

MOTIVATION AS A POTENTIAL VARIABLE TO EXPLAIN FARMERS' BEHAVIORAL CHANGE IN AGRICULTURAL TECHNOLOGY ADOPTION DECISIONS

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Introduction

Technological change has been a major factor shaping agriculture in the last 100 years. A comparison of agricultural production patterns, demarcate significant differences between developed & developing countries. In developed countries, it shows that harvested cropland has declined, the share of the agricultural labor force has decreased substantially, and the number of people employed in agriculture has declined yet agricultural production was increased. Internationally, tremendous changes in production patterns have occurred. While world population more than doubled between 1950 and 1998 (from 2.6 to 5.9 billion), grain production per person has increased by about 12 percent, and harvested acreage per person has declined by half [8]. These figures suggest that productivity has increased and agricultural production methods have changed significantly [16].

The United Nations Food and Agriculture Organization (FAO) [16] has observed an increasing trend in agricultural productivity for the last three decades. The world agricultural production has grown at a faster rate relative to the world population. Technology advancement, particularly in developed countries, is assumed to be the main factor that has contributed to this achievement.

For most of the world's developing countries, the picture is different. Agriculture continues to offer the leading source of employment and contribute large fractions of national income. In many of these countries, however, agricultural productivity is extremely low. Clearly, increasing agricultural productivity is critical to economic growth and development. One important way to increase agricultural productivity is through the introduction of improved agricultural technologies and management systems [16].

National research programmes exist in research organizations and universities are spending billions of money to develop new technologies. Developed technologies have to be utilized by the end users in order to achieve maximum benefit. Therefore, the developed technologies have to be transferred to the end users. The transferring process has to be planned in such a way that, it should be compatible and acceptable by the end users. Technology is a technical component. But the end users are humans. Therefore, it has a social component. People have certain behaviour, social norms and sub culture. The acceptability of new technologies depends on farmers' behavioural change, which determine by their norms, beliefs and attitudes. Understanding of these factors are critical to increase the production and profits in farmland. Therefore, agricultural scientists have turned to social scientists, asking for improved understanding of the mechanisms underlying technology adoption.

1. Importance of Behavioral Studies

In recent years, we have observed a growing tendency to include attitude measures in explanatory predictive type of studies. Research work now appears to have moved from being the purely descriptive, to more explanatory, "cause – effect" and predictive types of studies. This tendency is indicative of the current emphasis on attitudes as one of the major determinants of human behavior. Further, this shift of emphasis in research is also accompanied by new demands from policy makers. In order to use findings of research, it would be expected that methodologies used, have to be standardized and replicable and that they can be applied nationally and allow over time comparisons to provide indications of the directi-

ons of change [6]. Behavioral research has been criticized in the past for failing to take account of structural, external factors and constraints on action [23]. As a result, social psychologists have developed models to understand and predict human behavior.

Most of the models developed were followed an expectancy value form. That is, the expectancy or probability that an action will be followed by a particular consequence indexed by the subjective value or utility placed on the consequence [17]. The most widely used of these models is the Theory of Reasoned Action [18].

The aim of this paper is to understand and integrate widely used two approaches in behavioral studies namely Theory of Planned Behavior (TPB) and Self Determination Theory (SDT) in the farming context. The integration of these two theories provides a complimentary explanation of the unexplained process with in each theory.

2. Theory of Planned Behavior (TPB)

The Theory of Planned Behavior [1] builds upon the Theory of Reasoned Action in an attempt to predict and understand behaviors when control is incomplete [18]. Theory of Planned Behavior (Fig. 1) was created in order to incorporate socioeconomic, socio-cultural, psychological and economic approaches into the behavioral analysis [9]. According to Ajzen [2], behavioral intentions are a function of three components: attitude toward a behavior, subjective norms (social pressure), and perceived behavioral control (self-confidence). TPB proposes that behavior is predicted by the strength of an individual's intention to behave

the way they do. Attitudes, subjective norms and perceived behavioral control are assumed to be predictable from an individual's beliefs about the behavior.

