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PRODUCTION AND SUPPORTIVE POLICES IN IRAN (CASE STUDY OF WHEAT, RICE AND BARLEY)*

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With regard to the importance of agricultural products (in particular cereals) and government policies towards encouraging increased production as well as motivating towards self-sufficiency, it seems necessary to discuss such issues. This article focuses on the relation between self-sufficiency and production of basic agricultural products (wheat, barley, rice) and the two supportive policies of the government (guaranteed price and insurance of agricultural products) during the years 1988-2008. The stationary and cointegration tests are two ways to confirm that there is a direct relation between self-sufficiency and production of wheat & rice with insurance and guaranteed price. This direct relation indicates the success of the policy in attaining the intended objectives through production motivation and risk minimization in wheat & rice production process. However, there is no such relation confirmed for barley.
Keywords: Insurance, guaranteed price, self-sufficiency, stationary, cointegration

INTRODUCTION

Supporting the agricultural sector in different countries is carried out by applying different Inputs and basically with the intention of realizing certain objectives including the increase of farmers' income, protection of domestic producers and elimination of dependence, securing employment and minimization of poverty. A comparison of different levels of protection in the agricultural sector in various countries of the world indicates that, despite differences in the type and extent of policies, most countries provide a high level of protection. This is particularly manifested in the Common Agricultural Policy of the European Union and the New American Agricultural Law (Ardestani and Tousi, 2007; Komijani, 2001). The most important supportive policies in the Common Agricultural Policy of the European Union include price policies, indirect revenue payments (interest rate, Inputs, production and tax decrease), direct revenue payments (indemnification of natural damages) and other government costs and expenses for research, advertisement and marketing purposes. According to the American Agricultural Law and other agricultural plans, the protections provided include subsidy on agricultural loans, preservation of resources, price protections, product insurance and export subsidies (Shamsoldini, 2005).

Generally speaking, support in developing countries goes more to production Inputs and consumers, while in developed countries it is meant to protect agricultural producers against prices. In other words, about three-fourths of the total support provided to the agricultural sector in OECD countries covers the producers and only two-thirds of it relates to price protections. Moreover, during the past recent years, product insurance schemes in most developing countries have only covered the productivity fluctuations caused by natural disasters and farmers, especially retail farmers, have been given less importance in such countries. This is due to the fact that there are hazards which are more important than the hazards threatening the products. These include market price fluctuations and government's strategic decisions which will obviously result in the decrease of farmers' income (Ataei, 2006; Nikoei, 1998).

Insurance and guaranteed price in Iran

Insurance

Insurance scheme under the subcategory of agronomy was introduced in Khorasan and Mazandaran provinces during the years 1984-85 and was first applied to the two strategic products of cotton and sugar beet in an area of 89 thousand hectares. Today after 23 years, some 31 agricultural products in an area of more than 5.3 million hectares are covered by the Insurance Fund. The mission of the Insurance Fund under the agronomy subcategory is to realize the insurance coverage provided to more than 100% of

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notified programs, equal to 41% of the area under cultivation throughout the country (Ataei, 2006).

In the wake of successive droughts which started in the country within the years 1999-2000, the Insurance Fund, in congruity with other agricultural policies and in order to support the affected farmers, managed to get the approval of the general assembly for proposed draught insurance coverage plans and, concurrently, put into effect the draught insurance scheme as of the agricultural year 1999-2000. The mission of the Insurance Fund was to cover 99 thousand hectares of the country's farms in the first year after the scheme was effectuated. Today, however, the draught insurance coverage is extended to 3 million hectares for 15 agricultural products (Ataei, 2006).

The agricultural products insurance scheme is, in fact, a Strategy of taking risks by a corporate entity. Through the time, the agricultural products insurance scheme has undergone so many changes as regards the form, nature of execution and methods of application. Today, due to the development of insurance methods, we can see different insurance products such as operation insurance, Inputs insurance and income insurance in most of the countries in the world (Nikoei, 1998).

