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EFFECT OF STATE SUBSIDIES GRANTED TO FARMERS FOR CERTIFIED SEEDS ON WHEAT YIELD IN TURKEY

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ABSTRACT

Wheat grown in many regions in the world and in Turkey; It is an important plant in terms of its large producer mass and being the basic food of people. Wheat is an important nutritional raw material because it ranks first in consumption of foodstuffs made from wheat in Turkey. Wheat takes the first place with a rate of 69% among the total grain cultivation areas in our country. Farmers in Turkey have been subsidized to use certified seeds since 2004. However, studies to determine the effect of certified seed subsidies given to farmers are limited. In this study, the effect of the use of certified seeds on wheat yield, quality, and production cost was investigated. Study data were collected from 318 farmers. The survey was carried out between October and November 2018. In the selection of sample villages, the purposive-sampling method was used. The yield following the use of certified seeds regarding wheat production in dry areas increased by 41.4%, and in irrigated areas by 23.8%. With this increase, \$130.24 per hectare more in dry areas and \$79.64 more in irrigated areas were obtained. However, it was determined that the production costs in wheat production decreased by \$10.64 per hectare in dry and by \$11.78 in irrigated areas. It was concluded that certified-wheat-seed support increased wheat production in dry areas more than in irrigated areas. In addition, it was found that it contributed to the reduction of the cost of wheat production and the improvement of wheat quality.

Keywords: *agricultural policy, farmer preferences, profitability, wheat productivity.*

INTRODUCTION

In Turkey and the rest of the world, people demand increasingly high-quality food, while planting areas are gradually reduced in hectares (ha). In this sense, the increase in efficiency in the unit area can be realized by using newly developed techniques. The first innovation that comes to mind in crop production is the use of certified-seed varieties. In Turkey, 66.4% of agricultural areas (15.5 million hectares) is devoted to field agriculture. In these areas, approximately 71.0% (11.1 million hectares) of grains are planted. Wheat takes the first place with a share of 69% of the total grain-cultivation areas. Wheat-yield level was 2116 kg/ha in 1990,

2234 kg/ha in 2000, and 2872 kg/ha in 2015. Despite the increase in wheat production and productivity levels, this was not sufficient to meet Turkey's needs. Therefore, wheat imports in Turkey are made but vary depending on the year (Anonymous, 2017). The majority of wheat agriculture is performed in dry climate conditions in Turkey. For that reason, yield is low, and wheat farmers' income is less than that of other farmers growing other products. Various studies have shown that certified seed support contributes to increased production, higher producer income, access to quality seeds, and the reduction of rural poverty (Engindeniz and Adanacio lu, 2011; Awotide *et al.*, 2011; Dorward and Chirwa, 2011; Ali *et al.*, 2015). Similar studies have shown a decrease in the number of certified seeds, and an increase in yields per hectare as a result of support policies (Tester and Langridge, 2010). Various researchers stated that, if farmers adopt certified seeds, it can contribute to productivity in agriculture, an increase in operating income, a decrease in food prices, and poverty reduction (Sofijanova *et al.*, 2012; Laurance *et al.*, 2014; Cevher and Altunkaynak, 2020). In Turkey, the Ministry of Agriculture and Forestry supports certified-seed users to increase crop production, increase yield and quality, ensure sustainability in production, and develop agricultural techniques. With this support, it aims to increase the use of quality certified seeds demanded in the markets. The aims of this study was to determine the effect of certified-seed use on production increase in dry and irrigated areas. This study is expected to contribute to support policies for wheat production, increase producer income, and fill the gap in the literature in this field.