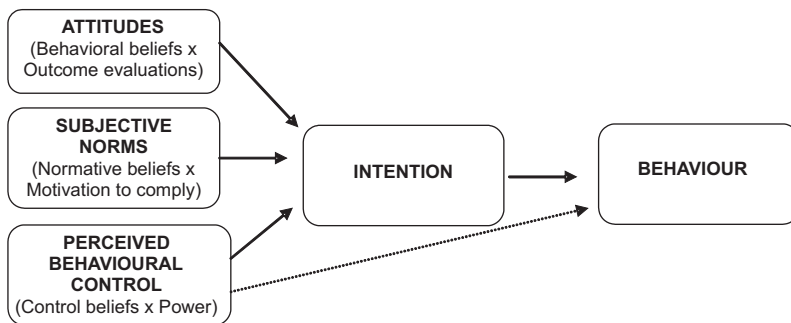
Behavioral intentions have been defined as the subjective probability that an individual will engage in a specified behavior [18]. Intentions comprise all the motivation factors that affect a behavior and indicate how much effort an individual will exert to perform a behavior. According to Ajzen [2], intentions are considerably accurate in predicting behavior. Consequently, the theory predicts that the stronger an individual's intent to perform a behavior, the more likely the individual will engage in that behavior.

Attitude toward the behavior refers to the individual's positive or negative assessment of engaging in the behavior. An individual's attitude is a multiplicative component consisting of the individual's strength of belief associated with the behavior and the individual's subjective evaluation or weighted importance of the beliefs attribute. The theory predicts that as the individual perceives the behavior as favorable, he or she will more likely intend to perform the behavior [18].

Subjective norms (SN) refer to the individual's perception of the social pressures to engage or not to engage in the behavior. In particular, it encompasses an individual's perception of whether or not to engage in the behavior as seen from his or her significant others. As a result, the theory predicts that if the individual perceives that his or her significant others would encourage such behavior, the individual will more likely intend to engage in the behavior.

Perceived behavioral control (PBC) refers to the individual's perceptions of the ease or difficul-

Fig. 1: Diagram of Theory of Planned Behavior



Source: Francis et al., 2004

ty of performing the behavior. It predicts that the greater an individual perceives that he or she has control, the more likely the individual will intend to engage in the behavior [18].

An assumption underlying TPB is that most human behavior is rational. TPB help us to explore the rationality that underlies the individual's decision to engage, or not engage, in a behavior [36].

3. Development of Conceptual Framework

The applications of TPB model in agricultural related areas are still limited, but so far, they have shown promising results. Beedell and Rehman [6] used a TPB model to explain the motives behind different conservation behaviors among different groups of farmers and found the relationships between the farmers' behavior, beliefs, attitudes and motivations (intentions), and social pressures. Bergevoet et al. [7] have also successfully applied a model derived from the TPB concept for examining the relationships between Dutch dairy farmers' entrepreneurship and their goals, objectives and attitudes. Hrubes et al. [22] also introduced some personal characteristics, i.e. self transcendence, self-enhancement, openness and conservation to the TPB concept, and reported a strong applicability of the model for predicting the rate of hunting behavior among outdoor recreationists. Using SEM, Chetsumon [12] analyzed the combination of the TPB components and some personal factors (a measure of intelligence, openness and extravert) to explain extension agents' intention to adopt an expert system. In contrast, Coleman et al. [13] used a simpler TPB model to estimate the behavior of abattoir stock people, which was affected mainly by attitudes and the "tough-mindedness" character. Sambodo [32] analyzed the decision-making processes of Indonesian semi commercial farmers using TPB. A study by Zubair and Garforth [35] also limited the measures of perceived behavioral control to include only the perceptions on the impediments relevant to the Pakistani farmers' intention and behavior towards growing trees.

