

Determining Extension Challenges of Agricultural Biotechnology from Experts' Perception

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(Received: 18 February 2011; accepted: 21 April 2011)

Agricultural biotechnology has the potential role to meet growing food demands while protecting the environment for future generations. The role of extension traditionally has been to provide research-based information to clientele on agricultural issues. Unfortunately, in implementation, agricultural biotechnology extension can be faced with several challenges. This paper reviews such challenges. The research population included all the experts in agricultural biotechnology research center and Qazvin jihad organization (N = 100). The initial and follow-up mailing generated 90 useable responses from experts resulting in a response rate of 90%. Using factor analysis, the challenges have been classified into five factors named Economical, Human Resources, Communication, Political, and Cultural. This study identified the economical challenge as the most important factor in agricultural biotechnology extension.

Key words: Agricultural Biotechnology; Extension; Challenges.

Human population growth and increasing urbanization are putting a massive pressure in demand for food production in developing countries. Mugabe (2003) reported that in order to meet the increasing demand for food and enlarge the prospects for food security in developing societies, increases in agricultural productivity through improvements in crop and livestock yields will be required. New scientific and technological advances therefore, remain the most probable option for sustainable food and fiber production in developing societies. According to James (2000), transgenic crops, often referred to as genetically modified (GM) crops, represent promising technologies that can make a vital contribution to global food, feed, and fiber security.

Biotechnology is a set of tools that utilize living organisms or parts of organisms to make or

modify products, in order to improve plants or animals for agriculture, or to engineer microorganisms for specific purposes. Proponents of agricultural biotechnology maintain that its benefit include the production of crops that are cheaper, have higher yields, are resistant to insect and disease, and are more nutritious (Tegegne *et al.*, 2003).

Extension organizations have a key role in brokering between biotechnologies, providers of those technologies and services and the client group they serve. In this role, they must be able to examine the appropriateness of various biotechnologies and to insure that biotechnology would reach and attend a large portion of farmer especially poor farmers.

Marra *et al.* (2001) indicated that quality and source of information influence on adopting the biotechnology by farmers. The information available is a critical factor in influencing farmers and it is provided through sources and channels such as extension officers, scientists, academics, private consultants and other farmers. These

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sources provide the content of interest to farmers while channels are the methods by which information is transferred.

The development and adoption of agricultural biotechnology in Iran is a slow process. Certainly, one has to identify extension challenges of agricultural biotechnology. The challenges identified in this study, would be brought to the knowledge of the agricultural planners, practitioners, policyholders and extension technology specialists in order to achieve a realistic biotechnology extension program. The objectives of this study are as follows: (i) identify the personal experts and (ii) identify extension challenges of agricultural biotechnology.

Many studies have identified the agricultural biotechnology extension challenges. For instance, Farajollah Hosseini *et al.* (2008) implied that extension organizations in fulfilling their tasks face several challenges in application of biotechnology. Potential challenges are (1) Lack of training for agents (2) Lack of knowledge and skills among agents (3) Financial constraints and (4) Legislative, policy and regulatory impediments. Davis Stone (2004) implied that Developing world farmers rely on observations of each others' fields and on information and interpretations passed among each other. Along with the benefits that genetic modification has the potential to offer, the technology may also disrupt the social component of agriculture. Two possible forms of disruption are decreased recognizability and accelerated rate of technological change. Ozor (2008) pointed out to several challenges of agricultural biotechnology in developing societies. These include (1) Lack of effective leadership (2) Poor funding of agricultural biotechnology research and development (3) Lack of research focus and infrastructure and (4) Inadequate human resources and expertise. Alabi *et al.* (2007) pointed out to inadequate resources and regulation which are determinants of agricultural biotechnology in developing countries. He indicated to lack of financial resources and scientific infrastructure. Laboratory that are fully equipped and well staffed are required to produce transgenic plants.

Based on prior studies, it was summarized into 19 variables for challenges.

MATERIAL AND METHODS

The questionnaire items were developed based on the previous literature. The questionnaire was revised with the help of experts who had significant experience in biotechnology to examine the validity of the questionnaire. A 5-point likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) was used for the measurement. A pretest for the questionnaire reliability was conducted with 18 experts randomly chosen from the target population. The computed Cronbach's alpha is 78.63%, which indicated the high reliability of the research instrument.

The research population included all the experts in agricultural biotechnology research center and Qazvin jihad organizations (N = 100). The small population of experts encouraged the authors to conduct a census study. The initial and follow-up mailing generated 90 useable responses from experts resulting in a response rate of 90%.

This research applied SPSS Software to analyze the data. Data was analyzed using the factor analysis. KMO index (71.8%) along with the Bartlett test verify appropriateness of the collected data for explanatory factor analysis.

