VOL. 7, NO. 2, FEBRUARY 2012 ISSN 1990-6145
ARPN Journal of Agricultural and Biological Science


www.arpnjournals.com

THE ATTITUDE OF AGRICULTURAL EXPERTS ABOUT DEVELOPMENT OF NANOTECHNOLOGY IN AGRICULTURE SECTOR OF IRAN

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ABSTRACT

The perception of agricultural experts about developing nanotechnology in agriculture sector of Iran was surveyed in this study. The research design was carried out by descriptive methods. The data collected by using questionnaire and 74 respondents returned the questionnaires. Respondents indicated that accelerating the process of growth in agriculture sector was the main advantage of developing nanotechnology. It was also reported that there were relationship between perception of respondents about development of nanotechnology in agricultural sector and working experience, educational level and knowledge about nanotechnology as independent variables energy.

Keywords: agricultural experts, nanotechnology development, attitude, west Azarbaijan, Iran.

INTRODUCTION

Nano technology as a new and emerging technology along with the biotechnology and information technology will undoubtedly be cover a spectrum of issues related to agriculture sector.

Agricultural sector is an important part of economic development in developing countries. It was reported that almost sixty percent of population in developing world will depend upon agriculture and its related industries. Many people also believe that modern technology can meet the food needs of the growing world population in the coming years (Miller and Senjan, 2006). Nanotechnology can bring solutions to some of the main problems in agriculture sector (Michelson, 2008).

Solimanpour and others (2011) citing the Moraru *et al*. (2005) and Rockefeller Foundation (2005) stated that nanotechnology will leave no field untouched by its ground breaking scientific innovations. The agricultural industry is no exception. Nanotechnology will have major, long-term effects on agriculture and the production of food, but it remains unclear whether effects on developing country agriculture and nutrition will be positive or negative. Nanotechnology may help make food products cheaper and production more efficient and more sustainable through using less water and chemicals, which would be a great help to developing world agriculture.

Scott and Chen (2003) elaborated on the application of nanotechnology in agriculture sector. They indicated that nanotechnology has the potential to improve treatment of diseases and can act as a new material for pathogen detection.

Nanotechnology with its new devices can treat plant diseases and can increase the ability of plants to absorb nutrients (Tiju and Morrision, 2006). Although investment in research and development is very crucial, but understanding of emerging technologies would certainly affect the utilization of technology (Mills and Fledderman, 2005).

Based on the report by United Nations, improvement in agricultural productivity was found out to be the second most important potential of nanotechnology (Sastry *et al*., 2007).

However, the full potential of nanotechnology in the agricultural sector has not been realized (Joseph and Morrison, 2006). In this regard, it is important to identify the factors and impediments in developing and adopting nanotechnology.

Developing countries such as Iran have adopted their own nanotechnology programs with a specific focus on agricultural applications. The Iranian Agricultural ministry is supporting a consortium of 35 laboratories working on a project to expand the use of nanotechnology in agro sector. The ministry is also planning to hold training programs to develop specialized human resources in the field (Joseph and Morrison, 2006).

In the year 2001, the Iran presidential technology cooperation office initiated a smart move in the field of nanotechnology. Through these efforts, nanotechnology gained national priority in the country and in 2003 the Iranian Nanotechnology Initiative was set up with the aim of pursuing the development of nanotechnology in Iran.

The attitude of stakeholders involved in public debates about the benefits and risks of agricultural technology has a significant effect on public opinion and policy outcomes. In this regard, the attitudes of agriculture experts as people who influence farmers to adopt agricultural innovations are very important.

Given a key role that experts have on development and diffusion of new technologies in agricultural sector, examining their attitudes will be very important. The main question of this study is to examine the attitude of agricultural experts about development of nanotechnology in agricultural sector of Iran.

METHODOLOGY

The methodology used in this study involved a combination of descriptive and quantitative research and

included the use of correlation and descriptive analysis as data processing methods.

The research population included seventy four agricultural experts and researchers in the City of Orumieh in West Azarbaijan Province.

Measuring respondents' attitudes has been achieved largely though structured questionnaire surveys. Data were collected through interview schedules. The respondents were asked to answer questions by using a 5-point Likert format. The Interval of Standard Deviation from the Mean was used to measure attitudes of respondents in four following levels:

A = Negative; Mean-SD
B = No opinion; Mean-SD<B<Mean
C = Positive; Mean<C<Mean+SD
D = Very Positivet; Mean+SD<D

Content and face validity were established by faculty members at department of agricultural extension and education department at Islamic Azad University, Science and Research Branch and some specialists in the West Azarbaijan Department of Agriculture. Minor wording and structuring of the instrument were made based on the recommendation of the panel of experts.

