The influence of education and knowledge on the growth of the added value of the agriculture sector in Iran

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Abstract: In the recent years our country, Iran, has experienced a considerable amount of growth (at least in terms of quantity) in the agriculture sector. The question which is being arisen is that how much these educations could or can influence the augmentation of the added value in the agriculture sector; and also by taking into consideration the ever-increasing amount of growth in the population and an increase in the demand for food staffs and products and also by paying attention to limitations in the production factors, according to the endogenous growth models, the best way to increase the performance per each hectare of the agriculture sector is paying attention to research and development (RandD) activities, absorption of the spillover of the research and development of the business associates and an increase in the charges of education and agriculture propagation in this way. The present study in the first part goes to investigate and deliberate on the variables of knowledge (the influence of the accumulation of internal and external charges of research and development, accumulation of the cost of propagation and education) on the amount of growth in the added value of the agriculture sector during the years of 1981 to 2012 and the aim of the second part of this study is to scrutinize the influence of education on the added value of the agriculture sector. Towards this aim, by means of using the statistical data out of the general census in the agriculture sector in Iran in the years of 2013-2014 for several provinces, the influence of several factors such as education on the added value of the agriculture sector was being scrutinized. To measure the influence of education (human resource) four yardsticks are being used which consist of the ratio of the educated persons to the total beneficiaries, the ratio of consumers with AA degrees and higher degrees in the field of agricultural sciences to the beneficiaries, the ratio of the beneficiaries with AA degrees and higher degrees in the non-agricultural majors to the educated beneficiaries and a weight index based on the number of educational years of the beneficiaries. The results of the study are indicative of the minute influence of the internal research and development accumulation and the external research and development accumulation on the growth rates of the added value in the agriculture sector. The influence of the coefficient of the variable of propagation and education in the agriculture sector on the growth of the added value in this sector is meaningful, while the coefficient of the traditional variables in production, accumulation of the monetary capital, and the workforce is meaningful and also through considering the influence of the educational variables on the added value of the agriculture sector, all of the four indices enjoyed a proper fitting model and the human resource index in all the regressions(models) except for the third regression was meaningful and also the obtained results are indicative of the influence of education on the added value of the agriculture sector.

Key words: Education; Agriculture sector; Added value; Knowledge component; Human resource; Research and development (R and D)

1. Introduction

The phenomenon of the rapid and unsystematic or disordered growth of urbanism that by the passage of time in an ever-increasing way is augmenting in terms of size and scope is one of the most obvious and evident phenomenon that the universal community experiences. The enormity of such a phenomenon and the intensity of ever-increasing problems of the cities in the developing countries are in a way that practically the rural society and its issues and problems are changing into lateral and pale subjects. But by the passage of time lots of states in the developing countries have come to this fundamental truth that in the first stage the urban crisis is the crisis of rural producers which in the present situations there is no choice but to migrate to the cities and at the end of this way and circle there is nothing but dislocation of the problems and changing them into more intricate things. In spite of the hasty growth of urbanism, the statistics say that an outstanding and earth-shaking percentage of the population in the developing countries consists of the villagers. Villages in addition to the aspect of population, in terms of economics are so much eminent. Because the share of the rural sector in job production and gross domestic production (GDP) of the developing countries is outstanding as well (Jom'epour, 1996).

Also, the agriculture sector is important in three aspects: First, the agriculture sector is a good source for the industrial development and conceivably the reflection of the industrial development in the rural sections leads to a dynamic trend that is a mixture of

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a progressing interaction between the sectors of agriculture and industry; Secondly, the strategic importance of food products is a subject that no country can turn a blind eye to this subject. It is such a grave and critical issue that can influence and impress the international political relationships among countries; Thirdly, the growth rate of the non-agricultural rural section to a large extent is dependent upon the development of the agriculture sector and in fact it is the growth of the revenues for the farmers that spawns a growth in the demand for the absorption and employment of the workforce and also an increase in the rate of payments in the non-agriculture sector of the rural society and deviates the pressure out of the wave of emigration of the workforce from the cities.(Malour, 2005).

Also, the added value in the agriculture sector has an eminent and eye-catching influence on the added value in the two sectors of industry and services. (Valadkhani, 1998) Besides this, an increase in the ability for competition or competitiveness in the agriculture sector can be perceived as an effective aid to create the nutritional or food safety, an increase in the welfare of the villagers and decrease the rate of migration from villages to the cities. Tehranchian (2003), besides this points refers to the domain of saving, the possibility of achieving foreign exchange earnings and the domain of workforce in the agriculture sector, specifically for the industrial sector it is like growth rings which are effective in the economic growth. Also, Simon Kuznets and lots of other economists believe that agriculture through supplying surplus food products and industrial raw materials, aiding the index of payments through exporting the surplus of products, job creation for the productive forces and for the occupational field, aiding the market and the development of side or lateral activities and financing can aid the economic development.(Najafi, 2004) Since the main activity in the rural areas of the developing countries such as Iran is agriculture and since it is mostly probable that in the process of economic growth and development of such regions the importance of the agriculture sector is so prominent, the necessity of paying attention to this sector and carry out the necessary and multiple cases of investment can be considered as one of the main factors of rural development.(Khaledi et al., 2008) In the realm of the economy of Iran on the one hand due to the growth of young population, shortage of job opportunities, creation of food safety, existence of multiple potential and de facto privileges in the agriculture sector and the requirement of these economic arenas for the revenue out of it, due to the considerable amount of capacity an increase in the quantity of the agricultural products due to the ecological diversity and an access to the seas(high seas), access to the fertile lands, pastures and forests, and also ready and fully-equipped workforce, more attention to the agriculture sector seems to be urgent.(Tehranchian,2003;Shahabadi, 2009)

