



A New Perspective on the Adoption of Sustainable Agricultural Practices: A Review

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Abstract

There have been plenty of studies investigating farmers' decision to adopt sustainable agricultural practices but a lot more segregated studies exist, highlighting the importance of individual factors affecting adoption. This review addresses this gap and provides a suggestion to effectively understand adoption of sustainable agricultural practices by farmers from a comprehensive perspective. The study underscores and justifies the use of the integrated framework of Reasoned Action Approach/Theory of Planned Behavior, to present a new perspective on studying sustainable agriculture. The paper presents a review of empirical studies, reports and some review papers from past research from 1995 to 2014. Till now, only a handful of studies have incorporated the usage of this framework, which has significant relevance in studying the adoption behaviour of farmers. As suggested by previous studies about the use of socio-psychological models in agriculture, and the importance of studying adoption from multi-disciplinary a perspective, this study justifies the use and significance of Reasoned Action Approach/Theory of Planned Behaviour by providing evidences from past literature. The study concludes that the framework is comprehensive enough to look at the multidisciplinary aspects, necessary to investigate farmers' adoption decisions, and thereby provides more than a starting point for contributing to the existing body of literature.



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Introduction

Scope of the Study


The study reviewed empirical literature, reports and some review papers from 1995 to 2014. Best

management practices, sustainable agriculture, and conservation agriculture are practices that intend to minimize the adverse environmental impacts of farming¹. Thus, this paper included

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studies investigating and discussing adoption by farmers, and referring to at least one of the terms of 'sustainable agriculture', 'conservation agriculture' and 'organic farming'.

Background and Definition of Sustainable Agriculture

For more than a decade now, the link of intensive conventional practices to the burgeoning degradation at farms has continuously been emphasized. Symptoms have been seen in the form of significant adverse impact on environment², detrimental impact on soil as a result of excessive ploughing and tilling activities by farmers³, and, the eradication of natural enemies of pests and the overall threat posed to the environment due to the misuse of pesticides⁴.

The cases of the developing countries in particular that have been the continuous users of pesticides banned in the industrialized countries⁵ have exacerbated the conditions. Further concerns are the burgeoning issue of food insecurity in poor-nations; unprecedented increase in food prices at the global level; soil erosion and fertility loss; and biodiversity depletion that creates spiralling challenges for

sustaining the natural resources. These can all be addressed by the integrated system approach of sustainable agriculture. The term sustainability is no longer a novel concept to agricultural science, farming practices, nor to agricultural policy.

The major attributes of sustainable agriculture as put forward by the Food and Agriculture Organization (FAO) are: (1) it is resource conserving, (2) environment friendly, (3) technically appropriate, (4) economically acceptable, and (5) socially justifiable⁶. Sustainable agriculture⁷ is defined as "an agricultural system combining sustainable agricultural practices while simultaneously discontinuing or reducing the use of agricultural practices harmful to the environment". The agricultural sector has to deal with major issues within economic, social and environmental dimensions [Fig. 1] which are given equal importance by the concept of sustainable agriculture⁸. The most of the societal issues are nowadays closely linked, global, and develop rapidly, sustainable agriculture promises effective solutions to establish and strengthen a secure agriculture, food system and safe energy for a healthy and sustainable future⁹.

