The effects of knowledge transfer on farmers decision making toward sustainable agriculture practices

In view of green fertilizer technology

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Abstract

Purpose – The purpose of this paper is to enhance the adoption decision of farmers and observe the factors that affect the adoption decision of sustainable agriculture practices (SAP) which is the major motivating force of Malaysian economy. The idea behind this study is to transfer knowledge to paddy farmers within regional areas of Malaysia and to comprehend their understanding of social innovation and sustainable agriculture engineering and their overall significance. The outcome of this research will suggest a strategic extensive plan to encourage the use of SAP and also help to develop SAP helping toward building a sustainable society.

Design/methodology/approach – This paper encompasses three phases: analyzing the process of SAP among Malaysian Paddy farmers, to agricultural industrialization, until the stage of SAP led by farmer's co-operatives, discussing the relevant practice together with literature and historically evidencing that there is no better way to promote SAP among regional paddy farmers within Malaysia.

Findings – Initial objective of this paper is to establish a thoughtful approach to enable the society to bridge a gap between embracing sustainability. The second objective investigates the misconception among farmers about social innovation. Furthermore, the study builds the conceptual framework and examines the relationship among the relevant constructs, this framework is critically examining the literature within paddy farming context. Harmoniously, there has been limited empirical research performed on the decision of adoption toward SAP usage among paddy farmers in Malaysia.

Originality/value – The clear worth of this research paper is the illustration from past reviews and practices to endorse SAP usage among paddy farmers in Malaysia. Another literature review suggests that these countermeasures comprehensively, historically, and theoretically are proven result oriented. The information about SAP will be beneficial for farmers and policy maker who are interested in the advancement. This learning delivers a comparative summary of knowledge transfer influencing farmer's intention and behavior of sustainable agriculture engineering to adopt green technology. In a future study, these construct will be empirically tested.

Keywords Knowledge transfer, Social innovation, Paddy farmers, Sustainable agricultural practices

Paper type Conceptual paper

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Nomenclature

SAP	sustainable agriculture practice
GFT	green fertilizer technology
GMO	genetically modified organism
KBV	knowledge-based view

1. Introduction

The observation of social revolution and sustainability seems pervasive in the modern world (Fuad-Luke, 2013). The profound reflection indicates that there is a substantial difference of perception; the way social innovation and sustainability are understood and implemented in the agricultural engineering of regional Malaysia (Othman and Muhammad, 2011). Social innovations strengthen new strategies, concepts, ideas and organizations that encounter in line with social needs of different elements in developed and developing countries, especially in Malaysia. Additionally, the notion of social revolution is often appointed as an essential part of agricultural industry. Social innovation and its significance also help for the growth toward sustainability in agriculture (Klerkx *et al.*, 2012). In agreement with this information dominated indication era, the farmers need to have the knowledge about sustainable agriculture development (Bredehoeft and Alley, 2014; Othman and Muhammad, 2011). In the context of this research, the study aims to examine how social innovation can help to promote knowledge transfers and provide exposure for sustainable agriculture development among paddy farmers in Malaysia (Othman and Muhammad, 2011). As Ismail (2006) illuminated sustainable agriculture development refers to the farm's capacity and capability to sustain production and offering assistances for maintaining nature as well as the environment and accelerating social growth in a rapidly changing environment. Additionally, the term sustainable agriculture development covers both aspects of the invention and conserving the overall atmosphere. The elevation of knowledge transfer among Malaysian paddy farmers has increasingly become a core issue among the policy makers. However, as per policy makers empirical information is observed; as a matter of fact to assume information, knowledge must deal with both the adaptable and flexible skills; that means, a specific farmer's unique capability to exercise as well as apply the appropriate information and techniques. This facilitative application is used in order to distinguish information from the knowledge source for further advancement toward deliverables. There are two main aspects of Knowledge such as personal and tacit, however, individual's knowledge is tough to accumulate, quantify, and relocate for others to utilize. So, it is a challenging task in the context of knowledge transfer among regional farmers. To trounce huddles, Gliessman (2015) appealed that knowledge transfers allow the decision makers to integrate the latest knowledge that assists adoptive innovative concepts as well as combine knowledge in an efficient manner. Since knowledge has some of the possessions of public interest, so there should be no restrictions on knowledge transfers apart from those obligated by the cost of transferring knowledge across unit boundaries (Szulanski, 2000; Hansen, 2002). Consequently, knowledge has some possessions of a farmer's well-being, so there should be no constraint in transference keeping the fact of cost of transferring knowledge. Besides, few scholars like Meijer *et al.* (2015) along with Hansen (2015) nominated that the transfers of knowledge may add to the sustainable path of reliance on transfers of knowledge resulting in farming communal clarification among units of a policy maker's premeditated approach and fortified common philosophies and strategies of information acquirement. Although, the policy makers refrain to reassess their acquired knowledge, they should apply information possession and detriment the retiring leads that arise from cumulative return of knowledge attainments, which appear from frequently emerging knowledge type (Cohen and Levinthal, 1990).

