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Examining Subsidy Polices on Maize Production in Iran (Panel Data Approach)

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Abstract

Among the agricultural important factors, inputs are the most significant in agricultural production. This article aimed to examine the impact of government subsidy policies on production of one of the most strategic products, namely maize, in Iran. To achieve this goal, panel data for the nine provinces of Iran's major producers of maize during the period of 1999-2007, is used. In this study, first the country's maize production function has been estimated by using data information for inputs: chemical fertilizer, labor, water, seeds and pesticides. And then, calculating the partial elasticity of production factors, sensitivity of production to changes in the value of inputs is evaluated. Also, using a methodology based on the maximum profit, inputs´ demand function is calculated.Results of analyzing government Subsidy Policy showed that, paying subsidy to chemical fertilizer decreases maize production 0.412 percent, because of low demand elasticity of this input. Also according to subsidy of seed, with regard to low demand elasticity of this input to its price, paying subsidy that decreases seed price, wouldn´t have so high effect on its consumption and consequently, on production growth, so that maize production only increased 0.478 percent due to paying subsidy to seed.

Keywords:
Subsidy, Production function, Input demand function, Panel Data, Maize, Iran

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INTRODUCTION

Among the oil seeds in agriculture, maize play an important role as the main energy source for many people in the world and also for poultry. Therefore, the development of the area under cultivation and production is of special priority. During the recent years, the plan of increasing the production of maize in Iran has been associated with considerable successes. As, the amount of maize to produce, has reached from 250 thousand tons in 1992 to average 1,110 tons per year of 1999-2001. In the same period the area under cultivation of maize has increased from 60 thousand hectares to 181 thousand hectares and the yield, of 4100 kg to 6133 kg per unit area. In Iran, three provinces namely: Fars, Khuzestan and Kermanshah are in the first to third place respectively, from the point of area under cultivation and production. The importance of maize in oil and variety of food and starch industries, and many other products that are being used as human food is always emphasized and also, it must be said that approximately 65 to 70 percent of the poultry diets is consisted of maize. And maize is really considered as a strategic and determining good in our country's poultry industry. Various sources of statistics are predicting country's total maize consumption over 2 million and 700 thousand tons per year, and surely, with the increasing population and consumption of population, this figure will increase too. Considering the content expressed, the approaches to the ways of take advantage of available opportunities to achieve higher output at a time when Iran's accession to the WTO is discussed on one hand, and evaluating the technology on maize production and deployment of resources and production facilities of country due to severe lack of studies related to it on the other hand, highlighted the need to conduct this study, and further more researches.

Today, governments in all countries, especially Third World countries, play a crucial role in the growth process and economic development by economic policies. One of the government´s key economic policies is adopting appropriate supportive policies; why, many factors can lead to imbalances between different sectors of production, distribution, consumption and foreign trade.

In Iran the government has always involved in production and pricing of agricultural strategic commodities such as wheat and sugar beets and maize. One part of government policies that have persisted since the last years by now, has been the payment of production subsidies to producers of agricultural commodities that, this has done in terms of various supportive tools, including paying indirect subsidies to agricultural inputs such as fertilizer, pesticides, seed and machinery, to pay damages to agricultural producers, pay part of premiums of agricultural products, guarantee purchase of some basic products, provide services and agricultural researches freely, helping to invest in agro-industry units or payment of damages or exporting awards; that all of these factors can be accounted as production subsidies (Raymond and Renfro, 1992).

In total, according to government budget constraints and the effects of inexpensive and irregular use of the above mentioned inputs, especially chemical fertilizer, it´s necessary to address both the financial aspects of changes in the distribution pattern of the fertilizer input and its welfare effects, too.

In Iran, the payment of subsidies to agricultural inputs are done with the following two objectives (Parmeh, 2004):

1- Strengthen the agricultural sector and domestic capabilities of production to increase the quantity of production, increase competitiveness and improve the quality of the products in this section.

2- Support manufacturers by reducing production costs and finally keep prices of products low in this market.

Experiences and studies done about the use of inputs in agriculture and impact of subsidies shows that, one of the concepts and indicators of liberalization is elimination of subsidies, which in recent decades, this concept in our country, that means the elimination of subsidies as an economic goal of government, especially in the production of strategic crops such as maize has been considered which can be noted on the following selection of internal and external studies.

Debrah (2002) states the main motivation of assistance policies in agricultural sector of world in growth and economic development especially in rural areas, support jobs and investment, protect domestic production and reduce dependence on foreign counties and elimination and poverty reduction to achieve the proper conditions for life.