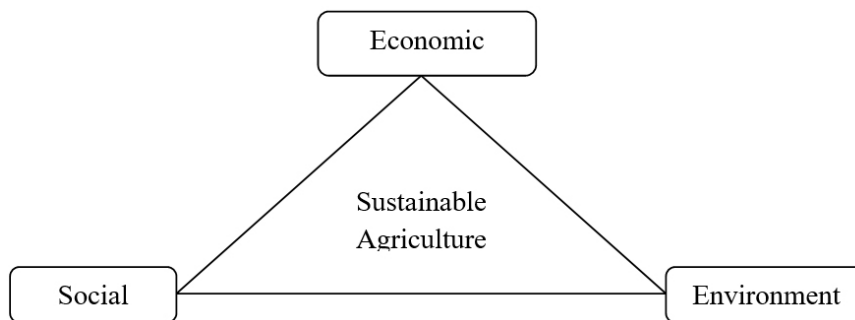


Fig. 1: The three interlinked dimensions of Agricultural Sustainability⁵

While conservation agriculture aims at creating a sustainable agriculture, it includes a wide variety of innovative practices. Also practices, used in animal husbandry like waste treatment facility, animal mortality facility, emergency animal mortality management can also be considered innovative. However, in this study we are concerned with cropland farming and providing significance of an integrative framework for studying adoption of sustainable agricultural practices from a new perspective, which could help comprehend farmer's adoption more effectively to strengthen sustainability.

By means of a literature review, this paper stresses on the significance and use of the integrative model of Reasoned Action Approach/Theory of Planned Behavior (RAA/TPB), which incorporates social and psychological dimensions to the economic models. In spite of considering farmer's adoption from a single perspective, this study aims to provide a sound theoretical basis for empirical studies to comprehensively understand farmer's adoption of sustainable agricultural practices in various regions.

This article is divided into four major sections. The first section clarifies shortly the scope of our literature review. This is followed by a section outlining background and definition of sustainable agriculture. The third section provides a new perspective on the adoption of sustainable agriculture practices, which explains the need for a behavioral approach in agriculture, its definition, and evidences of the Theory of Planned Behavior (TPB) model in the backdrop of agriculture. The next section uncovers the significance of the integrative model of Reasoned Action Approach/Theory of Planned Behavior (RAA/TPB) on the basis of the mentioned evidence. Finally, the last section presents conclusions and limitations of the study.

Methodology

The reviewed literatures were identified by our search in Google scholar, and included empirical research papers from reputed publications like Springer, Elsevier; Food and Agriculture Organisation (FAO) publications and proper cited review articles. 20 years research work (from 1995-2014) including thesis/dissertation from reputed institute, related to the topic were incorporated. Keywords like adoption, behavioral approach, behavioral models, conservation agriculture, green consumption behavior, psychological variables, sustainable agriculture, theory of reasoned action (TRA), resource degradation, theory of planned behavior (TPB), and reasoned action approach/theory of planned behavior were used to locate suitable articles. From the searched articles only those research articles were filtered that related to economic and behavioral adoption models in cropland farming. Also, the theoretical articles with core concepts related to the model of TPB, TRA and RAA/TPB were also included.

Results and Discussion

Perspective on Adoption of Sustainable Agriculture Practices.

The Need for a Behavioral Approach

In specific situations and circumstances, behavioral approaches such as social cognition theory¹⁰ have been used in research. In regard to the traditional diffusion model, it has been argued that it has contributed to the understanding of the adoption of innovations but failed to provide a complete account of the innovation adoption in the context

of sustainable agricultural practices¹¹. Traditional models have combined a variety of biological, physical variables, as farm size, farm type, soil type, agro-ecological zone, with some financial variables, as market prices, availability of credit, asset-debt ratio, to predict adoption¹². However, these models failed to represent a strong picture of the social side of farming. For instance, the FAO has noted a growing trend in agricultural productivity of developed nations for the last three decades owing to technological advancement¹³. The United Kingdom noticed the commencement of a number of voluntary schemes to make far-reaching changes to the farming industry, but their failure has steered a growing need of understanding the contribution of every actor to policy measures¹⁴. Further, for contributing to the process of overseeing change across Europe and over distinct time-periods, policy formulators also require approaches that are standardized and can be replicated^{15,14}. The acceptability of any innovative technique by both the developed as well as developing nations depends on the behavioral change of every contributor, which in turn is believed to be determined by certain factors. Hence, for a refined understanding of the processes underlying adoption of sustainable technology¹³ and to mitigate resource degradation, understanding of these factors is required. It has been marked that while researchers or policymakers cannot disregard economics, the behavioral models that embody conservation attitudes may better elucidate conservation behavior than stern economic models¹⁶. These calls have led to a recent surge in the use of 'behavioral approaches' for analyzing the implementation of agricultural policy¹⁴.

