equals total cost incurred. We called it a point where there is no profit or loss because revenue and cost are equal and profit is zero (Ditkaew, 2017). The analysis of economic relationship will result in a better understanding of the relationship between earnings and volume of agricultural production.

Consequences of MISCs: Impact of MISCs on agriculture innovations: Innovation can be defined as developing new products, services, processes, a new marketing method, or a new organizational method in business practices (Gault, 2018). Processes include production or delivery, organization and marketing processes. According to Jayani Rajapathirana and Hui (2018); Plescan & Gavriletea, (2008); Gloet & Samson, (2016), it was revealed that occurrence of innovation makes used of high quality resources and knowledge management. An example of insurance companies' knowledge is a competitive advantage for underwriting and servicing. However, capability of firm to innovate is an important factor for competitive advantages in the highly uncertain market environment. Innovation capability enables the organization to develop innovation continuously to respond the changing market environment (Slater, Hult, & Olson, 2010) and it is embedded with all the strategies, systems and structures that support innovation in an organization (Gloet & Samson, 2016). The company can create something new to initiate innovation (Laforet, 2011). In addition, innovation capability is considered as a valuable asset for the firms in order to provide and sustain competitive advantages and served as the implementation of the entire strategy (Rajapathirana and Hui, 2018). Manufacturing sector can start changing its products offered by adjusting methods of productions and delivery as it was interpreted as product and process innovation. Therefore, agricultural innovation of this study applied general definitions of the four types of innovation discussed in Gault (2015, 2016, 2018) which comprises product innovation, production or delivery innovation, organizational innovation, and marketing innovation. All of these types can be applied to three dimensions of agricultural innovation; decision making accuracy, effectiveness of productivity, and improvement of cost management, viewed as a way to build, achieve, and sustain competitive advantages in sugarcane planting. This study will explore and prove the consequences of MAICs and their effect on agricultural innovation.

Decision Making Accuracy: According to the discipline of both accounting and auditing, judgment and decision making have been increasingly recognized as highly important attributes in the profession because individuals make pivotal judgment and decision (Mala and Chand, 2015). The decision making is well-established as one of the major key reasonable for management accounting (Horngren, Foster, & Datar, 2005; Hall, 2010). Swami (2013) explained decision making as a mental process of selecting a logical choice or choosing among several competing alternatives by weighing between strengths and weaknesses of each alternative. Decision making accuracy is defined as a decision that is made clearly and reliability when facing with various alternatives. An empirical research of Butler and Ghosh (2015) said that Management accounting control system provides information to assist in decision making to attain goals underlying comprehensiveness leads to improvement of the advantage in achieving goals. Moreover, Empirical researches including Demski and Feltham (1976); Tiessen and Waterhouse (1983); Sprinkle (2003), defined that managerial accounting information takes on a role in influencing decisions and the use of it helps reduce uncertain conditions. Managerial accounting information is considered as an organizational mechanism critical to effective management of decisions and control in organizations (Sajady et. al., 2008). As a result, the role of managerial accounting information competencies supports quality of accounting information as correct, responsive, flexible, and relevant. It can be used in problem analysis and problem clarification. The alternatives are divided and evaluated; the accounting information of each alternative is weighted when making the decision. Accordingly, managerial accounting information

competencies provide primary data for making decisions. The characteristics of information currently prepared can help decision makers seek more alternatives to the solution of the problem in hand. Accessibility of information is related to main transactions of an organization that lead to categorized detailed information facilitating decision making in any difficult situation (Mia & Chenhall, 1994). This decision-making process uses management accounting information and the decision maker's knowledge and skills to yield a successful decision (O'Donnell and David, 2000). In other words, the decision-making process concerns with decision effectiveness with the outcome of the decision process (Dean and Sharfman, 1996). To be able to modify objectives and strategies quickly and to create competitive advantages over competitors based on information provided by MAICs, the critical points of a decision are problem comprehensiveness and decision speed (Borut, 2005). Therefore, Hypothesis 1 is formulated:

Hypothesis 1: Sugarcane agriculture with MAICs will achieve decision making accuracy.

