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TOTAL FACTOR PRODUCTIVITY AND EFFICIENCY ANALYSIS OF WHEAT PRODUCERS IN THE CASE OF A CENTRAL ASIAN COUNTRY: STOCHASTIC FRONTIER APPROACH

Abstract: While the economies of Central Asian countries highly depend on agriculture, only 20% of their land is suitable for agricultural purposes. This raises a great concern for efficient use of limited agricultural resources. However, very few studies, and in the cases of some Central Asian countries like Kazakhstan, Kyrgyzstan and Turkmenistan no single study have been done on agricultural efficiency. This article aims to fill this gap by conducting efficiency analysis in the case of the sample of wheat producing farms in Kazakhstan, by using stochastic frontier analysis. The paper has three main objectives: 1) to estimate technical efficiencies of wheat producers, 2) to examine the influences of inputs like land, labor, seed, fertilizer, pesticide and fuel on the productivity of wheat producers, and 3) to assess the impacts of explanatory variables such as education of the farmer, size of the farm, access to credits and subsidies and etc. on the efficiency of wheat producers.

Key words: Efficiency, stochastic frontier approach, wheat production, explanatory variables.

Introduction

In 1991 after the collapse of the Soviet Union, 15 member states became independent countries. They had to build their own political and economic systems and had to ensure an adequate food supply for their population. Food self-sufficiency was especially a great concern among Central Asian countries.

Central Asia consists of five former Soviet Union countries, namely: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. According to the most recent data, the total population of Central Asia is around 68 million people, of which nearly 60% live in rural areas (Population of Central Asia 2016).These five countries collectively cover an area of 400 million hectares. However, only 20% of this area is suitable for farming, and the rest is characterized as deserts and mountains. Nevertheless, agricultural production in that limited area forms the backbone of Central Asian economies (Bucknall et. al., 2003).

The five Central Asian countries are highly agrarian, with 60% of the population living in rural areas and agriculture accounting for over 45% of total number of employed and nearly 25% of GDP on average (S. Djalalov, S.C. Babu, 2006).

According to the above statements it is clear that agriculture plays a significant role in the economies of Central Asian countries. While these countries cover huge area of land, only one-fifth of this land is suitable for agricultural purposes. Therefore, maintaining high productivity in this sector is very important for the region. Decision makers have to pay high attention on agricultural efficiency in order to ensure adequate food supply for their population. However, limited to the knowledge of the authors, no singlework has been done on estimating the agricultural efficiencyin the case ofKazakhstan, Kyrgyzstan and Turkmenistan. Current research is aimed to fulfil this gap by assessing the agricultural total factor productivity in the case of thesample of Kazakhstani farms, thus contributing to the regional literature on agricultural efficiency. Limited numbers of efficiency analysis have been done in the case of Central Asian countries. One such work is conducted by Karimov (2014), who identifies factors affecting efficiency in the case of cotton producers in Khorezm Region of Uzbekistan.

In the current literature researchers examine the effects of different factors such as education of the farmer, size of the farm, access to external finance in the forms of loans or subsidies, supply channels and etc. on the efficiency levels of the farms at both macro and micro levels. However, the results of these studies are three-fold. While some of the scholars find significant positive effects of these factors on efficiency, others do not observe any connections at all, and some even find inverse relationships. For example, while Mathijs and Vranken (2001), Alene and Hassan et al.(2003), Asadullah and Rahman (2009) and Karimov (2014) observe positive connections between farmer education and efficiency, other studies like Llewelyn and Williams (1996) and Chirwa (2007) do not find any significant relationships. Furthermore, while many scholars such as Thapa (2007), Masterson (2007), Vu T.H. et al. (2012) and Ladvenicova and Miklovicova (2015) observe inverse relationship between farm size and agricultural efficiency, others like Karimov (2014), find a positive connection. Therefore a further research is needed to examine the effects of different factors such as farmer education, farm size, access to external finance and etc. on the agricultural efficiency, especially in the case of Central Asian countries. Examining the relationship between farm size and agricultural efficiency in the region is also important in order to justify or criticize the de-collectivization programs started after the collapse of the Soviet Union in some of the Central Asian countries.