Human resource is in fact the complement to the physical source and causes a better and more fruitful usage of physical sources. The experience of the developed countries and multiple studies concerning the economic development of countries in the passage of time or among the countries have illustrated that the explanation and interpretation of the rate of the economic growth only through using the traditional factors such as capital and workforce do not present exact results and the human source or capital as the main variable and factor should be presented and should appear in the form of growth models. Economic growth doesn't just depend on the size and amount of the human resource, but it also depends on its efficiency. If the workforce be more educated, the activity and vigor of it and as a result the rate of employment will increase. As much as the workforce enjoys more education and as much as this kind of education be more fruitful, then the improvement of the workforce quality will influence the amount of production more and more. (taghavi and Mohammadi, 2006)

Nowadays one of the distinguishing factors among the countries is their expert and educated workforce. Education and instruction have increased the scientific, technical and technological capacity and insight of the people in order to carryout practical and down to earth researches, inventions, and discoveries and causes that the workforce match itself with the incessant changes and landmarks that are being produced in the technology of the capital goods until it can employ and enjoy the developed machinery, equipment, and technologies better and more fruitful. (Tayyebi et al., 2008)

Based on this, the purpose of the present research is to scrutinize the influence of the accumulation of internal and external research and development costs and the role of accumulation of propagation and training for agriculture, the added value of the agriculture sector in the economy of Iran during the years of 1981 to 2012 and also by paying attention to the discussed points, the purpose of the present study is to consider and scrutinize the influence of education on the added value of the agriculture sector in Iran by means of periodical data which aims to increase the added value of the agriculture sector in alignment with increasing the competition power of the agricultural products in the international arena, development of exporting markets, increase of the level of standard in the domestic products and goods and moving toward the market economy and creation of food safety.

Fare et al. (2008), in a study scrutinized the evidence on the influence of research and development (RandD) activities on the growth of the added value and the efficiency of the U.S. agriculture sector during the span of 1910 to 1990. The results of their study illustrate that the growth of the added value and the efficiency of the U.S. agriculture sector has a positive and meaningful relationship with the costs of research and development during the above-mentioned span with a gap of 4 to 10 years.

Studies on the role of science in the added value of the agriculture

Hall and Scobie (2006), went to scrutinize the determining role of the internal and external science in the growth of added value in the agriculture sector of New Zealand. According to their words, growth of the added value of the agriculture sector of New Zealand is too much influenced by the amount of external and imported science and the main or leading inventions of an open and small-sized economy such as New Zealand do not originate from investment in the internal science but relatively it can be attributed to the spillover of science from other countries into New Zealand which are considered as the external domain of science.

Zhu(2004), throughout a series of studies went to scrutinize the role of general investment in the long-term food safety from 1979 to 1997 and says that in China's economy in order to increase the yield or output of production in the area of cereals, several deeds and measures such as price supports, border controlling and monitoring, and other administrative actions have been carried out; but in this view these actions spawn an increase in the current costs and the only case which has decreased the costs is an increase in the general investment in the field of agricultural researches.

Jacobs et al. (2000), scrutinized the importance of research and development spillovers in the economy of the Netherlands. The results of their study illustrate that most of the research and development activities in the Netherlands are being carried out through the channels of external technologies. Thus, an increase in the research and development (RandD) investment in order to create spillovers and the entrance or achievement of the foreign technology for an open and small economy such as the Netherlands is essential. Also, the obtained results are indicative of the positive and meaningful influence of the internal research and development on the growth of the added value and the efficiency of the agriculture sector in the Netherlands.

Zheng (2006), came to this conclusion that in the span of 1980 to 2002, 30% of the changes in the efficiency of the whole production variables in China have been explained through the variable of science.(i.e. RandD) in a way that %1 of increase in the costs of research and development increases the percentage of the efficiency of the whole production variables by %27. Jafari Samimi and Alerasoul (2009), in a study about the relationship between RandD and the economic growth used the data of thirty developing countries in the span of 2000-2006 that based on their findings in total there wasn't a positive and meaningful relationship among the developing countries.