Effectiveness of Productivity: Agricultural sector is sensitive to environmental changes and limited capacity of smallholder farmers in developing countries. Productivity is a combination of precision, optimal use of manpower, and available material resources while efficiency is determined through performance (Torabi and El-Den, 2017). Effectiveness of productivity is a process combining efficiency of all factors of the production involved in achievement of the result (Bebeselea, 2015). However, previous researches discussed effects of total quality management on productivity (Benavides-Chicón and Ortega (2014); Vrtiprah and Ban (2000); Avelini Holjevac and Vrtodušić Hrgović (2012)). The production rate greatly depends upon the productivity of the system, whereas the quality is related to the conformance of produced products to available quality standards. The productivity is considered as a key factor measuring performance of the manufacturing system (Rawat et al., 2018). The productivity simply displays a ratio of output to input as a fraction, but the effectiveness of productivity in this paper is a set of coordinated and planned actions to improve growth and a set of managerial accounting information helps reduce loss of production process. To utilize effective resources appropriately, value added should be applied and methods to boost the productivity of sugarcane should be considered. Then, Hypothesis 2 is formulated:

Hypothesis 2: Sugarcane agriculture with MAICs will achieve effectiveness of productivity.

Improvement of Cost Management: Cost management is fundamental to profitability of any firms. Moen and Norman (2006) discussed about cost management that is composed of estimation, budgeting, and control. Additionally, cost management refers to identification, information collection, measurement, classification, and reporting from useful information to manage related cost of products, customers, and suppliers for controlling and increasing decision making (Hensen et al., 2007). The research of Fayard et al. (2012) refers cost management as the cost of portfolio management and business activities to enhance management of cost and make cost management decisions in organizations. Cost management is much more than measuring and reporting costs. It is a philosophy, an attitude, a set of techniques designed to create more value at lower costs. It is a philosophy for improvement because it promotes the idea of searching for courses of action so that the organization may decide appropriately towards creating value. Cost management is a proactive attitude because costs are not simply incurred; they are the results of certain decisions. It is not enough for the costs to be calculated; there must be a direct concern for making decisions that affect costs. Cost management is also a set of techniques framing the cost calculation system and aiding the decision-making process, the achievement of the goals, and activities of the company.

For this paper, improvement of cost management is defined as the development of techniques supported by managerial accounting information competencies that provide cost information.

When this information was implemented, it enhanced the strategic position of the firm and reduced costs. In addition, with value chain analysis the manufacturing firm now had information of customer needs, qualities and descriptions, and raw materials of suppliers for production planning and control including delivery to customers. The information interchanged among organizations in the value chain: vendors, manufacturers, and customers, became a competitive advantage for the manufacturer. The manufacturer reduced production cycle times, decreased inventory levels and timely responded to customer's needs. Moreover, with cost driver analysis, the knowledge of causal factors that drive product costs, non-value added activities, and activities that did not increase value for customers were separated and eliminated. As a consequence, costs were reduced. Therefore, this process could create value for customers (Riccardo and Suresh, 2006). For this reason, Hypothesis 3 is proposed:

Hypothesis 3: Sugarcane agriculture with MAICs will achieve improvement of cost management.

