

Development of Innovative Agriculture a Knowledge Triangle Approach: Study Herbs Industry

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Abstract: Innovation in agriculture systematically looks at research factors, extension and education and defines their function and the role which they have in other factors of the system. This research investigates the effective connection of education-research-extension with rural center which can develop innovative agriculture in herb industry subcategory. The Food and Agriculture Organization (FAO) has introduced a model named “knowledge triangle” in order to contribute to the agriculture extension process in developing countries. In this applied research considering the experts theories and views in agriculture and based on open and unstructured interviews which were selected with snowball method, the research questions about the model were answered and after revising and confirming its justifiability and reliability, the following results were obtained: in the education-farmers strategies section, preparing some places such as libraries connected to databases, in the section of strategies for effective connection of research-extension, establishing counseling centers by private sector and in the extension and farmers section, texting (SMS notification) obtained the most score by experts. To be effective, all of these dimensions must work together systematically and organized.

Keywords: Agriculture Education, Agriculture Research, Agriculture Extension, Innovative Agriculture, Herbs.

Introduction

According to the document of the twenty years vision of the country, we can say that one feature of Iranian society outlook for twenty year in horizon of until 1404 that the first place in economic, scientific and technological would achieve in this area {1}. The general policies of the Fifth Development Plan for Economic, Social and Cultural Islamic Republic of Iran related to the agricultural sector also pays to the dimension of development based on overlook document that it makes inevitable necessity of agriculture development innovation.

According to the Universal Food and Agricultural Organization, wealth of the World Trade medicinal plants which are now about a hundred billion dollars a year, in 2050 cultivar will reach five trillion dollars. Iran has a far better the climatic conditions and plant diversity of Europe, currently only 60 to 90 million dollars of world trade in medicinal plants are allocated to itself.

Fortunately, attention of the world, especially the developed countries to the use of herbal products and increasing consumption in the world, whether in the pharmaceutical industry or in food industries and cosmetics - sanitary and due to climatic variation of our country and the possibility of growth of most plants in that a golden opportunity has portion to our country that by using the best way of possible we can increase our presence in international markets more than ever (Mir Derikuand, 2002; Kashfi Banab, 2010). If this issue as a national

necessity and in the framework of a clear program and view of holistic and with a systematic approach is given, it can addition to achieve of management the sustainable development in this sector, especially in the aspects of macro-economic development - environmental, health (self-medication), employment, food security and genetic resources at the national and international arena as a source of foreign exchange earnings for the country and its can play a role (Kashfi Banab, 2010).

Research theory bases

Major developments in the field of agricultural development

The field of agriculture is rapidly changing and of agricultural knowledge has also changed as a result of the production process. The World Bank point to the five major change in agricultural development, an examination of how a term is highlighted innovations agricultural sector, make more important (Sultan et al, 2010; World Bank, 2007).

First, what the increase agricultural development, it is market and not production.

Second: production, environment of trade and consumption patterns of agricultural production is increasingly dynamic and evolving in the unpredictable of methods.

Third: knowledge, information and technology in production, transpiration and the increasing are used by the private sector.

Fourth: Exponential growth in Information and Communication Technology (ICT), especially the Internet has been increased the ability to impart of knowledge that has been produced in the other places.

Fifth: the structure of the agricultural sector in many countries is changing significantly. So it is changing production processes and using knowledge. Usually changing happens in the following elements and forms.

Regardless of what the World Bank with a what view has been reached to this conclusions and that all these cases with the field of agriculture that has match with our country in transition or not, the facts that as not development agricultural and the ineffectiveness of the existing system research, education, extension in the realization of goals Vision Document the horizon in 1404 consensus of stakeholders in the agricultural sector. So, a new strategy appropriate with social features, the economy is inevitable (Sultan et al., 2010).

Plan of Agricultural Innovation System in response to Major developments for Agricultural Development

Different countries around the world rely on agricultural research and promotion programs have been designed with the objective to promote innovation and agricultural development. But the effectiveness of such programs currently has been questioned because it has been found that in addition to the promoting agricultural research systems, other factors, such as the producers involved in agricultural development, beneficiaries, unions and their formations, major buyers and sellers of agricultural inputs and intermediates goods trade level, consultants, nongovernmental organizations, local formations and others have a meaningful role in the innovations that lead to development of agriculture, Of the passer Innovation System go to the agricultural arena. The discussion of agricultural Innovation System is not an academic and theoretical discussion but its origins are agricultural development and improved the condition of operation. For a more thorough understanding of the roles and relationships between the different factors involved in the innovation processes it used from a framework to explain the Innovation System (Sultan et al, 2010).

