International Journal of Agriculture and Crop Sciences.
Available online at www.ijagcs.com
IJACS/2013/5-22/2710-2715
ISSN 2227-670X ©2013 IJACS Journal

Productivity growth of barley in Iran

Mohammad Reza Kohansal[1] , Mohsen rahimi[1*]

1. Associate Professor of Agricultural Economics Department, Ferdowsi University of Mashhad, Mashhad,Iran.
2. Ph.D Student of Agricultural Economics, International Campus of Ferdowsi University of Mashhad,Mashhad, Iran.

Corresponding Author email: rahimi810@yahoo.com

ABSTRACT: The aim of this study was to evaluate the productivity growth in Barely production of Iran country during 1992-2011 years. Using Tornqvist-Theil productivity index. The result show that , during the two first years , productivity index of Barely production ha increased relative to year 1992 (base year) but, has descending trend after that , so that at the terminal year of productivity index period of Barely production , relative to base year , decreased about , 30 Percent. During the total factors of barely production have very low fluctuated and its average during the total studied period was %7 Percent.
Keywords: Productivity growth, Iran, barley

INTRODUCTION

One of the main problems in developing Countries, is the absence or appropriate and stable agronomic growth. This problem not only. Caused the agronomic problems such as stagnancy and unemployment. But caused many political social and cultural problems. Using different instrument such as production factors enhancement is one of the ways to access, agronomic growth through increasing, and the production capacity. Productivity as a simple definition, is the output to input ratio (solo, 1957). Increasing this ratio means, better use of inputs. Productivity is a total and comprehensive concept that its increase , regards as an important access to human life enhancement ands making a wealthy society Almost , all the agronomic and policy thinkers , be lived that productivity increase , the best and the most effective way to access the agronomic growth , because its improvement m cause maximum use of sources , human labor , time and facilities and others also , helps to decrease the production expenses , marked development . Employment and life criteria improvement. (Akbari and Ranjkesh , 2003). With attention to agronomic frontiers weakening, efforts for productivity improvement, regarded as main competition base in the world using productivities increase we can increase, other sectors efficacy and so we can enhance production activities and crops production growth. Therefore in the fourth law of country development, all national and province structure, should determine the total productivity enhancement share of production factors in its production growth, to compile the national documents, and to provide the necessary methods and its necessities to change the country conditions from a based economy to a Productivity based economy, so that the total share of production Rectors in internal non-pure production growth would arrive to 1/31 percent. Among the economic sectors of developing countries, the agricultural part as the society food producer, has an important role (yazdani and doorandish, 2003). Therefore, to increase the productivity in Iran's economy, we should pay special attention to agriculture sector as a sector that has main share in economic activities. This sector, now has 14 percent of non-pure internal production of non-petroleum exports. Also it has produced about 80/1 percent of rood materials and 90 percent of the permutation industries needs However in the fourth development program in agriculture sector, the average growth of annual added value regarded as 6/5 percent that 4/3 percent of it, have resulted through the new capitals increase (using the inputs especially work labor and capital) and 2/5 percent have resulted through the growth of productivity growth of Total Production Factors (TFP). But , on the base of investigation, the annual average of productivity growth of total production factors in agriculture sector , during the 1985 – 2005 years , it has been about -3/08 percent or course TFP growth not only have not helped to added value , but causes its reduction (Tahami-poor and shahvari, 2006)

According to economic theories the low productivity resulted from non-appropriate composition and non-efficient production factors(water , soil , capital , human labor , seed and others in agriculture sector , cause the limitation in agriculture production factors productivity and affected the production in Iran, the lack of appropriately use of production factors and sources , irrespective sufficient potentials , have caused extreme productivity reduction in this sector so we should pay special attention to productivity increase in agriculture sector as one of the main and important sectors of economic activities in this country The productivity increase

in this sector with attention to special economic structure of Iran can help to arrive economic aims. Under tending the trend and the way of productivity growth in Iran's agriculture sector. Help to guidance the production source and facilities, so that the effective use of production factors should be resulted. In Iran , in spite of , long history of Asian productivity association (APO) membership , the attention to productivity concept , only has become comprehensive during a little years a go , and sufficient investigations about measuring the production factors Productivity in agriculture sector have not done however , with attention to productivity importance to appropriate use of production factors , in this investigation , the productivity growth status of total production factors in Barely production have been evaluated using Tornqvist-Theil index. Barely is of the most important agricultural plants and we predict that it is the first grain that human cultivated it. Barely is one of the most compatible grains that produce in appropriate weather and fertile soil with high water holding capacity. This plant relative to wheat is too resistant in drought climate and therefore in weathers that water because the grain production limitation, barely can produce the maximum crop. On the basis of agriculture ministry static report, the Barely, after wheat.

