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Evaluation Factors Affecting of Risk Production in Sistan Grape Growers by using Stochastic Frontier Approach*

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Abstract

Due to agriculture is a risky activity and risk models is important in order to analyze the behavior of farmers, hence, in this study, the factors affecting risk-taking and risk aversion is the region grape growers. Data analysis was performed by using stochastic frontier. Data gathered by questionnaires at three counties of Zabol, Hirmand and Zahak at 265 grape farmers in crop year of 2011-2012. The results showed that the cultivated area respectively for the county of Zabol and Zahak risk–reducing and risk-increases, labor Rental at Zabol county risks - reducing and animal manure for the county of Hirmand and Zahak was risk - Reducing respectively. Therefore, the positive and significant labor input on risk factor is production as a result of seasonality, It is suggested that the focus on seasonal labor and employment Rental through agencies or through the representatives of the Ministry of Labor and Social Affair.

Keywords:
Production risk, Stochastic frontier analysis, Grapes, Sistan

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INTRODUCTION

Scarcity of production factors constitutes the basis of economics. At various times, under any circumstances, will always produce limited amounts of inputs, both human and non-human resources available. Countries on a lack of resources limited opportunities for development and adoption of better technology face on the other hand the existing technologies do not use it efficiently. The types of natural hazards, social, economic and willful hands and a fragile and vulnerable to the producers of this section, provided that the final result of the instability of their income. Due to the natural and economic conditions of production of agricultural products in the context of economic activities is one of the most risky Since a major part of agricultural producers in the country, the average and median farmers, however, have limited financial and property in any given period of operation in the production process are hiring, they're sometimes even the least damage possible void and impose on them a miserable life. It is for these reasons agricultural insurance can be one of the levers of agricultural development; using this mechanism, it can provide more security for agricultural producers and better conditions to attract private investment in the agricultural sector can provide. However, agriculture in these countries, activity is associated with risk and risk models in order to analyze the behavior of farmers, It is important, evidence suggests that risk is or hazard in agriculture various reasons such as lack of control and farmers to climatic factors, pests and diseases and conditions of supply and demand of agricultural products and inputs markets face a risk and risks as important factors influencing the behavior of continuous and imbalance of farmers is listed in traditional agriculture. There are also risks causing agricultural production process in addition to profit maximization, revenue and profit goals, such as minimizing the variance also consider the and the risky agricultural activities, farmers' attitudes to different risks (Villano *et al.*, 2005). Thus risk of agricultural production is one of the most important issues in the current situation of the economy agriculture. Garden plants in the production of this grape are no exception. Given this, the need to assess the risk of production and allocation of resources are felt, taking into account the constraints.

The first key concept of risk management in agriculture can be explained by the old saying that no danger, nothing can be achieved. Risk management in agriculture, including the question of whether the risk is imposed by this section, in accordance will be obtained with the results. Farmers threaten to get the product too low, not too high. In other words, the farmer does not earn enough income to reasonably justify the risk, if the opportunity through a risk management process that are minimized already exists, can be used as overhead costs. Second, thinking in risk management, farmers are encouraged to recognize that no assurances that may have an impact on production targets and dynamic search for him to consider ways to propel the detection process. While the need to minimize threats to relinquish the matter. Given that grapes are one of the most valuable horticultural products of the world is important. This unique capability enables product diversity and breeding and production in different climatic zones of the country may have today, the world dedicated to the cultivation of grapes has extensive gardens, Grapes in the garden is one of the most important products in nutrition and healthy population is a special place. This product economically, in addition to the fresh, easy storage and has become secondary products. According to 2008-2009 horticultural crops in the production of pistachio orchards, vineyards with about 302 thousand hectares, equivalent to 11.8 percent is allocated to the country gardens. Infertile and fertile countries in total acreage are 301,729 ha; the yield of grapes and grape production of 1,598,573 ton, 140,930 ton is dry performance. Yield of 7960 kg per ha of irrigated grapes and dry performance in its 2.1832 kg is Sistan and Baluchistan among infertile acreage waterish 7.482 ha and 1100 ha of irrigated fertile, irrigated production also 7.9982 tone and performance equivalent to 1.9075 kg per hectare of grape-rich provinces of the country. The rate of Zabol county, much of it in the most economical and horticultural crops cultivated in the region

(Agriculture Report, 2010).

In this context, this paper seeks to answer these questions. Whether the consumption of inputs used to increase or decrease production risk in the study area is effective or not? And the risk of the agricultural infrastructure in the city's income is effective or not?

MATERIALS AND METHODS

Stochastic frontier production function model with inputs of production risk parametric method for a boundary function highest possible production rate of each vector specifies unknown inputs.