Concept and structure Agricultural Innovation System

What is clear in the concept of innovation systems, this is the logic that innovations are the product of social agents and economic networks that has interact with each other and as a result of this interrelationships, and they create new methods to manage their social or economic processes. So, social capital considers key elements of innovation systems (Sultan et al., 2010; Berdegue, 2005).

Assumptions OF Agricultural Innovation System distinguish it's of the national system of knowledge and information, or for linear and three faceted systems of research, agricultural extension and education summarizes in the following propositions:

*Innovation may happen anywhere in the society;

* Information and knowledge are the center of economic growth and development;

• Mutual deeds and learns knowledge is important for the flow of knowledge and information;

• Learning is important as much direct investment in research and development (Sultan et al., 2010; Temel & Maru, 2007).

Operations of research, agricultural extension and education to promote agricultural innovation

Reviews the current situation of research, shows that agricultural extension and education there is the need for a reconsideration of the approach and objectives of the system. Roostaei Asadi (Asadi Rostai, 2001) states that

agricultural extension of Iran is at a condition of disadvantage and it still cannot bring up the choice of approach and methods promote, develop goals and tasks, organizing and structure own organization. The study of philosophical and colleagues (Philosophical et al, 2007) showed that the promotion system in the delegation of authority to the provinces for regional planning and also the establishment of promotion of the perpetrators in the operational levels compared to the national and provincial level has not been much success. The study also showed that extension system in establishing relations with other organization and institutions have been successful in the medium or have limited success. In general, the main features of Iranian agricultural extension system include: defining and the role bends of promoting, giving ideas to promote technology transfer activities and parallel with the work of organization and executive levels (Sultan et al., 2010; Qamar, 2001).

Innovation is not just research findings of, but the changing of those findings are socially and economic valuable products (Sultan et al., 2010; Assefa et al., 2007). Based on this the promotion of in the innovation system has more important duty of operations and more (Table1)

The following table the evolutionary process system of education - research - promoting the in the agricultural sector shows based on studies conducted over time. That how from linear mode of one-way was became to systematic framework and Interactive with other relevant institutions.

Table 1. Evolution of education - research - promoting system in the agricultural sector.

Row	approach	Role of promoting	Overall framework
1	Technology Transfer	Communication bridge between research and agriculture	
2	Agricultural Knowledge and Information System	Facilitate knowledge management process	
3	Agricultural innovation systems	Facilitating innovation management process	<p>Government policies and regulatory framework</p>

Source: (Soltani et al., 2010)

The aim of the training agricultural education of cultivated individuals, scientist, expert and sympathetic that can be:

1. To prevent waste of resources (productivity management);
 2. To produce highest quality good (quality management);
 3. To produce more quickly (time management);
 4. To prevent wasting time (time management);
 5. To have better deal and more accurate with obstacles and constraints (strategic management);
 6. To be seek to discover and operation of new resources (creativity and innovation);
 7. Has power to predict and invest more (foresight and planning);
 8. Correct exploitation be engulfed in general (productivity management);
- And thereby can play a major role in agricultural development (Poursaeid, 2013)

Medical Plants Business

Medicinal plants are one of the most valuable resources in a wide range of natural resources of Iran that if scientific recognition, cultivation, development and proper utilization have important role in public health, employment generation and Non-oil exports. Fortunately, in recent years, significant efforts for comprehensive knowledge of medicinal plants according to the type plants and their distribution in Iran, ecological conditions, medicinal use, extraction, Decomposition identify active constituents, cultivation and domestication, modification of important species has been research new methods to increase the composition and effects of their medication and interesting results have been achieved.

