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SUPPLY RESPONSE ANALYSIS OF IRAQI WHEAT GROWERS

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ABSTRACT
Alternative specifications of model of supply response of Iraq wheat growers and their economic implications are considered in terms of the existences and nature of production lags, and the choice between expected wheat and gross returns as the preferred explanatory of producer's response to changing economic condition. The analyses indicate that there are lags which are due primarily to the difficulties and cost of rapid adjustment rather than to the time required to revise expectations. The statistical results were similar for the alternative specification of gross margins and wheat as the economic decision available. However, the wheat elasticities derived using the gross margins specification were about a third of those using the wheat specification. The gross margin specification yielded additional information in the form of yield and input cost elasticities.

INTRODUCTION
Agriculture is the largest sector of Iraqi's economy. The agriculture sector contributes around 24.1 percent in GDP, and engaged half of the total employed labor force. It is largest source of foreign exchange earnings and meets raw material needs' of country's major industries such as textile and sugar production.(Economic Survey of Iraq 2013-07). The growth in the agriculture sector increased from 4.6 percent to 7.8 percent in the current year. This increase attributes to 9 percent expansion in major crops, 4.9 in minor crops, 5.6 percent in livestock, and 8.3 in fisheries sector. A feature of improved growth in the agriculture sector is record production of wheat and wheat and recovery in cotton (Economic Survey of Iraqi 2013-07).

Improved growth in a agriculture sector is attributed to the government's agricultural policy reforms such as waiving of interest on loans, support wheat policy and introduction of micro credit facility. The growth is also attributed to timely measures to get cotton out of deep-seated crisis (at, el, S.M.Nasir) Wheat is the second principal food and commercial crop and occupies about 10% of the total cropped area. The total cropped under the wheat during the year 2014 thousand hectares, and production was 1983(Economic survey of Iraq 2013-005).

A considerable number of studies have focused on agricultural supply response to price and non-price factors with wide range of crops over the years. More important, expanding cultivated area is a viable option for increasing production (Molua, 2010). Understanding how producers make decisions to allot acreage among crops and how decisions about land use are affected by changes in prices and their volatility is fundamental for predicting the supply of staple crops and, hence, assessing the global food supply situation (Haile et al. 2013).

The government of Iraq is taking effective measures to increase the yield, production and quality of export wheat. Research efforts are continuing on developing high yielding varieties of Wheat. Emphasis is also being laid on agronomic research as well as on improved extension services, fertilizer use, direct seedling etc. The flow of input and credits is also being substantially increased. Very little analytic research as per the knowledge of this researcher has been carried out on acreage response of wheat growers in Iraq(Bailey and Womack (1985); Gulati and Kelley (1999); Mahmood et al (2007); Molua (2010).Thus there is an intense need to study acreage response of wheat growers to price and non-price factors in Iraq to give an insight to policy makers for allocation of land and production of maize in Iraq. The research was investigated with the objectives to determine the factors that affect the supply of wheat in Iraq, and to estimate the short run wheat elasticities of wheat in Iraq.

THEORETICAL MODEL AND DYNAMIC SUPPLY ANALYSIS
An agriculture supply function describes how the quantity of the product offered for sale varies as its wheat varies to relative to other product wheat (Cochrane 1995). Cochrane distinguishes between supply function

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response. The supply function describes the quantity, which would be supplied at different wheat's with all other things constant, while the supply response relationship describes what will happen to the quantity supplied when all other things are not held constant. Nerlove(1958) provided much of the theoretical frame work in the supply response studies, and (Rao J.M et al 1999) of the response analysis of agricultural commodities.

Let the supply equation be:

Qt = ao+ a1 P* t + a2 pt -1+ zt+ Dt ……(1)

Where **Qt** = Quantity produced in time t

P = Actual price of wheat

P* = Expected price wheat

$\mathbf{P_{t-1}}$= Lagged Price of Wheat

Zt = Supply shifters

Dt = Dummy variable

The expected wheat is not observable and is explained as expected 'normal' wheat, ie, the level about which the future wheat is expected to fluctuate. This can be expected as:

$\mathbf{P^* - P^*_{t-1} - \beta(P_{t-1}-P^*_{t-1}),\ 0\leq \beta\leq 1}$**……. (2)**

Assume $\mathbf{\beta=1= P^*=P_{t-1}}$

We can get the following equation by getting the value of P* from equation (2) and substituting in into equation (1) and rearranging it,

$\mathbf{Qt = bo + b1\ P_{t-1} + b2\ Qt + b3\ Zt - 1 + b4\ Zt}$**……. ……(3)**

The equation **(3)**: can be estimated economically.

