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Risk and Uncertainty (Variability) in Wheat Production in Turkey

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Abstract: The reasons for variability and the difference between risk and uncertainty were explained in the study. The level of uncertainty in yield, price and gross income was analysed for wheat via using coefficient of variation and coefficient of random variation. Results show that farmers are faced uncertainty in agricultural production due to some factors (climate, price policy changes, etc), which are not under the control of producers. Agricultural insurance, product diversification, contract farming and future markets can be solutions to reduce risk possibility and variability in Turkish agriculture.

Key words: Risk, uncertainty, wheat, Turkey

INTRODUCTION

In real life, knowledge about the future is imperfect. Therefore, people are faced with risk and uncertainty every time[1]. However, there are financial institutions such as insurance markets and the stock market can mitigate at least some of these risks[2]. Same idea is true for farmers because they have no enough information about future yields, commodity prices and income in many countries[1]. It is no doubt that the only certainty in agricultural production and marketing is its non-certainty[3]. Most economists acknowledge that farmers face significant risks and have only limited opportunity to avoid them through insurance and other markets. However, appropriate remedies are the subjects of theoretical and practical disagreement[4].

There are important differences among the concepts of risk and uncertainty. Risk implies that probabilities can be attached to variations in outcomes or situations. Probabilities can be computed for such events as accidents or fire loss to buildings and equipment. As far as uncertainty (variability) is concerned, outcome is indeterminate, that is, not certain to occur. Estimates of probability cannot be attached to any outcomes that result from uncertainty. Government programs and activities influencing production and marketing are examples of uncertainties[5].

Farmers are faced two major types of imperfect knowledge. These are yield uncertainty and uncertainty related to price conditions in product and input markets. Therefore, the aim of the study is to analyse yield, price and gross income variability for wheat grown in Turkey.

MATERIALS AND METHODS

Time series belonging to yield, price and gross income were used as data in this study. The annual data related to yield and prices of agricultural products were obtained from the records of State Institute of Statistics (SIS). Nominal prices of agricultural products were then deflated using wholesale price index (WPI) (1981=100) to get a real price series due to high inflation rate during investigation period in Turkey.

Annual data belonging to yield and price of wheat cover the period of 1981-2000. In the analysis of variability in yield, price and gross income, two criteria (coefficient of variation and coefficient of random variation) were taken into consideration.

Coefficient of variation is calculated using following formula[6]:

$$CV = \frac{S}{\bar{Y}} * 100$$

where, CV is coefficient of variation, S is standard deviation of the series and $\bar{Y}$ is mean of the series.

The formula of standard deviation of regression is as follows[6]:

$$S_{y\,i} = \sqrt{\frac{\sum_1^n (Y_i - \hat{Y}_i)^2}{n-k-1}}$$

where, S_{yi} is standard deviation of regression, Y_i is value for product I, $\hat{Y}_1$ is estimated value for product I, n is number of observation and k is number of independent variable.

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Coefficient of random variation is calculated using following formula[6]:

$$CRV = \frac{S_{yi}}{\bar{Y}} * 100$$

where, CRV is coefficient of random variation, S_{yi} is standard deviation of regression and $\bar{Y}$ is mean of series.

Trend equations can be linear or curvilinear in the some situations. Taking into consideration cumulative sum of forecast error, the equation was determined as linear.

RESULTS AND DISCUSSION

In the study the concept of variability was commented under two different assumptions. It is assumed that producers do not know anything about trends belonging to yield, price and gross income. That is, all of deviations in the production in the long term are random fluctuations. In the second assumption, it is accepted that farmers have enough information about economic events and technologic changes. That is, farmers have been aware of trends in the long run.

The series of real price, yield and gross income for selected agricultural commodities are given in Table 1.

Price uncertainty: Price has important effect on the preferences and decision making of farmers. Coefficient of variation (CV) and coefficient of random variation (CRV) for wheat were calculated as 12.41 and 12.19%, respectively (Table 2). These values show that the price of wheat fluctuates at important level in the period of 1981-2000.

Yield uncertainty: Yield uncertainty refers to the fact that the farmer cannot accurately predict the yields he will receive from combining particular quantities of inputs in the production of a farm commodity[6]. The yield has fluctuated due to the effect of some variables, which are not under control of producers. CV and CRV for wheat were calculated as 7.63 and 7.07%, respectively (Table 2). This means that producers could not solve uncertainty problems even if they have enough information about economic and technical.

Gross income uncertainty: Gross income equals to the value that yield of a product is multiplied by its price. Therefore, a fluctuation in either yield or price affects gross income of farmers. Table 2 shows that CV and CRV for wheat were calculated as 14.61 and 13.11%, respectively.

In the past, Turkish government has intervened in wheat sector via a fixed-minimum price to producers, stock holding and tariffs. All of this was done to raise producer income. However, the minimum price policy has provided incentives for overproduction of lower-quality wheat and underproduction of high-quality wheat[7]. In addition, inefficacy of sunn pest management and drought problem in some years leaded to yield decrease.

To sum up, Turkey's agriculture was faced to face price, yield and gross income uncertainty during the period of 1981-2000. However, farmers can reduce yield variability via using high yield varieties, resistance

Table 1: The series of real price, yield and gross income for wheat in Turkey

Years	WPI (1981=100)	Real price (TL kg^{-1}) (1)	Yield (kg ha^{-1}) (2)	Gross income (TL) (3=1*2)
1981	100.0	18.54	1838	34076.52
1982	127.0	18.39	1944	35750.16
1983	165.7	16.84	1777	29924.68
1984	249.1	17.79	1911	33996.69
1985	356.8	18.36	1818	33378.48
1986	462.3	17.74	2032	36047.68
1987	610.4	15.81	2007	31730.67
1988	1064.4	14.66	2173	31856.18
1989	1790.5	18.37	1732	31816.84
1990	2741.1	18.79	2116	39759.64
1991	4260.4	16.16	2118	34226.88
1992	7051.6	16.34	2010	32843.40
1993	11546.0	17.51	2143	37523.93
1994	25212.6	15.65	1786	27950.90
1995	47528.5	18.28	1915	35006.20
1996	83602.6*	21.80	1979	43142.20
1997	134657.9*	24.51	1997	48946.47
1998	257773.6**	20.56	2234	45931.04
1999	394552.0**	18.09	1919	34714.71
2000	597513.4**	16.74	2234	37397.16

(*) Calculated using 1987=100 WPI
(**) Calculated using 1994=100 WPI

Table 2: Parameters belonging to price, yield, gross income series for wheat

	Standard deviation (S)	Standard deviation of regression (S_y)	Mean of series ($\bar{Y}$)	Coefficient of variation (CV)	Coefficient of random variation (CRV)
Price	2.24	2.20	18.05	12.41	12.19
Yield	151.38	140.21	1984.15	7.63	7.07
Gross income	5230.77	4692.38	35801.02	14.61	13.11
	Trend equations representing time series				
Price	$Y_P = 17.92 * (1.005152)^t$				
Yield	$Y_Y = 1978.66 * (1.005178)^t$				
Gross income	$Y_{GI} = 35465.25 * (1.010357)^t$				

to plant diseases/insects/pests and other modern agricultural techniques. Besides contract farming and future markets should be implemented to decrease the negative effects of price fluctuations. Extension of crop insurance system throughout the country and covering all the crops and crop diversification instead of monoculture production are alternatives approaches to prevent gross income variability.

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