The general objective of the study was to examine the impact of government subsidy policies on production of one of the most strategic products, namely maize, in Iran.

MATERIALS AND METHODS

Data source

Data used in this study has been collected from the bank's cost of agricultural production from Ministry of Agricultural for the crop year 1999-2007. Statistics are estimated by panel data method. In order to estimate the model and doing the related tests of econometric, Evews6 software is used.

Model specification

Before discussing estimation, first stationary of variables is studied.

In this section, the stationary of whole provinces is tested by Unit Root in panel. In general, there are five tests to determine unit root in panel, most important of all; which are embedded in Eviews6 too, are as follows (Khazayi, 2008):

1- Levin, Lin and Chu test(LIC), (2003)
2- Im, Pesaran and Shin test(IPS), (2003)
3- Breitung test, (2000)
4- Fisher-type tests using ADF and FF tests, (Maddala and Wu (1999) and Choi(2001))
5- Hedri test

Estimating the production function

The importance of choosing the form of function for expressing the relationship between dependent and independent variables is doubled when the model´s estimated parameters to be the basis for new policies. For example, as in present study is considered too, when the purpose of estimating a production function is utilizing the parameters for calculating demand function of inputs and the elasticity of production and decisiding about how to use the inputs, so, carefully selection of correct form of function is of special importance. In the past, many tried to emphasize the importance of true selecting, particularly, correct selection of function form and show the sensitivity of parameters that reveal the structure and economic relations to the selection of functional form. Indeed, in economic literature, discussion and importance of selecting the functional form in production and consumption studies exists when Cobb-Douglas and Stone presented their functional form (Thompson, 1988).

Gujarati (1999) believes, fewer number of parameters, ease of interpretation, computational simplicity, well fit (R^2), power of generalization method and forecasting are other measures that can be useful in determining the econometrics model for the experimental works.

Consistence and compatibility of signs and parameters of function with economic theories are other criteria in superior pattern recognition from the viewpoint of Thompson (Thompson, 1988).

For this reason, with regard to discussed points, four types of flexible production function, included Transcendental logarithmic (Translog), Transcendental, Generalized power and Cobb-Douglas have been estimated by Pooled GLS method as the primary replacement for the relationship between factors of production and production of maize in Iran, and due to mentioned standards, Transcendental logarithmic(Translog) function was selected as the most appropriate maize production function of Iran.

In table 1 the general form of flexible functions estimated in the study, are described.

It should be noted that, although combining the data is of advantages, it creates some problems in model specification and the structure of residual, so that the residual includes errors associated with the time periods and cross sections or a combination of both, that in this connection, the following techniques have been introduced to reduce these problems (Azizan and Salami, 2005):

1- Combining data and using OLS estimation, that in these conditions, the classical assumptions about no correlation and Heteroscedasticity is violated.

2- Using fixed effects model, that is well known as Least Square Dummy Variable model (LSDV).

3- Using Error Component Model and apply GLS methods.

A model that is achieved at this step of our study, is named as common effects model. But in Pool or common effects, intercept and coefficients of the variables are considered as the same for all provinces, but this limitation makes the true relationship between maize production and inputs become distorted and not well displayed. So, as several factors such as economic factors, climate and so on.. are different in various provinces, these differences have reviewed by Panel model in the next steps.

Therefore, Panel model against the Pool, estimates a separate intercept for each unit, so that the difference in intercept or individual effects can be expressed as dummy variables. In other words, a common approach in formulating panel data model, is based on the premise that the difference between units can be shown as the difference in intercept.

Thus, in equation (1) each xi is an unknown parameter that must be estimated. To assume that xi and yi consists of T observation for i th unit and ε_{it} is residual vector. γ_0 is intercept of source unit. The model described can be shown as follow:

$$Y_{it} = \gamma_0 + \sum_{i=1}^{n} \gamma_i D_i + \sum_{j=1}^{m} \beta_j X_{jit} + \varepsilon_{it} \quad (1)$$

D_i is dummy variable that is 1 for i th unit and otherwise have a value of zero.

Test of significance fixed effects

At this step, for choosing the method of estimating between common effects and fixed effects F-test is used.

