

# **Evaluación multidimensional de los impactos de las innovaciones tecnológicas: resultados obtenidos a partir de diferentes aproximaciones metodológicas.**

**Vedevoto, Graciela**

## **Abstract**

It is undeniable that the incorporation of technological innovations in agriculture results in an effect for adopters of technologies and that this change is also reflected in the economic development of a region. Thus, it is increasingly necessary to investigate, assess and, insofar as possible, to measure these effects. Impact assessment of technology has a dual purpose. First it uses the results as feedback to the R&D for the purpose of directing future research and for the accountability of the institution that generates innovations, if public organizations must report results to investors (the government in most cases) and to society. This thesis aims at analyzing the process of assessing an economic and social point of view of the generation of innovations by Brazilian public research centers. The assessment impacts of these centers will be analyzed in three ways: First through a systematic review of information relating to the evaluation of economic and social impacts of a sample of impact assessments. The methodology involved the use of descriptive statistics as well as panel data techniques testing some models of static and dynamic panels. The results indicate a positive correlation to suggest that the high economic impact assessments also tend to have high employment generation. There is an interesting debate on the subject in the literature. So, it is common to find that the introduction of technological innovations in agriculture eliminated jobs. In addition, the study showed that there are differences between the average economic benefits according to the type of research center that generates the technologies. The dynamic panel model using the Arellano-Bover estimator (1995) / Blundell-Bond (1998) helped to confirm and explain this information. The contribution of the work is, in fact, to analyze the evaluation of 10-year results of a joint research centers of different types (basic, applied and oriented to specific ecoregions) that have contributed to change agriculture in Latin America. Second, through an exploratory data it was assessed the impact of intangible assets generated by these centers. In this part of the thesis, is intended to verify the relationship between intangible assets, research of various kinds and economic impacts. With regards to the statistical treatment of the data, correlation analysis, nonparametric methods and multiple regressions were used. The results indicated that intangibles related to the training of people, for example, are handled similarly in all types of center, while knowledge sharing occurs differently depending on the type of facility. The centers oriented toward the basic research appear as those presenting a significant amount of specific intangibles. Results also revealed that innovation helped to explain most part of the economic benefits. And third, through an appraisal of a biotechnology innovation project, results of two methods were used: firstly the traditional method, the net present value, and, secondly, through the use of real options. Surplus Economic Theory and Monte Carlo simulations were used to estimate the social benefits. The results indicated that the real options approach is well suited for the assessment of R&D public projects. The sample used to verify the first two goals of the thesis consists of a sample of evaluations of economic, social and intangible aspects conducted by 37 research centers of Embrapa, the Brazilian Agricultural Research, between 2001 until 2010. Were analyzed around 1200 reports of

results of technological impact assessment. To answer the third research question, we estimated economic impacts of biotechnology innovation (wheat seed). The data for the completion of the calculation was obtained from the Wheat Research Center of Embrapa. The choice of Brazil and the innovations developed in its agricultural sector comes from the importance of this sector for the country's development activities, which generates one in every three dollars of Gross Domestic Product - GDP. As in many countries, good export performance of the sector and the rising generation of jobs in the supply chain can not be attributed solely to the agriculture. The scientific and technological development, obtained through investments in R&D, remains crucial for obtaining positive results in the Brazilian agriculture.