Past studies using TPB model concluded that TPB is a good method of understanding variations in farmer behavior and most importantly can identify the drives that influence farmers' decision making process [6]; [20]. Even though it has been shown that the TPB is suitable for explain farmers'

behavior and decision making, some researches have shown that there are some negative aspects of this theory. The first criticism comes from the author himself. According to Ajzen [2], the TPB only provides a general framework for explaining the structure of one's behavior. In some cases, other factors may be added in order to improve prediction.

Ajzen [3] however, also states that there are some requirements for adding new factors into the TPB model. Firstly, the factor should have a causal relationship with the behavior in question. Secondly, the factor should be definite and measurable. It should be theoretically standalone but, at the same time, compatible with other elements in the model. Lastly, the factor should have an empirical basis.

Hagger, Chatzisarantis, and Biddle [21] argued that the relationship between beliefs and evaluations, proposed by the TPB, may not be sufficient for predicting and explaining human behavior because human judgment and behavior are not always a function of the computational rules suggested by the TPB. Intrinsic motivation for example is a spontaneous form of motivation and refers to 'the doing of an activity for its inherent satisfactions rather than for some separable consequences'. Further, the performance of social behavior is not always a function of expected outcomes that are operationally separable from the activity, and that people may engage in social behavior for its own sake and for the interest and pleasure that are experienced during performance of the activity.

Weber and Gillespie [34] demonstrated that there is a significant difference between intention and actual behavior. Further, they examined the link between intentions and behavior and found that, what an individual intends to do may not be what an individual actually does. As a result, they suggested that there might be other factors that strengthen this relationship. Therefore, this link becomes important to examine, not only to validate past research, but also to guide future research in ethical decision making.

It is observable that TPB has both strengths and weaknesses. Author of the theory has suggested to add new factors into the TPB model to minimize the weaknesses. Further, he has also provided a guideline to add new factors. Consequently, many researches have added new factors to improve the theory. (See [12]; [6]; [32]; [7]).

By considering these evidences, another potential factor that could be added to TPB modal to minimize its weaknesses is motivation. Self-determination theory is a key theory that explains motivation. It measures different levels of motivation of a person according to its origin.

3.1 Motivation

Motivation is the set of reasons that determines one to engage in a particular behavior. The motive is "internal tension" or "internal urge" that drives the human's organism to set himself a goal by means of the activity and to achieve it. The term motivation relates to the activation, it means invocation of the man's activity, to organization of his organism and in the same time to the coordination of the developed activities in certain direction, to certain objective [26].

Motivation can be categorized as either extrinsic motivation (outside the person) or intrinsic motivation (internal to the person). Intrinsic motivation is defined as doing something for the enjoyment or doing it rather than for an external reward [24]. Further, McMurran [25] describes intrinsic motivation as derived from values and beliefs and it is associated with greater long-term change. Conversely, extrinsic motivation is the motivation derived from the social environment [27] and may further be associated with material and/or social rewards [25].

Deci and Ryan [15] described that there is a relationship between intrinsic and extrinsic motivation. Further, Porvaznik [26] has mentioned that, with the time extrinsic motivation can be gradually reduced and simultaneously it can be replaced by intrinsic motivation. The chan-

ging or the overlapping point of extrinsic and intrinsic motivation is referred to as culmination point.

3.2 Self Determination Theory (SDT)

Self-determination theory is a key explanatory system for the understanding of the motivation behind volitional behaviors [15]. SDT basically distinguishes four categories of levels of internalization of regulation ranging from extrinsic motivation to intrinsic motivation. This taxonomy is defined by the degree to which motivation originates from the self [28]. A key concept in SDT is perceived locus of causality (PLOC), which is a measure of felt autonomy for behavior. PLOC measures the reasons for one's actions and ranges along a continuum from internally motivated to externally motivated behavior. SDT proposes that when individuals have a more internal PLOC for behavior, they will exert greater effort and experience greater satisfaction in performing the behavior or than when they have a more external PLOC [28].

Self-determination theory identifies three basic psychological needs for all individuals, a platform on which motivation is built: the need for competence, relatedness, and autonomy. The need for competence reflects wanting to find things to do and do them well. Autonomy is the regulation of the self by the self rather than external forces. Relatedness refers to having a connection with others, a sense of community. The three needs are the basis for determining an environment to be supporting or opposing an individual's pursuit of a more complex psyche [29].

