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Sustainable Agriculture: Developing a Conceptual Model for Technology Transfer*

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Abstract

Agriculture is the world's largest industry. It is not only crucial for the well-being of the world's population but also for most citizens whose prosperity is closely connected with the level of development in the agriculture industry. However, agriculture often places significant pressure on natural resources and the environment. According to the Food and Agriculture Organization, we pay an unsustainable price in social and ecological terms to provide food for 7.5 billion people in the world. To be sustainable, while increasing the productivity, agriculture needs to preserve the environment and improve the social conditions of the population. The transfer of existing technology, for example, from developed countries, as well as new technology from research and development centers, can help in achieving the right balance in scientific dimensions for sustainable agriculture. Building upon technology transfer models at the international level developed for the construction and the petroleum industries, we propose first a set of factors. Then, for each factor, while maximizing other technology transfer models at the same/less level, relevant sub factors were selected. The result is a conceptual model for technology transfer to be applied in the agriculture sector under a sustainable perspective.

Keywords: Technology Transfer, Agriculture, Sustainability, Channels, Performance.

1. Introduction

The agricultural sector has received far less attention in comparison to the financial and manufacturing sectors despite its critical role in ensuring food supply and the strong potential contribution of IT in agriculture (Clements & Davidson, 2005). In the long term, it is necessary to focus on agriculture to increase productivity and achieve high profits while preserving the environment and improving the social conditions of a population that keeps growing. We need a sustainable agriculture.

1.1. Sustainable Agriculture

The concept of sustainable development emerged in the 1980s. In a 1987 report, known as the Brundtland report, the World Commission on Environment and Development defined sustainable development as a process of change in which the exploitation of resources,the direction of investments, the orientation of technological development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations. In essence, sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Agriculture should play an important role in sustainable development.

Sustainable agriculture has been defined as a sustainable farming system in which resources, social and ecological aspects are counterbalanced (Ivan et al., 2018). Considering these aspects, sustainable agriculture should also promote the resilience and persistence of productive farming landscapes (Garibaldi et al., 2017).

On the economic aspects, changes in overall productivity and stability of production have been the indicators used for economic sustainability. However, research findings in the agricultural economics explain the need to balance labor productivity with social and environmental impacts (Valdes, Escobar, Ofkadas, & Jia, 2018).

On the social aspects, a stable social system is largely based on the proper relationship between individuals and collective. Individuals demand the satisfaction of requirements as health, safety and loyalty. An agricultural social system is sustainable when institutional settings allow all concerned individuals to either satisfy or improve the satisfaction of all of their physiological, security, social, esteem, and self-actualization needs while power and institutions continuously increase to system that allows future generations to do the same (Zadeh, Hatam, & Elmi, 2015).

On the environmental or ecological aspects, environment has to be addressed as a set of natural capital assets (air quality, biodiversity, etc., particular), assuring an efficient use of environmental resources while integrating appropriate natural biological cycles and controls. Conservation efforts should reflect the efficient and sustainable allocation of environmental assets(Hill, Dubrovski, & Vlasenko, 1998).

As stated in by the European Sustainable Development Initiative in Agriculture (2016), we need an efficient, productive, sustainable, To achieve it as an international, global level, technology transfer have developed to emerging and developing economies can play a significant role as enabler and accelerator of a desired convergence.

The proposed model for international technology transfer across some from the focus on profitability, financial performance, usually used to assess the initial effectiveness benefits, to include other dimensions, like environmental and social ones. Considering only financial performance can lead to the deterioration of the environment as well of the living conditions of the world population. Therefore, a successful technology transfer should balance economic, environmental and social performances. Building upon technology transfer models at the international level developed for the construction and the petroleum industries, antecedents such as technology transfer request, transferee and transferor characteristics were harnessed, but we included transfer technology elements at another key factor. As a consequence, we still were work on the contextualization of the model so it can be applied for sustainable development, namely, in the agriculture industry.

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