The goal of this work is to fill the gap in the literature by assessing agricultural efficiency in the case of a Central Asian country, and to contribute to the ongoing debates regarding the impacts of different factors on the farm efficiency. The main three objectives of the article are: 1) to estimate technical efficiencies of wheat producers using stochastic frontier approach, 2) to examine the influences of inputs like land, labor, seed, fertilizer, pesticide and fuel on the productivity of wheat producers, and 3) to assess the impacts of explanatory variables such as education of the farmer, size of the farm, access to credits and subsidies and etc. on the efficiency of wheat producers.

Wheat production in Kazakhstan

Kazakhstan is an important producer and exporter of high-quality wheat. Average annual production is about 13 million tons, but output is highly dependent on weather and in recent years has fluctuated between 10 and 17 million tons. About 75 percent of the country's wheat is produced in three regions: Kostanai, Akmola, and North Kazakhstan. Between 2 and 8 million tons is exported annually, mainly to destinations in Europe (including Russia and Ukraine), northern Africa, and Central Asia (United States Department of Agriculture, 2010). According to the study of Workman (2016), in 2015 Kazakhstan exported wheats for $1.2 billion. It accounted for 3,2% of the world wheat exports, and ranked the 8th largest wheat exporter in the world. In spite of this impressive statistics, wheat production in Kazakhstan declined almost twice after its independence from the Soviet Union in 1991(Urazaliyev, 2003).This huge decrease in production is believed to be the result of inefficient use of resources. Thus, by using the resources more efficiently Kazakhstan can potentially increase the level of wheat production at least to the levels experienced during the Soviet Union time. For this purpose, identifying the factors that can improve efficiency levels of wheat producers is of great importance for policy makers in Kazakhstan and in the transition countries of Central Asia.

Data and Methodology

For the purpose of the current study, a cross-sectional data for the year 2015 was collected by means of a questionnaire from the Akmola Region of Kazakhstan. Akmola is one of the largest wheat producing regions in Kazakhstan. Together with other two major wheat producing regions, North Kazakhstan and Kostanai, they account for nearly 75% of all wheat production in the country. Using the multistage sampling technique, a sample of 161 wheat producing farms from 36 districts in Akmola region have responded to the questionnaire. The sample was selected in such a way that they would adequately represent the population.

The Stochastic Frontier Analysis (SFA) was used to estimate agricultural efficiency in the region. This method was originally introduced by Aigner et al. (1977) and Meeusen and van Den Broeck (1977). Since then SFA models became very popular among scholars and have been widely used in the economics literature. The works of Alvarez and Arias (2004), Kwon and Lee (2004), Tashrifov (2006), Villano et al. (2006), Odeck (2007), Nkengne (2010) and Karimov (2014) are just a few examples of the recently conducted agricultural efficiency analysis using Stochastic Frontier Approach.

Half-Normal distributed, output-oriented stochastic production frontier model for cross-sectional data can be specified as:

$$ln\, y_i - ln\, y_i^* - u_i, \quad u_i \geq 0, \tag{1}$$

$$ln\, y_i^* = f(x_i; \beta) + v_i \tag{2}$$

$$u_i \sim i.i.d.\, N^+(0, \sigma_u^2),$$

$$v_i \sim i.i.d.\, N(0, \sigma_v^2),$$

where y_i is the actual output quantity for the i^{th} farm, x_i and β are the vector of input variables and their corresponding parameters respectively, v_i is a random error with mean level of zero and u_i is a non-negative error term that captures production inefficiency. Equation (2) defines the stochastic production frontier function, given x, it gives y_i^*, the maximum possible level of output. It is stochastic because of the v_i random error term. Because of the non-negative error term, the observed output, , isalways lower than the frontier output, y_i^*. Error terms u_i and v_i are distributed independently from each other (Kumbhakar et al., 2015).