Inside and outside the country, different investigations about productivity measurement and its changes has done that some pf them, are mentioned below. Shaykh Zainuddin and Torkamani (2007) evaluated the total Productivity of borty production using Trenquist index during the years 1363-81 in Fars province. The result of the investigation showed that the productivity growth rate of total production factors in dry farming and irrigated barely was- 50% , -%2 percent respectively. The average of productively growth of total irrigated and dry farming barely production factors was %2-%7 respectively.

Mazhari and Mohaddos Hosseini (2006) in a study evaluate and analyzed the total and trivial productivity in strategic corps in khorasan-Razavi province, including irrigated wheat, barley, cotton and sugar-beet using the Tornqvist-Theil index. The results of these investigators showed that during the third social-economical development program, The amount index of total sectors for irrigated wheat, barley, cotton and sugar-beet had average growth about 16/01, 14/01, 14/46, 16/24, respectively. Amirteymoori (2005) in his study, showed that the Productivity of total factors in main in Iran during the years 2000-2004 in spite of it's descending trend was 1 percent, expect during the 1381T that annual growth rate of it was positivity, and it showed that the Productivity improvement of total production factor, have resulted. Akbari and Ranjkesh (2003) in their study. Showed that the productivity is an appropriate method that it's increase, have considered as the key to resolve the economy's growth and enhancement, in this study, the productivity growth rate of total production factors for Iran agricultural economy.
During the years 1375-1345 have valued separately.

Nin et al (2009) compared, the productivity growth of total factors in agricultural sector during the years 1940-1960. The results showed that the productivity growth of total production factors in agriculture sector in china economy, after 1979 and in India economy. After 1975, have accelerated but the productivity growth of total production factors in India economy have had a faster acceleration. These investigators total the main parameter of productivity growth in total production factors in china and India economy as the political reforms and institutions developments in china economy. Foogly, et.al (2007) evaluated the productivity of total production factors in agricultural sector of American.

They resulted that, productivity is the simulant motor of agriculture sector growth during 1948-2004, and higher than $\frac{2}{3}$ of this sector resulted from the productivity. They know, new techniques development as the main reason of this improvement that itself, resulted from government capitali2ations in agricultural researches. Also, these investigator believed that extreme fluctuations in productivity growth resulted from weather conditions, political interventions, and general economic conditions and other factors, and increasing the relative human labor price relative to other factors, because the farmer's compatibility with new conditions to use the capital- based ways. Also they believed that huge economic politics with attention to new capitalization enhancement and research and technology encourager publicities, have had many effects on the productivity total production factor in agricultural sector Bili, et al (2004) measured the productivity growth in England agricultural sector, using Tornqvist-Theil index.

The results showed that during the years 1953-2000, the Productivity growth in the sector have been high khakbazan and Garry(1993) did an investigation about human labor productivity in Iran agriculture sector using Treslock production function and showed that during 30 past years , agriculture sector , have not an human labor absorb ant and also , the human labor productivity has been negative .

RESEARCH METHOD

Productivity measured as trivial and general productive of total production factors. The main disadvantage of this method in productivity analysis of a glance is that the other factors effect dose not considered and the resulted changes in other inputs, regarded as a special input. Total productivity with , attention to this fact that all production factors are economically rear, in an index that evaluate the relative effect

of an input set in producing one or many products for different technological states and shows the relative improvement of a production unit or sector during the Therefore of a production unit or sector during the time Therefore. Usually we should not limit the productivity indexes to compare the output with only of input in economic methods the productivity evaluation of a production function, an expense function or crop presentation equation or production factor demand related to profit function. In the second way, the productivity criteria determines using mathematical programming or evaluation the numerical index. Although parametrical methods can explain all economical events, theoretically. But, because of using parametric bed and production function are faced with many application and computational problems, in these methods need to knowing basal teal technology, forced analyses to select a parametrical function form for production function. Also in this paramedical function form for production function type dose no change from a period to another one , Although in fact , may not be as follow one of the other computational problems is related to discrete data essence because in parametrical methods , always , a concrete production function , estimated for discrete data and it cause the error and diagonal state in computation in non – parametrical methods , four method , including slows Residual analysis , input output analysis(Domer aggregation index, index number Approach and data Envelopment Analysis (DEA), are used to measure the total productivity of production factors. All of these methods have Limitations and advantages. In this investigation, we used the index number Approach. Index number Approach, to compute the productivity based on index number, there hypothesis are considered.
In this method, the productivity growth of total production factors defined as: the crop amounted index to in Auto amounted index ratio.