The Concept of the Behavioral Approach

The term 'behavioral approach' is defined as an approach that anchors on attitudes, motives and values that dictate the processes of decision-making of every farmer. It has been mentioned in a wide variety of studies that incorporate actor-oriented systems of methods, especially quantitative methods that investigates decision-making¹⁴. The behavioral research in the context of agriculture is research¹⁴ that (1) attempts to understand individual behavior of farmers or land owners, (2) aims to explore psychological factors like values, motives, goals and attitudes but frequently collects additional information on the economic situation of farmers,

their farm structures, and (3) uses mainly quantitative methods, particularly scales like Likert scales for probing psychological constructs.

Evidence of Theory of Planned Behavior Model in Agriculture

The usage of the TPB model in agriculture and allied fields is still sparse but to date, it has yielded valuable results¹³ as is evident from the existing work¹⁷⁻²⁰. The various studies^{15,17,18,21,22,23}, showed the influence of perceived behavioral control (the perception of the ease or difficulty of the particular behavior) on intention towards the adoption behavior of farmers. The study in North America showed perceived behavioral control²¹ as an important factor in determining intention towards behavior of strawberry farmers, and a significant and positive effect of perceived behavioral control²³ on behavioral intention of avocado farmers. Another study showed contrasting results displaying perceived behavioral control to be insignificant in determining factors of behavioral intentions^{15,17}. Besides perceived behavioral control, other factors, which were reported in studies that proved influential in adoption behaviors of farmers were goals, attitudes and subjective norms^{18,22}.

Attitude was also found to be important in affecting farmer's adoption decisions in Sri Lanka and Belgium. The study showed that it was mainly attitude that led to the adoption of organic farming, followed by control and social factors²⁴. And, the factors affecting the adoption of soil conservation practices in Belgium were intention as the dominant determinant of behavior, and attitude, which showed a high explanatory value for predicting intention²⁵. The two studies reported on the effect of attitude and subjective norms in shaping farmers' behaviors^{23, 26}. A study of avocado producers indicated that attitude had an insignificant and negative effect on behavioral intention while the construct of subjective norm had a significant and positive effect on behavioral intention²³. The study also identified contextual factors and values as significant predictors of pro-environmental agricultural practices²⁶, in addition to attitude and norms. In another study, the agricultural wheat behavior was analyzed in relation to a wheat self-sufficiency plan and it highlighted a noteworthy difference in attitude, intellectual norms and intention domain²⁷.

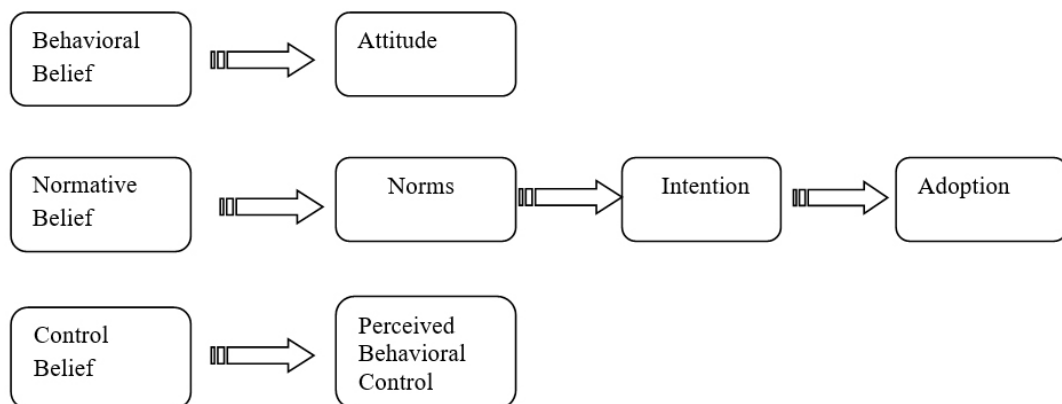


Fig. 2: A representation of the model of TPB in which an individual's perceived behavioral control, attitudes, and norms affect their intention which ultimately defines their behavior²⁹