The log difference between the maximum possible level of output and the actual output can be denoted by the term u_i, from the equation (1). The term u_i, therefore, shows the portion of output thatis lost because of inefficiency. Thus, the value of u_i being closer to zero means that the farm is operating at the level close to full efficiency. Rearranging equation (1), we can have the following relationship:

$$\exp(-u_i) = \frac{y_i}{y_i^*} = TE \tag{3}$$

where $\exp(-u_i)$ is the ratio of actual output to the maximum possible output, and can be denoted as technical efficiency of the i^{th} farm. The value of $\exp(-u_i)$ is always between 0 and 1, with 1 meaning full technical efficiency and 0 meaning full technical inefficiency (Kumbhakar et al., 2015).

The relationship between explanatory variables and inefficiencies can be expressed with the following equation:

$$u_i = \delta_0 + \sum_m \delta_m Z_{i,m} + \varphi_i \quad (4)$$

where u_i represents technical inefficiency of the i^{th} farm, $Z_{i,m}$ is the vector of explanatory variables, φ_i is the non-negative random error term, and δ_0 and δ_m are the inefficiency coefficients to be estimated (Karimov, 2014).

The analysis was conducted using the STATA "sfmodel" package by Kumbhakar et al. (2015) and Frontier 4.1 software package by Coelli (1996).

Results and Discussion

Table 1 Descriptive Statistics

	Units	Akmola (n=161 observations)			
		Mean	Std. Dev.	Min	Max
Output variable					
Output	KZT, thousands	58500	148000	720	1370000
Production Variables					
Labor	KZT, thousands	9482.07	20100.00	600	165000
Land	hectars	2523.03	7133.87	20	62000
Seed	tons, thousands	356.63	896.26	0	7000
Fertilizer	tons, thousands	139.86	1576.89	0	20000
Pesticide	tons, thousands	13.80	100.14	0	1000
Fuel	KZT, thousands	1464.86	2207.4	42.5	20000
Cooperates with other farms (cooperating)	Dummy	0.174	0.380	0	1
Farm characteristics					
Size	hectars	3114	8639	20	62000
Age	years	9.09	6.24	1	23
Machines	numbers	6.24	5.73	0	54
Distancefrom the crop land (distance)	km	25.16	74.54	2	870
Belongs to parental organization (par_org)	Dummy	0.031	0.174	0	1
Uses insurance (insurance)	Dummy	0.342	0.476	0	1
Educational characteristics					
Has special agricultural education (edub)	Dummy	0.354	0.480	0	1
Graduated from university (eduu)	Dummy	0.720	0.450	0	1

Graduated from college only (educ)	Dummy	0.180	0.385	0	1
Supply characteristics					
Supplies directly to Agro-processing enterprise (supply_ch1)	Dummy	0.205	0.405	0	1
Supplies directly to Procurement enterprise (supply_ch2)	Dummy	0.391	0.490	0	1
Supplies under contract (supply_contract)	Dummy	0.739	0.440	0	1
Access to external finance					
Credit	Dummy	0.130	0.338	0	1
Subsidies (subs)	Dummy	0.385	0.488	0	1

Note: KZT (Kazakhstani tenge) – currency used in Kazakhstan

Table 1 illustrates a descriptive statistics of output, inputs and explanatory variables involved in the production function. Output is the monetary value of the total grain produced and is measured in KZT. Seven input variables such as labor, land, seed, fertilizer, pesticide, fuel and cooperating were used in the study.

