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The Wheat Cropping Pattern in Iran

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Abstract: The area under different crops obviously depends upon a number of factors including temperature and rainfall and economic issues such as, marketing affairs. However, this paper has paid attention only to prices volatility as one of the most important components in market performance. The research's main objective is to determine wheat cropping pattern in the provinces of Iran. To do so, we have estimated the wheat share equation considering barley and maize crop in cropping pattern. The results showed that the coefficient of share of wheat crop in each year has affected strongly share of wheat in cropping pattern in next year. However, the coefficient of wheat price in each year is too small that its volatility affects the wheat cropping pattern. This indicates that probably the cropping pattern depends upon other factors, such as soil type, temperature, rainfall and traditional procedures.

JEL Classification: Q1 · D8 and Q18
Ke ywords: Cropping Pattern · Price Volatility · Profit Function and Share Equation

INTRODUCTION

According to Singh [1], the cropping pattern means the proportion of area under various crops at a point of time or regional allocation of land among different crops. The decision to allocate area across different crops takes place each year and expected output prices at the time of harvest play a key role in this decision.

Changing cropping patterns might be difficult because the farmers are used to growing a particular crop for ages and food habits would not change. Hence, many researchers have focused on the problem of area allocation in order to determining optimum cropping pattern in agriculture.

Although, the cropping pattern of Iran is based mainly on the traditional system of farming in which farmers try to produce everything the main objective of this study is determining the wheat cropping pattern in response to wheat price volatility in different years.

In the next section we consider description of the data. Section 3 contains theoretical model. Section 4 describes econometrical model. And Section 5 contains the results.

Description of the Data: The used data in this paper were obtained from FAOSTAT [2] in the form of cross section and time series data over the period 1994-2009. We divided the country in 29 agricultural regions as 29 provinces. The advantage of using this classification in types of agricultural regions is homogeneity of soil within regions [3].

Considering that the data in the paper are annual time-series data, we need to pre-test for stationary and the existence of a cointegration vector before we move on the specification of model. For this, prior to estimation, the integration properties of the data were investigated using Levin, Lin, Im, Pesaran and Shin, ADF-Fisher Chi-square, PP-Fisher Chi-square unit root test. The results indicates that the variables contain unit root but they become integrated and stationary at first level at a 95 percent significance level according to Table1 and therefore the test reply was satisfactory. [1]

Theoretical Model: The cropping pattern is influenced by physical factors like irrigation, improved varieties and availability of fertilizers, yield of crop, land reform consolidation of holding, credit facilities, price

[1] The Eviews output is available on request from the authors

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Table 1: The obtained results for testing unit root

	Statistic	Prob
Levin, Lin & Chu	-6.1473	0.0000
Im, Pesaran and Shin	-5.7491	0.0000
ADF-Fisher Chi-square	137.044	0.0000
PP-Fisher Chi-square	330.887	0.0000

structure, procurement policies and storage facilities [4]. Higher income among farmers was also important determining factor of cropping pattern. So the farmers whether small or large they always try to make best use of their land according to their own ability and judgment in order to maximize their income.

A profit maximizing farmer usually takes the prices of inputs and outputs as exogenous. Therefore a profit function with multiple outputs that treats total land as fixed, allocable input and other inputs, such as capital and labor can be considered as follows [5]:

$$\pi_{st}(P_t, F_t, A_{st}) \equiv Max \textstyle\sum_i^I \pi_{sit}(P_{it}, F_t, a_{sit}) \qquad (1)$$

Subject to: $\sum_i^I a_{sit} = A_{st}$ $S=1,\dots,S,\ i=1,\dots,I$ *and* $t=1,\dots,T$

where:

$\pi_{st}(P_t,F_t,A_{st})$	Is restricted profit function for province S and time period t,
$\pi_{sit}(P_{it},F_t,a_{sit})$	is restricted profit function for province S, land use i and time period t,
P_t	Is vector of exogenous output prices per hectare land,
P_{it}	Is output price of land use i at time period t,
F_t	Is vector of exogenous variable input prices per hectare of land,
A_{st},	Is total number of hectares to be allocated to different land uses and
a_{sit}	Is number of hectares for province s allocated to land use i at time period t.

Now, each province as a producer, must decide how to allocate ☻ hectares across different land uses i in order to maximize total profits. Exogenous output prices ☻ differ across land use and time period. And exogenous input prices ☻ are the same across land use and time period. Theoretically; we assume that for one province, homogeneity in soil kind exists, whereas it is not exist in empirical case.

Moreover, the total number of hectares of all provinces is as follows:

$$A_t = \textstyle\sum_s^S \sum_i^I a_{sit} \qquad (2)$$

Equation (2) must be equal to the total number of agricultural land in each year.

