

# Chapter 6

## Impact on Agricultural Sustainability of Maghreb Countries: An Empirical Analysis by 3SLS

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### ABSTRACT

*This paper is aimed at making the diffusion of the technological innovation and their role in affecting the agricultural sector in the three-sided (social, economic and environmental), a hand, it can participate to resolve problems of the agricultural sector: the effects of the climatic changes, the farming exodus and the migration and the problems of poverty. The theoretically and empirically studies analyze the mechanical innovation role in improving agricultural sustainability through the impact of mechanization on agricultural productivity, CO2 emission and demographic growth for a panel of three Maghreb countries (Algeria, Morocco and Tunisia) during the period 1999-2012. By using simultaneous equations, the authors' finding that mechanical 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.*

### INTRODUCTION

The agriculture is a sector which plays a crucial role in the enhancement of territories, since this sector contributes to the increased growth of the country, nourishes all living things, but meeting a sustainability problem especially in developing countries. Agriculture is introduced into the sustainable development plan to improve and modernize this sector for agriculture called 'environmentally responsible' (Ambroise et al, 1998).

At the beginning of the seventy years, agriculture has found its place in political debate through the exposure of these issues such as: the mode of production productivist, environmental degradation, political and institutional structures etc.

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## ***The Challenge of Mechanical Innovation***

This is a great debate that is open to the world in all commissions and United Nations organizations that is related to sustainable agriculture to set new targets for renewable and sustainable development.

This debate based on the work of UN member states, seeks to combine a consensus around vital of a new human world politics, fair and concerned with protecting the environment.

The birth of this new concept “political ecology” began to spread in the world where some developed countries were changing their mode of production by the substitution of industrial processes of physical or chemical to biological processes. For example, with the use of nitrates substituting nitrogen fixation by bacteria as herbicides and pesticides will have been replaced with natural antagonists of weeds and insect pests (Estevez et al, 1999).

The Sustainable increase in agricultural yields each time was not achieved without the destructive effects of the environment. The transition from conventional mode to sustainable ways of agriculture has formed a long journey that has supported both socioeconomic and environmental terms.

On this basis, in the early ninety, the concept of sustainable agriculture began to appear officially. This new agriculture aims to protect resources in agriculture (soil, water, energy ...) and stimulating the biological process that is the basis of stability by the mastery of pests and weeds (Estevez et al, 1999) and find a quick way to balance the three aspects already mentioned in the economic, social and environmental occurrence and in the agricultural sector.

Although the word sustainability was popularized by the spread of the concept of sustainable development (Delchet, 2004), the term sustainable agriculture and sustainable society have been discussed in the North American continent (The limits to growth, Meadows and al, 1972). On this basis, the author has initiated a debate on the production-growth and its environmental and social consequences in a period characterized by an energy crisis. Since then, the concept of sustainable agriculture has been distributed increasingly in all environmental debates.

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 sustainability agriculture sector of the Maghreb countries in order to identify their socioeconomic and environmental factors.

To better understand what leads the mechanization effect on the Maghreb agriculture sustainability, we browse in these paper three types of factors, social, economic and environmental. The scope of our study covered 3 Maghreb countries during the 1999-2012 periods. We utilized an econometric methodology based on the 3SLS.

Our results show that the mechanical innovation, 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. The rest of the paper is devoted to the presentation of some solutions, policy implications, suggestions and conclusion.

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