Labor and fuel stand for the total cost of labor and the total cost of fuel respectively and both are measured in thousands of KZT. Fuel is used as a proxy variable to measure the use of machinery services in the production. Land represents the total cultivated area and is measured in hectares. It is worth to mention that there is a huge difference between the observed farms, in terms of both output and land used. With the smallest farm cultivating only 20 hectares of land and getting an output of 720’000 KZT and the largest farm cultivating 62000 hectares of land and getting an output of 1.37 billion KZT. Seed, fertilizer and pesticide are the total amounts of

seeds, fertilizers and pesticides respectively, used in the production of grain. All three are measured in thousands of tons. Finally, cooperating is the dummy variable, used to identify if the observed farm cooperates with the other farms or not. Of the total grain producers surveyed, 28 farms conduct joint operations with the other farms in the region.

According to their features, explanatory variables are divided into four groups: farm characteristics, educational characteristics, supply characteristics and access to external finance. Average size of the farms is 3114 hectares, however it has high standard deviation with the sizes of the smallest and largest farms being 20 and 62000 hectares respectively. The average experience of the farm and the number of machines used by the farm are 9 years and 6 machines respectively. Again there is a high standard deviation, with the youngest farm having an experience of 1 year and oldest farm having an experience of 23 years and with one farm having no machines at all and the other farm having 54 machines. The distance between the most distant cropland and the farm on average is 25 km. Within the sample of respondent farms, 3.1% belong to some parental organizations and 34.2% use insurance to secure their agricultural activities.

If we come to the educational characteristics, 35.4% of all farm managers have specialized education on agriculture. While 72% of all farm managers have university level degrees, 18% of them have only college level education.

Nearly 60% of all farms supply their outputs directly to agro-processing (20.5%) and procurement enterprises (39.1%) and almost 74% of all supplies are conducted under special contractual agreements.

Finally, more than half of the farmers have access to external finance either by the means of credits (13%) or subsidies (38.5%). Table 2 Maximum Likelihood Estimates of the stochastic frontier production function

Note: Significance level at 10% *, 5% **, 1% ***

Table 2 represents the maximum likelihood estimates of the frontier production function, calculated by the Stata “sfmodel” package. The output elasticities of all inputs except fertilizer were positive and statistically significant. Surprisingly, fertilizer has negative, but fortunately statistically not significant elasticity. The highest elasticity accounts for cooperating (0.59), followed by land (0.40), labor (0.24), fuel (0.09), seed (0.06) and pesticide (0.04). The sum of all coefficients is 1.44, suggesting increasing returns to scale. Thus, based on the results of current data, we can say that grain producers in Akmola Region of Kazakhstan have increasing returns to scale.

Table 3 Descriptive Statistics of Technical Efficiency

Variable	Obs	Mean	Std. Dev.	Min	Max
TE	161	0.776940	0.040553	0.565906	0.865324

Table 3 demonstrates that the highest and the lowest technical efficiency levels are 0.865 and 0.565 respectively. Moreover, the average technical efficiency level is 0.7769, meaning that the farmers on average are performing only at 77.69% of their full capacity. This means that grain producers have huge potential to further improve their production efficiencies. To be more precise, farmers on average can still increase their efficiency levels by 22.31%. The standard deviation of 0.04 is relatively low, suggesting that technical efficiencies of most farmers are near to their mean level.

loutput	**Coef.**	**Std. Err.**	**z**	**P>z**	**[95% Conf.**	**Interval]**
frontier						
llabor	0.24844***	0.07443	3.34	0.001	0.10257	0.39432

lland	0.40342***	0.05608	7.19	0	0.29351	0.51333
lseed	0.06021***	0.02104	2.86	0.004	0.01897	0.10145
lfertilizer	-0.00653	0.01391	-0.47	0.639	-0.03378	0.02073
lpesticide	0.04577***	0.01693	2.7	0.007	0.01259	0.07894
lfuel	0.09910*	0.05844	1.7	0.09	-0.01543	0.21364
cooperating	0.59809***	0.15560	3.84	0	0.29313	0.90305
_cons	8.50355	1.05198	8.08	0	6.44171	10.56539

