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The Economic, Political and Legal Factors in Enhancing Partnership between Public and Private Sector in Developing Agricultural Biotechnology in Iran

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This study was conducted to identify the political, economic and legal factors in attracting partnership between public and private sector in developing agricultural biotechnology in Iran. A questionnaire was developed and data collected from 66 agricultural biotechnology experts from research institutes and universities. The ordinal factor analysis was used and the results show the paying soft loans among economic variable, changes in economic policy among political variables and laws and regulations for intellectual property rights among legal variables were determined as the most important variables by order of their impacts.

Key words: Agriculture, Biotechnology, Iran, Legal, Economic, Political.

Agricultural biotechnology offers innovative ways to improve both productivity and quality of the agricultural produce while ensuring better income for the resource-poor farmers through reduce cost[1,2].

Iran among countries of West Asia, North Africa and Near East has achieved a unique position in development of agricultural biotechnology and in ECO member countries has been recognized as biotechnology center[3].

However, in comparison with rest of the world, Iran is in the primary stages especially in commercialization of products. The main obstacles are lack of capital and limited financial, technical and human resources[4]. The numbers of private companies that produce biotechnology products are few and research in this field is mainly in control of public sector[5].

Private public sector cooperation or partnership in R&D has over the past two decades become a prominent form of organizing and managing technological innovation mainly in developed countries. The pressure of international competition, increased diffusion of information and communication, declining public financing of R&D, and the opening up of national economies including liberal foreign direct investment and trade regimes have facilitated the enlarging of private industry engagement in R&D[6].

The private sector is likely to focus on those areas opportunity that will repay their investment in innovation. The public sector must maintain the freedom to operate in an era of increasing proprietary technology[7].

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These partnerships will be beneficial to both as their strengths are complementing each other and will reduce the time between the development of the technology and its reaching the end user _ farmer. So, they should be encouraged for harvesting the synergies between the vast infrastructure and expertise of public sector and product delivery network of private sector[2].

Kameri_Mbote et al, cited that a number of conditions have to be put in place for public_ private partnerships in biotechnology, such as government support, political goodwill andenhancing Intellectual property rights as stipulated and recommended by World Intellectual Property organization (WIO)[8].

Reza Abdiand others pointed out to allocation of cheap loans, allocation of more customs tariffs to import of biotechnology products[9].Behbudireferred to the reduction of tariffs on export of biotechnology products and import of key technologies[10].

Trigo et al, cited some mechanisms for facilitating public/private joint ventures in biotechnology such as facilitating the institutional changes,Public funding for private sector R&D projects, co-financing, subsidized loans, tax credits for R&D, Promotion of risk and venture capital mechanism[11].

The major question of this study was to identify political, economic and legal strategies in attracting partnership between private and public sector in developing agricultural biotechnology in Iran.

MATERIAL AND METHODS

The questionnaire items were developed based on the previous literature and a series of in-depth interviews were conducted with senior experts in agricultural biotechnology in the universities and research institutions. The questionnaire was revised with the help of experts who had significant experience in agricultural biotechnology to examine the validity of the research model.

A 5–point likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) was used for the measurement. A pretest for the reliability of the instrument was conducted with 15 experts randomly chosen from the target population. The computed Cronbach's alpha is 89%, which indicated the high reliability of the questionnaire.

The research population included Agricultural biotechnology experts in the public and private sectors (N=66) included private companies, universities, Agricultural Biotechnology Research Institute, National Institute For Genetic Engineering & Biotechnology. The data collected by interviewing the respondents and analyzed by SPSS-Win software by using confirmatory factor analysis technique.

RESULTS

The mean age of respondents was 36.8 years and seventy eight percent of experts were male. Experts were asked to report their educational backgrounds and 7.6% of respondents indicated that they had bachelor degree, 43.9% had master degree and 47% had completed PhD degree. The mean of working experience for experts was 9.5 years. Less than half of them had a degree in biotechnology (45.5%).

KMO and Bartlett test were used to show the extent variables have correlation and dependence to each other. In factorial analysis when KMO is less than 0.5, data are not suitable for factorial analysis and when KMO is between 0.5-0.7, data are suitable for factorial analysis. KMO amount and meaningful level of Bartlett test indicated in table 1, that shows in the each factor data are very suitable for factorial analysis.