RESULTS

Table 2 summarizes the demographic profile and descriptive statistics of biotechnology experts. As Table 2 represented: 78.2% of experts are male; average age of them is about 39 years; and more than 50% of them have Bachelor level of education. A factor analysis was conducted on the ratings of 19 challenges and yielded five factors, named Economical, Human Resource, Communication, Political, and Cultural challenges.

Table 3 represents components of each factor, as well as, portion of each factor from the total common variance. As one may observe, about 57.10% percent of total common variance explained by these 5 factors, which the majority of it has been explained by the economical factor.

DISCUSSION

This study identified the economical challenge (included: Lack of infrastructure to biotechnology extension, Poor funding of

Table 1. Theoretical Framework for Extension Challenges of Agricultural Biotechnology

Challenges	Source
Lack of infrastructure to biotechnology extension	Hosseini et al., 2008
Poor funding of agricultural biotechnology and research	Ozor, 2008
Cost of technology for small farmers	Ozor, 2008
Infrastructure obstacles in private sectors	Ghareyazi, 2002
Misunderstanding of managers regarding to biotechnology's capacities	Ahani, 2003
Not aware of farmers about biotechnology's capacities	Hosseini et al., 2008
Lack of existence a cultural adoption to employ new technology	Ahani, 2003
Existence groups which are against of biotechnology	Abdi, 2003
Negative attitude toward biotechnology's food	Abdi, 2003
Lack of skillful human resources in biotechnology	Golestane, 2005
Poor media coverage about biotechnology	Dobos& Karaali, 2003
Lack of communication between research and extension	Hosseini et al., 2008
Lack of communication between researchers and farmers	Ghareyazi, 2002
Valueless the role of the agricultural extension	Saboori, 2009
Legal limitations in biotechnology extension	Hosseini et al., 2008
Anti-supportive policies of agricultural biotechnology	Saboori, 2009
Not enough attention to agricultural biotechnology extension	Hosseini et al., 2008
Public concerns about biotechnology products' health	Ozor, 2008
Public concerns about biotechnology ethical issues	Ozor, 2008

Table 2. Demographic profile and descriptive statistics of experts

Gender	Male=78.2%	Female=21.8%
Level of education	Master (40.2%) and Bachelor (54.1%)	Ph. D (5.7%)
Age/year	Mean=39	S.D= 6.381

Table 3. Factor Analysis of Agricultural Biotechnology Extension Challenges

Factor name	Variables included	Explained common variance by factor
Economical	Lack of infrastructure to biotechnology extension, Poor funding of agricultural biotechnology and research, Cost of technology for small farmers, Infrastructure obstacles in private sectors.	17.43%
Human Resources	Misunderstanding of managers regarding to biotechnology's capacities, Not aware of farmers about biotechnology's capacities, Lack of existence a cultural adoption to employ new technology, Existence groups which are against of biotechnology, Negative attitude toward biotechnology's food, Lack of skillful human resources in biotechnology.	11.06%
Communication	Poor media coverage about biotechnology, Lack of communication between research and extension, Lack of communication between researchers and farmers, Valueless the role of the agricultural extension.	11.00%
Political	Legal limitations in biotechnology extension, Anti-supportive policies of agricultural biotechnology, Not enough attention to agricultural biotechnology extension.	8.83%
Cultural	Public concerns about biotechnology products' health, Public concerns about biotechnology ethical issues.	8.76%
Total	-	57.10%

agricultural biotechnology and research, Cost of technology for small farmers, Infrastructure obstacles in private sectors) as the most important factor in agricultural biotechnology extension. This finding supported by Ozor, 2008; Hosseini et al., 2008 and Ghareyazi, 2002.

Ozor (2008) implied that biotechnology developments need high inputs of finance which are in short supply in most developing nations. Even where the economy of such nations is somewhat stable, the budgetary allocation to science and technology and biotechnology R and D in particular is not encouraging. Much of the developing societies today depend on public sector investments in agricultural research and extension, but over the years, budgets for research and the quality of national research institutions have declined in many developing countries. Ghareyazi (2002) pointed out that Lack of money for science has been another common problem for most developing countries.

Factor analysis results suggested Human Resources challenges (included: Misunderstanding of managers regarding to biotechnology's capacities, Not aware of farmers about biotechnology's capacities, Lack of existence a cultural adoption to employ new technology, Existence groups which are against of biotechnology, Negative attitude toward biotechnology's food, Lack of skillful human resources in biotechnology) as the second important factor. Ozor (2008) implied that Agricultural biotechnology is an intensive research area which needs high capacity of human resources to achieve substantial benefits.

Based on the study results, one may suggest that government bringing into account the private sectors for investing in extension of agricultural biotechnology.

The government may hold several international exhibitions to attract investment in agricultural biotechnology. The biotechnology extension agents and instructors may be supported by establishing a financial fund.

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