Agriculture innovation and sustainability competitive advantage: Competitive advantage is capability which occurs from attributes and resource to higher level of performance (Tseng et al., 2008). The source of the advantage in the planning process can be analyzed in order to lower the operating costs, calculate the actual cost, and increase share earnings under constantly changing conditions (Porter, 1980; Porter, 2008). Competitive advantages can be measured by market position, profitability, and market share. Sustainable competitive advantages, thus, refers to long-term performance and level of profitability, market share, (Maury, 2018; Wu and Harindranath, 2015; Srinivasan and Yu, 2014) and better creation of customer value when comparing to competitors (Rui et al., 2017; Ma, 2000). From the above theory of RBV of the firm, it explained about resources in agricultural sector that are managerial accounting information competencies which are rare and hard to imitate. MAICs serve as sustainable competitive advantages through agricultural innovation. Thus, agricultural innovation can be viewed as a way to build, achieve, and sustain competitive advantages in companies. This means that agricultural innovation throws away the old ways of engaging in agriculture and creates new paradigms of agriculture. For this paper, innovative agriculture has three dimensions: decision making accuracy, effectiveness of productivity, and improvement of cost management. Thus, the Hypotheses 4a-4c and Hypothesis 5 are proposed:

Hypothesis 4a: Sugarcane agriculture with higher decision making accuracy will achieve higher competitive advantages.

Hypothesis 4b: Sugarcane agriculture with higher effectiveness of productivity will achieve higher competitive advantages.

Hypothesis 4c: Sugarcane agriculture with higher improvement of cost management will achieve higher competitive advantages.

Hypothesis 5: Sugarcane agriculture with higher managerial accounting information competencies will achieve higher competitive advantages.

Research Methodology

According to relevant literature, in Thailand, there is an opportunity to study the field of managerial accounting, especially managerial accounting information competencies (MAICs). Few have researched the MAI issues in the Asia Pacific region. In this region, most studies have been undertaken in Australia, New Zealand and Malaysia and extended to China and Hong Kong, but none has researched Thailand. Thus, the motivation of this study is to examine the consequences of MAICs in the context of Thailand.

Population and Sample: Population for data collection in this research is a group of sugarcane farmers in Kampangphet province, because the government policy supports farmers in Kampangphet province and factories have enough capacity of dealing with

sugarcane. In addition, Kampangphet is a pilot province for the preparation of the land use or zoning and the integration of government and private sectors to encourage sugarcane industry. From these reasons, sugarcane farmers in Kampangphet province are a great representation for the research interview and the information from the interview can be an example for other forms of agriculture. The population of the research's data collection is a group of 1,500 sugarcane farmers from the sugarcane farmer leader quota in Kampangphet province (Sugarcane Planters Association, Northern Region, 2017). The samples are 306 sugarcane farmers in Kampangphet province (Krejcie and Morgan, 1970) chosen by purposive sampling from such quota. They are sugarcane farmers who possess several and large areas of sugarcane planting and also contact with sugar factories. They are key informants who have much experience and can be a great representation for this research.

Data Collection: The data was collected from a questionnaire by the researcher to the chief sugarcane quotas. For one month, 306 responses were collected. Four were unusable because of incomplete answers, leaving 302 useful responses. The effective response rate was 98.69%. By comparison, the mail survey response rate of Aaker et al. (2001) was approximately 20 percent. Thus, the response rate of this study was considered acceptable. Additionally, the non-response bias was investigated by t-test. The results confirmed that the means of the demographic variables of the two groups had no significant differences at 95 percent confidences level. Therefore, it implied that the questionnaires had non-response bias. Thus, there was no systematical difference in who responded and who did not (Armstrong & Overton, 1977).

Reliability and Validity: The reliability of the collected data was tested by Cronbach's α (alpha) to measure internal consistency of respondents' answers for all the items in the questionnaires. Each construct was measured by multi-item 5-point Likert scale. Table 1 shows alpha coefficients greater than 0.70 which are consistent with the assertion that the coefficients should have value greater than 0.70 (Nually, 1978). Alpha coefficients of constructs had value ranging from 0.75 to 0.92; the lowest coefficient (0.75) was effectiveness of productivity and the highest coefficient (0.92) was managerial accounting information competencies. That is, internal consistency for all constructs was good for the measures used in this study. Factor analysis was used for testing construct validity to direct contents in the study. Items were used to measure each construct that was extracted to be only one principal component. Table 1 shows factor loading of each construct with a value greater than 0.70 (range from 0.73 to 0.93). Thus, the construct validity of this study was tapped by items in the measurement as theorized. That is, factor loading of each construct should not be less than 0.4 (Hair et al., 2006).