In general, in panel data it´s necessary initially the homogeneous or heterogeneous of individuals (units) to be tested. If the units are homogeneous, Pooled Least Square method (common effects) can be used simply. otherwise, using fixed effects is necessary. In other words, it is necessary to demonstrate significance of fixed effects or simultaneous significance of dummy variables by using F-test that mentioned above (equation 2).

$$F_{(N-1,NT-N-K)} = \frac{(R^2_{UR} - R^2_R)/(N-1)}{(1-R^2_{UR})/(NT-N-K)} \quad (2)$$

In equation (2), N is the number of cross sections. N-1, the number of limitations in restricted model or in other words, restricted model´s the degree of freedom. K is the number of explanatory variables and T, The number of observations over time.

The fixed effects is suggested as unrestricted model(UR) and pooled method as restricted model (R). thus, R^2_{UR} is the coefficient of determination of unrestricted model and R^2_R is the coefficient of determination of restricted model. So assumptions of the test can be defined as follows, that rejecting the null hypothesis indicates significance of fixed effects and using fixed effects method (Green, 2002).

H_0: provinces have the same intercept.

H_1: provinces have different intercept.

Then, the elasticity of production factors have been calculated and interpreted. Elasticity of inputs in flexible functions, is a function of the amount of the use of inputs and in some cases, production levels. According to the norm in such studies, mentioned elasticities are calculated in average of other factors.

As the production function of the study is translog form, the elasticity of the i-th input, also expressed in Table 1, is defined as the following form:

$$E_{Pi} = (\beta_i + \beta_{ii} (\ln X_i) + \sum_{j=2}^{n} (\ln X_i)\,) \quad (3)$$

Input demand function

The demand function of input is mathematical expression of the amount of applied input for business in various prices of inputs, product prices and income of firm. Input demand function, depending on including one or more variables and current and durable inputs, can be different shapes, that in this study, assuming a competitive market, input demand function will be obtained from the condition for profit maximization (Dejpasand, 1991). Although the monopoly of the corn market, and most agricultural products, using this relationship may not be correct, but due to lack of awareness maize buyers´ function using this approach is Justifiable.

Condition for profit maximization, in the case of allocating multiple inputs to produce a product in a competitive market is according to (4) equation:

$$VMP_x = P_x \rightarrow MP_x . P_m = P_x \quad (4)$$

For translog production function, equation (4) will be as follows:

$$P_y . \left(B_i + \beta_{ii} (\ln X_i) + \sum_{j=2}^{n} (\ln X_j) \right) = P_x$$

By displacing the elements of first order conditions of maximization(provided the second-order conditions), the input demand function is obtained that, with the placement of input and product prices in it, optimal amount of each input can be achieved. It should be noted, to calculate the demand functions, instead of other inputs, the average amount of inputs are used in the given years.

Finally, using the demand functions for inputs and assuming that the values of other inputs are consistent and the market is competitive, Price elasticity of inputs´ demand are calculated in accordance with equation (5):

$$E_{ii} = \frac{\partial \log X_i}{\partial \log P_i} \times 100 \quad (5)$$

RESULTS

In order to examine the impact of government subsidy policies in maize production, the elasticity of factors of production and then, price elasticity of demand were calculated. So, primly, maize production function is estimated by panel approach and then input demand functions are given.

Results of estimating production function

First, the stationary of the natural logarithm of all variables used in the model were tested. Results showed that all variables are stationary in levels(have unit root). According to the discussions, four types of flexible production function as expressed functions in table (1) are estimated by pooled GLS method, for five inputs including chemical fertilizer **(X_f)**, seed **(X_s)**, water **(X_w)**, labor force **(X_l)**, poison **(X_p)**, as the primary replacement for the relationship between factors of production and production of maize in Iran. The results of estimation along with t statistics obtained for each coefficients as well as R2 & D and F statistics associated with each of the equations are given in Table 2.

Translog production function for a single crop mode with five inputs (labor, seed, fertilizer, water and pesticides) are defined as follows:

$$ln(Y) = \alpha + \sum_{i=1}^{5} \beta_i \, ln(X_i) + 1/2 \sum_{i=1}^{5} \gamma_{ii} \, (ln\, X_i)^2 + \sum_{i=1}^{1} \sum_{j=2}^{5} \gamma_{ij} \, (ln\, X_i)(ln\, X_j) \quad (6)$$

Considering F statistics, indicates that the regression is significant at a high level that the value of 56.20 for it, confirms this fact. This function´s determinant coefficient was obtained 0.82, this means that, 82 percent of changes in maize production are explained by exogenous variables. About Dourbin-Watson statistic, notifying this point is necessary that, despite getting the value of 1.16 for this statistic, although this figure doesn't represent the absence of serial correlation between the components of residuals of model, but basically serial correlation in pooled