Shahabadi (2007), illustrated that the accumulation of internal and external capital for research and development has a positive influence on the efficiency of the whole economic variables in Iran and the influence of the accumulation of internal and external research and development, the factor or yardstick of openness and imaginary variables have an stronger influence on the economic growth than other variables. Rabi'I (2009), in a study on the

influence of innovation and human resource on the economic growth of Iran concluded that intermediate commodities, workforce, human resource, physical resource, and the importing of the machinery lead to the growth of Iran's economy while the potential of the workforce and human resource factors in Iran are high which is indicative of its importance in the economic growth of Iran. As the results of the above-mentioned studies illustrate, mostly the research and development have a positive influence on the process of the economic growth and the growth of the efficiency in several countries whether developed or developing.

Concerning the importance of agriculture propagation and education on the added value and the efficiency of the agriculture sector several studies have been carried out which will be mentioned in the following.

Lots of studies about the influence of education or human resource on the growth and production are being carried out. Millerand Aidhai, (2000), got into scrutinize the influence of open economy, the commercial situation and the situation of human resource on the efficiency of the whole production variables. The obtained results illustrated that for countries which are commercially more open human resource has a positive influence on the efficiency of the whole production variables. For the poor countries, the positive influence of human resource depends on the level of commercial openness of these countries.

Self and Grabouski (2003), scrutinized the relationship between the growth and increase of the levels of education in the pre- world war and the post-world war era of Japan. The obtained results illustrated that the primary education before and after the second world war and education in the levels of junior high school and high school only after the second world war have spawned the economic growth of Japan; but the academic education has not had a direct influence on the economic growth of Japan.

Sitatah (2009), by means of panel data models got into scrutinizing the influence of education on the economic growth of four African countries in the span of 1980-2000. The obtained results were indicative of the positive and meaningful influence of education on the growth and also the dynamic relationship between education and growth. Chadrie et al. (2010) scrutinized the influence of human resource and the level of commercial openness on the economic growth of Pakistan in the span of 1927-2007 by means of Johansson conglomeration. The obtained results illustrated that the human resource in the long-term and in the short-term has a positive and meaningful influence on the growth and also there is a one-way causal relationship between human resource and economic growth.

Salimifar et al. (2009), in a study scrutinized the role of human resource in the industrial production of the province of North Khorasan (by emphasizing the large industries). The obtained results are indicative of the positive influence of the human

resource in the span of 2005 on the output value of industries in this province.

Rabi'i(2002), by means of Rumor propagation model and the chronological model of the years 1968-2004 turn to scrutinize the influence of human resource and innovation on the economic growth of Iran. They used the sum of the university registration statistics in the state and non-state (Azad) universities as a yardstick for the human resource and also used the ratio of machinery importing to the whole amount of importing as the spillover of the technology. The obtained results illustrated that an increase in the amount of human resource and the machinery importing improves the economic growth of Iran.

By scrutinizing the performed studies it gets clear that first of all the performed studies about the influence of education on the growth of the agriculture sector is rare. So, by paying attention to the importance of these issues, the necessity of performing such a study is too critical. Secondly, the majority of the studies are being carried out by using the time-series data and any study which is being performed by means of rare periodical data is rare, specifically concerning the agriculture sector there is not such a study. This is the story while the periodical data illustrates the long-term effects better than the time-series data, since the realization or manifestation of the compiled deeds such as the performed investments can be viewed in the successive years in a specific span.(Baltagi,2005) In addition to this area, perhaps the influence of education on the production and the method which is being used for the periodical data cannot illustrate the influence of education in practice because in most of the time-series studies yardsticks such as the positive rate of the university registration or the number of university students are being used. But it is mostly probable that the university graduates never ever get employed until they can illustrate their knowledge and skills. This issue in the arena of agriculture should be taken into consideration more than ever; since most of the university graduates of the agricultural sciences in the universities of Iran are mostly unemployed or turn to jobs that are irrelevant to their major.

2. Research method

2.1. The Role of Knowledge on the Added Value of the Agriculture Sector

According to the endogenous models of growth, the role of internal technology on the growth of the added value is determining and in the atmosphere of an open economy, the transition of technology has almost an effective influence on the growth rate of the added value; since the transition of technology decreases the technological gap between the developing countries and the developed countries. Of course, as we are approaching the technological margin of the developed countries , its yield of efficiency shrinks and the importance of innovation

in the fall or decrease of the technological gap increases (Rabi'i, 1999). Due to this, it can be said that absorption of the spillovers of the foreign research and development in parallel with the development of the internal research and development activities set a more proper stage for an increase in the added value, because the technology is mostly being created by a huge amount of costs; and since its entity or essence is of knowledge, it propagates very cheaply and this characteristic has spawned that many of the developing countries without undergoing a heavy or backbreaking cost of research and development and becoming involved in these risky budget allocations, after that the researches in the developed countries bear fruit, enjoy the results of them easily. The determining factors in the added value of the agriculture sector according to the theoretical bases and empirical studies are presented in the following.