Table 1: Factor Loading and Alpha Coefficients of Constructs

Constructs	**Factor Loading**	**Alpha Coefficient**
Managerial Accounting Information Competencies (MAICs)	.77 -.91	0.92
Agricultural Innovation (AI)	.85 -.90	0.86
Decision Making Accuracy (DMA)	.73 -.83	0.81
Effectiveness of productivity (EP)	.79 -.92	0.75
Improvement of cost management (ICM)	.78 -.82	0.84
Sustainable competitive advantages (SCA)	.77 -.93	0.89

Statistical Technique: Basic data analysis of samples and variables were mean, standard deviation, and correlation coefficient. Regression analysis was employed to analyze the relationship between dependent variables and independent variables. Ordinary least squares

(OLS) regression analysis was used for testing the hypotheses. From the relation model and the hypotheses, the following model equations were formulated:

To test relationship between managerial accounting information competencies and agricultural innovation. (Hypotheses 1- 3)

Equation 1: DMA $= ß_{01} + ß_1 MAICs + ß_2 LS + ß_3 GA + \varepsilon$

Equation 2: EP $= ß_{02} + ß_4 MAICs + ß_5 LS + ß_6 GA + \varepsilon$

Equation 3: ICM $= ß_{03} + ß_7 MAICs + ß_8 LS + ß_9 GA + \varepsilon$

To test relationship between agricultural innovation and sustainable competitive advantages. (Hypotheses 4a - 4c)

Equation 4a-4c: SCA $= ß_{04} + ß_{10} DMA + ß_{11} EP + ß_{12} ICM + ß_{13} LS + ß_{14} GA + \varepsilon$

To test relationship between managerial accounting information competencies and sustainable competitive advantages. (Hypothesis 5)

Equation 5: SCA $= ß_{05} + ß_{15} MAICs + ß_{16} LS + ß_{17} GA + \varepsilon$

MAICs are managerial accounting information competencies; DMA is decision making accuracy; PE is effectiveness of productivity; ICM is improvement of cost management; SCA is sustainable competitive advantages; LS is land size; GA is growing age; β_i are regression coefficients; ε_i is an error term.

Results and Discussion

Table 2 shows the correlation matrix for all variables. To check multicollinearity problems among independent variables, variance inflation factors (VIF) were used, ranged from 1.75-3.89, well below the cut-off value of 10 recommended by Hair, et al., (2006). Thus, there were no significant multicollinearity problems confronted in this study.

Table 2 Descriptive Statistics and Correlation Matrix

	MAICs	AI	DMA	EP	ICM	SCA	LS	GA
Mean	2.58	2.79	4.01	3.68	3.77	3.63	2.35	1.88
S.D.	0.53	0.57	0.52	0.62	0.55	0.68	0.49	0.50
MAICs								
AI	.48**							
DMA	.51**	.54**						
EP	.32**	.55**	.45**					
ICM	.35**	.58**	.58**	.32**				
SCA	.56**	.54**	.67**	.36**	.52**			
LS	.17	.14	.18	.06	.09	.10		
GA	-.08	-.08	-.09	-.03	-.04	-.06	.08	

** Correlation is significant at the.01 level (2-tailed)

* Correlation is significant at the.05 level (2-tailed)