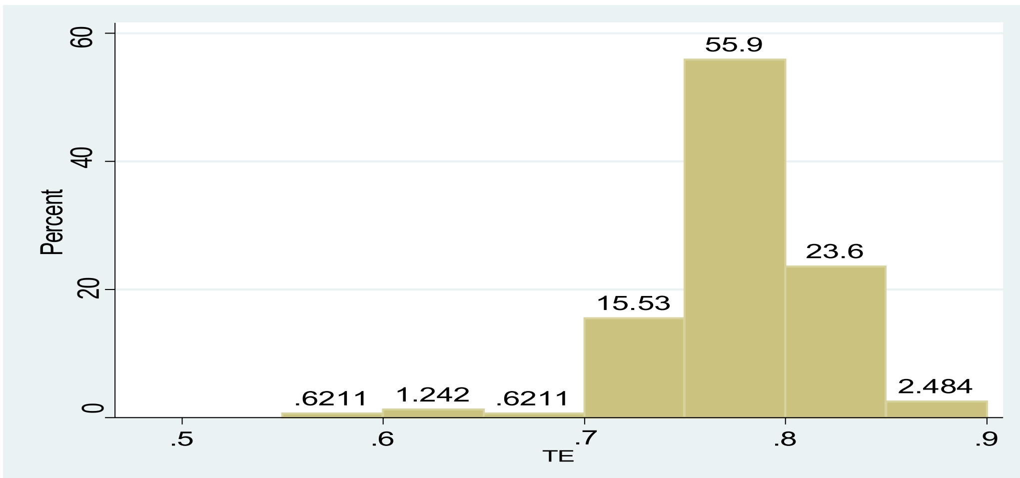

Figure 1Technical Efficiency Distribution

Figure 1 illustrates the distribution of technical efficiencies. While more than 70% of all grain producers have TEs between 0.7 and 0.8, around 26% of them perform between 0.8 and 0.9 and only 2.5% perform below 0.7.

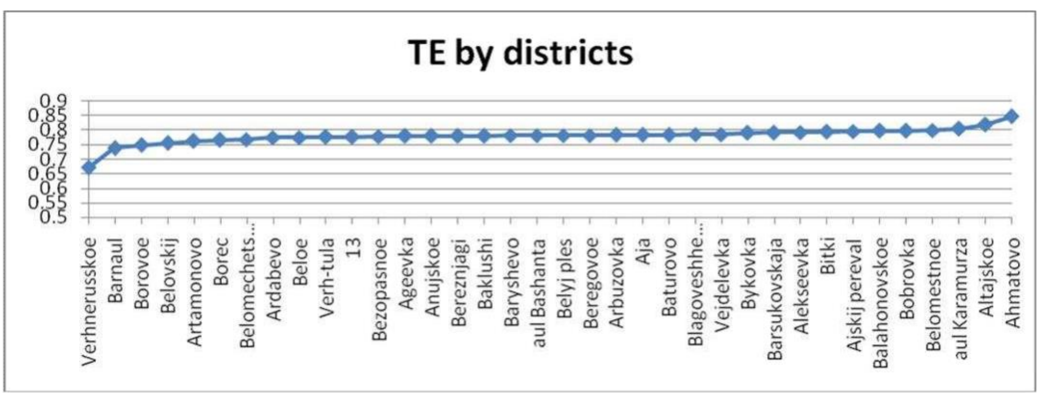

Figure 2 Distribution of Technical Efficiency by Districts

The distribution of technical efficiencies by districts is illustrated in Figure 2. While Ahmatovo and Verhnerusskoe districts are the best and the worst performers with 0.84 and 0.67 TE levels respectively, others perform more or less around the mean level of 0.77.