2.2. Accumulation of capital for the internal RandD (Sd) and the external RandD (Sf)

According to the recent theories about the endogenous growth and the empirical studies of Fare et al. (2008), HallandScobie (2006), Jacobs et al. (2002; 2002), Coe and Helpman (1995), Co et al. (1997), the added value of the agriculture sector is a function of internal research and development (RandD) capital accumulation and the spillover of RandD for the commercial associates (accumulation of the external RandD capital). Calculation of the internal RandD accumulation in the arena of agriculture is being carried out by means of the equation which is presented by Griliches (1998), and the measurement of the accumulation of the external RandD capital is being carried out by means of an equation which is presented by Coe and Helpman (1995), and Coe et al. (1997) as well.

Based on the separate studies being carried out by Alstone et al. (1998), and Lin and Huffman (2001), that we also referred to them in the study which was being carried out by Khaksar astaneh and Karbasi (2005), the third determining factor for the added value in the agriculture sector is considered as the capital accumulation which is relevant to the agriculture propagation. According to the definition which is being offered by Moer, agriculture propagation is a process through which some activities such as the exterior or the out-of-school education and exterior or extra out-of-university education, especially in the rural areas and among the farmers are being carried out in order to augment the level of living among the villagers and farmers and modifying the economic or material life of these families specifically in the arena of agriculture and to expedite the process of developing welfare among the rural societies. Also, in this view, propagation of the rural agriculture is a process which is resulting from interactions among some factors such as technology, agricultural propagation education, products, the beneficiaries, and the communicative methods. (Hosseininia, 1999) From

among the above-mentioned factors, technology, products, and the beneficiaries are totally necessary and the propagation-based agricultural education and the communicative methods act as a catalyst.

The Accumulation of the monetary capital (sk) and Workforce (L)

In the whole models of the growth of traditional components, capital accumulation and the accumulation of workforce is being considered in the form of production factors. So, we can illustrate the function of the added value of the agriculture sector in the form of the general equation of (1-2) as follows:

$$VA_t = A. F(L, K, S_r^d, S_r^f, E_t) \qquad (1)$$

in which $VA_t \cdot K \cdot L \cdot S_t^d \cdot S_r^f \cdot E_t$ and A are representing the added value, accumulation of the monetary capital, workforce, accumulation of the internal RandD, accumulation of the external RandD, capital accumulation for the agriculture propagation and education and the factor of residue and also(t) that equals the variable of time. By considering the production function of Kab-Douglas, if we take the logarithm of the above function then we will have:

$$Ln\,VA_t = c + \alpha^L LnL_t + \alpha^k LnK_t + \alpha^{sd} LnS_t^d$$
$$+ \alpha^{sf} LnS_t^f + \alpha^e LnE_t + \varepsilon_t \qquad (2)$$

It is worth mentioning that the statistical source of the added value variables and the formation of fixed and gross capital of the agriculture sector for the national bank accounts from 1981 to 2011 (based on the fixed prices of the year 1997 which have been issued by the central bank of the Islamic republic of Iran (2014), the changing statistical source of the workforce which was being employed in the agriculture sector which is being issued in No.102 of ''Planning and Budgeting Magazine'' of Management and Planning Organization of Iran''.(Amini et al., 2007) and the statistical source which is related to the internal research and development costs in the arena of agriculture and the agricultural propagation costs as a subdivision of the yearly budgetary legislations. Also, it is worth mentioning that according to the inaccessibility of the statistics which are relevant to the research costs of the private sector, only the public sector (state) costs of the researches are taken into consideration. The statistics which are relevant to the importing of the agriculture products and the brokerage goods and the capital goods of the agriculture section in the G7 member states (to measure the accumulation of the external RandD costs in this section) are taken from the statistical yearly of the customs office of the Islamic Republic of Iran. Following the Grilches Method (1988), by measuring the primary accumulation of the monetary capital, the accumulation of the internal RandD and the accumulation of agricultural education and propagation, and by means of the results of the study which is being carried out by Coe et al. (2009), the rate of yearly accumulation of capital amortization, the accumulation of internal RandD, and the accumulation of the agricultural propagation and education are totally being considered as %5. It

should be mentioned that the statistical sources of ''Accumulation of RandD as the commercial associates of Iran'', the study which is being carried out by Coe and Helpman (1995), Coe et al. (2009), and '' the ratio of RandD cost to the gross domestic production of the commercial associates of Iran'' are also being taken from the statistics of the website of the World Bank (WDI, 2010).

2.3. The role of education in the added value of the agriculture sector

In this study to scrutinize the influence of education on the added value of the agriculture sector the general census statistics of agriculture in Iran in the year 2013 for 30 provinces and also the book for the yearly budget are also being used. To achieve the periodical estimation a Kab-Douglas function is being used as the following:

$$LAV = \alpha + \beta_1 LL + \beta_2 LBUD + \beta_3 EDU + U_i \qquad (3)$$

in which LAV represents the added value of the agriculture sector, LL equals the number of the beneficiaries (as a replacing variable for the number of workforce), BUD equals the state investment in the agriculture sector (as a replacing variable for the amount of the physical capital), EDU equals the index of the human resource and Ui equals the disturbance factor. To measure the human resource or to illustrate the influence of education three indices are being used.