Table 3 presents the results of OLS regression analysis, the effect of MAICs on decision making accuracy (DMA), effectiveness of productivity (EP), and improvement of cost management (ICM). The results showed that MAICs had a significantly positive effect on decision making accuracy (Model 1: $\beta_1 = 0.31$, $p<0.05$). This result agreed with Demski and Feltham (1976); Tiessen and Waterhouse (1983); Sprinkle (2013), claiming that information from management accounting can reduce uncertainty for decision making. Similarly, Nielsen et al. (2015) revealed managerial accounting information in complex and strategically significant decision-making settings. Quality of information means that managerial accounting provides financial and non-financial information according to needs of business management, planning and control, and analysis for decision making (Mihãilã, 2014). O'Donnell and David (2000) also stated that decision-making process uses

management accounting information and the decision maker's knowledge and skills to yield a successful decision. Moreover, the results also said that MAICs exert a significantly positive influence on effectiveness of productivity (Model 2: $\beta_4 = 0.55$, $p<0.05$). This result revealed that productivity was measured from coordinated and planned actions to improve growth and the set of managerial accounting information helped reduce loss of the production process. Even though this result agreed with the study about total quality management (TQM) of Benavides-Chicón and Ortega (2014); Vrtiprah and Ban (2000); Avelini Holjevac and Vrtodušić Hrgović (2012), this research introduced a new perspective that managerial accounting was a part of quality management that enhanced effectiveness of productivity. In addition, the results revealed that MAICs had a significantly positive effect on improvement of cost management (Model 3: $\beta_7 = 0.65$, $p<0.01$).

This result displays that sugarcane planting needs to calculate realistic cost of planting in order to reduce cost and increase performance. Furthermore, Henri et al. (2016) stated about strategic cost management in terms of structural cost management. According to Staiculescu (2012), management accounting is a tool for determining, evaluating, and analyzing in accordance with existing political changes and social or economic conditions which always change both internally and externally. Contribution of cost analysis of using resources and pricing analysis can be controlled by specific methods and provision of information in terms of deviations and ways of correction. Thus, ***hypothesis 1, hypothesis 2, and hypothesis 3 were supported.***

Table 3 Results of OLS Regression Analysis[a]

Independent	**Dependents Dependent**			
	Agricultural Innovation (AI)			**Sustainability Competitive**
	(DMA)	**(EP)**	**(ICM)**	**Advantages (SCA)**
	(1)	**(2)**	**(3)**	**(4)**
Managerial Accounting Information Competencies (MAICs)	.312** (.086)	.552** (.064)	.653*** (.067)	.354*** (.053)
Land Size (LS)	.105 (.086)	.154 (.087)	.115 (.085)	.086 (.086)
Growing Age (GA)	.024 (.081)	.068 (.080)	.077 (.079)	.084 (.045)
Adjusted R^2	.623	.565	.662	.685

***p*<.05, ****p*<.01

The effect of MAICs on sustainable competitive advantages also presented in Table 3. The result showed that MAICs had a significantly positive effect on sustainable competitive advantages (Model 4: $\beta_{15} = 0.35$, $p<0.01$). This result agreed with Deng et al. (2018) that investigated decision making with managerial accounting and building sustainability performance evaluation system. Also, rational decision making resulted in higher work and organizational performance (Busari & Spicer, 2015; Singh, 2014; Smolka et al., 2016; Uzelac, Bauer, Matzler, & Waschak, 2016). The effectiveness in planning and control can improve the ability in capacity planning, cost estimation, and inventory control. This corresponds with the research about supply chain management of Hill et al. (2018) which stated that planning can enable better coordination of activities on supply chains, improve forecasting of customers' demand, production scheduling as well as enhancing firm performance. Debrell et al. (2014), likewise, showed that formal strategic planning processes and planning flexibility are positively concerned with firm performance and each of them is positively related to innovativeness.