Table 1: General form of flexible functions estimated in the study

Function name	Functional form	Elasticity of input i, (E_{xi})	The number of parameters
Transcendental logarithmic (Translog)	$\ln(Y) = \alpha + \sum_{i=1} \beta_i \ln(X_i) + 1/2 \sum_{i=1}^{n} \gamma_{ii} (\ln X_i)^2 + \sum_{i=1}^{n}\sum_{j=2}^{n} \gamma_{ij} (\ln X_i)(\ln X_j)$	$(\beta_i + \beta_{ii} (\ln X_i) + \sum_{j=2}^{n} (\ln X_j))$	1/2(n+1)(n+2)
Transcendental	$Y = \alpha \prod_{i=1}^{n} X_i^{\beta i} e^{\gamma i * xi}$	$((\beta_i / X_i + \gamma_i) * X_i$	2n+1
Generalized power	$\ln(Y) = \alpha + \sum_{i=1}^{n} \beta_i X_i + 1/2 \sum_{i=1}^{n} \gamma_{ii} (X_i)^2 + \sum_{i=1}^{n}\sum_{j=2}^{n} \gamma_{ij} (X_i)(X_j)$	$(\beta_{i} + \gamma_{ii} (x_i) + \sum_{j=2}^{n} \gamma_{ij(x_j)})(x_i / y)$	1/2(n+1)(n+2)
Cobb-Douglas	$Y = \prod_{i=1}^{n} X_i^{\beta_i}$	β_i	n+1

Table 2: The results of estimating production function as Pool, during 1997-2007

Parameters	Translog Function		Transcendental		Generalized power		Cobb-Douglas	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
INTERCEPT	-273.28* (0.0008)	-3.52	0.42 (0.98)c	-0.24	-68499.49 (0.77)	-0.28	*11.59 (0.000)	5.22
X_f	-	-	-0.001 (0.74)	-0.33	-2152.84 (0.58)	-0.58	-	-
X_s	-	-	-0.18 (cc0.68)	-0.40	8073.63 (0.40)	-0.83	-	-
X_w	-	-	-0.0007 (0.10)	-1.64	-242.48* (0.01)	-2.44	-	-
X_l	-	-	-0.0002 (0.10)	1.63	755.74 (0.55)	-0.59	-	-
X_p	-	-	-0.15* (0.0018)	3.24	140812.2* (0.000)	4.48	-	-
lnX_f	48.12* (0.0056)	2.86	2.55 (0.40)	-0.84	-	-	*-0.78 (0.01)	2.46
lnX_s	68.02* (0.0012)	3.38	-0.70 (0.70)	-0.37	-	-	-0.08 (0.69)	-0.39
lnX_w	9.50* (0.0007)	3.56	-0.49* (0.04)	-2.04	-	-	-0.93* (0.000)	-9.79
lnX_l	-11.58* (0.0003)	-3.82	-0.15 (0.32)	-0.98	-	-	-0.02 (0.83)	-0.20
lnX_P	1.25- (0.23)	-1.19	-0.14* (0.02)	2.33	-	-	*-0.31 (0.000)	5.50
$(1/2)(lnX_f)^2$	-2.63 (0.24)	-1.18	-	-	-	-	-	-
$(1/2)(lnX_S)^2$	3.18- (0.08)	-1.75	-	-	-	-	-	-
$(1/2)(lnX_W)^2$	*0.46- (0.005)	-2.87	-	-	-	-	-	-
$(1/2)(lnX_L)^2$	-0.03 (0.72)	-0.34	-	-	-	-	-	-
$(1/2)(lnX_P)^2$	*-0.10 (0.000)	5.63	-	-	-	-	-	-
$(1/2)(X_f)^2$	-	-	-	-	1.10* (0.02)	2.29	-	-
$(1/2)(X_S)^2$	-	-	-	-	-71.19 (0.48)	-0.70	-	-
$(1/2)(X_W)^2$	-	-	-	-	-0.24* (0.000)	5.52	-	-
$(1/2)(X_L)^2$	-	-	-	-	-0.09 (0.39)	-0.85	-	-
$(1/2)(X_P)^2$	-	-	-		-15922.2* (0.000)	-4.98	-	-
$(lnX_f).(lnX_S)$	-8.53* (0.0007)	-3.56	-		-	-	-	-
$(lnX_f).(lnX_W)$	-1.16* (0.0060)	2.83.	-		-	-	-	-
$(lnX_f).(lnX_L)$	1.74* (0.0005)	3.65	-		-	-	-	-
$(lnX_f).(lnX_P)$	-0.27 (0.08)	1.74	-		-	-	-	-
$(X_f).(X_S)$	-	-	-		-8.06 (0.49)	-0.68	-	-
$(X_f).(X_W)$	-	-	-		-0.19 (0.11)	-1.61	-	-
$(X_f).(X_L)$	-	-	-		-1.48 (0.50)	-0.67	-	-
$(X_f).(X_P)$	-	-	-		-68.23 (0.06)	-1.87	-	-
R^2	0.81		0.67		0.73		0.62	
D.W	1.16		1.09		1.06		1.23	
Prob (F-statistic)	0.000		0.000		0.000		0.000	