This index regarded as Pasha and laspear's indexes but using it requires a lot of information's. Data Envelopment Analysis (Malm-quist Productivity index): Malm-quist productivity index, defend based on space functions. Space function Measure the maximum production in special level of inputs.

Malm- quist index, estimates using mathematical programming and has more complexity than other non- parametrical (methods Tornqvist-Theil index (Tranlog index): Tranquist's amounted indexes is a discrete approximation of Divizhia index. Tornqvist-Theil ammonal index for input and output defend respectively using (1), (2) relationships. (1) (2)

$$Q_T = \frac{1}{2}\sum_{j=1}^{M}(R_{jt} + R_{js})\ln\left(\frac{Y_{jt}}{Y_{js}}\right) \quad (1)$$

$$Q_T^* = \frac{1}{2}\sum_{j=1}^{N}(S_{it} + S_{is})\ln\left(\frac{X_{it}}{X_{is}}\right) \quad (2)$$

R is the crop's share and s is, each of input's share. With knowing input and output ammonal indexes, Tornqvist-Theil (Productivity index defied as below. (3)

$$In\left[\frac{TFP_t}{TFP_s}\right] = \frac{1}{2}\sum_{j=1}^{M}(R_{jt} + R_{js})\ln\left(\frac{Q_{jt}}{Q_{js}}\right) - \frac{1}{2}\sum_{i=1}^{n}(S_{it} + S_{is})\ln\left(\frac{x_{it}}{X_{is}}\right) \quad (3)$$

Which TFP = productivity index of total production factors

$S_{it} + S_{is}$: respectively the share of it input form the total expenses production unit in the base tear and the year.

R_t, R_{it} : Are respectively the share of the output (crop) of total profits in production unit at base year ant the year. In this investigation. Because this investigation, because there are only one crop. The relationship writes as below:

$$\left[\frac{TFP_t}{TFP_0}\right] = \frac{1}{2}\,Ln\frac{Q_t}{Q_0} - \frac{1}{2}\sum(S_{it}+S_{i0})Ln\frac{X_{it}}{X_{i0}} \quad (4)$$

That Q_t = Barely production in the year Q_o : Barely production in base year, s_{it} = the input share from the total expenses for barely production in the year. s_{io} = the input shave of total expenses in barely production in base year, x_{io} = the input amount in barely production in base year, x_{io} = the in input amount in barely production in the base year.

Inputs are in clouding, chemical fertilizers, machineries, pesticides land, labor and water. The above index would measure for an 18 year period (1388- 1387) in Iran country.

In the fourth equation, the average of each input and output in base year and comparison year, used a weight in aggregation the input and outputs elements.

In making inputs and outputs of Tornqvist-Theil equation each inputs share in production expenses and crop's share from the total profit is determined. However the event in production process during the investigated years would report accurately and efficiently. Also the Tornqvist-Theil index coincides on Translog's homogenized production function and it causes its flexibility.

This characteristic cause that , this index to consider the effects result from replacement and data complementary character in the production process , in other world if production inputs , replace each other during the studied period , or place in the complementary relationship productivity in this mine , their effects would reflect in above productivity index(Diewert -1,81).

Among the other advantages of Tornqvist-Theil productivity index, is that the production unit structure or production sector coincides with homogenized function of Translog the Tornqvist-Theil index would be an accurate and appropriate criteria of techniological changes during the studied period . in theatrical changes and Tornqvist-Theil index relative to other index , are better and also between these two indexes , Tornqvist-Theil index has higher advantages but it should be mentioned that selecting a model cannot be the only basis Of theoretical principles , but applicability of it , is an is important and determinant factor in selecting the function's shape. Using Fisher and Tornqvist-Theil index, especially, the first index, request many information's and because the availability of these information's to use Tornqvist-Theil index for compute the productivity , and with regarding to it's appropriate characters. Using this index in productivity computations, recommends in Iran. With attention to above characteristic, in this investigation, productivity growth of barely production factors during 1992-2011 analyzed in this project using Tornqvist-Theil method. Results: Because of extreme changes in general level of prices during the study period, the nominal amounts of input, output's value change to real prices of year 1367 using the price's index. In this conversion, barely value using the agricultural crop's index, fertilizers, pesticides, using the price of chemicals materials and petrochemical materials, the used expenses to hire the work labor using the total index and also used expenses of facilities, and machineries, using machinery's price index.