Social modernization is getting precarious for the policy makers to regulate the transfusion of knowledge to paddy farmers, in order to improve the paddy production through sustainable agricultural development within Malaysia (Hall and Helmers, 2013). The solicitation of societal revolution can be defined as "the process of inventing, securing support for, and implementing novel solutions to social needs and farmers problems toward the adoption of sustainable agricultural development" (Ghadiyali Tejaskumar and Kayasth Manish, 2012). Nevertheless, Tey (2013) debated that knowledge transfer within farmers is mostly unresponsive due to an absence of encouragement. However, result-oriented knowledge curved the best performance which are based on largely accessible among the farmers who rely on the usefulness and the type of that specific information, source it originates, that transfer knowledge among farmers. Consequently, to acquire effective approach toward the societal innovation one should exceed vital areas, stages of detailed analysis as well as techniques with a view to discovering the procedures such as the approaches, tactics, and philosophies needed to amend in order to apply sustainable and fruitful approach. Whereas Adnan, Nordin and bin Abu Bakar (2017) observed that the innovation can be done with the help of either a procedure or goods, the main focus of innovation that we are emphasizing here is the sustainable agricultural development and its positive outcome. Like a process, innovation encompasses the paddy farmers as well as the cumulative communal processes which can help farmers to adopt sustainable agricultural practices (SAP) through proper knowledge transfer from policy makers, which includes individual creativity, environmental context, social and economic factors within a timeframe (Conway and Barbier, 2013; Nordin *et al.*, 2014). Modern agricultural practices enable farmers to meet all three goals of sustainability, conservation and protect natural assets to encounter the food and fuel requirement of the rapidly growing population in terms of financial feasibility for both consumers and growers. Figure 1 illustrates three important aspects of sustainability.

Observed as a sustainable agricultural development, innovative nuance is a consequence that demonstrates itself as an innovative good, equipped with the features, and production techniques that are environmentally friendly. This division of research observes the bases and economic significances of innovation (Nazari and Hassan, 2011; Padfield *et al.*, 2015). Moreover, number of researchers (Hezri, 2004; Peuckert, 2011) explained that innovation majorly comprises of adoption or diffusion toward the particular innovation (Adnan, Nordin, Rahman, Vasant and Noor, 2017; Rahman *et al.*, 2014) along with the unique value shaped by achieving the SAP. This paper focuses toward the theory which provides a framework of a proposed knowledge transference along with decision-making prototypical which can generally be utilized in order to comprehend and elucidate decision-making

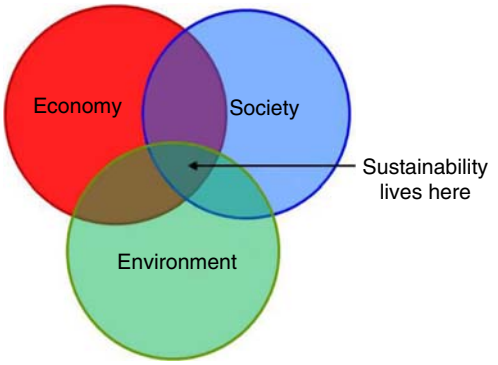

Figure 1.
Three important aspects of sustainability

involvement in respect to social innovation issues (Motsumi *et al.*, 2012). In a nut shell, we concluded with the prospects of future study and practice obtainable by briefly discovering some theories that can support to clarify the claim and adaptation of innovative agricultural technologies such as sustainable agricultural development. Innovation terms itself a complicated process and can include both the acceptance of latest technology along with the variation of current practices which is widely considered high time for the transitions to sustainability. The next section focuses on the descriptive part of sustainability as well as its role toward positively achieving the goal of environment-friendly agriculture.