Table 3: Results of estimating production function as Panel

Explanatory variables	Coeficients	t-statistic
INTERCEPT	-147.99	-3.157
ln Xf	22.04	2.11
ln Xs	45.10	3.91
ln Xw	3.57	2.18
ln Xl	-0.33	-0.17
ln Xp	-0.22	-0.33
$(1/2)(\ln Xf)^2$	0.036	0.02
$(1/2)(\ln Xs)^2$	-2.05	-2.33
$(1/2)(\ln Xw)^2$	0.013	0.13
$(1/2)(\ln Xl)^2$	0.018	0.50
$(1/2)(\ln Xp)^2$	0.054	4.41
(ln Xf).(ln Xs)	-5.68	-0.88
(ln Xf).(ln Xw)	-0.57	-2.36
(ln Xf).(ln Xl)	0.040	0.13
(ln Xf).(ln Xp)	0.072	0.71
Fixed Effects (Cross)		
_K-C	0.061367	
_KSH-C	0.965216	
_F-C	1.945700	
_G-C	0.0194760	
_H-C	0.715147-	
_Y-C	1.329720-	
_KH-C	1.0823061	
_SI-C	0.958845-	
_ES-C	1.070352-	
R2	0.97	
D.W	1.38	
Prob(F-statistic)	0.000000000	

data, has not so much problem, then, the results of model will be usable (Rashidghalam, 2010).

The model that is achieved at this stage, named common effects model, that its specification is according to equation (4):

$$\ln y = -273.28 + 48.12 \ln X_f + 68.02 \ln X_s + 9.50 \ln X_w - 11.58 \ln X_l - 1.25 \ln X_p - 2.63(\ln X_f)2 - 3.18 (\ln Xs)2 - 0.46 (\ln X_w)^2 + 0.03 (\ln X_l)^2 + 0.10 (\ln X_p)^2 - 8.53 (\ln X_f).(\ln X_s) - 1.16 (\ln X_f).(\ln X_w) + 1.74 (\ln X_l) + 0.27(\ln X_f).(\ln X_p) \quad (7)$$

But as mentioned before, in the pool, the coefficients of the variables and intercept are considered the same for all provinces, but this limitation makes the true relationship between maize production and production inputs become distorted and not be shown well. Therefore, as mentioned in the introduction, as several factors such as economic factors, climate and so on… vary in different provinces, at the next stage these differences will be checked by the Panel.

Thus, fixed effects model, which is our main model of panel, is as following form:

$$Ln\ Y = 0.06 + 0.96D_1 + 1.94D_2 + 0.19D_3 + ... - 1.07 D_8 + 22.04 \ln X_f + 45.10 \ln X_s + 3.57 \ln X_w - 0.33 \ln X_l - 0.22 \ln X_p + 0.36(\ln X_f)^2 - 2.05 (\ln X_s)^2 + 0.13 (\ln X_w)^2 + 0.18(\ln X_1)2 + 0.54(\ln X_p)^2 - 5.68(\ln X_f).(\ln X_s) - 0.57(\ln X_f).(\ln X_w) + 0.40(\ln X_f).(\ln X_1) + 0.72(\ln X_f).(\ln Xp) \quad (8)$$

As can be seen, in this estimate, a separate intercept is obtained for each province, the constant amount of intercept corresponds to Kerman province, with value 0.06, and if D1 = 1, the observations corresponds to Kermanshah, and is zero otherwise. For other dummy variables is interpreted like this. The question that comes to mind at this step, is that, which of the two estimated models are preferred? model (7) or model (8)…that is answered by F-test:

$$F = \frac{(0.97 - 0.81)/8}{(1 - 0.97)/58} = 38.66$$

Consequently, the null hypothesis that provinces have the same intercept, is rejected and fixed effects approach is accepted.