Any firm should be that produces the maximum levels, it is generally assumed in the traditional production functions, that all firms and farms are operated so efficiently. This makes the error of the regression function to be attributed to measurement errors and non-visible variables, But put aside the assumption that the boundary functions (Tan *et al.,* 2010; Khan *et al*., 2010).

$$Yit=f(X_{it},\alpha)\exp(\varepsilon_{it})$$

In this model i is garden number for the time t, the vector (k × 1) of the factors of production, and other explanatory variables, α vector (1 × k) of the parameters of the unknown that must be estimated, N the number of observations, and t the number of courses studied. The sentence ε it compound that error is defined as:

$$\varepsilon_i = g(Xi;\beta)Vi\text{-}h(Xi;\delta)Ui$$

(Xi; β) VI is risk a function of h (Xi; δ) Ui is an indication of inefficiency function. β and δ are vectors of parameters. Model when the function f (Xit, α) was determined (For example, the Cobb-Douglas type, transcendental) and taking into account the distribution assumptions for Vit (normal) and Uit (usually), can be estimated using maximum likelihood. Independently and randomly generated symmetric component of variation due to factors outside the farmer's control such as weather, equipment performance, pests and diseases which affect normal distribution with zero mean.

Random variable is negative, indicating that partial non-performance-related issues that are representative of production inefficiencies such as skills, effort, or lack of farmers and the limitations of the effort technical includes. For units is that are produced on the frontier production function equal to zero. Is zero, but the production units that are below marginal production curve is greater than zero. This indicates a certain level of consumer surplus is on the boundary of the actual production (Aigner *et al*., 1977).

$$EF_{it} = \exp(-U_{it})$$

This indicator field is which acts on exactly frontier production function and therefore quite useful in terms of technical efficiency, equal to one. Computational number between one and zero otherwise acquires the fields in the relatively inefficient production work. Frontier models may be possible to test various hypotheses (Villano *et al*., 2005; Khan *et al*., 2010).

Renato Viliano *et al*. (2005) according to the model Kumbhakar (1993) positive or negative effects of inputs on production risk allowed have in accordance with the model of Just and Pope the relationship between the inputs and production risk he took). They combined data set including the error in equation (4), have the following form (Villano *et al.,* 2005):

$$\varepsilon_i = g(Xi\ );\ \beta)[V_i - U_i]$$

Renato Viliano *et al.* (2005) expressed using equation (4), equation (5) can be assumed to equal g (Xi; β) VI = h (Xi; δ) Ui can be written as follows:

$$Yi = f(Xi;\alpha) + g(Xi;\beta)[Vi - Ui]$$

Equation (5) is corresponds to the standard stochastic frontier production function with flexible risk properties using Baties Currently *et al.* (1997). In this case, the product of the mean and variance of setting up a product for the farmer if i am having values of inputs and technical inefficiency:

$$E(Y_i\ |X_i,U_i) = f(X_i;\alpha) - g(X_i;\beta)U_i$$

The variance of the risk function according to equation (7) is defined as:

$$Var (Y_i|X_i,U_i) = g^2 (X_i;\beta)$$

Final product risk factor by taking the partial derivative with respect to Xj is defined as production variances that can also be positive or negative:

$$\partial Var(Y_i-| X_i,U_i)/\partial X_{ij} > 0 \text{ or } <0$$

Accordingly, technical proficiency farmer i is (TEi) is the ratio of average production for farmer i, if the quantities of inputs (Xi), and lack of technical proficiency in their (Ui), the average production, if any, lack of technical proficiency, there is no are:

$$TE_i = E(Y_i \mid X_i,U_i)/(E(Y_i \mid X_i,U_i=0) =1-TI_i$$

TIi is technical inefficiency and the potential loss defined as:

$$TI_i = U_i.g(X_i,\beta)/E(Y_i-| X_i,U_i =0) = (U_i.g (X_i,\beta) /(f(X_i; \alpha)$$

If the stochastic frontier production function parameters are known and unknown, then the best measure to predict if Ui, TEi hope will be the realized values is given of the random variable Ei=Vi-Ui (Villano *et al.,* 2005).

Data collection method

The study population included grape growers, which includes the county of Zabol in Sistan region, was Zahak and Hirmand. A questionnaire was used for data collection and data required for risk assessment grape growers of the study area by the total population in 2011, Introducing the variables used in the study (a questionnaire) according to the statistics of the local national and international studies of observed data available to researchers, the six factors of production (inputs) as the stochastic frontier model was selected variables that respectively. X1: cultivated area (ha), X2: Labor force Rental (day - people), X3: Labor Force Family (days - people), X4: irrigation frequency (time), X5: animal manure (kg), X6: Fertilizer (kg).

Data analysis

According to the area under cultivation, Rental labor force, labor force, family, frequency of irrigation, fertilizer and animal manure as explanatory variables and socio-economic characteristics such as age, education, experience, household size, other than activity, number of pieces of land, between the trees, attending a garden size as variables promote inefficiency in the stochastic frontier model considerer's. Summarizes the data on production inputs have been studied in the city.