2. Sustainability: policy making

The crucial issues in transitions toward sustainability are the processes involved in problem identification that needs to be addressed which leads in selecting suitable approaches to address them efficiently, which are majorly political constructed and often contested process. Indeed, there is typically ample scope for debate over the sustainability of both incumbent regime and alternative niches (Sterling *et al.*, 2008). Sustainability appraisals are necessarily undertaken from different positions and perspectives. Overall goals for sustainability such as preservation of biodiversity or reducing the environmental impact of agricultural practices often achieve broad rhetorical consensus. However, more specific criteria tend to be fiercely contested with profound implications for the favored pathways. A most recent example is the current debate regarding the sustainability of biofuel production, which is rife with ambiguities on the choice of indicators, the projected future environmental and collective impact along with the evaluation of effects in developed and emerging countries. Regarding agriculture, there are obviously several contending paradigms (van der Ploeg, 2009; Freibauer *et al.*, 2011; Levidow and Boschert, 2011; Kitchen and Marsden, 2011). We observed significant discussions, for instance, whether a transition to sustainability can be achieved by focusing on technological artifacts (e.g. GMOs, nanotechnology, precision agriculture) or whether it is more effective to focus on consumer behavior, social relations, allocation rights, institutional structures and cultural perspectives. Each of these elements becomes a part of a discourse and there was intense debate as to what standards are suitable as well as which criteria adequately reflect sustainability as legitimate. Thus, the transition presupposes and bring about a shift in standards of legitimacy. These standards of legitimacy are reflected in the conceptual frames that define certain problems are persistent (while ignoring and downplaying others), and what solutions are appropriate to address the problems. As a result, emerging transitions tend to be rooted in contrasting sets of interests and prospects, different values, and cognitive frames. A societal discourse ensues on which of these are legitimate, often by influential members of the established regime (such as agri-business groups, banks, state agencies, expert systems or researchers). Regime actors are likely to attempt to block transitions that are advocated as necessary by particular lobbies along with supporting another emerging transition by arguing it as "objectively necessary for modern era," given the rationality (Ramli *et al.*, 2013) knowledge is more likely an echo of institutional supremacy as is a vigorous or comprehensive understanding (Stirling, 2011). The issue of the definition of what counts as a transition to sustainability is directly connected to the question of "whose system counts" (Stirling, 2008), which includes the definition of the boundaries of the system under consideration along with its structure and its full functionalities (Shove and Walker, 2007). Consequently, the identification of persistent problems and the choice of criteria to assess the relative worth of alternative pathways along with the solutions that are understood as leading to sustainability becomes an amalgamated result of social interaction, political decision making, and conflict. Sustainability, as a process, is best assessed as one which changes farming structures

alongside route toward the better sustainability which describes further in the next section. The idea behind the sustainability lies into different stages and each segment has its own importance which we can see the cycle of the sustainable policy making process in Figure 2.

3. Measuring progress toward sustainability

The issue of sustainability is not only a subject of describing sustainable or unsustainable agriculture but also measuring the recent alternatives of farming systems as well as farming practices (Ramli *et al.*, 2013). For this paper, the authors' definition of sustainable agriculture does not make a high-pitched dichotomy between conventional and sustainable farming systems not only because farming enterprises reflect many combinations of farming practices, organization forms, and management strategies, but also because of various types of farming systems can potentially contribute to achieve major sustainability goals and objectives (Dastagiri *et al.*, 2014). Finding ways to measure progress along with sustainability trajectory is an important part of the experimentation and adaptive management processes (Shiva, 2016). Environmental, economic, and social indicators can be used to pronounce the performance of agriculture by providing information on whether a farm, a farming system type or agriculture at any scale is on a trajectory toward improved sustainability. Many indicators are means-based and others are outcome-based, however, either type presents limitations and strengths. Efforts to develop indicators to assess social dimensions of agricultural sustainability are sparse (Tey and Brindal, 2012). Yet, there are no established standards regarding what indicators to use under different conditions to satisfy the on-going requirement (Yadav *et al.*, 2015). Insufficient measures have been authenticated by the farmers, researchers, and mass community that can fulfill the necessities. Developing a reliable as well as an operative indicator would ease the sustainability assessment of farming practices in general. Knowing the connections between sustainability pointers and the outcomes they are intended to symbolize is on precedence for the upcoming research. Kahn (1995) stated that the model of "sustainable development" is defined in Agenda 21. These components are "environmental sustainability," "social sustainability," and "economic sustainability" (see Table I).