In this stage of research, one important point is necessary to be mentioned. In case of random effects estimation, the number of cross sections should be higher than the number of variables. Otherwise, we´ll face with an error message (Ashrafzadeh and Mehreghan, 2008). So, considering that in this study we have such a situation too, this case will occur. Thus, we stopped the work at this point and accepted the estimation by fixed effects method and we don´t need doing Hasmn test to choose between two methods of estimation, fixed and random effects.

Choosing fixed effects method has two important reasons c (Jhonston, 1997):

1- If the actual model is random effects and estimated by mistake by fixed effects, the estimation is consistent. But if the actual model is fixed effects and estimated wrong by random effects, the estimation is not consistent. Therefore, the precaution would be using fixed effects estimation method.

2- When the number of cross sections is less than the number of coefficients to be estimated, using random effects is not possible.

Calculate the partial elasticity of maize production

Results of calculating elasticity of production factors, according to equation (3), to determine the factors affecting the production of maize in country and show the amount of each input´s role in increasing or decreasing of production, are shown in table 4.

Results indicates that, production elasticity of chemical fertilizer is negative, that means 1 percent increase in consumption of chemical fertilizer, will decrease product 2.73 percent. This shows that, farmers are actually active in third area of production (the non-economic area), in other words, use this input more than optimal level in maize farms. The economical reason of this issue, is related to the prices of this input, that's why, chemical fertilizer is the subsidized input that, by receiving government subsidies, the price of it fell down and get away from its real price. So, farmers can buy and use it more than necessary. Therefore, it can concluded that as the input subsidy is reduced or eliminated, we´ll see optimal and economical use of it by farmers in second area of production. And finally, increased maize production in our country, in future.

Also, the numerical value of water elasticity is equal to (-0.51) which shows that, maize farmers are not doing economical in use of this input and are in third area or production. So, causes the indiscriminate loss of this valuable input into in farms.

Elasticity of seed was calculated 2.78, which indicates that one percentage change in consumption of seed will increase the production of seed 2.78 percent.

For labor, this value was obtained 0.38, that means a 0.38 percent increase of production due to one percent increase in applying the labor force.

Production elasticity of Poison is equal to 0.11 which shows, one percentage increase in consumption amount of this input, increases the production of maize by 0.11 percent. Poison is not included as subsidized inputs, so, optimal and appropriate use of it by farmers is not unexpected.

Results of calculating input demand functions

Demand for farm inputs, is a derived demand and its value largely depends on the demand for agricultural products. In general, demand for input in agricultural economics depends on following factors:

1- Price of product being produced

2- Input´s price

3- Price of substitute and complementary inputs in that exist in production function.

4- Technology coefficient or fixed parameters

Table 4: Results of calculating partial elasticity of production factors

Input	Fertilizer	Seed	Water	Labor	Poison
Elasticity	-2.73	2.78	-0.51	0.38	0.11

Source: Research findings

Table 5: Calculating input demand functions

Inputs	Input demand functions
Chemical fertilizer	$P_m.(22.04-0.36 \ln X_f -5.68 \ln X_s -0.57 \ln X_w +0.4 \ln X_l +0.72 \ln X_p).(M/X_f)=P_f$
Seed	$P_m.(45.10-2.05 \ln X_s -5.68 \ln X_f).(M/X_s)=P_s$
Water	$P_m.(3.57+0.13 \ln X_w -0.57 \ln X_f).(M/X_w)=P_w$
Labor	$P_m.(-0.33+0.18 \ln X_l +0.4 \ln X_f).(M/X_l)=P_l$
Poison	$P_m.(-0.22+0.54 \ln X_p +0.72 \ln X_f).(M/X_p)=P_p$

Table 6: results of calculating the price elasticity of demand for factors of production

Input	Fertilizer	Seed	Water	Labor	Poison
elasticity of demand	-0.151	-0.172	-0.189	-0.109	-0.047

of production function.

5- Under certain conditions, available budget for purchase of input that may be effective on input demand function .

Input demand functions are given in table (5).

Calculating price elasticity of demand

One indicator that can display the technology of a production unit as summary is Price elasticity of demand for production inputs. Own price elasticity of demand for a production input, shows percent of changes in quantity demand of that input as a result of changes in price of input. Which is defined as follows:

$$E_{ii} = \frac{\partial \log X_i}{\partial \log P_i} \times 100 \qquad (9)$$

In this study, using demand functions for inputs, obtained in the previous section, assuming that the values of other inputs are constant and the market is competitive, the price elasticity of demand for inputs are calculated as equation (9) and results are given in table 6.