To access a constant criteria to delete the effects of under. Production level in production value and input's use with dividing the crop's amount and production's amount and production's expenses to under cultivation expenses of crop's value variables in hector the expenses amount in hector have used in productivity estimation.

During the 1991 and 1992 relative to past year decreased 10/5 , 22% , respective where , during the year 1993, 1994 , relative to past year , year, respectively there was 11% , 23% increase , This trend for 1998, 2000 was a descending trend and in spite of 1% , 2% increase during the year 2000 , barely value had a descending trend until the year 2000, so that this amount , in the year 2002 relative to the year 1998 , had about 53% decrease, during the year 2003 until 2007 , barely value had increase so that during the year 2007 relative to 2011 , this crop value has 68% increase .

Compares on- he barely crop value in hector in the year 2011relative to the year 1992 , showed 28/5% decrease , where the input usage amount in hector during the studied period. Showed 36% increase. Evaluating the used input elements showed that the water usage in hector , fertilized and machineries in hector, decreased , respectively 22% , 24%, 21% and the poisons usage amount and the human labor in hector increased respectively 82% , 16% .

The amount of cultivated area during the above years, shows cultivated area decrease from 941793 hector in the year 1991 to 5448622 hector in the year 2011.

The investigation showed that the water expenses amount during 2010-2011 with constant price had the highest expense during the studied period in the next years , there was fluctuations in the water usage expenses with constant price but totally water usage share in the total production expenses during the studied period was not highest than 25% .

The chemical fertilizer usage during the studied period in spite of trivial fluctuations, had a descending trend. Also, the fertilizer share expenses in total production expenses was very low and was about 6% wheeze. This amount in the end of studied period decreased to 2 percent. Evaluating the poisons usage expenses in hector during the studied year showed that the poison usage in spite of fluctuations has a transcending trend, so that in the end of the studied period relative to the beginning of studied period increased four fold the expenses of human labor and barely machineries in hectare at the highest share in total production expenses. In the studied period for barely production in the used machinery amount, there was lower fluctuations relative to other inputs but comparing to use expenses on machineries in hectare and barely production in hectare there was high fluctuation in the crop amount in hectare. The comparison of expenses in the first and last studied period showed that in these two years, the human labor and machinery share in total production expenses, was highest and the Fertilizer share and poisons want lowest.

Calculate the total productivity of factors of production

The results of the Tornqvist-Theil index estimation are shown in Table 1. The results showed that in the years 1370-1371, 1371-1372 the productivity index had high change and its growth was negative and its reason was rapid increase in inputs price. After two years, productivity change percent had fluctuations but its trend was transcending. The commutated amount for Tornqvist-Theil index showed that except for 1369 and 1370 years , that productivity index of barely production relative to base year has 5.4% increase this index in other years relative to base year(1368) decreased so that in tree final years , of studied period (1364-1386) this index showed 40% decrees in productivity of barely production relative to the base year(1368) Evaluating the index amounts of barely crop and inputs index showed that the barely crops index in all studied years relative to base year have decreased that the highest decrease war related to the year 1378 and the lowest decrease was related to the year 1372. Also the inputs index except the years 1369-1370, 1378-1379 that decreased relative o the base year in other years, relative to the base year have increased. The inputs index reduction in the years 1369-1370 was so that , it caused barely crops productivity index to increase But, reduction in inputs index during 1378 and 1379 because of higher reduction in barely crops index , have not cause to increase the productivity index of barely:

Table 2. Result of Tornqvist-Theil productivity index of barely crop and input usage index (1992-2011) percent of Tornqvist-Theil index change

Percent Tornqvist-Theil index	Tornqvist-Theil index	Index of Inputs	Product Index	year
	100.000	100	100	1992-93
6.113	106.113	90.28	95.2	1993-94
-1.374	104.739	80.97	84.29	1994-95
-48.161	56.587	158.36	88.81	1995-96
6.019	62.606	158.51	98.6	1996-97
-2.232	60.736	144.91	87.39	1997-98
13.434	74.17	112.81	83.11	1998-99
9.225	83.395	100.61	83.36	1999-2000
-9.154	74.241	105.44	78.36	2000-01
-0.742	73.499	103.94	76.9	2001-02
4.855	78.354	88.62	69.01	2002-03
2.614	80.968	92.07	74.08	2003-04
-7.41	73.558	109.96	8034	2004-05
-0.115	73.443	116.3	84.81	2005-06
-8.155	65.288	137.86	88.94	2006-07
-3.317	61.971	142.75	87.75	2007-08
-2.02	59.951	142.38	84.6	2008-09
0.23	60.181	148.31	88.52	2009-10
-2.799	57.382	149.69	85.16	2010-11