Farming systems that move toward greater sustainability comprise of major objectives that generally strive to work with ecological and biogeochemical processes and cycles to

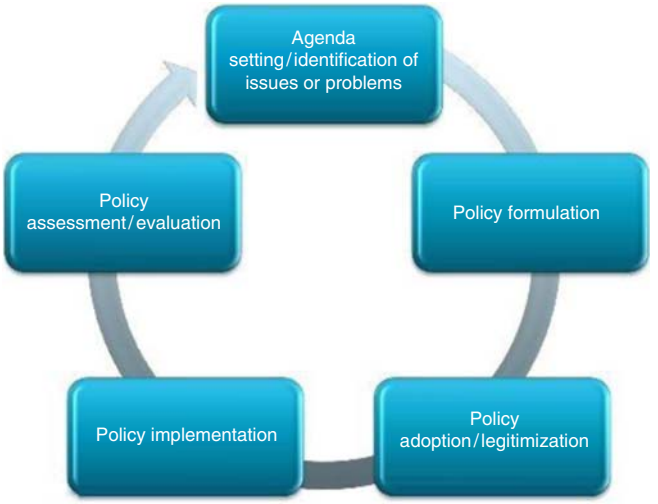

Figure 2.
Cycle of the sustainable policy making process

Component	Measures
Economic Sustainability	Progression
	Efficiency
	Trickle down
	Development
Social sustainability	Fairness
	Convenience
	Empowerment
	Involvement
	Cultural identity
	Sharing
	Institutional steadiness
Environmental sustainability	Biodiversity
	Carrying capacity
	Eco-system reliability

Table I.
Kahn's (1995) example regarding sustainable development stated in Agenda 21

maximize synergistic interactions along with the beneficial use of internal resources, minimize dependency on external inputs and use added inputs efficiently (Velten *et al.*, 2015). Through those efforts, they potentially reduce discharges to the environment and additional waste disposal activities, providing economic resilience and enhanced social well-being. As exemplified in a case study, many farmers who work toward improved agricultural sustainability manage their operations to encourage social and economic synergistic relationships on-farm and throughout the food chain (Velten *et al.*, 2015). The overall sustainability or robustness of a farming system along with the ability to adopt stress/pressure and changes in circumstances in the context of time limitations are the amalgamated result of resistance, resilience, and adaptability of the coupled biophysical and socioeconomic system. Whereas, policy makers in developing countries focus more on agricultural sustainability in order to increase the farm productivity (von Hase, 2013), most of the farmers in developing countries are unaware of SAP (Tiraieyari and Uli, 2011). However, it's a dire need for the policy makers to educate the farmers about the benefit of SAP which leads them toward a sustainable as well as environment-friendly farming system and also benefit their offspring.

4. What are SAPs?

Sustainable agriculture is the practice of the farming using principles of environment. This study focuses more on the relationships between organisms and their environment. It has been defined as an integrated system of crop production practices having a site-specific application over the long term. Figure 3 illustrates the sustainable agriculture diagram:

- safety human food and fiber needs;
- make the most efficient use of non-renewable resources and on-farm resources and integrate, where appropriate, in a natural way;
- sustain the economic viability of farm operations; and
- enhance the quality of life for farmers and society as whole.

5. Benefit of SAP

Agricultural practices determine the level of food production and, to a great extent, the state of the global environment. SAP are environmentally non-degrading, resource conserving, socially acceptable, technically appropriate and economically viable (FAOstat., 2008).

Figure 3.
Sustainable agriculture practices

In general, attaining SAPs is directed toward the efficient use of natural resources. Cutting down reliance on synthetic inputs minimizes environmental and social externalities. Adoption of SAP in tillage, covers crop and mulches as well as green fertilizers along with composts intensifies crop production in part due to increased retention of organic matter and decreased risk of soil erosion (Chau and Hu, 2001). Use of intercropping, crop rotation, integrated pest management (IPM) and green fertilizer technology (GFT), enhance crop protection partly because of the disruption of pest cycles and reduced thread of pest outbreaks (Adnan, Nordin and bin Abu Bakar, 2017; Taylor *et al.*, 1993). Keeping the fact and figures in consideration along with some examples, SAPs are clearly seen as offering versatile benefit and at the same time promoting productivity and sustainability. The promotion of SAPs through GFT has been tailored to reflect the particular locales of individual regions or countries (Adnan, Nordin and bin Abu Bakar, 2017). For example, in response to the European soil degradation issue, SAP tillage, cover crops and mulches and crop rotation have all been packaged under the label "sustainable agriculture practices" by the European Sustainable Agriculture Federation (Knowler and Bradshaw, 2007). These sustainable practices and other sustainable practices (e.g. intercropping, organic fertilizers and composts, IPM, precision technologies along with waste-nutrient and water-related systems) are known as "best management practices" to overcome general production-based sustainability issues in the USA (Baumgart-Getz *et al.*, 2012; Prokopy *et al.*, 2008). In that general context, these practices have been promoted as SAPs in other countries (e.g. Malaysia). Most of the farmers in these developing countries are not unaware of the latest innovations in agricultural practices to increase the yield without damaging the environment. In order to make farmer aware about the latest innovations, agricultural extension officers of these developing nation need to transfer the knowledge in an appropriate and understandable manners among farmers for efficient and effective production.