In order to approaches of Ministry of Agricultural Jihad based on conduct agricultural activities in the framework of strategic programs of single-product and thematic and forecasting Effective role of these practical programs to making more and more application of the research programs of the Ministry Agricultural Jihad, review and evaluate policies and strategic policies according to their research record, Taking into account the country's basic needs, Perspective Document and the Fourth Development Plan of our country in the field of medicinal plants, can be benefit in optimized planning future studies due to sustainable development and also the prevention of waste of energy and resources of the country, by defining major goals and executive program to achieve them, the role of forests and rangelands Research Institute as trustee of medicinal plant research in the country and it explain coordination with other stakeholders medicinal plants with this collection to reach predicted objectives.

Planning for development activities in the field of medicinal plants, requires careful consideration the current situation, sufficient recognition of existing potentials of in the field of agricultural and natural resources as the main origin of in our country native species, as well as proper understanding of the limitations and challenges (Kashfi Banab, 2010).

Hawkins (1994) believes that the combination of motivational and training can be resorting to methods of education. Rogers (1993), believes that because of the need today society to scholars and innovational, necessity of changing in teaching methods and learner-centered taught practices appreciate in society. Effective methods according to the situation and needs of rural exploiters, the facilities available and the ability of teachers are difficult work. Selection of optimal training methods - promoting has a significant role in enhancing the effectiveness of training. Inappropriate teaching methods - Promoting causes the rural exploiters do not make the right connections with educators and educational content, this lack of communication causes the effectiveness period of training reaches to its lowest usefulness (Rostami & Ali Abadi, 2013). So the aim of this research is identifying effective strategies for teaching - research - promoting medicinal plants sector.

Materials and Methods

This research is a research applied with the aim of investigating and identification of problems in education, research and promote existing in industry of medicinal plants and the creation of solutions for agricultural innovation in this subsection, under the model proposed by FAO and the World Bank 6 (2000) (Ansar Ali, 2003) entitled "knowledge triangle".

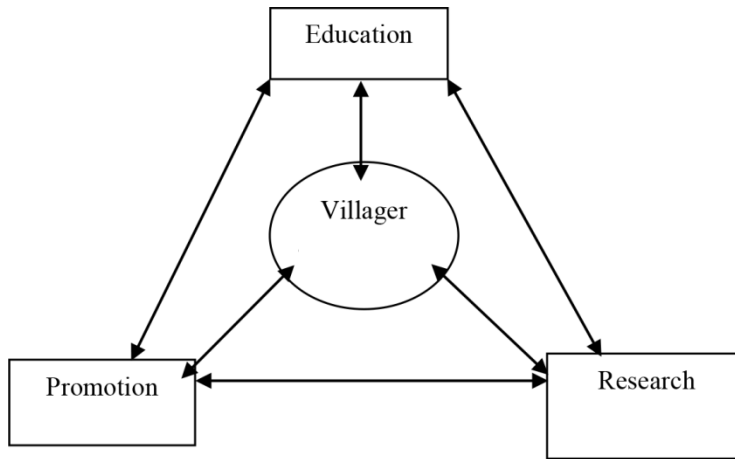


Figure 1. Knowledge triangle, FAO and the World Bank in 2000, quoted from: Ansar Ali Khan, 13, (2003).

It was conducted due to the nature of the survey that is identify and finding the cause and finding solutions, based on theoretical saturation. Our statistical population is formed by professors of Guilan University agricultural and experts in agricultural promotion Guilan University of Gilan province the day. Samplers in this study by using of snowball method was performed that this method is a non-probability sampling methods in which the sample is based on personal judgment chooses with the objectives of study. Sample of this study, Gilan University (Faculty of Agriculture - Deputy of professors the Department of Horticulture and researching College of Agriculture) and expert assistance agricultural extension Gilan province) were selected. The following table first and last name and the professors and experts to be included statistical sample who for interview and identify effective strategies and respond to research questions have been referred to them as a statistical sample.

Table 2. Statistical sample of the present study.