Insurance services applied to rice were first provided in the year 1988, that is three years after such services were provided to cover wheat (planted through irrigated farming). Insurance services for wheat (planted through dry farming) and barley were, respectively, provided in 1990 and 1997 (Ataei, 2006).

These products were covered against hazards such as hail, flood, cold, storm, torrential rain and earthquake. Such hazards also included freezing weather for wheat and barley (planted through irrigated farming) as well (Ataei, 2006).

Based on the existing statistics (relating to the past 10 years), the loss inflicted (directly) upon the agricultural sector as a result of damages caused by natural disasters amounts to an average of 10 thousand billion rials per year. On the other hand, this figure has amounted to 20 thousand billion rials per year in the course of the past 5 years. Accordingly, if we estimate the value of agricultural products at 400 thousand billion rials per year, the coefficient of damages caused by natural disasters in the agricultural sectors will amount to an average of 5% the value of agricultural products (valued at 20 thousand billion rials).

Therefore, in order to establish a comprehensive and effective agricultural insurance coverage system and to realize and continue the supportive objectives of the Insurance Fund vis-à-vis the agricultural producers as well as to promote the level of investment security in this sector, financial resources amounting to 20 thousand billion rials as insurance premium (30% farmer's share plus 70% government's share) are expected to be secured each year (Ataei, 2006).

Unfortunately however, in the course of the Third Five-Year Development Plan and during the agricultural years 2004-05 and 2005-06 (the first two years of the Fourth Plan, the average financial resources that were provided each year to the Insurance Fund both from farmer's share and the government's share did not exceed 610 billion rials (Ataei,2006).

Guaranteed prices

Since September 1989 when the Agricultural Products Purchase Guarantee Law, comprised of one Single Act and three Notes, was approved, the government has resorted to this law as a tool to support the farmers. Studies show that prior to this date, government measures towards interfering in the market of agricultural products were only limited to the times when supply was lower than demand or the times when control of prices through import of products was required. We can dare say that there was no systematic plan to support the agricultural producers at that time. Thanks to the efforts of a great number of directors and officials of the agricultural sector, the Basic Agricultural Products Purchase Guarantee Law was approved by the Islamic Consultative Assembly in September 1989 (Najafi, 2000).

Approval of this law was considered to be an important step towards providing protection to the agricultural sector. However, an analysis of the results of enforcement of this law through the past years indicates that the lawmaker's intended objectives, such as equalization of agricultural system and prevention of wastes, have not been realized and even in some cases the farmers have been dissatisfied with the guaranteed price as determined due to the fact that it did not cover their production costs. In case of major export products such as raisins and dates, with regard to the world price fluctuations and presence of powerful competitors, government pricing and interference through guaranteed purchase of products has, as one of the effective factors on export, complicated the process of exports. Therefore, due to the numerous changes in the economy of Iran and the world, it is necessary to review and reconsider the nature of supports and to amend the existing law (Najafi, 2000).

The products specified in the Purchase Guarantee Law are generally divided into several categories, depending on how much they benefit from the guaranteed purchase supportive Inputs:

a) Products, such as wheat and sugar beet, which have an almost exclusive market and only the government or government companies are considered as major purchasers of these products. In this case, the price determined for the product is fixed.

b) Products that are considered as the raw materials of industries and factories manufacturing fabric, oil and the like. These products include cotton, oil seeds and cocoon of silk moth. Purchasers of such products are mostly private sector companies and factories and the guaranteed price plays the role of basic price and is thus important in adjustment of the market for these products. With regard to the high decomposability of oil seeds and the necessity of their quick transfer to the factory, the amount of subsidy to purchase one kilogram of any oil seed will be calculated by the Support Organization and notified upon approval of the Management and Planning Organization.
c) Products that have a free trade market but, in some cases, the government interferes to either adjust the market or prevent losses incurred by the farmers. These products include barley, rice, whole kernel corn, pulses, potato and onion, raisins, dates.
d) So many other agricultural products such as different fruits, patch products, vegetables and most fodder plants are not covered by the Purchase Guarantee Law and have thus a free trade market. The price of these products is determined based on the supply and demand Strategy (Yavari, 2001).