6. SAP toward sustainable society

In the agricultural history, the term agricultural system examined and distincted the economic and environmental outcomes of SAP which could help them toward sustainable society that could improve sustainability (Garnett *et al.*, 2013). Whereas, farmers of the twentieth century in the second half helped to validate a method to an

agriculturaltoward systems investigation that had formerly been measured nonscientific, many so-called alternative practices at that time (IPM, no-till farming, and cover crop planting) are now used by some farmers in mainstream agriculture sustainability.

Nevertheless the possible assistances for farmers in order to improve the undeveloped structures it could improve by practising sustainability, their adoption is far less common than the society may need. One reason for the low rate of adoption is because of social, economic, and policy incentives that disappoint essential deviations in the farming systems. Another reason is that some of those observers have compromised so that they might deliver assistances in one feature and negative significances in another (Notarnicola *et al.*, 2012). The association toward better sustainability could be hampered by society's lack of mutual promise on which objectives are the uppermost precedence and how compromises should be managed. In order to make the society work in a better way, we need to approach the farmers towardto get knowledge about SAP which can shape the sustainable society (Alvarez *et al.*, 2017).

7. SAP through GFT

Sustainable farming, or in a broader term, sustainable agriculture is using farming practices considering the environmental sequences (Barrios-O'Neill and Schuitema, 2016; Garnett *et al.*, 2013). SAP are not only economical but also help in the sustainability of our natural resources (Fischer *et al.*, 2012). Sustainable farming also helps reduce the need for chemicals fertilizers and pesticides. Sustainable farming or sustainable agriculture helps the farmers innovate and employ recycling methods, this apart from the conventional perks of farming (Garnett *et al.*, 2013). A very good example of recycling in sustainable farming would be the crop waste, animal manure or control released fertilizer. Controlled-release fertilizer has been developed to minimize the contamination while keeping high yield and has become a GFT for agriculture (Quemada *et al.*, 2013). The same can be transformed into fertilizers that can help enrich the soil. Attaining SAP through GFT provides beneficial environmental advantages of agricultural practices and the costs that influence farmer or societal choices about production methods in order to increase the farm production with the help of sustainable mean (Othman, 2012). Raising yields on existing farmland is essential for "saving land for nature," but the prospects for yield increases (Othman and Muhammad, 2011). Whereas paddy farmers in Malaysia are generally unfamiliar with the idea of sustainability but once they understand through proper knowledge they understand the meaning of transference (Oliveira, 2013; Parkinson *et al.*, 2013). They appear to identify the positive with its value and priority.

8. Theories based on knowledge transfer

Numerous hypothetical methods stem from finances but the organizational theory addressed the theory of the firm. Firm theories endeavor to model, conceptualize, explain and predict firm's structure and behavior (Grant, 1996). Within this field, there is no single theory but many competing and often complementary approaches. One of the classic and influential approach is the transaction cost theory which addresses the efficiency of the authority-based organization (hierarchy) vs contract-based organization (markets) (Coase, 1937; Williamson, 1975). The evolutionary theory of the firm (Nelson and Sidney, 2005; Kogut and Zander, 1992) has also been very influential to observe. Whereas, firms are assessed as repositories of idiosyncratic and path-dependent routines in the evolutionary theory, the organization theory analyzes the internal structure of the firm and the relationships between its constituent units and departments. Strategic management used both economic and organizational approaches in an attempt to explain firm's performance and the determinants of strategic prime (Grant, 1996). However, the researcher has taken the knowledge-based theory of the firm to deliver the knowledge among farmers. Elsawah *et al.* (2015) stated that it is a very effective theory in order to transfer the knowledge to the farmers.