The first index or LHR is being obtained by dividing the ratio of the number of the literate beneficiaries to the total number of beneficiaries and the third index is being obtained by dividing the number of beneficiaries with an AA degree or higher degrees in the non-agricultural fields to the total number of the literate beneficiaries. The fourth index is being defined as the following:

Beneficiaries with the high school degree=12 plus beneficiaries with the elementary school degree=5 plus beneficiaries with an LWI degree in the agricultural sciences =16, the number of the beneficiaries with higher than AA degrees and higher degrees =total number of beneficiaries.

As it is being observed, this index is a weight average in which each group of the beneficiaries according to their years of education receives a weight. To a beneficiary with an AA degree and higher degrees in the non-agricultural majors, a surplus weight is being appropriated in comparison with beneficiaries with the same degrees whom are being graduated in non-agricultural majors, because it is assumed that the first group has a multiplied efficiency in their work which is relevant to their specialty.

The first index is being used in this respect to measure whether employing most of the university graduates in the field of agricultural sciences has an influence on an increase in the added value of the agriculture sector or not. It is expected that the coefficient of this variable be positive and meaningful because as much as the number of the beneficiaries be among the agricultural sciences

graduates than other graduate persons, the added value of the agriculture sector increases.

The third index is being used for this purpose to measure whether employing most of the non-agricultural sciences graduates instead of non-academic literates has an influence on the added value of the agriculture sector or not. It is not expected that the coefficient of this variable be meaningful since members of the first group due to their working in an area which is irrelevant to their major have no specific privilege in comparison with the second group.

The fourth index besides enjoying a mixture of the former three indices has a higher level of measurement exactness because the role of education in each level is being measured based on

its importance. Thus, the best index is the index of human resource inventory.

3. Results and discussions

The Role of Science on the Added Value of Agriculture:

Scrutiny of the Stability of the Added Value Variables in the Agriculture Sector by means of Extended Tabulations of Dickey-Fuller tests

In order to scrutinize the affectability of the above-mentioned variables in the added value of agriculture in Iran, firstly, the amount of correlation in each term of the equation was being determined by means of the concept of stability of the added value variables of the agriculture sector.

Table 1: value variables of the agriculture sector

Variable	Statistical Value of the Extended Dicky Fuller test	The critical Values of Mckinton	Degree Of Convergence	Results
Lne	-2.024	-4.226	I(1)	Unstable
D(Lne)	-3.422*	-3.198	I(0)	Stable
Ln k	-2.069	-4.226	I(1)	Unstable
D(Lnk)	-3.413*	-3.198	I(0)	Stable
Lnl	-1.963	-4.219	I(2)	Unstable
D(Lnl)	-6.215***	-4.226	I(0)	Stable
Ln sd	-2.248	-4.211	I(1)	Unstable
D(Ln sd)	-8.811***	-4.219	I(0)	Stable
Ln sf	-3.655**	-4.219	I(0)	Stable
Ln Va	-2.356	-4.211	I(1)	Unstable
D(Ln va)	-8.286***	-4.219	I(0)	Stable
Residual	-5.014***	-3.639	I(0)	Stable

(*, **, *** are indicative of the critical values in the levels of %10, %5, %1)
*Source: research findings

The symbol D represents the subtraction of the first rate of variables

According to the results which are obtained from stability test, the null hypothesis about the existence of one common root for all the variables except for the variable of accumulation of external RandD costs and the monetary capital accumulation was being rejected. But the results of the first rate difference test illustrated that after one time of subtraction, the

instability hypothesis would be rejected and other variables change into stable. In other words, the model variables on the level or in the first grade math subtraction worksheet (Table 2) are stable. Also, the existence of one root in the remainders is being considered and according to the tabular data in Table 2 their instability is being rejected.

Table 2: Dicky-fuller extended test for the common root for the residual terms

		Statistical Value of t	Probability Rate
	Statistical value Of Dicky-fuler	-4.939	0.0018
Critical Values	%1 level	-4.252	
	%5 level	-3.548	
	%10 level	-3.207	

*Source: research findings

So, it can be said that the variables of this model are accumulated as well and a long-term relationship exists between the dependent variable and the descriptive variables.

Based on table No.3, the results of the estimations are indicative of the positive influence of the added value in the agriculture sector in the previous year, the accumulation of the internal and external RandD capital, the agricultural propagation's accumulation

of capital and accumulation of the monetary capital and the workforce in the agriculture sector and also the negative influence of the false variable which is relevant to the draught years on the added value of the agriculture sector.