To estimate elasticities the formula used was $\mathbf{\partial Q/\partial P.\ P/Q}$ the first term for short and long run will be

Short run $\mathbf{\partial Qt/\partial P_{t-1}}$ and Long run**: b1/1-b2**

ANALYTICAL MODEL AND METHOD OF ESTIMATION

The main interest of this study is the response of total planned output to a number of variables, because the planned output is an unobserved variable so time series data on planned output are not available. Hence, a proxy of actual output has to be used in analyzing the response of planned output of wheat to variation in its wheat. The second analysis in this paper is done by taking the acreage under wheat a dependent variable. Area is concerned to be a reasonably good proxy for production so long as it is a major input. The main objective of supply response studies is to analyze the movements in the intended acreage to wheat changes. The actual acreage may not reflect the intended acreage due to certain constraints (Lim, 1975). Necessary time series data over the years 1983-2014 were collected from the secondary sources.

Variables included in Econometric Model

IProduction of Wheat $\mathbf{(QR_t\ 1.\ )}$

Depended variable was total production of wheat in Iraq. The time series data of wheat production were collected from different sources.

2*. Acreage under Wheat* $\mathbf{(AW_t)}$

Acreage under wheat in Iraq was taken as a dependent variable in the acreage response model. Time series data were collected from government publications.

3*. Lagged of Wheat* $\mathbf{(PW_{t-1})}$

The data on wheat of were collected from 1983-2014. The lagged value of wheat has direct relationship with production and acreage under wheat t. Therefore, the coefficient of this variable should have a positive sign.

4*. Lagged production of Wheat* $\mathbf{(PW_{t-1})}$

This variable is expected to have a significant impact on production of wheat in year t. This variable was expected to have a positive sign.

5*. Lagged acreage under of Wheat* $\mathbf{(AW_{t-1})}$

The lagged acreage under wheat also has a positive impact on the acreage under wheat in year t. The variable has a positive sign.

6*. Lagged production of Cotton* $\mathbf{(PC_{t-1})}$

The lagged wheat of cotton has an inverse relationship with production and acreage under wheat because the cotton is competitive crop. Therefore the coefficient of this variable was expected to have a negative sign.

7. *Dummy Variable* $\mathbf{(D_t)}$

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Due to war, a dummy variable for the year 1983-2014was added to adjust the disruption to agriculture production. The coefficient of this variable was expected to have a negative sign for production and acreage under wheat.

MATHEMATICAL FORM OF THE MODEL

The following models were chosen among the various mathematical forms on the basis of economic, statistical and econometric criteria

A. Production Response :

QRt = f (PW t-1, QW t-1, PW t-1, D t, et)

:

B. Acreage Response

AW_t = f (PW t-1,QWT-1, AW t-1, PC t-1,D t, e t) where,

AW_t: Is the total acreage under wheat (000 hec) in year **t**.

PW_{t-1}: Is the wholesale wheat of Wheat (Rs/mounds) in year **t-1**.

QW_{t-1}: is the total wheat production (000 tones) in year t-1.

AW_{t-1}: is the total acreage under Wheat (000 hec.) in year t-1.

PC_{t-1}: is the wholesale wheat of Cotton (Rs/mounds) in year t-1.

Dt is the dummy variable for war. et is the random disturbance term.

RESULTS AND DISCUSSION

The time series for the present study was from 1983 to 2014 and secondary data will be collected for the analyses. The results presented in **Table1**, and **2**:

(A) Production Response

Ln QWt = 2.83 + 0.185 Ln PW t-1+ 0.553 Ln QW t-1- 0.017 Ln PC t-1 – 0.358LND t

Variable	Co-efficient	Standard Error	Ratio– t	Significant
Constant	2.83	0.860	2.948	***
Pwt-1	0.183	0.077	2.468	**
Qwt-1	0.553	0.123	5.282	***
PCt-1	-0.017	0.083	0.230	----
Dt	- 0.358	0.103	2.489	**
R2	0.9674			
R2 (Adjusted)	0.9629			

Notes: *** = Significant at 1 percent level of Significance.
** = Significant at 5 percent level of Significance.

INTERPRETATION OF RESULTS

The examination of the co-efficient of determination for production response equation indicated that 96% variation in the production of wheat in Iraq was explained by the explanatory variable included in the model.

A) Lagged production of Wheat (PW_{t-1})

The Coefficient of lagged wheat of wheat had a positive sign with a value of 0.183. The coefficient is significant at 5% confidence level, which indicated that with one unit increase in the wheat of the wheat in the last year, the production increased by 0.183 units. The sign and magnitude of co-efficient was according to expectations. Result is similar to that of Mahmood et al. (2007), Molua (2010) and Bailey, Gulati and Kelley (1999), Mahmood et al. (2007).

B): Lagged wholesale of Wheat (QW_{t-1})

The co-efficient of this variable had a positive sign with a value of 0.553 and was significant at 0.1 confidence level, which showed that lagged production of wheat had a significant influence on the production of the wheat. The size and sign of c0-efficient was according to the expectations based on theory. This result is in conformity with the results of Gulati and Kelley (1999), The result is in contradiction with the findings of Molua (2010).