MATERIALS AND METHODS

To analyze the effects of guaranteed price and insurance policies on production level and self-sufficiency of selected products, certain techniques including the time series analysis and, more specifically, the cointegration test are used. For this purpose, the stationary nature of variables is first studied and then the issue of cointegration or the existence of a long-run relation between the variables is discussed.

Unit Root Test (Stationary Test)

The test used to study the stationary nature of time series is called Unit Root Test. To better understand this test, take the following model:

(2) $$Y_t = Y_{t-1} + U_t$$

Where:
Y_t is indicative of a given time series
Y_{t-1} indicates a time series with one time lag
U_t indicates a random or stochastic error term that follows classic hypotheses (zero mean, fixed and uncorrelated variance).
This error term is called net Noise or white Noise term.
Considering the fact that this equation is a first-grade Auto Regression or *AR*(1) equation where the value *Y* in the time *t* is regressed on its value in the time *t-1*, then if the coefficient Y_{t-1} equals one, we will have a unit root. In other words, if after estimation of regression:

(3) $$Y_t = \rho Y_{t-1} + U_t$$

we will find that ρ=1, then we would say that the variable Y_t has a unit root. In this case, Y_t is called a Random Walk Process and represents a non-stationary time series. We can say that the time series *Y* is a first-grade integration and we show it as *I*(1).
Moreover, if we calculate the difference of the time series twice and the first becomes stationary, we could say that the time series *Y* is a second-grade integration or *I*(2). Therefore, whenever a time series is of grade one or more, the time series will be non-stationary.
If ρ equals zero, the time series will be of grade zero or stationary and it will be shown as *I*(0).
In this article, we discuss the stationary nature of 12 variables including production level, self-sufficiency, insured level and guaranteed price for three products namely wheat, rice and barley, using ERS, KPSS and Ng-Perron tests.

Artificial regression

It is likely that in time series regressions, we get to artificial or doubtful results. In other words, the results of regression are apparently meaningful, but with a little bit of attention, we'll find out that they are not valid enough.
The process of Random Model Movement of two variables is like two players who randomly walk in a coordinated way. Such coordination that is directly understood as time series and is the main idea in cointegrated time series is called cointegration. Later we will see that regression results are not artificial and therefore *t* and *F* tests are correct and valid. According to Grenjer, we can use cointegration test as a pretest to avoid artificial regression situations.

Cointegration Test

When the time series *Y* is *I*(1) and the time series *X* is *I*(1), these two variables could be cointegrated. Generally speaking, if *Y* is *I*(*d*) and *X* is also *I*(*d*), we can use a simple regression to find whether or not there is a long-run relation between these two variables. In other words, the regression is no more artificial and we have not missed any long-run information. Moreover, when the two variables have integration of different grades, we can use the cointegration test to find their relation. When the coefficients resulting from the regression become meaningful, we can accept that there is a long-run relation between them; otherwise, the existence of any relation between them is rejected.

Data

In this article, self-sufficiency of the above-named products has been determined based on the production-consumption ratio. The statistics relating to production and consumption of the products in question have been taken from the website of Food and Agriculture Organization of the United Nations (FAO), while the statistics relating to the insurance level of the products have been taken from the Agricultural Products Insurance Fund and those pertaining to guaranteed prices from the Ministry of Commerce.

RESULTS AND DISCUSSION

Here, we will discuss in detail the relation between insurance level and guaranteed prices of selected agricultural products of Iran (wheat, rice and barley) with the production level and self-sufficiency of products separately:

Wheat

Government of Iran has allocated the guaranteed price of wheat to both wheat and DOROOM wheat. Here, the average of these two prices has been used as the guaranteed price. Moreover, the government insurance level covers both the wheat planted through irrigated farming and that planted through dry farming. Again, the total of these two levels has been used as wheat insured level.