Table 1. KMO measure and Bartlett's test to assess appropriateness of the data for factor analysis

Factor	KMO	Bartle's test of sphericity	
		Approx. chi	square Sig.
Political	0.748	63.247	0.000
Economic	0.848	256.913	0.000
Legal	0.751	61.389	0.000

Table 2 represents Eigen-value for political factor is 1.863 which show 46.580 percent of the total variance of political factor has been explained by four variables

Table 3 represents components of political strategy, as well as, Eigen-value, factor

Table 2. Eigen-values and variance of political factor explained by variables

Factor	Eigen-value	% of variance
Political	1.863	46.580

loadings, communality of each variable and portion of factor in explanation of variance of variable.For estimating factor loading of each variable the maximum likelihood method has been utilized. Factor loading which were greater than 0.50, considered as to be significant. Prioritizing of

Table 3. Variables loaded in the political factor using maximum likelihood method

Variable	Eigen-value	Communality	FactorLoadings	% of variance
Change in economic policies	0.403	0.556	0.746	0.556
Recognizing the public private partnership policies in the R&D development plans	0.360	0.470	0.686	0.470
Political goodwill	0.353	0.451	0.671	0.450
Adopting policies to attract venture capital	0.314	0.386	0.622	0.386

variables base on factor loading show change in economic policies with factor loading of 0.74 was determined as the first priority and about 55.6% of its variance was explained by the political factor. The results also show that 55.6 percent of variance in this factor was in communality with variance of other variables.

The result of factorial analysis about economic factors is reported in table 4. Economic factor contains seven variables and pay soft loan with factor loading of 0.92 was the first priority and about 86% of its variance was explained by the economic factor. The variable forming joint investment fund with factor loading of 0.16 was the last priority among economic variables.

Table 4. Variables loaded in the political factor using maximum likelihood method

Variable	Eigen-value	Communality	FactorLoadings	% of variance
Paying soft loan	0.788	0.862	0.929	0.862
Providing adequate incentives to public and private sector scientists and researchers	0.666	0.585	0.765	0.585
Introducing tax incentives	0.573	0.560	0.757	0.570
Paying subsidies to investors	0.597	0.550	0.742	0.550
Establishing support system	0.509	0.500	0.707	0.500
Giving land at subsidized rate	0.489	0.543	0.699	0.489
Forming joint investment funds	0.384	0.477	0.619	0.384

(Sig= 0.003)

Based on table 5, Eigen-value for economic factor is 3.943 which show 56.327 percent of the total variance of economic factor has been explained by these seven variables.

Table 5. Eigen-values and variance of economic factor explained by variables

Factor	Eigen-value	% of variance
Economic	3.943	56.327

The perception of respondents about variance of legal factor was displayed in table 6. As shown in the table, enacting law and regulation regarding intellectual property right with factor loading of 0.805 was determined as the most important variable and about 64% of its variance was explained by the legal factor. Also, amount of communality show 64.8 percent of variance of R12 variable is common with variance of rest variables. The results also show that allocating tariff for

import of biotechnology products was the least important variable.

Based on table 7, Eigen-value for legal factor is 1.830 which show 45.742 percent of the total variance of legal factor has been explained by these four variables.

Table 6. Variables loaded in the political factor using maximum likelihood method

Variable	Eigen-value	Communality	FactorLoadings	% of variance
Law and regulation about intellectual property rights	0.442	0.648	0.805	0.648
Facilitating the process of issuing license for establishment of private companies	0.371	0.490	0.700	0.490
Omitting customs tariff to export of biotechnology products	0.327	0.418	0.646	0.418
Allocation customs tariff to import of biotechnology products	0.224	0.274	0.524	0.274

(Sig= 0.559)

Table 7. Eigen-values and variance of legal factor explained by variables

Factor	Eigen-value	% of variance
Legal	1.830	45.742

DISCUSSION

The findings of first order factor show among variables of political factor, change in economic policies was found to be the most important variable. The result is in accordance with findings of research by Kameri_Mbote et al. and Mugabe[8,6].

The results of economic factor indicated that paying the soft loan was the most important variable. Several researchers such as Karihaloo&Prabhu[12]; Maghsudi[13]; MohseniAzar[5]; Chaturvedi[14] and Trigo *et al.*,[11]also confirmed this finding.

The perception of respondents show that they believed the intellectual property rights is the most important legal issue which would affect the attraction of public and private sector in developing biotechnology in agriculture sector of Iran. The finding was verified by Shoemaker *et al.*[15]; Escaler[1], Persley[7] and Karihaloo& Prabhu[12].

Finally, these findings suggest development of national level biotechnology policy can work towards the promotion of Public-Private Partnerships, and a macro-level policy and legal change, providing funds, and supportive services is required to make Public-Private partnership more effective.

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