Row	Name and Last Name	post
1	Doctor Bakhshi	Research Vice Chancellor of Guilan University.
2	Doctor Hamid Oghli	Faculty member of Department of Horticulture, College of Agriculture, University of Guilan
3	Doctor Olfati	Assistant Professor, Department of Horticulture, College of Agriculture, University of Guilan
4	Engineer Hosseini	Guilan University of Medical Laboratory
5	Engineer Karjooyan	Master of Agricultural Extension & Education - Jihad Organization of Gilan

Main research questions

1. What are bilateral effective communication strategies for teaching - research to develop innovative agricultural in industry of medicinal plants?
2. What are bilateral effective communication strategies for Education - promotion to develop innovative agricultural in industry of medicinal plants?
3. What are bilateral effective communication strategies for Research - promotion to develop innovative agricultural in industry of medicinal plants?
4. What are strategies for Farmers with educational centers to develop innovative agricultural in industry of medicinal plants?
5. What are strategies for Farmers with research centers to develop innovative agricultural in industry of medicinal plants?
6. What are strategies for Farmers with Promotion Centers to develop innovative agricultural in industry of medicinal plants?

Technical features (Reliability and Validity) Data collection tools

Narrative: In this study, after an initial interviews and identify effective strategies, in order to confirm the validity of strategies has been recognized by researchers and prioritize them properly, the whole five-item Likert questionnaire was designed and as a panel of experts were provided, to concessions to the strategies and prioritize them to confirm their respective strategies.

The results of the answers to the questionnaire were analyzed by SPSS software and statistical tests were used for analysis. Test hypotheses with regard to the whole 5-point Likert-type are defined as follows, in order of numbers of 5,4,3,2 and 1 for strongly agree, agree, average, disagree and strongly disagree was used in the software.

And to check the status of each of the strategies has been used the average statistical test.

$$H_0: \mu=3 \quad H_1: \mu \neq 3$$

In the hypothesis of H_0 respondents about the types of strategy are neither agree nor disagree. If the H_1 hypothesis is approved and the average is more than the number of 3, it type of strategy is approved. Whatever this average is more the strategy type is more approved.

Reliability or credibility: One of the simplest ways to address the credibility and category or categories (experts) is that the rankings are done by two or more persons and the difference between them is measured. The command of reliability analysis is as follows:

$$C.R = (M) / (N_1 \dots N_{10})$$

Where C.R. = coefficient of credibility, M = the number of cases that encrypts agree with each other, N_1 and N_{10} = decision making for coding. From experts were asked to prioritize their own in terms the types of strategy. To that strategies which in expert views have the highest priority among the rest of strategies is awarded the weight of 6 and to the lowest weight of 1 and the rest of weights are placed between these two numbers.

Results

According to interviews and conclusions have been conducted to the main research questions can be answered;

1. What are bilateral effective communication strategies for teaching - research to develop innovative agricultural in industry of medicinal plants?

Prioritization research; which means that researches performs at universities and of research centers based on existing problems in every sector and industry in order to respond to the application of questions.

2. What are bilateral effective communication strategies for Education - promotion to develop innovative agricultural in industry of medicinal plants?

Greater emphasis on massively educations in promotion section as a strategy that butts low cost but has the ability to cover more individuals.

3. What are bilateral effective communication strategies for Research - promotion to develop innovative agricultural in industry of medicinal plants?

Having sufficient force under the management of researchers and private sectors investment exists to serve in the promotion of in villages and villages of the country that they can gave consultancy services in various fields and in the connection with the different types of plants to the villagers.

4. What are strategies for Farmers with educational centers to develop innovative agricultural in industry of medicinal plants?

Making centers such as libraries connected to the databases and centers of services with the aim of advisers to mutual learning, in order to enjoying of indigenous knowledge of farmers And also academic knowledge of educational institutes by creating mutual confidence among both groups, which can be the basis of the fifth questions to answer;

5. What are strategies for Farmers with research centers to develop innovative agricultural in industry of medicinal plants?

Establish centers Services of advisers by the private sector in the Iran to serve the rural villages of Iran in the face of problems, pests and natural disasters... As one of the best strategies for effective connection research section was considered with villagers.

6. What are strategies for Farmers with Promotion Centers to develop innovative agricultural in industry of medicinal plants?

Individual promotions in the education sector, face to face training to meet with individuals in their field and reviews their problems one by one Closely by researchers, which is promotion sector of the most costly and time-consuming strategy.

Promotions groups in the education sector, education field school (Farmers Field School) is the most efficient strategies has been reviewed that it costs less but individual training is more effective performance in the group sector.