Analysis of the unit root test indicated that the time series of wheat production, wheat self-sufficiency, wheat insured level as well as wheat guaranteed price are stationary and convergent with grade zero. Therefore, the simple OLS regression will be used to study their relation. Moreover, the stationary test will be performed on the regression Residual to make sure.

(4) $P_w = 8502+2.88\ garw$

Where:

P_w indicates wheat production, while garw is indicative of guaranteed wheat price (Table 1).

As we see, the existence of a direct relation between production level and guaranteed price as determined by the government is approved in the above equation, in a way that in the years of study, every increase of one unit in the guaranteed price of wheat has resulted in an increase of 2.88 units in the production level. It seems that this policy has been successful in attaining the intended goals. Considering the interval of one year in the above equation, no meaningful relation exists in the variables in question. This means that wheat producers have not changed their production level based on the previous year guaranteed prices.

(5) $SSW = 0.65 + 0.0001\ garw$

In this equation, SSW and garw represent, respectively, wheat self-sufficiency and guaranteed price (Table 2). As you can see, the direct relation between wheat self-sufficiency and guaranteed price is so pale. This is due to the small value of wheat self-sufficiency resulted from production level divided by wheat consumption. Even by considering an interval of one year in the equation, no meaningful relation was approved. Therefore, the level of self-sufficiency is not dependent upon previous year guaranteed price.

(6) $P_w = 8574 + 0.001\ insw$

Where:

P_w indicates wheat production and insw is indicative of wheat insured by the government (Table 3).

In this equation, there is a direct yet slight relation between wheat production level and wheat insured by the government and the increase of 1 unit in the insured level of wheat results in the increase of 0.001 unit in the production level. To study the effects of insurance level on production level with one year delay, we entered an interval of one year in the model which did not give us a meaningful relation. We therefore conclude that wheat producers have not increased their production level based on the level of wheat insured the previous year. The other study confirm above result and emphasis on effective insurance on production crops (Kurosaki and Fafchamps, 2002).

(7) $SSW = 0.65 + 0.7^{*}\ 10^{-7}\ insw$

In this equation, SSW and insw represent, respectively, wheat self-sufficiency and level of wheat insured by the government (Table 4). As you can see, the direct relation between wheat self-sufficiency and insured level is so pale, in a way that changes in the wheat insurance level will leave a positive yet very small effect on the self-sufficiency of this product which may be due to the small value of self-sufficiency against wheat insurance level, Yavari study confirm this result (Yavari, 2001). No significant relation was obtained when we applied an interval of one year to the model.

Rice

In Iran, the guaranteed price is allocated to four of the following types of rice: Sepidrood, Khazar, Neda, Nemat, Amol and Charam. In this article, the average price in every year has been used as guaranteed price. The study of stationary test on rice time series indicated that the time series of rice production level, rice self-sufficiency and rice insured level are stationary. Their relation can be found by means of OLS method. The time series of rice guaranteed price, however, is convergent and of grade one. Therefore, we can study the relation between this variable and other variables using the cointegration test.

(8) $Pr = 1437.82 + 0.09\ garr$

Table 1. Wheat production and the guaranteed price estimation

Dependent Variable: PW
Method: Least Squares
Date: 05/12/09 Time: 18:07
Sample (adjusted): 1368 1386
Included observations: 19 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8501.777	555.1064	15.31558	0.0000
TWK	2.876010	0.500261	5.749021	0.0000
R-squared	0.660348	Mean dependent var		10964.47
Adjusted R-squared	0.640369	S.D. dependent var		2566.159
S.E. of regression	1538.907	Akaike info criterion		17.61483
Sum squared resid	40259987	Schwarz criterion		17.71425
Log likelihood	-165.3409	F-statistic		33.05124
Durbin-Watson stat	0.794379	Prob. (F-statistic)		0.000024