Tab. 1: Types of motivation according to the SDT

Type of Motivation	Extrinsic Motivation			Intrinsic Motivation
Type of regulation	External regulation	Introjected regulation	Identified regulation	Intrinsic motivation
Perceived locus of causality	External	Somewhat External	Somewhat Internal	Internal
Quality of Behavior	Non self determined (Controlled)			Self determined (Autonomous)

Source: Ryan, R., and Deci, E. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1).

3.3 Types of Behavioral Regulations

i. External Regulation

This is the most controlled form of extrinsic motivation. It represents behavioral engagement based on external pressures or usually to satisfy an outside demand or trying to attain a contingent reward [28].

ii. Introjected Regulation

Introjected regulation is also characterized by an external perceived locus of causality, although not as severe as the previous category. It is partly internalized extrinsic motivation. Its behavior is directed by internal pressures such as 'fear of punishment' and the avoidance of negative emotions such as guilt and shame. [28].

iii. Identified Regulation

Identified regulation is a more autonomous type of extrinsic motivation, where a person engages in an activity because the activity is personally meaningful and valued. However, identified regulation is not experienced as such a controlling form of behavioral regulation as external or introjected regulation. Behavior is directed by goals and/or outcome that are important to the individual and in this regard behavior is considered to be directed by informational events. Behaviors that result from identified regulation are viewed as relatively self-determined [28].

iv. Intrinsic Motivation

Intrinsic motivation refers to a behavior that is directed by the spontaneous feelings that are experienced during performance of the task. People engage in these activities because it has joy, fun, excitement and interest rather than for an external reward. The perceived locus of causality is internal, and is characterized by satisfaction and interest. It is the most self-determined form of motivation and is associated with positive outcomes like persistence, performance quality [5], goal attainment [33], and positive feelings [15].

Self-determination theory has been applied to many areas, such as medication adherence, weight loss, and test-taking behavior in school-aged children [31]. However, no study has been reported that, this theory has applied specifically to agricultural related area.

4. Measuring Variables in TPB

i. Measuring Attitude

The behavioral belief strengths and outcome evaluations for the different accessible beliefs

provide substantive information about the attitudinal considerations that guide people's decisions to engage or not to engage in the behavior under consideration. Behavioral belief strength (bb) and outcome evaluation (oe) can also serve, to compute a belief composite that is assumed to determine the attitude toward the behavior (AT) in accordance with an expectancy – value model [4]. It can be shown symbolically in the following equation:

$$AT \propto \sum_{i=1}^s bb_i oe_i \quad (1)$$

ii. Measuring Subjective Norms

Measures of normative belief strength (nb) and motivation to comply (mc) with respect to each accessible belief offer a "snap shot" of perceived normative pressures in a given population [4]. An overall, subjective norm (SN) can be obtained by applying the expectancy – value formula to these measures, as shown in the following equation:

$$SN \propto \sum_{j=1}^t nb_j mc_j \quad (2)$$

iii. Measuring Perceived Behavioral Control

Examination of the average strength of different control beliefs (cb) and power (p) of the different control beliefs provides a picture of the factors that are viewed as facilitating or impeding performance of the behavior [4]. Using an expectancy – value formulation, it is possible to compute perceived behavioral control (PBC).

$$PBC \propto \sum_{k=1}^u cb_k p_k \quad (3)$$

According to the concept of TPB, the overall model of TPB becomes,

$$AB \approx BI \propto AT + SN + PBC \quad (4)$$

Where,

AB = Actual Behavior

BI = Behavioral Intension

When the elements in the variables applied to the model

$$AB \approx BI \propto \sum_{i=1}^s bb_i oe_i + \sum_{j=1}^t nb_j mc_j + \sum_{k=1}^u cb_k p_k \quad (5)$$