8.1 Knowledge based theory of a firm

The "theory of the firm" states many issues relating to presence, limits, and production of the firm (Fama, 1980). This theory not only presents the idea of contractual nature but also depicts the productive knowledge such as innovation about new technology among the people for the industrial advancement (Foss, 1996). The industry in this understanding occurs as a different social unit that can benefit people to grow on the basis of this industrious knowledge (Guo and Jolly, 2008; Van Herck *et al.*, 2012). Knowledge-based philosophy of the firm addresses few issues as to how they differ, what determine their scales and scopes of knowledge. On the other hand Szucs *et al.* (2015) and Williamson (1999) observed that the resource-based competencies are more concerned with the process of learning and the lesson of the strategies. At the end, they concluded that both are much needed as an effort to understand the knowledge of innovation within that firm. Subsequently, firm's knowledge-based view (KBV) is becoming important in the recent era as we progressively deal with the development of a competitive differentiation acquaintances as well as strategic management (Martín-de Castro *et al.*, 2011).

The indispensable features of the KBV can be conceded as follows:

- effective knowledge is the most significant resource and a factor of production;
- performance differences between firms exist because of differences in firm's stock of capabilities to utilize and develop knowledge;
- organizations exist to create, transfer and transform knowledge into a competitive advantage;
- knowledge is connected to individuals;
- individuals are intentional and intelligent agents;
- humans are bounded by cognitive limitations, for instance, quantity and quality of knowledge do have cognitive limits and therefore they have to specialize;
- integration and coordination of knowledge is a vital tool in complex issues which cannot be understood by single individual especially;
- cognition and actions are related to each other so the knowledge either should acquire or demonstrated in action;
- knowledge is described in the magnitude of practices as well as can be positioned on numerous stages, located individuals' minds and bodies, entrenched in administrative processes and habits along with codified in books and databases and so on;
- some of the knowledge can be expressed into the explicit methodology. On the other hand, other at all times stay tacit; and
- the form of knowledge inspires how it can be transferred and leveraged for efficient productivity.

This nontraditional information has been an accounting trick, since Flamholtz (1976) and contributions of the human assets (Posner, 1993) among KBV research discovery of Posner (1993) pointed out the strong relationship between human capital to that of investment in human capital (e.g. learning of farmers) as well as the resulting value of knowledge acquired. According to the findings of Flam Holtz and Posner, knowledge-based information such as knowledge transfer and knowledge creation has an effect on decision making in accounting for knowledge-based information. The main important issues are stimulating firm in order to measure the performance of knowledge-based information (Aguilera-Caracuel *et al.*, 2012). The problem is aggravated by the circumstance that some

practice of knowledge is more quantifiable than others, depending on how the organization or agencies transfer that knowledge. Therefore, some researcher backed up the theory that at times knowledge can be viewed as both unambiguous and unstated. Unambiguous knowledge possesses the properties of the public interest (e.g. the expectation of farmers attaining knowledge). Although the core problem of knowledge is understandablity, we tell more than what we know (Bijker *et al.*, 2012). Unstated knowledge is related to individual's involvements and is acquired and stored with the passage of time by people; knowledge cannot be transferred or operated as a separate object. On the contrary, knowledge can easily be understandable which depends on knowledge-based information and presents an important source. Oliver *et al.* (2012) highlighted that knowledge-based information is very effective in order to get adoption of decision making among farmers. Fafchamps and Minten (2012) additionally explained that knowledge-based information provides decision makers information based on their knowledge toward the adoption decision of social innovation. Fransson *et al.* (2011) explained that information also supports the impression of the knowledge-based theory of the firm as proposed by fellow investigators. Kogut and Zander (1992) studied a corresponding distinction where knowledge is divided into know that, which they call information, and know-how, considering the procedure. Know that is associated with information, description, and declarative knowledge, while know-how is associated with procedural knowledge of how something happens or can be done. Furthermore, these knowledge types can be assessed on individual, group, organizational, and network levels (see Table II).

8.2 Knowledge transmission of decision-making model for farmers

In proceeding findings, the researcher describes the knowledge transmission decision-making paradigm for farmers. This study delivers a comprehensive conceptual framework for investigative interconnected procedures that influence societal revolutionary choices. It associates the variable of perceptual awareness processing (framing of a problem), information (both traditional and knowledge-based), judgmental processing (analysis of framing/information), and decision choices. The paradigm of decision making is useful in theorizing a number of significant issues in industries (Ho and Rodgers, 1993; Robert Mitchell *et al.*, 2011; Rodgers, 1999). These paradigm critical pathways in the adoption of decision making are prejudiced by knowledge and information. Additionally, the paradigm imprisonment variable of decision maker's implicit knowledge is influential in the interpretation of decision among farmers. In this paradigm, the decision makers describe multiple phases of the information processing function to farmers about sustainable agricultural development which provide cognitive procedures that are used to produce a set of outcomes. Hogarth (1987) explained that difference of viewpoint and misconception as to how many clusters and subroutines exist in the phases and the direction in which segments occur. Nevertheless, the paddy farmer's usage of awareness, judgment, information and choice in the suggested model with some steadiness is discussed in the study.