C): Lagged wheat of Cotton (PC_{t-1})

The lagged wheat of cotton hah a negative sign with a value of 0.017 and non significant. The sign of co-efficient indicated that lagged wheat of cotton and wheat production had an inverse relationship, as both are competitive crops. The co-efficient is non-significant because cotton is mainly grown on marginal land and has little influence on production of wheat, like Mahmood et al. (2007). However, it opposes the finding Gulati and Kelley (1999) who observed that this factor is not a significant variable explaining *Production* changes.

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***D)**: War Dummy (**Dt**)*
The dummy variable represented the war iraq. The co-efficient was negative, as was expected with a value of 0.358 and a significant at 5 percent confidence level. The negative influence of war on production might be due to non-availability of inputs at crucial stages in the production.

B) Acreage Response

Ln AWt = 8.4 + 0.087 Ln PW t-1+0.165LnAWt-1+ 0.054 Ln PC t-1 – 0.0936LnD t

Table.2 Structural co-efficient, their significance and value of R2 for wheat production response in Iraq (1983-2014)

Variable	Co-efficient	Standard Error	Ratio– t	Significant
Constant	8.4	1.043	6.518	***
Pwt-1	0.0875	0.0389	2.478	**
Awt-1	0.165	0.128	1.235	----
PCt-1	0.054	0.035	1.67	----
Dt	- 0.085	0.0486	1.924	**
R2	0.9604			
R2 (Adjusted)	0.9564			

Notes: *** = Significant at 1 percent level of Significance.
** = Significant at 5 percent level of Significance.

INTERPRETATION OF RESULTS

The examination of the co-efficient of determination was 0.0875, which indicated that 95% percent variation in the acreage under wheat in Iraq was being explained by the independent variable included in the model.

***A)**: Lagged price of Wheat (**PW_{t-1}**)*
The Coefficient of lagged wheat of wheat had a positive sign with a value of 0.0965. The coefficient is significant at 5% confidence level, which indicated that lagged wheat of wheat had significant influence on acreage under wheat. Result is similar to that of Mahmood et al. (2007), Molua (2010) and Bailey and Womack (1985)who observed that the Lagged price factor is a significant variable explaining area changes. However, it opposes the finding Gulati and Kelley (1999) who observed that the price factor is not a significant variable explaining area changes.

***B):** Lagged production of Wheat (**AW_{t-1}**)*
The lagged acreage under Wheat had a positive sign, according to expectations, with a value of 0.165 and was non-significant. This indicated that scope of horizontal expansion in iraq was limited. like Mahmood et al. (2007), These results are in contrast to the findings of Tey et al. (2009) and Molua (2010), which shows significant effect of Lagged production area allotment in Malaysia and Cameroon, respectively.

***C):** Lagged production of Cotton (**PC_{t-1}**)*
The co-efficient of this variable had a positive sign with a value of 0.054 and was non-significant. The unexpected sign of co-efficient showed that wheat of cotton had no influence on the acreage of the wheat as the cotton are sown on marginal lands. Like Gulati and Kelley (1999). These results are in contrast to the findings of Mahmood et al. (2007).

***D) :**War Dummy (**Dt**)*
The dummy variable represented the war iraq , the co-efficient was negative, as was expected with a value of 0.085 and a significant at 5 percent confidence level. This indicated that war had a negative impact on the acreage under wheat, which might be due to destruction of irrigation and other infrastructure and non-availability of inputs and other services.

ELASTICITIES

The estimated short-run and long run elasticities for production and acreage response under wheat are summarized in Table.3

Elasticity	Production Response	Acreage Response
Short Run	0.184	0.080
Long Run	0.44	0.110

CONCLUSION

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The "best" model was a long linear form, many variables were not including in the model due to non-availability of data, and important variables are included. The results of the analysis indicate that wheat growers are response to changes in the wheat case of production and acreage under wheat response. The lagged wheat of cotton has no significant impact on the production of wheat and acreage under wheat. This may attributed to the reason that cotton is grown on marginal lands and usually in the western areas of Iraq. The cultivation of cotton is also risky due to the attack of pests. The dummy variable for the war period had a negative impact both on production and acreage under wheat in the years 1983-2014. The co-efficient of lagged acreage was non significant, which indicated that horizontal expansion in area is limited in Iraq, any increase in production will come through vertical expansion in future. This is a policy implication for government policy makers and researchers. With regards to elasticities. The own wheat elasticity of wheat is 0.183 and 0.522 for short-run and long run production response and were acceptable on economic and statistical criteria. there is a need of research to find out the problems faced by the farmers in order to tackle them and increase wheat acreage.

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