

# Chapter 1

## Technological Innovation and the Agricultural Sustainability: What Compatibility for the Mechanization?

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### ABSTRACT

*The diffusion of the technological innovation can affect the agricultural sector in the three-sided (social, economic and environmental), a hand, it can contribute to solve problems of the agricultural sector: the effects of the climatic changes, the farming exodus and the migration and the problems of poverty and it can improve the agricultural productivity. But on the other hand, he can lead to new problems, such as depletion of energy resources caused by excessive use of energizing technologies, pollution of air and water and the destruction of soil by industrial waste. This paper aims to theoretically and empirically analyze the role of technological innovation in improving agricultural sustainability through the impact of mechanization on agricultural productivity, energy production and net income per capita for a panel of three Maghreb countries (Algeria, Morocco and Tunisia) during the period 1997-2012. By using simultaneous equations, the authors' finding that technological innovation cannot achieve the purpose of sustainable development in the agriculture sector in the Maghreb countries through the negative impact of mechanization and research and development on agricultural productivity.*

### 1. INTRODUCTION

The world today endures some several economic, social, political and environmental problems, as the climatic change, the reduction of biodiversity, the destruction of soils, the shortcomings of production and consumption, poverty, the transferable illness development, the problems of unemployment, etc.

A new approach has emerged in development economics for solving these problems, which incorporates the concept of sustainability is «sustainable development».

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On this new basis, a sustainable development was defined by the Brundtland Report (1987) as:

*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet in their generations. (Franck-Dominique, 2003; Karen Delchet, 2004; Olivier Godard, 2002)*

In 1992, have Rio politicians negotiated during a summit of the earth, the development situation and environment, their issues and constraints (Franck-Dominique, 2003; Karen Delchet; Olivier Godard, 2002). In this summit was also attended by men of science and technology, recognizing that environmental issues should be a major concern in all areas of humanity.

The innovation is indispensable to the sustainable development and reciprocally the sustainable development determines the orientation of the innovation. These two principles are complementary and their convergence can constitute a big advantage for the economy of tomorrow.

While the question of whether technological innovation, particularly the mechanization improves or prevents the agricultural sustainability opens the door to the birth of several economic and political debates, there are little theoretical and empirical studies on the factors of development and economic durability of irrigation system in Maghreb countries.

The objective of this paper is to make up the void in the literature and make an in-depth analysis the agriculture sector of the Maghreb countries in order to identify their main factors.

To better understand what leads the mechanization effect on the Maghreb agriculture sustainability, we browse in this paper three types of factors, social, economic and environmental. The scope of our study covered 3 Maghreb countries during the 1997-2012 periods. We utilized an econometric methodology based on the simultaneous equations.

Our results show that the technological innovation such as mechanization, research and development cannot achieve the sustainable development purpose in the agricultural sector of the Maghreb country in particular economic efficiency.

The rest of the paper is organized as follows. Section 2 furnishes a brief literature review of the impact of technological innovation in the agricultural sustainability. Section 3 presents the trend of agriculture and mechanization in the Maghreb countries. Section 4 shows the data and the adopted econometric methodology. The empirical results are obtained and interpreted in section 5. Finally, section 6 presents some conclusions and policy implications.

## **2. TECHNOLOGICAL INNOVATION AND SUSTAINABLE DEVELOPMENT IN AGRICULTURE: A BRIEF LITERATURE REVIEW**

Major prior studies related to the present paper include Jimmy Alani (2012), Jean - Marc Blazy, Alain carpentier and Alban Thomas (2011), Roberto Esposti (2002), Fédés van Rijn, Erwin Bulte and Adewale Adekunle (2012), Graeme J. Doole (2012), Gershon Feder and Dina L. Umali (1993), Vernon W. Ruttan (1977), Khaled et Hammas (2014). These studies focus on the effects of technological innovation on the development of agricultural sustainability in developed and developing countries.

Jimmy Alani (2012) shows that improving agricultural productivity is linked with technical progress, he argues their work by a theoretical model derived from a production function type Cobb - Douglas.

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