	Individual	Group	Organization	Network
Information	Realities	Who knows what	Profits, accounting data, formal and informal structure	Prices, whom to contact, who has what
Know-how	Skill of how to communicate, problem solving	Recipes of organizing such as Taylorist methods or craft production	Higher-order organizing principles of how to coordinate groups and transfer knowledge	How to co-operate, how to sell and buy

Source: Kogut and Zander (1992)

Table II.
Types of knowledge (group, individual, organizational, and network levels)

The approaches of judgment that effect decision choice are underneath an individual's thoughtful control. Established by Figure 4, the processes of decision making among individuals can be signified by a prearranged way as per the next five pathways:

- Awareness → Information (knowledge creation).
- Awareness → Judgment (transfer of knowledge).
- Information → Judgment (acquisition of information).
- Awareness → Decision (utilization of knowledge).
- Awareness → Intention (knowledge preparation).
- Judgment → Intention (knowledge transfer).
- Intention → Decision to adopt (knowledge utilization).

The teaching of these learning delivers the decision-making procedures. From the essential part of teaching, we can extract all the noticeable tracks with the help of arrows shown in Figure 4 indicating the five sets of individual pathways. Out of these five sets of primary stages of the decision-making process among farmers, the knowledge creation part is the most important part for the policy makers because it provides farmers the information and imaginative approaches spontaneously. Figure 4 illustrates farmer's decision to use SAP with the help of arrows from one variable to another variable directed toward the causal relationship among the construct, whereas awareness and information in the direction of adoption of SAP are portrayed as an independent construct because information can have an effect on how the decision of adoption solves the problem. On the other hand, awareness shows that how farmers need to choose the right innovation for the firm's productivity. Informative approach to adopt SAP could lead farmers to make up their mind in order to be a part of decision-making process. The double-ended arrow in Figure 4 shows the linkage between the awareness and information which represent the knowledge transfer process also known as a dual process (Kahneman, 2003; Slatter and France, 2011). Furthermore, a knowledge transfer process indicates that information influences the awareness and