Table 2. Wheat self-sufficiency and the guaranteed price estimation

Dependent Variable: SSW
Method: Least Squares
Date: 05/12/09 Time: 18:27
Sample (adjusted): 1368 1386
Included observations: 19 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.651916	0.041063	15.87600	0.0000
TWK	0.000138	3.70E-05	3.722433	0.0017
R-squared	0.449063	Mean dependent var		0.769872
Adjusted R-squared	0.416655	S.D. dependent var		0.149047
S.E. of regression	0.113838	Akaike info criterion		-1.408782
Sum squared resid	0.220304	Schwarz criterion		-1.309367
Log likelihood	15.38342	F-statistic		13.85650
Durbin-Watson stat	0.824065	Prob. (F-statistic)		0.001693

Table 3. Wheat production and insurance estimation

Dependent Variable: PW
Method: Least Squares
Date: 05/12/09 Time: 19:58
Sample (adjusted): 1369 1387
Included observations: 18 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8574.685	359.9571	23.82141	0.0000
BW	0.001468	0.000155	9.479114	0.0000
R-squared	0.848848	Mean dependent var		11345.94
Adjusted R-squared	0.839401	S.D. dependent var		2223.180
S.E. of regression	890.9356	Akaike info criterion		16.52686
Sum squared resid	12700259	Schwarz criterion		16.62579
Log likelihood	-146.7417	F-statistic		89.85361
Durbin-Watson stat	2.264983	Prob. (F-statistic)		0.000000

In this equation, PR and garr represent, respectively, rice production and rice price guaranteed by the government (Table 5). We can see a direct relation between rice production level and its guaranteed price in a way that with 1 unit of change in the guaranteed price, rice producers have changed their production level by 0.09 unit accordingly. This direct relation indicates the success of the policy in attaining the intended objectives through production motivation and risk minimization in rice production process.

Table 4. Wheat self-sufficiency and insurance estimation

Dependent Variable: SSW
Method: Least Squares
Date: 05/12/09 Time: 20:00
Sample (adjusted): 1369 1387
Included observations: 18 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.651949	0.034245	19.03755	0.0000
BW	7.30E-08	1.47E-08	4.952687	0.0001
R-squared	0.605222	Mean dependent var		0.789702
Adjusted R-squared	0.580548	S.D. dependent var		0.130875
S.E. of regression	0.084761	Akaike info criterion		-1.993514
Sum squared resid	0.114952	Schwarz criterion		-1.894584
Log likelihood	19.94163	F-statistic		24.52911
Durbin-Watson stat	1.364016	Prob(F-statistic)		0.000144

Table 5. Rice production and the guaranteed price estimation

Dependent Variable: PR
Method: Least Squares
Date: 05/12/09 Time: 18:32
Sample (adjusted): 1369 1386
Included observations: 18 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1437.819	68.83999	20.88640	0.0000
TR	0.086392	0.021699	3.981333	0.0011
R-squared	0.497661	Mean dependent var		1651.889
Adjusted R-squared	0.466265	S.D. dependent var		249.6402
S.E. of regression	182.3801	Akaike info criterion		13.35450
Sum squared resid	532199.7	Schwarz criterion		13.45343
Log likelihood	-118.1905	F-statistic		15.85101
Durbin-Watson stat	1.502604	Prob(F-statistic)		0.001073

(9) $ssr = 0.66 - 0.3*10^{-8}\ garr$

Where:

ssr indicates rice self-sufficiency and garr is indicative of rice price guaranteed by the government (Table 6). Equation 9 shows us the indirect relation between rice self-sufficiency and its guaranteed price, in a way that 1 unit change in the guaranteed price has resulted in the change of rice self-sufficiency by $0.3*10^{-8}$ unit in the versus direction. Generally speaking, due to different changes in the process of production and consumption of products, there is no tight and reliable relation between self-sufficiency of products with other variables.

(10) $Pr = 1309 + 0.003\ insr$

Here, PR represents rice production and insr represents the level of rice insured by the government (Table 7). As we can see, there exists a slight yet direct relation between production level and rice insured level in the years of study, meaning that rice producers change their production level with the changes in rice level insured by the government in the same direction. Accordingly, with 1 unit increase in the insured level, we see an increase of 0.003 unit in the production level. Moreover, study of unit root test on

regression Residual approves the stationary nature which, by itself, is an indication of validity and reliability of regressed model. No meaningful relation was observed between rice production level and its insured level in the previous year when we applied an interval of one year in the regression. In other words, rice producers do not change their production level based on insurance level of previous year and introducing changes in wheat insurance level to motivate production in the following year does not seem to be an efficient policy.