Table 4 Estimation of inefficiency effects

	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
usigmas						
size	1.85017**	0.79827	2.32	0.02	0.28559	3.41474
age	-0.56993**	0.27922	-2.04	0.041	-1.11719	-0.02266
machines	-1.86856***	0.72011	-2.59	0.009	-3.27995	-0.45717
distance	-1.85439*	1.02076	-1.82	0.069	-3.85504	0.14626
par_org	6.42729*	3.59243	1.79	0.074	-0.61374	13.46831
insurance	1.89477	1.80356	1.05	0.293	-1.64014	5.42968
edub	-3.86146*	2.26294	-1.71	0.088	-8.29675	0.57383
eduu	-4.39831*	2.32457	-1.89	0.058	-8.95438	0.15776
supply_ch1	-14.73729	10.18415	-1.45	0.148	-34.69785	5.22327
supply_ch2	0.01914	1.12381	0.02	0.986	-2.18348	2.22177
supply_contract	0.66806	1.15964	0.58	0.565	-1.60480	2.94092
credit	-4.10273	3.81719	-1.07	0.282	-11.58428	3.37882
subs	-4.99307*	2.62063	-1.91	0.057	-10.12941	0.14328
_cons	5.47691	5.05908	1.08	0.279	-4.43870	15.39252

Note: Significance level at 10% *, 5% **, 1% ***

Table 4 presents the inefficiency effects of thirteen explanatory variables. As technical inefficiency is a dependent variable in this case, negative coefficients mean a positive impact on efficiency and vice versa. Eight explanatory variables out of thirteen demonstrate statistically significant relationships, with six of them having positive and two of them having negative connections. Farm size *(size)* has negative and statistically significant effect on efficiency, meaning that the scale of the operations is very important in efficient use of resources. The larger the size of the farm is, the less efficient it tends to use its resources. The inverse relationship between farm size and efficiency have been proved by many scholars such as Thapa (2007), Masterson (2007), Vu T.H. et al. (2012) and Ladvenicova and Miklovicova (2015) and became almost a stylized fact in the economics theory. The agricultural experience, represented by a variable *(age)* has a significant positive impact on efficiency. As it is expected, younger farms tend to be less efficient compared to the older farms which have more experience and expertise. Similarly, farms with more machines under their use generally are more efficient compared with the ones that have lesser machines. This statement is proved with the variable *(machines)*, which has significant and positive effect on efficiency. Surprisingly, the variable *(distance)*, which is the distance of the most distant cropland from the farm, is positive and significant. This connection can hardly be explained intuitively and thus requires a further research including more time frame and observations. Being the part of a parental organization, variable *(par_org)*, seems to have a significant negative effect on efficiency. The possible explanation might be that, when the farm is a part of a bigger organization, it has less responsibility and thus might not use resources as efficiently as if it would have in other case. But again, this relationship should be studied in a more detail in the future works. Knowledge indicators like *(edub)* and *(eduu)* have significant positive impact on efficiency level. More educated farmers, who have university level education or a specialized agricultural education tend to manage farms more efficiently compared to others. This statement is supported by many scholars such as Mathijs and Vranken (2001), Alene and Hassan et al. (2003), Asadullah and Rahman (2009) and Karimov (2014) who find the similar relationships between farmer education and efficiency. Finally, the last variable that proved to be significant in the current analysis is an access to finance in the form of subsidies *(subs)*. Although the positive connection between subsidies and efficiency was observed, this relationship seems to be quite controversial in the current literature. While many authors such as Lansink and Zhu (2010) and Latruffe and Bojnec (2013), believe that the use of subsidies by farmers reduce their efficiency levels, others like Kumbhakar and Lien (2010), state that the opposite is true. Therefore, the current study contributes to this two-fold issue by supporting the group of researchers who observe the positive connection between subsidies and efficiency. Access to credits *(credit)*does not have any significant impact on efficiency according to our analysis, probably because of relatively high interest rates. Likewise, no relationship was observed between the farmers' use of insurance *(insurance)* and efficiency. Finally, no significant relationships were observed between any of the supply variables and efficiency. Whether farmers supply their outputs directly to agro-processing enterprises (supply_ch1), procurement enterprises (supply_ch2) or whether the supplies are done under special contractual agreements (supply_contract) have nothing to do with efficiency, at least in the case of the producers observed under current study.