Computable Model of TPB,

$$AB \approx BI = \gamma_1 \sum_{i=1}^s bb_i oe_i + \gamma_2 \sum_{j=1}^t nb_j mc_j + \gamma_3 \sum_{k=1}^u cb_k p_k \quad (6)$$

4.1 Measuring Variables in SDT

Ryan and Connell [30] developed an instrument assessing behavioral regulations in the academic domain. They assessed behavioral regulations through motives for doing academic-related work. Four types of behavioral regulation are recognized. They are termed as External regulation, Introjection regulation, Identification regulation, and Intrinsic motivation. "Relative autonomy index" (RAI), which weighs each types of motivation according to its degree of autonomy. This will be used to stratified respondents into two groups, namely an "Autonomous group" and a "Controlling group". This index has been widely used in educational contexts [30]. The RAI is computed as follows, and represents a relative level of autonomous motivation, such that positive scores indicate stronger autonomous motivation and negative scores represent stronger controlled motivation.

$$RAI = 2(\text{Intrinsic}) + 1(\text{Identified}) - 1(\text{Introjected}) - 2(\text{External}) \quad (7)$$

5. The Integration Approach

Ajzen [3] states that there are some requirements for adding new factors into the TPB model. Firstly he suggested that, the added factor should have a causal relationship with the behaviour in question. Deci and Ryan [15] described that Self-determination theory is a key explanatory system for the understanding of the motivation behind volitional behaviors. Further, it identifies different levels of motivation of a person according to its origin [28]. Since SDT explains motivation behind one's volitional behavior and it identifies from where it origin, it can establish a causal relationship between motivation and behavior in question (in this study it is technology adoption). Therefore, it fulfills the first requirement placed by Ajzen.

SDT identifies three concepts on which motivation is built. They are autonomy, relatedness and competence. Autonomy is the regulation of the self by the self rather than external forces. Relatedness refers to having a connection with others or a sense of community. Competence reflects wanting to find things to do and do them well [29]. Motivation is build upon three concepts. Therefore, it is theoretically standalone. The concepts of motivation are compatible with the elements in TPB, as all the concepts of SDT and elements in TPB are refers to an

individual's psyche. Consequently, it fulfills the next requirement placed by Ajzen [3] that added factor should be theoretically standalone and compatible with other elements in the TPB model.

SDT further defines motivation through a series of categories on a continuum ranging extrinsic motivation to intrinsic motivation. These categories are identified by perceived locus of causality, which measure the reasons for one's actions and autonomy for behavior [28]. Further, "Relative Autonomy Index" developed by Ryan and Connell [30] which weighs each types of motivation according to its degree of autonomy, helps to fulfil the last two requirements placed by Ajzen that added factor should be definite, measurable and should have an empirical basis.

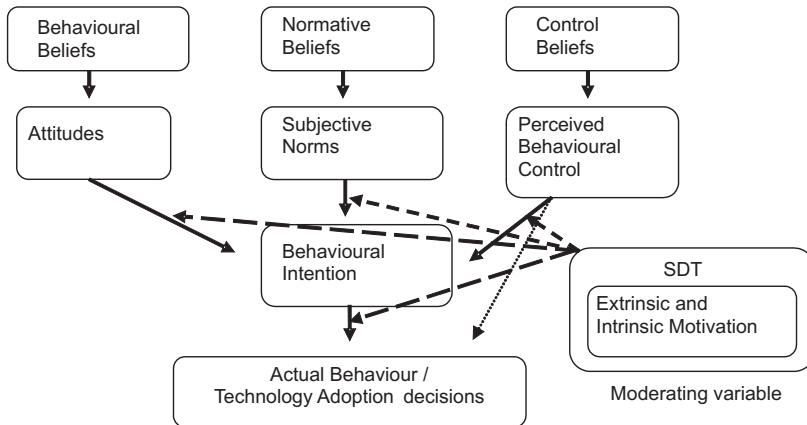
Based on the above evidence, it can be identified that motivation is a potential factor that could be added into TPB model to minimize its weaknesses and simultaneously explain behavioural change vigorously.