Table 3: .Results of the estimation of the role of science components on the agriculture sector added value

variable	Coefficient	Standard Deviation	Statistical Value of t
Lne	-2.614***	0.536	-4.487
Lnk	2.772***	0.503	5.501
Lnl	0.647**	0.223	2.895
Ln sd	0.085***	0.016	5.154
Ln sf	-0.382**	0.120	-3.180
DUM	-0.024	0.025	-0.944
C	0.408	2.540	0.160
R2=0.99	F=751.146(0.000)		

*Source: research findings

The variable of internal R and D cost accumulation in the model and the accumulation of external R and D in the levels of %1 and %5 are meaningful respectively and influence the added value of the agriculture sector. Also, from Table 4 it can be concluded and understood that the variables of the accumulation of the internal and external RandD costs due to the lowness of their coefficients of influence in the model (0.085 and 0.35 respectively) have no determining influence on the growth of the added value in the agriculture sector. Also, the shortage of research workforce in the agriculture sector of Iran in comparison with the universal level and also the lack of any relationship between the internal and external research centers can be perceived as the reasons for the lowness of the internal research and development (RandD) accumulation coefficient. Based on the results of the estimation, the coefficient of the variable of workforce in the agriculture sector is meaningful in the %5 level. It seems that meaningfulness for the above-mentioned coefficient of variable originates from the relative increase in the literacy level of farmers in the recent years. Since the speed of absorbing the innovation in the low-educated individuals in comparison with the experts and the educated persons is negligible, thus perhaps it can be said that the rarity of the internal research activities and the purposelessness of the technological transmission from the commercial associates of G7 and the absence of educated workforce lead to an increase in the affectability of the added value in this sector from the imported machinery to cultivate more farms and aggravating the superficial activities in the agriculture sector. In other words, the result of such a model approves of this issue that the main weight and burden of the added value growth in the agriculture sector in the recent decades is not due to the technological advancement but it is due to the increase in the quantity of the farms under cultivation. (Shahabadiand and Bashiri, 2010)

Also, in the present research the coefficient of the variable of activities for agriculture propagation in spite of its potential importance in the growth of the added value of the agriculture sector is low and is meaningful in %1 level. Meaningfulness and positiveness of the variable of material or monetary capital accumulation in the %1 level is indicative of its influence on the added value of the agriculture

sector. The imaginary variable of drought-stricken years (i.e.1972, 1978, 1988, 1999, 2001) in the model is also indicative of the relative importance of the climatic and atmospheric situation in the agriculture sector. In other words, based on the inappropriateness of the water supply for agriculture, the function of the agriculture sector is to some extent under the influence of this variable that it is mostly probable that this variable itself be under the influence of the improper usage of up-to-date knowledge and technology.

Influence of education on the added value of the agriculture sector

In Table 4, the human resource indices for the provinces of Iran are being illustrated.

As it has been observed in tableNo.4, the LHR index in the province of Tehran has the maximum amount which indicates that Tehran has the most ratios of literate beneficiaries. And also, Sistan and Baluchestan province has the minimum amount of LHR index. According to the LAGR index which is being observed by dividing the number of the beneficiaries with AA degrees and the higher degrees in the agricultural majors to the total literate beneficiaries, the maximum amount goes to Tehran which is indicative of absorbing most of the agricultural science graduates in the agriculture sector and the minimum amount goes to Kurdistan. According to LANGR index which is indicative of the usage of most of the agricultural sciences graduates in the non-agricultural fields, Tehran province has the maximum amount and Khorasan razavi province, North khorasan province, and Hamadan province have the minimum amount. LWI index which is a mixture of the former three indices has a higher level of measurement accuracy because it measures the role of education in each level based on its importance. In this view, Tehran province and West Azerbaijan province have the minimum amount respectively.

Table 5 illustrates the results of regression estimation of the added value by means of the periodical data in three provinces of Iran and the four indices of human resource. The coefficient of R to the power of 2 and R bar to the power of 2 for all the four regressions is in an acceptable level. This goes while due to the lack of data which is relevant to the inventory of the physical capital a replacing variable (public sector investment) is being used. By considering that the main part of investment in the agriculture sector is being carried out by the government; state investment can be a proper replacement for the investment in the agriculture sector. The quantities of R2 and R bar2 for the third index (i.e. LWI) are a little more than the other three variables because the importance of better educational years is being determined through this variable. The coefficients of R and R for the first index (LHR) are almost equal to the amount of this coefficient for the second index. It means that due to a considerable amount of illiteracy in the rural and agricultural section of Iran, illiteracy or literacy can

illuminate the situation of human resource in this section as much as the agriculture experts.

Table 4: Human resource index

Provinces	LHR index	LAGR Index	LNAG Index	LWI Index
Eastern Azerbaijan	0.5	0.005	0.015	4.75
Western Azerbaijan	0.46	0.006	0.012	2.74
Ardabil	0.48	0.006	0.014	5.132
Isfahan	0.61	0.008	0.023	6.73
Ilam	0.49	0.009	0.023	6.28
Bushehr	0.57	0.011	0.026	7.38
Tehran	0.75	0.019	0.076	11.34
Chaharma Hal and Bakhtiari	0.51	0.007	0.018	5.74
Southern Khorasan	0.51	0.004	0.023	4.67
Razavi Khorasan	0.59	0.006	0.017	5.7
Northern Khorasan	0.52	0.005	0.01	5.01
Khuzistan	0.44	0.006	0.01	5
Zanjan	0.53	0.004	0.012	4.55
Semnan	0.62	0.009	0.025	7.16
Sistanand Baluchistan	0.34	0.005	0.007	4.05
Fars	0.6	0.009	0.026	7.06
Ghazvin	0.61	0.006	0.022	6.07
Ghom	0.59	0.008	0.025	6.56
Kurdistan	0.42	0.003	0.006	3.84
Kerman	0.51	0.011	0.025	7.01
Kermanshah	0.49	0.007	0.014	5.48
KohgiluyehandBoyerahmad	0.5	0.01	0.047	7.09
Gholestan	0.6	0.006	0.03	7.33
Gilan	0.6	0.008	0.026	7.39
Lorestan	0.47	0.006	0.017	5.13
Mazandaran	0.64	0.01	0.052	9.12
Markazi	0.56	0.005	0.013	5.32
Hormozgan	0.46	0.005	0.008	4.7
Yazd	0.63	0.009	0.045	7.17