In 2009, Fishbein and Ajzen integrated these three models of Theory of Reasoned Action, the model of TPB, and the Integrative Model (the Integrative Model, which was created by Fishbein in 2000)²⁸ and referred to it as the 'Reasoned Action Approach' (RAA), which is used on the principles of TPB (hence

the name RAA/TPB). But this model emphasizes background factors including demographic factors, and several variables of social psychology and its allied disciplines. Also, it encompasses descriptive norms with the normative construct, and the perceived behavioral control embodied [Fig. 2] self-

efficacy²⁹. Evidence that rests on the importance of such background variables is in the study conducted across Europe in which various drivers and barriers of adoption of soil conservation practices are recognized and compared³⁰. It found that the main drivers were lower fuel and labor requirement, soil erosion policy and perception of non-inversion tillage as less labor intensive, while existence of a plough in the farmers' barn and absence of suitable machinery were the barriers.

Significance of Reasoned Action Approach/ Theory of Planned Behavior Framework

While the RAA/TPB model has been used in several studies considering the adoption of conservation practices¹⁶, few researchers have put forth the negative aspects that it assumes too much rationality. Other criticisms deal with the issues of methodology¹. Fishbein and Ajzen responded to it contending that whether or not behavior is rational or irrational is irrelevant to behavioral prediction, and depends on how rationality is defined³¹. While researchers studying the adoption of conservation practices recognize that the model may not be fully adequate to spell out all differences in adoption behavior, they asserted that it offers a useful support¹⁷.

The background factors affect the adoption decisions of the producers in some way or another, and are linked to each other showing complex connections. This is illustrated by a recent study that argues that "effectively it can be contended that age links to education via a cohort effect, experience is a direct effect of age, and experience and education are connected via the tendency of both to enhance cultural capital and thus socially appropriate courses of action³²".

Criticizing RAA/TPB for providing a general framework for explaining behavior, it was suggested that in few cases, other factors may be incorporated so as to enhance prediction¹³. So, past studies have called for new perspectives in sustainable agriculture adoption studies, focusing on the perception of innovations, institutional and economic factors, and farmer's attitude¹¹. However, Ajzen declared few prerequisites for the inclusion of new factors into the

model³³. Besides having a causal relationship and empirical basis with the behavior, the included factors should be specific, measurable, and compatible. This study also suggested the addition of other factors into the model³⁴ and a few researchers have included new factors to refine the theory^{17,18,20,35}.

In Burton's study¹⁴ it was argued that by using Ajzen's TPB³⁶ as a framework, the behavioral approaches in the field of agriculture could be enhanced. This can be done better by gaining substantial account of perceived self-efficacy, normative influences, and self-identity in particular. Recently, a study integrated another set of factors, which are categorized as 'perceived practice characteristics' into the framework of RAA/TPB to further enhance its predictability in studying adoption behavior³⁷. The factors under this category are derived from the Diffusion of Innovations Theory, where Roger's identifies five characteristic of innovations that influence conservation practice adoption. These were observability, relative advantage, trialability, complexity and compatibility¹⁶. Empirically these characteristics proved significant in affecting adoption behavior of farmers. These characteristics were identified³⁹ that described the significant features of sustainable agricultural practices making them acceptable to land owners³⁷. A study using the same modified model, in Sub-Saharan Africa, concluded that the erosion risk perception was crucial for adoption and application of soil and water conservation measures. By using the integrative framework of RAA/TPB in Oregon^{40,1}, the study found the perceived relative advantage of practice, complexity in using a practice, observability and compatibility as the drivers to adoption of conservation practices, and farmer's age and perceived lack of human agency emerged as barriers to adoption.

Hence, this framework allows for the integration of various sets of factors¹ that incorporate farmer/farm characteristics, perceived practice characteristics, informational factors, and contextual factors for providing a better prediction of farmer behavior and holds a mounting significance in the agricultural domain [Fig. 3].