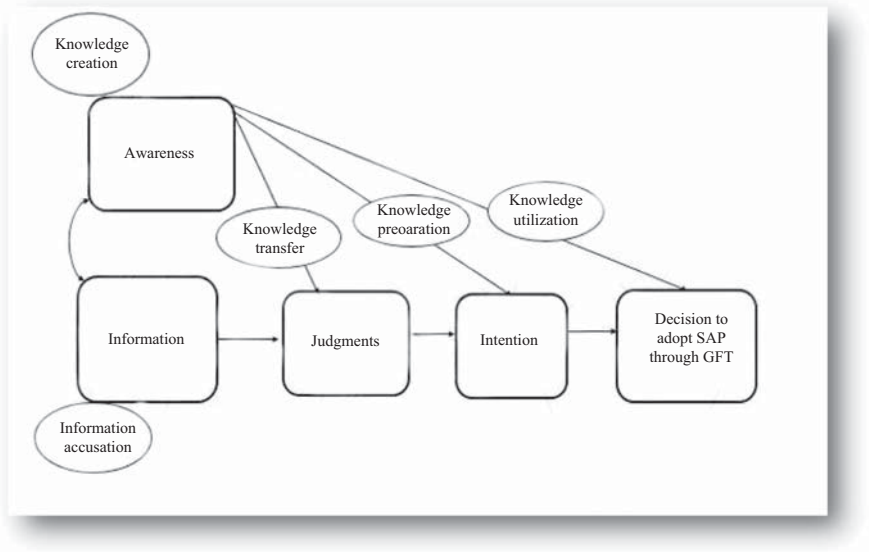

Figure 4.
Paradigms of knowledge transfer decision making

judgment of the farmers v the adoption of SAP. For instance, how information is being kept by the farmer's mind affects decision evaluations of the framed scenarios. Farmers make the decision where each individual encodes the information and develops intention that leads to knowledge processing adoption decision of SAP. On the other hand, it is viable in the awareness and judgment and influences decision choice, which signifies a knowledge utilization process. A number of studies by Barlett (2013); Chambers and Conway (1992); Kahneman and Tversky (1979); Sharifpour *et al.* (2013) indicated that awareness is like heuristics, whereas information processing strategies (judgment) deliberate the involvement in the decision choices. In this research study, a heuristics method was used to help avoid the errors and produce a result from the cognitive mechanism of farmer's decision-making process where farmers are largely unaware and these may have a direct influence on individual decision choice (Rodgers, 1999). Farmers deliberate control on the strategies of judgment which influence decision choices of SAP (Marx and Weber, 2012). It is compulsory to break up all the paths marked with the arrow in Figure 4 in order to study the decision-making process among farmers. The arrow path is divided into the five sets of individual pathways where the most intuitive type of knowledge transfer is a vital stage toward the decision-making process among farmers to use the creative strategies among them (Raman *et al.*, 2014), whereas the individual farmer's information process is spontaneous so that the information has been influenced by farmer's perception about any innovation. Even though, at the same time it inspires and shapes the awareness of farmer's adoption decision problem about SAP (Iser and Wilson, 2011). The information that is lifted through the communication among one's (farmer's) awareness and presented knowledge to be contingent on whether one (farmers) distinguishes a great grade of coherence among the information and farmers prior expectations or the principles around the significance of the knowledge (Barlett, 2013; Tasezer and Karabati, 2014).

The preliminary processing phase can effect concluding clusters of policy making procedures by giving a new look toward a societal innovation, delinquent or transfer knowledge in order to contribute to solving a particular problem (Dalkir, 2013). As an illustration, the creation of knowledge via the early spontaneous inventive process may convey regarding fresh paradigm generated via the preliminary intuitive that innovative processes can carry forward the latest practices and methods that can be combined into and utilized in successive clusters of decision (Barlett, 2013; Dalkir, 2013). Farmers normally use the obtained information for doing the analysis (this is called judgment stage).

The individual normally make a decision by encoding the existing knowledge as well as developing a demonstration of the particular problem as shown in Figure 4 by the influence of information (or more precisely their information acquisition) on the judgment. Approaches are indispensable when there are gaps between knowledge utilization and transfer of knowledge in social innovation. A comprehensive strategy regarding the creation of knowledge exhibits itself in the final stage of decision making, and becomes a significant selection. Decision choice can be affected directly by awareness judgment (Barlett, 2013). However, awareness always influences judgment as perception-like heuristics as well as more deliberate strategies regarding information processing are included most of the time (Foss and Rodgers, 2011; Jamal *et al.*, 2014; Rodgers, 1992). Both awareness and the decision to adopt along with judgment paths comprise of knowledge deployment that might be affected by the transfer of knowledge as well as the information acquisition phase.

9. Future research directions

The transformative method targets major development in the performance of sustainability by tailoring modern agricultural practices with the help of systems viewpoint which considered a variety of interrelating factors. One of them is to adjust the amalgamation of agricultural system categories with practices utilized at the countryside level in order to address key local

glitches like water over drafting and ecological pollution. It is significant to carry out research and addition that incorporate multiple disciplines related to total objectives of SAP in view of GFT. The forthcoming studies should also take account of the training effects in terms of decision making and social innovation to adopt SAP. Additionally, such research would deliberate the presence of policy making models toward SAP through GFT justification for the numerous paths which an individual follows for decision making with a view to assisting in meaningful knowledge-based information development among paddy farmers in Malaysia. It is necessary to develop collective contributions between civil society and disciplinary experts to build a combined as well as cohesive vision for a prospective future of Malaysian farming that poses and improves the aims to gain SAP with the help of GFT.

10. Conclusions

The study, based on knowledge transfer, is a procedure that gains primary attention among policy makers toward the knowledge creation. Whereas the policy makers contribute less attention on knowledge dissemination that influences farmer's decisions which lead toward intention and then toward the actual adoption of SAP (Argote, 2012; Tey, 2013; Oliveira, 2013; Parkinson *et al.*, 2013), this paper presented methods toward unfolding the connections between the policy maker's approach to deal with transferring knowledge, information acquisition and farmer's knowledge utilization process in order to make the decision in direction of adopting SAP through GFT. Earlier research suggests that the information and knowledge are separated into two numerous parts in the knowledge transfer processing model which the researcher obtains as shown in Figure 4 where we can see the clear model presentation. Transfers of knowledge grow from the 1st processing clusters to knowledge utilization in the second cluster of processing model. However, the first cluster of knowledge transfer procedure exemplifies that how policy makers made the decision by using creative approaches and acquire information in their second clusters of processing (i.e. judgment). Together, the first and second cluster processing assistance, analysts arrive at SAP adoption decisions. Adoption decision of SAP in the line of GFT benefits farmers to grow technologically and increase the production benefitting the offspring in order to shape a sustainable society.

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