*source: research findings

The F statistical value for all the four regressions is meaningful in %1 level which is indicative of the total meaningfulness of the regression considering that the heterogeneity of the variance is the biggest danger for the estimation of the periodical data and in case of its existence, t statistical value and F statistical value are not reliable, by means of Breusch-Pagan (BP) test, the heterogeneity of the variance was being tested. As it has been illustrated in Table 5, for all the three regressions the null hypothesis about the homogeneity of the variance is not rejected. By paying attention to this point that the normality of the residual terms causes more reliability in the results of the estimation, by means of Jarque-Bera statistical value (JB), this issue is being tested. The amount of this statistical value is not higher than the critical value, so it can be concluded that the residual terms are normal. The measurement tests approve of the estimated regressions in terms of statistics.

Table 5: the results of the regression estimation for the added value of the agriculture sector

Variable	First regression With LHR index		Second regression With LAGR index		3rd regression with LNAG index		4th regression With LWI index	
	coefficients	Statistical Value of t	Coefficients	Statistical Value of t	Coefficients	statistical value of t	Coefficients	statistical value of t
C	7.808	1.019	12.534	1.946	*14.168	1.942	11.758	1.511
LL	1.611*	2.111	2.046**	3.209	2.229**	3.087	2.007**	2.593
LBUD	0.233***	13.979	0.233***	16.610	0.229***	15.041	0.233***	14.091
LEDU	0.023	0.891	0.014**	2.412	0.049*	1.816	0.009	0.975
R2	0.94		0.95		0.95		0.94	
R	0.93		0.94		0.94		0.93	
F	67.769(0.000)		95.949(0.000)		81.816(0.000)		68.626(0.000)	
BP test	6.335(019)		2.226(0.13)		3.286(0.60)		2.736(0.86)	
JB test	0.468(0.79)		0.872(0.64)		1.433(0.48)		0.995((0.60)	

(***, **, 8 are in the %1, %5, %10) are meaningful.
The parenthesized numbers illustrate the probability levels
Source: research findings

So we can go to analyze the estimated coefficients with certainty. But before that it is necessary to mention that in this study the emphasis is being put more on the results which are being obtained from the fourth index (LWI); since this index covers the other three indices as well, the high rate of correlation coefficient in this index in comparison with the other three indices (i.e. more than %85) is indicative of this story.

As it has been observed in Table 5, the estimated coefficients for the variable of the number of beneficiaries (LL) in all the four regressions are positive according to the expectations and they have no significant difference based on all the four regressions with %1 increase in the number of workforce(number of the beneficiaries), the added value of the agriculture sector increases by 1.611,2.046, 2.229, 2.700 respectively that from among the four regressions, LWI is being approved more and is more effective.

The coefficient of the variable for investment (LBUD) has been positive and meaningful in all the four regressions and the obtained coefficients illustrate almost similar amounts that are 0.233 for LHR index with %1 meaningfulness on %1 level, 0.233 for LAGR index with %1 meaningfulness, 0.229 for LNAGR index with the meaningful level of %1, and finally for LWI with %1 increase in the amount of investment of the public sector, the added value of the agriculture sector increases by 0.233.

Based on the four indices, education has a positive effect on the increase of production in the agriculture sector. Based on the first estimating regression by an increase in the ratio of the literate individuals to all the beneficiaries, the added value of the agriculture sector increases by 0.233.

Based on the second estimating regression, by %1 increase in the ratio of the agriculture experts to other literate persons in the agriculture sector, the added value in this sector increases by 0.o74. This issue indicates that as more individuals with a university degree in the agricultural majors get employed in this section it will be beneficial for the production of the country in the agriculture sector.

By estimating the third regression, the importance of involvement of the graduated students of the agriculture majors instead of non-agriculture university graduates becomes more prominent because by %1 increase in the ratio of experts in the arena of agriculture to other literate persons in the agriculture sector the added value in this sector increases by %0.049. By using the LNAGR index it gets clear that by devoting time and energy to replace the irrelevant university graduates in the agriculture sector with the relevant ones no meaningful increase appears in the added value. In other words, the influence of the existence of academicians with non-agriculture university degrees like existence of non-academic literate individuals (with elementary level, junior high school, and high school levels). So, an attention is being needed to pave the way for the involvement of

individuals with the agricultural science university degrees to take part more in this sector from among university graduates.