According to table 6, all price elasticity of demand has proper and reasonable sign which are consistent with economic theories and show, there is an inverse relationship between prices and quantities of inputs. Also based on the results, the sensitivity of demand of corn farmers to all corn factors is smaller than one and therefore, the amounts of these inputs to their price has low elasticity. That means for every one percent change in input prices, the demand of inputs change less than one percent.

Also, the demand elasticity of labor to price changes is very small. Therefore, labor force does not adjust for changes in the wage and significant changes in the amount of labor, with an increase or decrease in wages, won't occur.

DISCUSSION

The purpose of subsidy policy and subsidizing, is to reduce production costs and increase farmer income, increase production, reduce imports and therefore reduce foreign ownership. On the other hand, considering the high cost of subsidizing chemical inputs, according to government subsidies should be completely removed and this cost of fertilizer should be used to produce better quality crops.

Our farmers just think to increase production per hectare through the overuse of chemical fertilizers than the quality of crops. If the price of inputs be too low, its use and application will increase without any restrictions, and this leads the farmer to use the input regardless of the ultimate efficiency. Thus, removal of subsidies, without negative effect on the production, can remove a heavy financial load of the government. Therefore, analysis and evaluation of factors affecting agricultural production and policy of price guarantees, easy access of producers to agricultural market and et al, is inevitable in politics.

For more detailed analysis of the effects of subsidy policies and examine the impact of subsidizing on maize production, Chart 1 is used.

Government's policy of subsidizing on input, will reduce its price. According to demand law, as the price and quantity have an inverse relationship to each other, the demand for it increases. If input demand be elasticity to price, reducing price, causes more consumption of

Table 7: Results of the impact of subsidy policy of inputs on maize production

Input	Chemical fertilizer	Seed
Elasticity of demand	-0.151	-0.172
Partial elasticity of production	-2.73	2.78
Percentage of changes in production, per one Percent change in input´s price	-0.412	0.478

input. Now if the partial elasticity of production to this input be negative, increasing consumption of it will reduce production. If the partial elasticity of production is between zero and one, increasing its consumption will increase production; but production rate increases less. If the partial elasticity of input production be greater than one, by increasing consumption of it, production will increase more. Based on Table 7, the partial elasticity of chemical fertilizer production is -2.73, increased consumption of this input which is the result of its reduced price through subsidy policy, reduces maize production by 0.412. So it can be concluded that subsidy policy of government to increase maize production has not been successful.

Also in relation to seed subsidy, with regard to low elasticity of this input to its price, it can be analyzed such as that, in return for subsidizing seed and reducing its price, according to own price elasticity of it that is equal to -0.172, the consumption of input increases much less than price reduction. As well as, production elasticity of input is positive and equals to 2.78. That means, farmers use this input in the first economic area. Increasing use of input, affects the production and increases the production to the rate of 0.478. It can be concluded that, demand and consumption of seed is inelastic to price changes and subsidies, which will reduce the price of seed, won't have so important effect on its consumption, in result of production increase. So here it is also clear that the policy of subsidy on corn production had little effect and only had great financial burden on the state (Table 7).

CONCLUSIONS AND RECOMMENDATION

1- According to numerical results, the production elasticity of fertilizer was obtained a negative value, indicating that: due to low price of this input because of subsidies, farmers do not use this input economically and use it in the third area of production(non-economic region).

2- According to the results, the best production function for corn production of Iran, based on test F, is Translog production function with fixed effects and coefficients of the inputs: fertilizer, seed, water and labor have a significant effect on the production of this strategic crop and estimated production function has diminishing returns to scale.

3- Results show that the elasticity marks are fully consistent with economic theories which express the right choice of production function and appropriate use of integrated data versus just cross-sectional or time series data.

4- In estimating the intended model of this study, based on provincial observations, the heterogeneity of provinces should be considered. As can be seen, if the production function is estimated regardless to this matter, estimates will be significantly different from the reality. (Comparison of the common effect method and fixed effects).

5- Results indicate that, demand elasticity of corn farmers to changes in price of all inputs is less than one, in other words, farmers are indifferent to changes in inputs.

6- As demand for chemical fertilizer is inelastic to its price(-0.151), on price reduction of this input due to subsidizing, increase level of its consumption, is less than the rate of price reduction. So changes in fertilizer price won't have any important effect in its consumption. Results showed that, per reducing the fertilizer price due to subsidy policy, corn production decrease to 0.412 percent. That means, government's policy of Subsidizing chemical fertilizer in corn production of country is not efficient.