Another group that has been very effective extension education is called rural household in this kind of training, group education is considered a household and their job is considered as a Home business.

massively promotions in the education sector, the use of CDs and instructional videos and broadcast them among the villagers and persuasion them to apply instructional strategies mentioned in these films, using the mass media such as radio or cell phone text messages and finally, using the Internet due to low level of literacy villagers in this section to informed the villagers from their own Harvesting Goods from the right time or the condition of weather or training new and more economical methods planting, harvesting, which than two types of individual and group training includes and also is covered the lower cost and greater level of rural society.

The single-sample T is used to testing this hypothesis whether a given sample with an average of a particular belong or not. In case of rejection of H0 means known strategy approved by the target population has been identified in the strategy identified for accepting H0 have not been approved the target population.

Table 3. One sample T-test.

	t	Degrees of freedom	Test value = 3			
			Significant amount	Test result	Confidence interval of 95%	
					low	high
Strategy 1	13.077	9	0.000	Rejection H0	3.14	4.45
Strategy 2	8.573	9	0.000	Acceptance of H0	2.06	3.53
Strategy 3	21.000	9	0.000	H0 Rejection	3.74	4.65
strategy 1-3	14.402	9	0.000	H0 Rejection	3.70	5.09
strategy 4	11.635	9	0.000	H0 Rejection	3.06	4.53
strategy 5	16.837	9	0.000	H0 Rejection	3.63	4.76
strategy 6	10.002	9	0.000	H0 Rejection	2.63	4.16
Strategy 1-6	15.461	9	0.000	H0 Rejection	2.81	3.78
Strategy 2-6	15.492	9	0.000	H0 Rejection	3.41	4.58
Strategy 3-6	13.077	9	0.000	H0 Rejection	3.14	4.45

Obtained numbers in this table be whatever greater than the number of 3 means that intended strategy has more acceptable in the eyes of experts.

Table 4. Status compare to average in one sample T-test.

	N	Mean	Standard deviation	Mean Square Error
Strategy 1	10	3.8	0.91	0.290
Strategy 2	10	2.8	1.03	0.326
Strategy 3	10	4.2	0.63	0.200
strategy 1-3	10	4.4	0.96	0.305
strategy 4	10	3.8	1.03	0.326
strategy 5	10	4.2	0.78	0.249
strategy 6	10	3.4	1.07	0.339
Strategy 1-6	10	3.3	0.67	0.213
Strategy 2-6	10	4.0	0.81	0.258
Strategy 3-6	10	3.8	0.91	0.290

According to Table 3 and 4 except the second strategy means the greater emphasis on mass trainings in section of promotion as strategies that involve lower financial and time cost. But is included more people, the rest of strategies were confirmed and most agreement were on strategies of 3, 5 and 6.

In order to assess credibility total identified strategies first credibility or CR calculated for every single strategies and ultimately overall CR is achieved the average of CR of all strategies.

Table 5. Calculation of credibility.

Source of ideas	C.R	Each type of Strategy weight from expert opinion	Weight of each source × C.R
Strategy 1	0.4	1.8	0.72
Strategy 2	0.5	1.4	0.7
Strategy 3	0.5	2.4	1.2
Strategy 4	0.5	2.04	1.02
Strategy 5	0.5	2.4	1.2
Strategy 6	0.3	2.1	0.63

The coefficient of credibility or C.R here is number of 0.91 that is very good reliability coefficient.

To the success with researching, promotional and Agricultural Education in its programs, not only should pay attention to changes in the changing world of innovation but seriously environmental innovations in the field of agriculture must be identify and with select appropriate strategies mentioned changes to agricultural development to be performed innovative.

More than 30 scientific articles and research about future process of promotion showed that most of the experts and researchers of promotion science and related science believe that Agricultural extension and education to continue survive of its life in not too distant future must pursue new strategies and process (Ahmadvand et al., 2011).

As can be seen in Table 6, agricultural extension and education in different fields will be coming processes in the future. In terms organize and formation should be privatization, restructuring and be made decentralizing. The nature of the agricultural extension and education should be educational nature and communication information and globalization, commercialization, agricultural productivity, and providing and the empowerment of farmers and facilitating the participation of local groups and NGOs to target. They put clientele in agricultural extension and education, groups and NGOs and the tools promotion of this time is information and information networks.