Average production in the county of Zabol, Hirmand and Zahak is 11049, respectively, 10799 and 10648 kg per ha. Rental Task Force Hirmand to the county with the highest average number of 97 people-are working day. Average irrigation frequency in each city is about 16 times. Information about the social features - Economic samples are shown

The sample farmers in the region have averaged about 60 years of age. Minimum education level of the sample was illiterate and maximum college education. Can be said about the number of plots of land in each city studied are enumerated from 1 to 5 pieces. Distance trees between 1 and 3 meters. Average size of the garden city of Zabol, Hirmand and Zahak was 1860 respectively, 1912 and 1889 trees. In order to investigate the effect on risk of inputs grape production, the risk was estimated to produce a linear fashion. In fact, the risk estimates of the marginal product of the logarithm of the residues of certain components of the estimated production function, the logarithm of the factors considered in the model using ordinary least squares method, regression is. Table (1) risk estimate the results of the study indicate that the factors examined in the Sistan region. In this table, the estimated coefficients indicates the type of grape will produce effects on risk of inputs and coefficients of determination (R^2) is also expressing a percentage of risk-related inputs are required.

As the results in Table 1 it is observed that the relatively low value of R^2 for each city Which

Table 1: Results grapes produce a risk estimate based on average values input in Sistan

	Hirmand		Zahak		Zabol	
Input	**t-statistics**	**Coefficient**	**t-statistics**	**Coefficient**	**t-statistics**	**Coefficient**
Cultivation	-1.15	-1.36	2.25	1.67**	-1.67	-0.92*
Workforce Rental	1.20	0.79	-0.65	-0.38	1.91	0.47*
Family labor	0.21	0.18	-0.10	0.07	-0.89	-0.36
Irrigation frequency	-3.27	-0.97***	2.29	-0.23**	-2.21	-0.09*
Animal manure	-2.51	-1.55**	-2.95	-2.07***	-0.33	-0.11
Chemical fertilizer	0.64	0.25	-1.58	-0.73	1.01	0.44
The coefficient of determination	**R^2=0.15**		**R^2=0.27**		**R^2=0.12**	

*p<0.1 **p<0.05 ***p<0.01

represents the percentage of low-risk production in cities is related to production inputs. This table shows the results for the county of Zabol, labor and fertilizer Rental, risk-reducing, the increases are produced; each of them has a positive effect on risk. Conversely, cultivation inputs, labor, family, animal manure irrigation frequency and are risk-reducing and have a negative impact on production risk. The effect (positive or negative) and labor for cultivation Rental is significant. About interpretation negative and significant effect on the risk of cultivation can be stated that the increase in area under cultivation, management and labor are used more as a result, monitoring each unit is more rebellious and the risk- reducing significantly positive effect on risk of inputs, Workforce Rental, likely to be limited workforce specializing in viticulture as well as excessive Workforce Rental, especially during harvest, thus increasing the risk becomes greater demand. For Zahak county, area under cultivation, labor, and family are risk-increasing popular and have a positive effect on production risk. This effect is significant only for cultivation. Interpret the positive and significant effect on the risk of cultivation can be expressed. Cultivation of their higher risk (the risk due to lack of compliance with the IT production environment, technology, divisibility, etc.) is also a plus, as well as increasing the cultivated area per square meter and the time taken to resolve conditions of production decreases and risk increases. Also according to the sign of estimated coefficients in the county Zahak have stated that labor inputs Rental, frequency of irrigation, fertilizer, animal manure and risk-reduction and a negative has impact on production. The effect of (negative) is significant for animal manure, Mostly this is because farmers in this city both agricultural and livestock activities are simultaneously, so convenient access to animal manure at every stage of production is possible, and provide plant nutrition and the risk of falls. Workforce Rental inputs in Helmand city Family labor and fertilizer, are risk-increasing and a positive effect are on production risks, But none of these variables were not significant. The cultivation inputs, irrigation frequency and manure risk-reducing the risk and negative impact on production.

The input that is significant to the inputs of animal manure like the county Zahak is probably due mostly to the farmers in this county, both agricultural and livestock activities are simultaneously, So convenient access to animal manure at every stage of production is possible and reduced production risk. Water is scarce in the region of an input and irrigation in this region is reported to be critical, thus reducing the risk of its lack of resources in the study area.

RECOMMENDATIONS

Given the positive and significant labor input is on risk of inputs in the city of Zabol that this result of seasonality, recommended a focus on seasonal labor and employment rental by institutions or by representatives will be done of the Ministry of Labor and Social Affairs.

Government support for producers to monitor prices and banking facilities, providing resources production and marketing of grapes can improve the possibilities of basic strategies for success and money is their manufacturers.

Grape Cooperative Unions in the region to improve timely marketing, crop insurance and credit, planning and building industries related to purchases of surplus grapes and creating value-added product delivery time.

Creating and strengthening infrastructure facilities required such as roads, transport, social overhead fridge Scheme (SOC) in partnership with the government and people.

Evaluation of the efficacy and field studies showed that none of the study, other factors also affects the types of performance, unfortunately, the possibility of importing or collected from the farmers did not get the right answer. These factors include the personal interests of agriculture, the opportunity cost for other tasks or person's access to credit, the correct estimation of the extent of use of certain inputs such as water, it is recommended that advocates for people with high performance and interview pros in their approach to consider.

New methods and technologies for water supply and farming methods to suit the climatic conditions of the region.

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