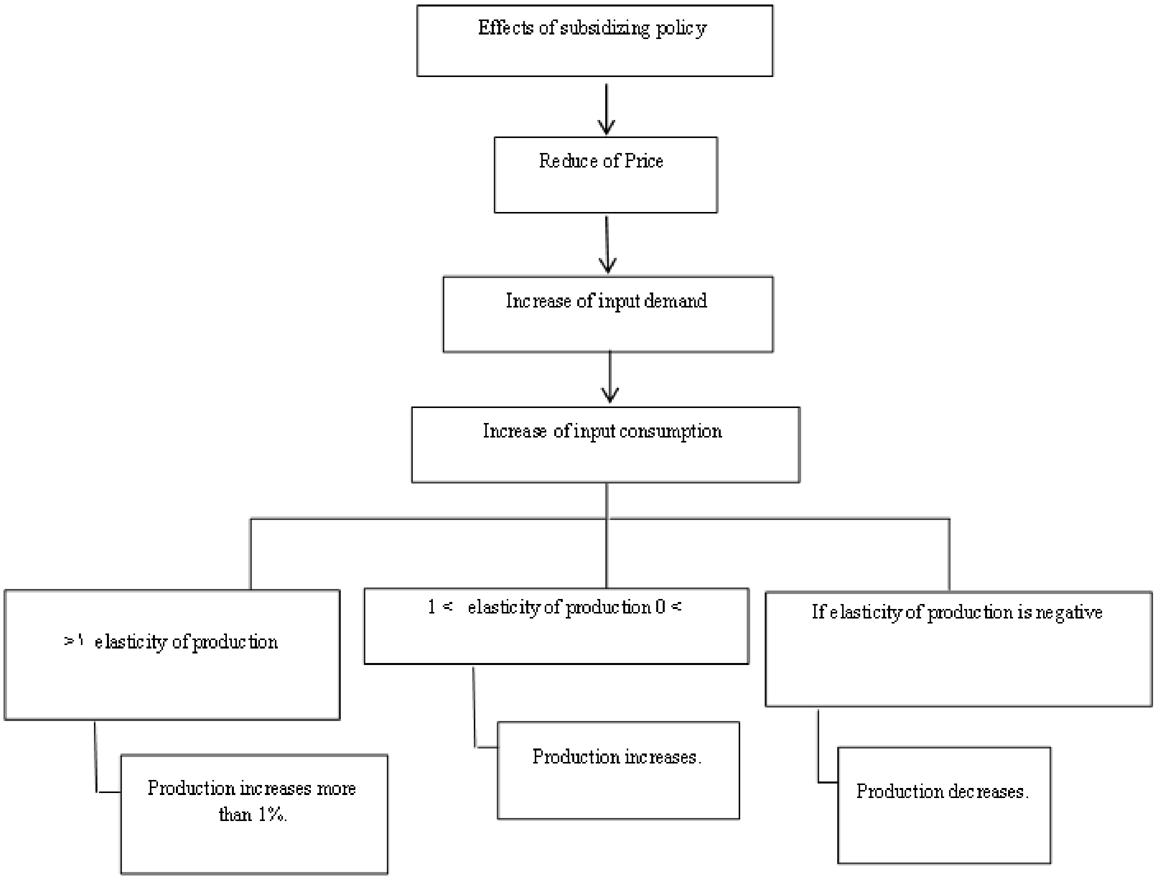

Chart 1: The effects of subsidizing production inputs´ policy
Resource: Rashid ghalam, 2009

Policy recommendations

7- Based on results, it´s revealed that corn farmers are using water too much which must be taken strategies to reduce the consumption of this valuable input. So, it is recommended, to better use of this input, using modern irrigation systems will provide necessary field of investment.

8- About two inputs: fertilizer and seed, price policy, including subsidies, or elimination of subsidies, will not cause so much changes in use of them. On the other hand, fertilizer subsidies reduce the production. So, it is recommended, eliminating subsidies and bringing prices to competitive prices, on one side a heavy financial burden of government is removed and on the other hand, environmental damages is prevented. But it should be kept in mind that, with sudden removing of subsidies, small farmers may be strongly affected and even, may lead them removed from production cycle.

9- Equivalent to the removed subsidies, either direct, cash and based on yield or Acreage, is better to pay to farmers. Moreover, removed subsidies can be allocated to other agricultural inputs or to indirect support policies such as reducing insurance premiums of farmers.

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