Motivation is identified as a stimuli from the place where it origins. Therefore, it has an effect on attitude, subjective norm and perceived behavioural control, the way it determine intension. In other words, motivation manipulates the relationship of attitude, subjective norm and perceived behavioural control with the intension. Consequently, motivation act as a moderating variable to the model and it has a contingent effect on the independent variable – dependant variable relationship. The presence of a moderating variable, modifies the original relationship between the independent and the dependant variables [33].

5.1 Theoretical Schematic

Therefore, it can be concluded that integration of SDT into the TPB will offer a more comprehensive view of behavioral change than either do standing alone. Whereas SDT identifies the forces and factors that may influence on an individual to initiate and participate in behaviour change, while TPB provides structure to move through the behavior change. Further, TPB provides a basis for the translation of general beliefs into intentional behavior. In this way, the TPB compliments the SDT by explaining how people convert their generalized motives into specific actions. Therefore, this specific relationship between these two theories has yet to be determined within the farming community.

Fig. 2: Integration of motivation in to TPB model



Source: Own expression

The following studies also have integrated different types of motivation into the TPB model. Chatzisarantis and Biddle [10] included SDT into TPB in their study of analyzing functional significance of psychological variables that are included in the Theory of Planned Behavior. Further Chatzisarantis et al. [11] in their study, they have added SDT to analyze the influence of intrinsic motivation on execution of social behavior within the theory of planned behavior. These studies have done in the field of health psychology.

Conclusion

This paper tries to identify a potential variable that explains behavioural change in farmers' agricultural technology adoption decisions vigorously. The key theory used in this paper is TPB. It is observable that TPB has both strengths and weaknesses in explain ones behavior. It has been suggested by various researches that the weaknesses can be minimized by adding other appropriate variables. This study identifies the motivation would be another potential variable that could be added to the TPB model to enhance its predictability. SDT is a key theory that explains motivation. It measures different levels of motivation of a person according to its origin. Integration of TPB and SDT will provide an improved understanding of technology adoption decisions of farmers, which provides preliminary information for policy makers to offer better assistance to farmers. Further, the developed argument can be tested

empirically to verify the explanatory power of the added variable in farmers' technology adoption decisions.

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ABSTRACT**MOTIVATION AS A POTENTIAL VARIABLE TO EXPLAIN FARMERS' BEHAVIORAL CHANGE IN AGRICULTURAL TECHNOLOGY ADOPTION DECISIONS****Chaminda Shaman Herath**

Technology adoption plays a key role in improving productivity and income from farmlands in developed and developing countries. However, new technologies have not been fully utilized by the farmers over the past years [16]. Technology adoption depends on farmers' behavioural change. Farmers behaviour determine by their beliefs and motives, which they have for long time. Understanding the beliefs and motives affecting farmers' adoption of improved technologies are critical to increase the production and profit in farmland. The key theory used in this paper is Theory of Planned Behaviour. It explains that ones actual behaviour is guided by three variables namely attitude, subjective norm and perceived behavioural control. There are some criticisms about prediction of farmers' behaviour by these three variables. As a result, many researches have suggested that prediction of behaviour can be increased by adding other factors into the TPB model.

Motivation is one of the potential factors that can be explained individual's decision making more comprehensively. The aim of this paper is to link the different types of motivation to improve the prediction of farmers' behaviour by identifying most relevant beliefs that determine technology adoption decisions. To fulfil this purpose, different types of motivation, and how they contribute to technology adoption decisions of farmers, were identified. Theory of Planned Behaviour (TPB) and Self Determination Theory (SDT) were used as the main theoretical models. These two theories were integrated in order to develop a more explanatory model to predict individual's behaviour. The model developed by this paper will contribute to the advancement of agricultural extension and policy makers to offer better assistance to farmers.

Key Words: Technology adoption, Theory of Planned Behavior, Self-determination theory, Attitudes, Subjective norms, Perceived behavioral control, Intention, Behavior.

JEL Classification: I38, L29, Z13.