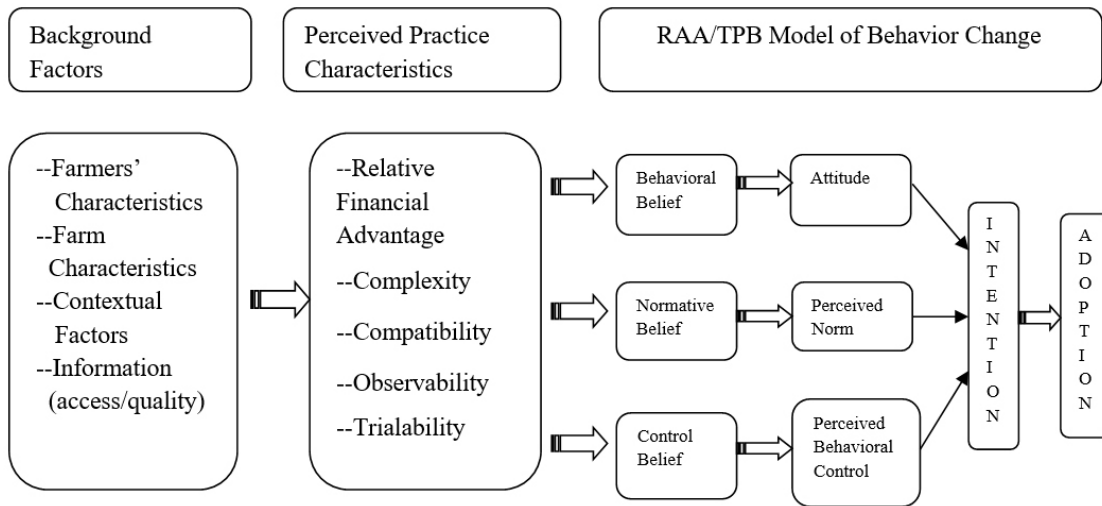


Fig. 3: Depiction of the framework of the Reasoned Action Approach/Theory of Planned Behavior with inclusion of Roger's stated characteristics of innovations that impact adoption of conservation practices. Adopted from the study^{34,7}

Conclusion

Given the proliferating contribution of agricultural practices in both developed and developing nations to the degradation of the natural resource base, and the impoverished nature of the behavioral approaches in agricultural sector of many countries, it is possible that decisions, programs, policies etc. that are based on such weak behavioral approaches would threaten the sustainability of agricultural systems. In this paper, we assessed the question of whether and how the consideration and integration of socio-psychological aspects can improve the understanding of the adoption of sustainable agricultural practices. For this purpose, we presented a literature review and focused on the refined and integrated RAA/TPB framework. The evidence proves that we cannot disregard economics, but behavioral models that embody conservation attitudes describe better conservation behavior than purely economic models^{41,42}. Thus, both previous and recent research was reviewed to discuss the need for the "integration" of the factors conducted in the study of Malaysian vegetable sector⁴³ as well as the suggestion for the use of a socio-psychological model like TPB in agriculture⁴⁴. Thus, the significance of the integrative model was brought to the forefront and it has been shown that it provides the possibility of combining several factors into a single framework and shows their interactions in order to better predict farmer behavior and decision-making.

The limitations pertaining to this review lie in the fact that in spite of the attempt of being exhaustive in collecting existing research work on sustainable/conservation agriculture, there are chances that few studies may have remained unexplored. Additionally, sustainable agriculture is a broad term that addresses a multitude of social, environmental, and economic aspects and covers many different areas within agricultural production (dairy, livestock, poultry, etc.) and beyond. Meanwhile, this study has focused only on cropland farming. Lastly, this review is restrained only to those publications that are related to the factors affecting the adoption behavior of sustainable agricultural practices/conservation practices/organic farming.

In a nutshell, besides the integrative model being a good predictor of behavior, it fulfils the requirements suggested in recent studies. Therefore the review undertaken here yields more than a starting point for its contribution to the existing body of literature.

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