Source: research findings

With attention to the result, the weight growth of inputs expenses in many of studied years was higher than the growth of production value. Therefore, during these years, always, increasing the production inputs price have caused to increase the production expenses and in result, cause to productivity reduction. Productivity growth of total production factors, had a low fluctuation and the average of productivity growth during the whole period, was percent. If we pay attention to the composition of inputs usage in barely production, we would see that the lowest share of inputs in total expenses of production was related to chemical Fertilizers and poisons, and also the highest share was related to human labor and machineries. It is so that the increasing in used expenses on machineries with constant price during the end years of studied period was table to increase the level and also didn't increase the productivity of human labor on the basis of results the usage of machineries to produce, one unit of crop during the year 1992 was equal to 19% and in year 2011, reached to 37% unit, it means that there was 2 unit increase. It should be say that the tribal productivity of human labor during the year1368 was equal to 25/6 where, decreased to 22/2 during the year2011. Increasing some inputs such as poisons did not increase the barely crop production so that poisons productivity decreased from 1000 unit to 250 unit in the end of period.

Suggestions

According to these result to increase the productivity of above production in Iran , we recommend some ways that result to increase the knowledge or agricultural management

In present , and in many of the country regions , inappropriate labels are used for barely production so it recommend to evaluate the lands before barely cultivation to determine if suitable condition are there or not and if there isn't imitable conditions , lands should use for crops that have necessary productivity.

Recommended that barely price with attention to whole expenses determined and it can encourage the farmers to use better inputs and in result cause the barely productivity.

REFERENCES

Akbari N, Ranjkesh M, 2003.The growth of total factor productivity in the agricultural sector of Iran during the period 1966-1996., Journal of Agricultural Economics and Development. 43 and 44: 142-117.

Amirtimur S, 2006. Dynamic of self-sufficiency in maize production of publications.research and development in agriculture and horticulture.79: 78-89.

Baily A, Balcombe K, 2004. Measuring productivity growth when technological change is biased – a new index and application to UK agriculture. Journal of agricultural Economics.31:285-295.

Diewert W.E, 1981.The economic theory of index number: survey essays in the theory and measurement of consumer behavior, Ed. R. Deaton, Cambridge University Press.

Fuglie Keith O, MacDonal, James M, Ball E, 2007. Productivity growth in US agriculture. Economic Brief, No. 9.

khakbazan M, GRAY R ,1993.The role of labor in Iranian Agriculture labor productivity and estimation of agricultural production function second symposium of policy in iran shiraz, shiraz.

Mazhari M, Mohadds Husseini A, 2007. Measured TFP strategic agricultural products, Journal of Agricultural Economics. 2: 15-27.

Nin Pratt A, Yu,B, Shenggen F, 2009.Comparisons of agricultural productivity growth in China and India. Available on: WWW.springerlink.com/index/x977174pmnh931162.pdf

Peterson W.L, Hayami Y, 1977. Technical change in agriculture, in a survey of agricultural literature: traditional fields of agricultural economics, 1940s to 1970s, University of Manasota Press for the AAEA.

Shaykh Zainuddin A and Torkamani J, 2007. Total Factor Productivity barley production in the province, the Sixth Conference of Agricultural Economics, Mashhad.

Solow, R.M (1957), Technical change and the aggregate production function, The Review of Economics and Statistics, 39:313-320.

Tabandeh Tehrani K, 2001. Economic Analysis of inputs used in the production of barley, Address Jihad (Agricultural Extension and Rural Development). 244 and 245: 68 – 76.

Thamypour M, Shah Moradi M 2006. A measure of total factor productivity growth in agriculture production and its contribution to value added growth, Journal of Agricultural Economics, No. 2, 332-317.

Yazdani S, Dorandish A, 2003. Compared the productivity of rice production in major growing areas: Tornqvist-Theil index.Journal of Agricultural Science and Technology in Mashhad: 1, 1-3.