The planning flexibility, as well as the ability to effectively conduct formal strategic planning, can be a powerful, though somewhat paradoxical, means to create competitive advantages. Debrell et al. (2014) also agreed with Frezatti et al. (2011); control of management is an important mechanism responsible for the design and implementation of strategies while management accounting structure concerns with planning process development to strengthen firm performance. Therefore, production planning and control can decrease lead time and elevate customer satisfaction. Moreover, sugarcane farmers investing in uncertain environment should make decisions to maximize wealth and firm value to gain profit in the long run. Survival and sustainability of the firm depend on operational management efficiency. Reducing future cash flows of the net present value as a process of discounting by using the discount rate (Karanovic and Gjosevska, 2012) and analyzing information production and sales volume of the products to make a profit by business goals lead to sustainable competitive advantages. *Thus,* ***hypothesis 5 was supported.***

Table 4: Results of Multiple Regression Analysis[a]

Independent	**Dependent**
	Sustainability Competitive Advantages (SCA) (5)
Agricultural Innovation (AI)	
Decision Making Accuracy (DMA)	.488***
	(.066)
Productivity Effectiveness (EP)	.359***
	(.069)
Cost Management Improvement (ICM)	.683***
	(.052)
Land Size (LS)	-.031
	(.046)
Growing Age (GA)	-.045
	(.034)
Adjusted R^2	.541

**p<.05, ***p<.01

Also, Table 4 presents the results of multiple regression analysis and the effect of agricultural innovation consisting of three dimensions on sustainable competitive advantages. The results showed that decision making accuracy, effectiveness of productivity, and improvement of cost management had a significantly positive effect on sustainable competitive advantages (Model 5: $\beta_{10} = 0.49$, $p<0.01$; $\beta_{11} = 0.36$, $p<0.01$; $\beta_{12} = 0.68$, $p<0.01$). These results agreed with Barney (1991) and Porter (1980, 2008) demonstrating that agricultural sector had resources including managerial accounting information competencies which are rare and hard to imitate. MAICs will be long-term competitive advantages through agricultural innovation. Also, agree with Kuncoro and Suriani (2017) to said that innovative and competitive are able to affect competitive advantage. Thus, ***hypotheses 4a-4c were supported.***

Conclusion, Limitation and Further Research

The current information revolution, witnessed globally, strengthened the position of information besides being human and material resources for sugarcane planting and preserved available resources. Technically, managerial accounting information has an important role in the process of managing an enterprise's activity in sector of agriculture.

There is only few studies in agriculture conducted in the context of Thailand as an agricultural country; therefore, farmers should find a way to enhance sustainable competitive advantages through intangible resources in order to compete with international competitors.

As a theoretical contribution, the conceptual model of MAICs is explained by the resource-based view (Barney et al., 2001). It focuses on the influential resources to enhance sustainable competitive advantages through agricultural innovation. The resources are the assets, capability, processes, information and knowledge. This study explained MAICs as an intangible resource; (1) to produce accounting information reliably, accurately, relevantly, and timely; (2) to perform planning and control; (3) to analyze capital budgeting and relationship between cost, volume, and profit to provide decision making accuracy, effectiveness in productivity, and improvement of cost management. Consequently, competitive advantages are improved in the long term.

As a practical contribution, the MAICs proposed in this paper will help shape farmers' agricultural innovation for more effective operation, management process, cost management, and competition for survival in the marketplace. Agricultural sector with MAICs will bring up a new perspective in agricultural innovation and therefore enhance their competitive advantages. The MAICs and factors that are consequences of MAICS should enable performance to allocate their MAICs activities better. In the event of the ASEAN treaty, MAICs can help Thai farmers improve their competitive advantages, build corporate intelligence, achieve productive processes, products and services, and gain competitive edge sustainability.

There were, however, some limitations of the study. Firstly, the proposed conceptual model was only tested on farmers from Kampangphet province, Thailand. A study needs to be conducted on another province as well. Secondly, some of the consequences of MAICs may have been omitted. In further researches on the impact of MAICs, new variables should be added, such as strategic performance measurement and other variables. Finally, the antecedents of MAICs should be examined: How do antecedents of MAICs such as executive vision governance and accounting practice affect MAICs?

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