A pilot study was conducted with 30 persons in Kermanshah Province to determine the reliability of the questionnaire for the study. Computed Cronbach's Alpha score was 75 %, which indicated that the questionnaire was highly reliable.

RESULTS

It was reported that slightly less than 60 percent of respondents were male and more than 70 % of the respondents had earned a 4 year degree. Of those who responded to question, 23% had earned master degree and nearly 2 percent had earned doctoral degree. The results show that majority of respondents had a degree in agronomy (n=149). The mean age of respondents was 39.5 years and mean of their working experience was 13 years.

Approximately sixty four percent of respondents indicated that their knowledge about nanotechnology is in high range and only 10 percent they had very little knowledge of nanotechnology. More than one third of respondents reported that they were informed about nanotechnology by using internet and slightly more than 23 percent had attained knowledge through seminars.

In order to measure the attitude of respondents about nanotechnology in agriculture, the Interval of Standard Deviation from the Mean was used and the results show that less than 17 percent had a negative attitude, while more than 39 percent had positive attitude about nanotechnology (Table-1).

Table-1. Attitude of respondents about nanotechnology.

Attitude	Frequency	Percentage	Cumulative percentage
Negative	13	17.6	17.6
No opinion	16	21.6	39.2
Positive	29	39.2	78.4
Very positive	16	21.6	100
Total	74	100	-

In regard to perception of agricultural experts about advantages of nanotechnology in agriculture sector, majority of respondents (n=66) agreed that nanotechnology can contribute in controlling pollution in agricultural sector. Table-2 shows that the highest mean number for role of nanotechnology in accelerating growth in agriculture sector (mean=4.31) and the lowest mean number refers to role of nanotechnology in producing good quality agricultural products (mean=3.99).

Table-2. Means of respondents' views about role of nanotechnology in contributing in agriculture sector (1= strongly disagree; 5=strongly agree).

Statements	Mean	SD
Accelerating the growth in agriculture sector	4.31	0.72
Controlling the pollution in agriculture sector	4.24	0.71
Protecting natural resources	4.23	0.69
Improving the economic growth	4.22	0.79
Achieving sustainable development	4.20	0.81
Increasing agricultural production	4.07	0.78
Improving the quality of agricultural products	3.99	0.89

Spearman and Pearson coefficient was employed for measurement of relationships between independent variables and dependent variable. Table-3 displays the results which show that there were relationship between perception of respondents about development of nanotechnology in agricultural sector and working experience, educational level and knowledge about nanotechnology as independent variables.

Table-3. Correlation measures between independent variables and development of nanotechnology.

Independent variables	Dependent variable	R	p
Age	Development of nanotechnology	-0.181	0.123
Working experience	Development of nanotechnology	-0.253*	0.029
Educational level	Development of nanotechnology	0.384**	0.001
Knowledge about nanotechnology	Development of nanotechnology	0.371**	0.001

**p<0.01, *p<0.05.

SUMMARY AND CONCLUSIONS

Based on the perception of agricultural experts, majority of respondents had positive attitudes about application of nanotechnology in agriculture sector. It was reported only 17 percent had a negative attitude about nanotechnology. The reason could be the significant contribution of nanotechnology in the agriculture sector in many developed and developing countries. Michelson (2008) indicated that nanotechnology could solve some of the major problems in agriculture.

In a study about the perception of Illinois farmers about new technologies such as biotechnology, results show that those farmers who utilized or planned to utilize GM crop technology had more optimistic perceptions of biotechnology and GM crops than did those who chose not to use the technology (Chimmiri, *et al*., 2006).

The respondents believed that the main contribution of nanotechnology is to speed up the growth in agriculture sector. Nanotechnology has the potential to play a significant role in agriculture production and could increase the value of agricultural products and their safety (Scott and Chen, 2003).

The role of public in developing nanotechnology is the key factors in determining the success of its application. In this regard, the lack of understanding and knowledge about risks and benefits should be a major issue in developing nanotechnology (Chaudhry *et al*., 2008).

It is recommend the initiation of a wide range of participatory processes to enable direct input from the general public into new technology assessment and determination of priorities and principles for public policy, R and D and legislation (Johnson *et al*., 2007).

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