Conclusions

Central Asia remains to be an interesting region, still having many undiscovered aspects for economists and alike. One such issue is agricultural efficiency. Central Asian countries highly depend on agriculture. It accounts for nearly quarter of their GDPs and employs nearly half of their working population on average. However, in spite of the high importance of agriculture, only limited area of their land, nearly 20%, can be used for agricultural purposes. This raises the issue of efficiency in the agricultural sector. These countries should use their limited resources as efficient as possible and secure adequate food supply for their population. Despite of the huge need for efficiency analysis in this sector, few studies have been done in the case of Central Asian countries. Even worth, limited to knowledge of the authors, in the case of some Central Asian countries like Kazakhstan, Kyrgyzstan and Turkmenistan no single study on agricultural efficiency has been found. Current article aims to fill this gap in the literature, by conducting a total factor productivity analysis in the case of 161 wheat producers from Akmola Region in Kazakhstan. For the purpose of the study, stochastic frontier analysis and software packages like STATA ("sfmodel") and Frontier 4.1 are used.

The results of the study can be described in three steps:

Firstly, the mean technical efficiency of wheat producers was 0.7769, with maximum and minimum levels of 0.565 and 0.865 respectively. Meaning that, farmers on average can still improve their efficiencies by 22.31%. More than 70% of the farms have TE levels between 0.7 and 0.8, and only 2.5% of them perform below 0.7. While Ahmatovo and Verhnerusskoe districts are the best and the worst performers with 0.84 and 0.67 TE levels respectively, others perform more or less around the mean level of 0.77.

Secondly, the elasticities of all inputs, except fertilizer were positive and statistically significant, with cooperating (0.59) and pesticide (0.04) having the largest and lowest coefficients respectively. Cooperating is a dummy variable that shows if a farm under observation cooperates with other farms in the region or not. The sum of all coefficients is 1.44, suggesting that wheat producers in the region have increasing returns to scale.

Finally, eight explanatory variables out of thirteen demonstrate statistically significant relationships, with six of them having positive and two of them having negative connections. The inverse relationship between farm size and efficiency, which became a stylized fact in an economics literature, was proved by the results of current study. Moreover, significant positive connections were observed between the explanatory variables such the age of the farms, the number of machines that the farm has, access to subsidies and farm efficiency. Similarly, producers with farm managers having university level education or specialized agricultural educationtend to be more efficient than others. Being part of a parental organization, in contrast, seem to decrease efficiency levels of farmers. Surprisingly though, having an access to credits and insurance does not have any significant impact on the farm efficiency, at least in the case of the region under observation.

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ОРТАЛЫҚ АЗИЯ ЕЛДЕРІ ЖАҒДАЙЫНДАҒЫ ЖАЛПЫ ТИІМДІЛІГІ МЕН БИДАЙ ТИІМДІЛІГІНЕ ТАЛДАУ: СТОХАСТИКАЛЫҚ ШЕКАРАЛЫҚ ТӘСІЛ

Аңдатпа: Орталық Азия экономикасы ауыл шаруашылығынан қатты тәуелді болғанына қарамастын, алып жатқан жер көлемінің тек 20% ғана ауыл шаруашылығы мақсаттары үшін жарамды болып табылады. Бұл, шектеулі ауыл шаруашылығы ресурстарын тиімді пайдалану үшін үлкен алаңдаушылық туғызады. Алайда, Қазақстан, Қырғызстан және Түркіменстан сияқты кейбір Орталық Азия елдерінің жағдайларында, ауыл шаруашылығы тиімділігін зерттеу үшін жасалған зерттеулер тым аз. Бұл мақалада «stochastic frontier analysis» әдісін қолдана отырып, Қазақстандағы бидай өндірушілердің жағдайындағы тиімділікті талдау арқылы осы олқылықтың орнын толтыру негізделген. Зерттеу үш негізгі мақсаттан тұрады: 1) бидай өндірушілердің техникалық тиімділігін бағалау, 2) жер, еңбек, тұқым, тыңайтқыштар, пестицидтер және көгілдір отынның, бидай өндірушілердің тиімділігіне ететін әсерін зерттеу; 3) ауыл шаруашылығының мөлшері, несиеге қол жетімділігі және субсидиялардың және т.б. бидай өндірушілердің тиімділігіне әсерін бағалау.