The farmer tries to maximize profit per hectare of land and so each province effort maximizes total profit over the total number of hectares in itself. Hence, we can reformulate profit function (1) for a single province as follows:

$$\pi_{st}(P_t, F_t, A_{st}) \equiv Max \textstyle\sum_i^I (P_{it}a_{sit} - F_t a_{sit}) \qquad (3)$$

Subject to: $\sum_i^I a_{sit} = A_{st}$

Profit function (3) has the following properties:

- Convex and continue
- Increasing in P_t and A_{st}
- Decreasing in F_t
- Positively linearly homogeneous in P_t and F_t.

Now we can consider the restricted profit function as a Lagrangian form that shows the constrained maximizing problem as:

$$L_{st} = \textstyle\sum_i^I \pi_{sit}(P_{it}, F_t, a_{sit}) + \lambda_{st}(A_{st} - \sum_i^I a_{sit}) \qquad (4)$$

Where ☻ is the shadow price on land constrained. The necessary conditions for interior solution are:

$$\frac{\partial L_{st}}{\partial a_{sit}} = \frac{\partial \pi_{sit}}{\partial a_{sit}} - \lambda_{st} = 0 \qquad (5)$$

$$A_{st} - \textstyle\sum_i^I a_{sit} = 0 \qquad (6)$$

Equation (5) allocates land among land uses to equate marginal profit from each land use. The input constraint in (6) is binding, assuming an interior solution. Solving (5) and (6) gives the optimal allocation of land as:

$$a_{sit}^{\pi} = a_{sit}^{*}(P_t, F_t, A_{st}) \qquad (7)$$

This represents the province's multi-output equilibrium in land allocation. If we consider that relation (7) is homogeneous of degree 1 in A_{st}, we can reformulate it as follows:

$$a_{sit}^{*}(P_t, F_t, A_{st}) = a_{sit}^{*}(P_t, F_t, 1)A_{st} \qquad (8)$$

This means that if total amount of land decreases whit the factor q, land allocated to land use i also decreases with the factor q. this can be written share function that represents the share of land for one province, for one land use, in one time period.

$$Share^{*}_{sit} = Share_{sit}(P_t, F_t, A_{st}) = \frac{a^{\pi}_{sit}}{A_{st}} \quad (9)$$

Hence, the shares depend on all output and input prices.

Econometric Model: Knowing that the paper's objective is determining wheat cropping pattern we estimate the wheat share equation considering barley and maize crop in cropping pattern. The mentioned tree crops are almost perfect substitutes due to their similarities in both, growing cycle parameters and agro-ecological requirements. Specially, maize and barley can be planted in any land where wheat grows well.

County-level data for twenty-nine provinces over fifteen years (1994 – 2009) were used to estimate share equation for wheat crop considering barley and maze cropping in the form of panel data. Although both yield and price uncertainty is relevant variables in arable farming, this paper focuses on price volatility and assumes that farmers face no yield uncertainty.

When an input price increases, farmers may switch from crops that use the input intensively to crops that use it less intensively. But because of lake of data we don't consider input prices in the model. Off course, since using inputs in cropping wheat, barley and maze, nearly is similar, above matter cannot cause any problem.

$$S_{jt} = f(S_{jt-1}) \quad (10)$$

S_{jt} Is share of wheat crop considering barley and maze cropping in j province and t year.

S_{jt-1} Is share of wheat crop considering barley and maze cropping in j province and t-1 year.

P_{t-1} Is vector of exogenous output prices per ton in the country in t-1 year.

Within above model we suppose the price variation to be equal across provinces. Hence, in each one of the provinces under analysis one price for wheat is considered. This matter is reasonable because prices for wheat are guaranteed by the government in Iran.

Table 2: Estimated Coefficients for the parameters

	Coefficient	t-statistic	Prob
Constant	0.07	2.80	0.005
Sjt(-1)	0.87	33.27	0.000
Pt(-1)	0.0002	2.13	0.033
Adjusted R-squared	0.7421	Durbin-Watson	2.50

RESULTS

On the base of Panel Generalized Method of Moments (PGMM) the obtained results from this research associated with the pertaining regression are gathered in Table 2.

It is observed from the table that all of the estimated coefficients in the considering regression are of the expected sign. And also, econometrically, the results are satisfactory. The coefficient of Sjt(-1) has affected strongly share of wheat in cropping pattern. But the coefficient of P_t (-1) is too small that wheat price volatility affect the wheat cropping pattern. This shows that likely the cropping pattern depends upon other factors, such as soil type, temperature, rainfall and traditional procedures.

REFERENCES

1. Singh, G., 2012. Factors Influencing Cropping Pattern in Bulandshahr District-With Special Reference to the Size of Land Holding, International Journal of Scientific and Research Publication, pp: 2.
3. Boere, E., J. Peerlings, S. Reinhard, T. Kuhlman and W. Heijman, 2012. Effects of Volatile Output Prices on Agricultural Land-Use Change, the 123rd EAAE Seminar, Agricultural Economics Society of Ireland.
4. Maghbool, B., 2011, Changing Cropping Patterns: Food Grains and Non-Food Grains in Uzbekistan, Journal of Agricultural Extension and Rural Development, 3(3).