Table 6. Results of the study, researchers' ideas about the promotion and its future trends.

Promotion elements	Trends	Researchers
Promotion goals	Empowerment, increase productivity, facilitators and providing for greater attention to environmental sustainability	Deshler, 1990; Faryngton, 1994, Harriman and Dougherty, 1992; Jones and Garfors, 1998; Pykioto and Anderson, 1997; Karka, 1998; Garfors and Lawrence, 1999; Corniche, 2000; Astansyl and panic, 2000; Qamar, 2002; Willett et al., 2003; Shah Wali and Yousefinejad, 2000; Shah Wali and Monfared, 2001.
target group	Involvement of local groups, according to public and non-governmental organizations	Faryngton, 1994; stencil and panic, 2000; Corniche, 2000; Shah Wali and Yousefinejad, 1378; Qamar, 2002.
Measures to promote	Communication and information, gain more knowledge In the field of agriculture, agricultural globalization	Hartmann et al., 1992; Rivera, 1997; Shah Wali and Yousefinejad, 2009; Shah Wali and Monfared, 2001.
Organizing promote,	Privatization, decentralization, restructuring, revitalization.	Riva, 1992; China, 1992; Jones and Garfors, 1998; Rivera, 1993; Faryngton, 1994; Karka, 1998; Pykioto and

		Anderson, 1997; Boonal, 1998; Gallagher, 2002; Vansly, 2002; Garfors and Orense, 1999; Muhammad Quli Tarzan and Zarifian, 1998; follow and Matthews, 1999; Marsh and panels, 1999; Shah Wali and Yousefinejad, 2000; Qamar, 2002; Willett et al., 2003.
Ways to promote	Collaborative approaches, strengthening local informal groups	Faryngton, 1994; Corniche, 2000, stencil and panic, 2000; Shah Wali and Yousefinejad, 2009; Qamar, 2002.

Conclusion

In this changing world, agricultural extension cannot be attributed to the many transformations in the surrounding environment going on remain indifferent and ignore simply of them. Several reviews articles and research about future process of promotion showed that most of the experts and researchers of promotion science and related science believe that Agricultural extension and education to continue survive of its life in not too distant future must pursue new strategies and process.

As can be seen in Table 6, agricultural extension and education in different fields will be coming processes in the future. In terms organize and formation should be privatization, restructuring and be made decentralizing. The nature of the agricultural extension and education should be educational nature and communication information and globalization, commercialization, agricultural productivity, and providing and the empowerment of farmers and facilitating the participation of local groups and NGOs to target. They put clientele in agricultural extension and education, groups and NGOs and the tools promotion of this time is information and information networks.

Experts and policy makers have suggested the several ways to deal with the new challenges facing with Innovative agriculture that performing some of them had been accompanied with success. Experiences that over the years have been gained to reach Innovative agriculture, many of countries, especially South East Asian countries have realized to integrated approaches.

In order to reach agriculture in the innovative medical plants, first, a series of steps should be done till we can hope that we have used innovation in agriculture. According to the method of the study, teaching and research was suggested on the best strategy of prioritization. For this purpose, that given direction of our in the research and educational sectors should be the purposeful, and to reach to responding for a problem, not just based on ideas often impractical and recurring themes. And in promoting that communication sector has been considered the main village and universities, also due to budget constraints and time Promote training through instructional videos and sending the text of the notification has been suggested as a best practices. As well as using of the private sector, that can promotion of investment in the sector in fields such as establish centers of consultancy services in villages and sections and the use of college graduates a great help to the promotion, and effective connection teaching - research - promoting the villagers to each other.

Suggestions

- Established counseling centers by the private sector, in order to connect more effective the research sector to farmers.
- Supporting companies, NGOs, scientific associations and networks of production and research to increase establish centers of consultancy services in the field of medicinal plants;
- promotion of the training, cultivation, growing and processing of medicinal plants by establishing libraries to connect to databases in order to access global knowledge in medicinal plants;
- Organize the network research, education and promotion of medicinal plants and create of cohesion and continuous cooperation and effective among all institutions and centers of medicinal plants.

Conflict of interest

The authors declare no conflict of interest

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