(11) $ssr = 0.59 + 0.8*10^{-9}$ insr

that the change of 1 unit in the insured level of rice would result in a change of self-sufficiency by $0.8*10^{-9}$ in the same direction, in comparate with other studies indicate of conversely relation in fars province in IRAN during the years 2000-2002 (Najafi, 2000).

Barley

In Iran, insurance scheme as applied to barley covers two types of this product, barley planted through irrigated farming and that planted through dry farming. Study of stationary and cointegration tests, relation (if any) between time series of insurance level,

Table 6. Rice self-sufficiency and the guaranteed price estimation

Dependent Variable: SSR
Method: Least Squares
Date: 05/12/09 Time: 18:33
Sample (adjusted): 1369 1386
Included observations: 18 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.607636	0.026449	22.97420	0.0000
TR	-3.20E-07	8.34E-06	-0.038437	0.9698
R-squared	0.000092	Mean dependent var		0.606841
Adjusted R-squared	-0.062402	S.D. dependent var		0.067982
S.E. of regression	0.070071	Akaike info criterion		-2.374172
Sum squared resid	0.078559	Schwarz criterion		-2.275242
Log likelihood	23.36755	F-statistic		0.001477
Durbin-Watson stat	1.233973	Prob(F-statistic)		0.969815

Table 7. Rice production and insurance estimation

Dependent Variable: PR
Method: Least Squares
Date: 05/12/09 Time: 20:02
Sample: 1367 1387
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1308.994	74.44677	17.58295	0.0000
BR	0.002892	0.000589	4.907758	0.0001
R-squared	0.572305	Mean dependent var		1604.650
Adjusted R-squared	0.548544	S.D. dependent var		291.1273
S.E. of regression	195.6097	Akaike info criterion		13.48476
Sum squared resid	688736.8	Schwarz criterion		13.58433
Log likelihood	-132.8476	F-statistic		24.08609
Durbin-Watson stat	1.688094	Prob(F-statistic)		0.000113

Here, ssr indicates rice self-sufficiency and insr is indicative of rice insured by the government (Table 8). As we earlier discussed, there is no tight relation between self-sufficiency and other variables. However, this very slight relation is direct in case of rice, in a way guaranteed price, production level and self-sufficiency gave us no meaningful relation. It seems that this policy has created no motivation for increased production and self-sufficiency in the years of study.

Table 8. Rice self-sufficiency and insurance estimation

Dependent Variable: SSR
Method: Least Squares
Date: 05/12/09 Time: 20:04
Sample: 1367 1387
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.593974	0.026003	22.84216	0.0000
BR	8.35E-08	2.06E-07	0.405791	0.6897
R-squared	0.009065	Mean dependent var		0.602513
Adjusted R-squared	-0.045987	S.D. dependent var		0.066805
S.E. of regression	0.068324	Akaike info criterion		-2.434464
Sum squared resid	0.084028	Schwarz criterion		-2.334891
Log likelihood	26.34464	F-statistic		0.164666
Durbin-Watson stat	1.788884	Prob. (F-statistic)		0.689679

CONCLUSION

There is a direct relation between self-sufficiency and production of wheat with insurance and guaranteed price(the direct relation between wheat self-sufficiency and guaranteed price is so pale, This means that wheat producers have not changed their production level based on the previous year guaranteed prices) This direct relation indicates the success of the policy in attaining the intended objectives through production motivation and risk minimization in wheat production process. There is a direct relation between production of rice with insurance and guaranteed price and direct relation between self-sufficiency of rice with insurance and indirect relation between self-sufficiency of price with guaranteed price. That the producers of such agricultural products have increased their production level based on the insurance and guaranteed price (except rice) policies during the above-mentioned years. However, there is no such relation confirmed for barley.

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