In Table 6, it will be observed that the coefficient of the variable LHR is more than the variable of the coefficient LAGR. This issue can mean that due to the high percentage amount of the existence of illiterate beneficiaries which are mainly elderly persons, the fall of illiteracy in the agriculture sector is a more critical priority than the involvement of agriculture graduates in lieu of other literate persons. Thus, in the first step illiteracy in the agriculture sector should be rooted out and in the second step the graduates of the agriculture sector should have a more eminent involvement in this sector. Of course as the university students and experts of the agriculture sector replace the illiterate beneficiaries, Iran can experience a leap in the arena of promoting the human resource in the agriculture sector. According to the fourth estimating regression it gets clear that with an increase in the inventory of the human resource by %1(LWI), the added value of this sector increases by 0.009%.

4. Concluding the recommendations

In the present study first of all we scrutinized the influence of the variables related to the exponents of science on the added value of the agriculture sector during the years of 1981 to 2011 and after that by means of the data which were being gathered from thirty provinces of Iran, we scrutinized the role of education on the added value of the agriculture sector. In scrutinizing the influence of the science variables on the added value, the variables of the accumulation of the monetary capital and the accumulation of the internal research and development(RandD) costs in agriculture with a positive mark became meaningful in %1 level and the accumulation of the capital for propagation and education in the agriculture sector became meaningful with the negative mark on %1 level and also the workforce with the positive mark in the %5 level and the accumulation of internal research and development cost with the negative sign in the %5 level became meaningful.

As it has come in the previous sector, the results of the present research is indicative of the approval of the first hypothesis about the positive and meaningful influence of the accumulation of the internal research and development cost in the agriculture sector on the growth of the added value in the agriculture sector of Iran which is compatible with the results of the researches which were being carried out by Gutierrez and Gutierrez(2007), Hall and Scobie (2006), Jacobs et al(2002), Coe and Helpman (1995), Coe et al. (2009), and Akbari et al. (2003).

The second hypothesis about the positive and meaningful accumulation of the external research and development cost on the growth of the added value in the agriculture sector in Iran in the present

research is being reported and has a negative influence; since as it is being deduced, what is being transported through importing from developed countries to less developed countries are just machinery and instrument and techniques not technology. (Amjadi and Chizari, 2006). Apart from these stories, by paying attention to the diminutiveness of the agriculture farms in Iran, probably the structure of importing the agriculture machinery is not compatible and harmonious with the level of economic and social structure and development in Iran. Also, according to the obtained results it can be perceived that the variables of the accumulation of the internal and external research and development cost due to the lowness of their coefficients of influence in the model(0.085 and 0.38 respectively), have no determining role in the growth of the added value of the agriculture sector which it is mostly probable that it is due to an inattentiveness to the internal research and development activities and the low capacity of absorbing the research and development of the commercial associates for Iran. Due to this for a more proper use of the spillover of the foreign research and development activities there is a need for a serious and fundamental vision toward the creation of the minimum amount of the absorption capacity.(i.e. accumulation of the internal research and development activities and the employed human resource).

Finally, the coefficient of the variable of accumulation of activities for the agricultural education and propagation appeared in the meaningful model with a reverse sign. In other words, the third hypothesis about the positive influence of the costs of propagation and education in the agriculture sector on the growth of the added value in this sector in Iran during the years of 1981 to 2011 contrary to the studies which were being carried out by Huffman and Evenson (2003), Alstone et al. (1998), and Lin and Huffman(2001) in the present research was being rejected, that maybe its reason is that the agriculture propagation educations in the field of agriculture are seasonal. In fact, agriculture propagation education in the level of villages are limited to spring and summer and often they are being carried out in more developed villages, that this amount of education cannot be a help for the occurrence of a landmark in the agriculture sector toward an stable agriculture.

Also, to scrutinize the influence of education variables on the added value of the agriculture sector all the four yardsticks had a proper fitting model and the index of human resource in all the regressions except for LNAGR regression were meaningful which means that the index of human resource in the LHR regression is indicative of the considerable influence of the literacy campaign on the growth of production in the agriculture sector. By estimating the LAGR and LNAGR regressions it became clear that as the number of employers in this sector with a university degree in agriculture increases, it will be beneficial for the agriculture production of Iran and based on

the fourth estimating regression it will become clear that by %1 increase in the inventory of the human resource in the agriculture sector (LWI), the added value in this sector increases by 0.007%

5. Recommendations

1-By paying attention to the meaningfulness of the coefficient of accumulation for the internal research and development(RandD), and its positive and negligible influence on the agriculture sector of Iran, investment in the internal research and development leads to an increase in the performance of the agriculture sector.

2-Although in the present study the influence of education on the added value of the agriculture sector is taken into consideration quantitatively, but it is so clear that the importance of the quality in education should not be ignored. Considering the quality of the agricultural education can be an important subject for other studies in this domain.

3-As most of the university graduates and experts of the agriculture majors get employed in this domain, the added value of this sector will increase. Thus, it is recommended that more attempts be made for the employment of these individuals in the agriculture sector.

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