Кілт сөздер: тиімділігі, stochastic frontier approach, бидай өндіру, түсіндірме айнымалылар, Орталық Азия.

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АНАЛИЗ ОБЩЕЙ ПРОИЗВОДИТЕЛЬНОСТИ И ЭФФЕКТИВНОСТИ ПРОИЗВОДИТЕЛЕЙ ПШЕНИЦЫ В ЦЕНТРАЛЬНО-АЗИАТСКИХ СТРАНАХ: СТОХАСТИЧЕСКИЙ ПОГРАНИЧНЫЙ ПОДХОД

Аннотация: В то время как экономики стран Центральной Азии сильно зависят от сельского хозяйства, лишь 20% их земли подходит для сельскохозяйственных целей. Это вызывает большую озабоченность для эффективного использования ограниченных сельскохозяйственных ресурсов. Тем не менее, очень мало исследований на эту тему, а также в случаях некоторых странах Центральной Азии, как Казахстан, Кыргызстан и Туркменистан, ни одно исследование не было сделано на основе изучения эффективности сельского хозяйства. Эта статья призвана восполнить этот пробел путем проведения анализа эффективности в отношении производителей пшеницы в Казахстане, с помощью метода “stochastic frontier analysis”. Исследование имеет три основных цели: 1) оценка технической эффективности производителей пшеницы, 2) изучение влияния вводимых ресурсов, таких как земля, труд, семена, удобрения, пестициды и топливо на продуктивность производителей пшеницы, и 3) оценка воздействия объясняющих переменных, таких как образование фермера, размера фермы, доступ к кредитам и субсидий и т.д. на эффективность производства пшеницы.

Ключевые слова: эффективность, stochastic frontier approach, производство пшеницы, объясняющие переменные, Центральная Азия.

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ҚАЗАҚСТАНДА ТАБЫСҚА САЛЫҚ САЛУ ЖҮЙЕСІН ЖЕТІЛДІРУ ЖОЛДАРЫ

Аңдатпа: Мақалада Қазақстанда табысқа салық салу жүйесін жетілдіру жолдарының сұрақтары қарастырылған. Салық жүйесінде заңды тұлғалардан алынатын табыс салығының атқаратынын рөлі.Қазақстанда Республикасында қолданыстағы корпоративтік табыс салығының қазіргі жағдайы қарастырылды.

Нарықтық қатынастар кезінде салықтардың ел экономикасының дамуына ықпал ететін басты қару ретінде маңыздылығы айқын. Бүгін жергілікті өзін-өзі басқару органдарын қаржыландыратын түрлі табыс көздерінің ішінде алдыңғы қатарды салықтар, әсіресе табыс салықтары алады.

Салық саясаты экономикалық реттеудің ең маңызды құралдарының бірі, экономиканы мемлекеттік реттеудің қаржы-несиелік негізі болып табылады. Мемлекет салық саясатын нарықтың теріс құбылыстарына әсер етудің белгілі бір реттеуіші ретінде қолданады.

Кілт сөздер: Бақылау жүйесі, салық, салық жүйесі, салық саясаты, салықтық бақылау, табыс,табыс салығы, тіркелген активтер, экономика, экономикалық реттеу.

Қазақстанда әлеуметтік-экономикалық қайта құру кезінде, экономикалық жағдай енді ғана қалыпқа түсіп келе жатқан тұста және оның секторларына жаңарту жүргізіліп жатқанда салықты осы