Dr Mariusz Maciejczak

Models of innovations diffusion in the agricultural sector on the example of GM crops

Abstract

Since Schumpeter brought forward the concept of innovation, people have realized that innovations being brought into product or process are one of the determinant factors of economic development. Today new innovations are emerging in large numbers and constantly struggling for market acceptance. The diffusion of innovation has traditionally been defined as the process by which the innovation is communicated through certain channels over time among members of a social system. Various models then have been constructed to explore the principles of innovation diffusion and market share. Research on the diffusion of innovation has resulted in a large body of scientific literature. Indeed, the diffusion process is perhaps one of the most widely researched social and economic phenomena. However the later statement does not apply directly to the agricultural sector, where researches of innovation diffusion are not so widespread.

Thus, the paper has two aims. Firstly, it is assumed to analyze, on the conceptual basis, theories and models concerning diffusion of innovation, with the special emphasis on the so-far application to the agricultural sector. Secondly, the diffusion of genetically modified (GMO) crops as the innovation in the agricultural sector will be investigated.

It is important to notice that the number of countries electing to GMO crops has increased steadily from 6 in 1996, the first year of commercialization, to 18 in 2003 and 25 in 2008. In 2008, the global cultivation area of GMO crops continued to grow strongly reaching 125 million hectares, up from 114.3 million hectares in 2007. This translates to a growth of 10.7 million hectares (the sixth largest increase in 13 years) or 9.4% measured year to year.

The paper argues that as the agriculture based on biotechnology is concerned there could be distinguished both classical linear models of innovation diffusion, however there also could occur more complex processes based on more sophisticated interaction or system models. The linear model assuming casual role of direct application of a scientific discovery, i.e. new genetic modification of plants, was observed in the countries covered by Green Revolution in 60ties of XX century. This model applies the approach of “pushing by science”, in which casual role is played by development of science, which outcomes are directly transferred and commercialized on different markets.

The afterwards diffusion of GMO is based on non-linear models, which turned from static to very dynamic in recent years. They are characterize by positive and negative feedback loops as well as non-linear effects resulting from changes and cooperation of certain stakeholders of the agricultural system. However, there remain characteristic the fact, that as the GMO diffusion is concerned, this kind of innovation is still pushed into agricultural sector based on external-influence factors.

Key words: innovation, innovation diffusion, GMO, agriculture

Author:
Mariusz Maciejczak, Ph.D.
Faculty of Economic Sciences.
Warsaw University of Life Sciences – SGGW
Nowoursynowska Str. 166
02-787 Warsaw, Poland
e-mail: mariusz@maciejczak.pl

MARIUSZ MACIEJCZAK, Ph.D.
Warsaw University of Life Sciences – SGGW
Faculty of Economic Sciences

MODELS OF INNOVATIONS DIFFUSION IN AGRICULTURE ON THE EXAMPLE OF GENETICALLY MODIFIED CROPS

Objectives of the analysis

- **To analyze, on the conceptual basis, theories and models concerning diffusion of innovation, with the special emphasis on the so-far application to the agricultural sector.**
- **To investigate the diffusion of genetically modified (GMO) crops as the innovation in the agricultural sector.**

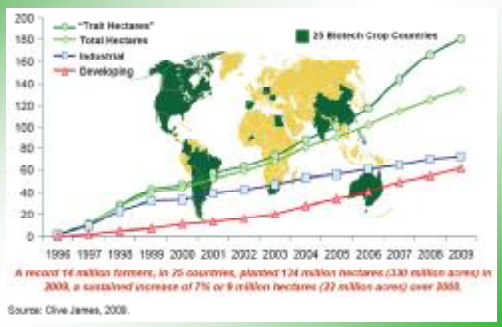
Diffusion of Innovation is the process by which an innovation is communicated through certain channels over time among the members of a social system ***/E.M. Rogers, 1962/***

Stages of diffusion of GMO innovation in agriculture

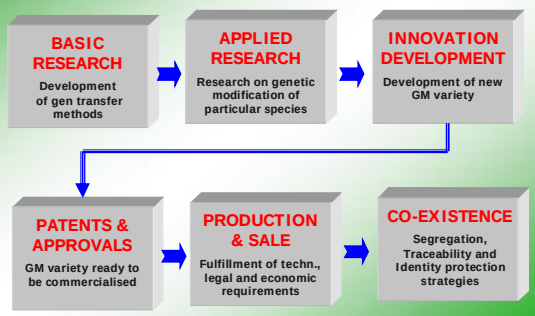
- **Awareness** - the individual is exposed to the innovation but lacks complete information about it
- **Interest** - the individual becomes interested in the new idea and seeks additional information about it
- **Evaluation** - individual mentally applies the innovation to his present and anticipated future situation, and then decides whether or not to try it
- **Trial** - the individual makes full use of the innovation
- **Adoption** - the individual decides to continue the full use of the innovation

Global area of biotech crops

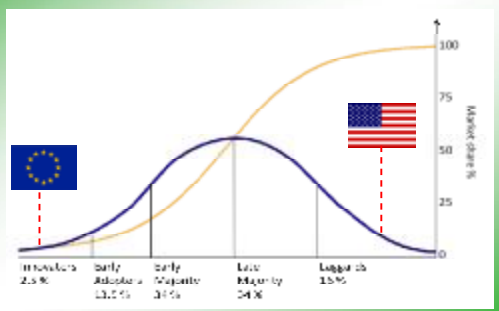
from 1996 to 2009, in mln ha



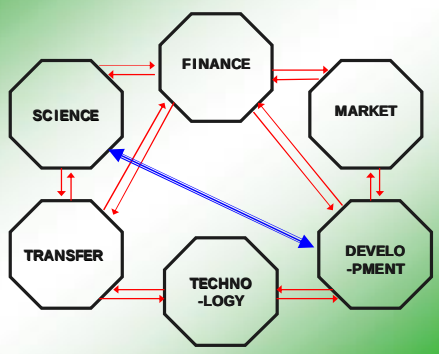
Linear model of GMO diffussion



The diffusion of GMO innovations based on Rogers conceptual model



Non - Linear model of GMO diffussion



Models of GMO diffusion in agriculture are changing dynamically, old drivers are coming down, new arrangements need to be developed.

Author: Mariusz Maciejczak, e-mail: mariusz@maciejczak.pl