MATERIAL AND METHODS

In the analysis of the benefits of certified-seed support policies, the seed amount used before and after support in dry and irrigated areas was examined. "Before" includes the period before the use of certified seed, and "after" covers the period after receiving support for using certified seeds. Physical data related to wheat cultivation practices, costs, and yield, use of physical input, sale quantity, and selling prices were collected for the 2018 production year. The population of the study consisted of 1750 farmers using certified seeds in Ankara. Data were collected by face-to-face surveys of farmers selected with the Stratified Sampling Method. The number of farmers who would be interviewed was set to 318 as a result of the calculation. After the selection of the subjects was determined, questionnaire forms were prepared in accordance with the purpose of the research. The final version of the questionnaire was reviewed by expert researchers on agribusiness and agricultural. There are 27 questions in the survey. The questions were considered in three categories. The questionnaire consists of the individual characteristics of the farmers, the infrastructure of the enterprise and before and after using certified seed. Primary information was collected by using a pretested interview schedule, with a face-to-face interview method between October and November 2018. Assumptions of normality and homogeneity of variance were examined with the Kolmogorov-Smirnov and Levene tests, respectively. Since assumptions were met, parametric tests were used to compare the groups. A paired

t-test was performed before and after support. The upper limit was 0.05 for significance.

RESULTS AND DISCUSSION

Effect of certified-seed use before and after yield support

The desired yield and quality level in grain production have not been reached in Turkey. To eliminate this situation, certified-seed users are supported by the Ministry of Agriculture and Forestry. In this study, the effect of certified seeds on production, quality, gross profit, and production cost was demonstrated. In this context, the production technique, by using or not certified seeds, was compared. As a result of this production comparison, the effect of certified-seed use on operating income was determined. For the subsidy given to producers to be effective, the used technology must have an impact on operating costs (Oluwatoba *et al.*, 2019). Another study found that farmers who had access to certified wheat seeds had higher income than farmers who did not (Ali *et al.*, 2015). It was determined that newly used technologies cause a decrease in average production cost and an increase in farm income (Challa, 2013).

The obtained yield from wheat production in dry areas before support was between 1500–3500 kg/ha, while yield amount was found to vary (3800–6500 kg/ha) in irrigated areas. In wheat production after support, yields in dry areas varied in the range of 2000–4100 kg/ha, and in irrigated areas in the range of 3500–8000 kg/ha. Distributions of yield amounts before and after support in dry and irrigated areas are shown in Table 1, which shows that the highest yield rate was in the 2010–2500 kg/ha yield range before certified-seed support, followed by the 2510–3000 kg/ha yield range. The ratio of producers in these two yield ranges was 70.7%. The rate of producers with yields of more than 3010 kg/ha was 6.1%. In these yield levels, gross production values to be obtained by the wheat producer were not sufficient. The average size of agricultural enterprises in Turkey is 600 hectares. Therefore, the income from agricultural enterprises is not sufficient for farmers' sustainable agricultural production. Consequently, it is necessary to increase the yields to be obtained in the research area. One of the most important factors in increasing wheat production is the spread of certified-seed use. In this context, the Ministry of Agriculture and Forestry initiated a certified-seed support project to promote the use of certified seeds. After subsidies, the amount of certified seeds used by producers began to increase. Therefore, yields of wheat production after certified-seed support were determined. The obtained yields are shown in Table 1, showing that the rate of producers producing wheat in the yield range of 2010–2500 kg/ha was 22.5%. The ratio of those who produce in the 2510–3000 kg/ha yield range was 28.0%. The ratio of producers in these two yield ranges was 50.5%. The ratio of producers in these two yield ranges decreased by 20.2% (70.7–50.5%) when compared to the support level. Therefore, we determined in which yield range the decrease in these two yield ranges shifts. Table 1 shows that the ratio of producers who received more than 3010 kg/ha before support was 6.1%, and this ratio increased to 47.1% after support. This result shows that producers in other yield ranges were in a yield range of more than 3010 kg/ha. As can be seen from the

table, there was a significant increase in yields above 3010 kg/ha, while the use of other certified seeds declined.

Although most wheat production is carried out in dry areas in the research area, it also occurs in irrigated areas. For this purpose, we determined the level of wheat production in irrigated areas. As can be seen in Table 1, producers in the 5010–6000 kg/ha yield range before support constitute half of total producers (50.0%). The rate of producers having yields more than 6010 kg/ha was determined as 10.0%. After the use of certified seeds, the maximal yield amount was 6010 kg/ha, which was in the 2090 yield range because change rates in other yield ranges varied between 2.7% and 1.8%. According to these results, the yield in dry areas was higher than the yield in irrigated areas and it can be said that the yield ratio obtained both before and after support is higher in dry areas.

Table 1. Wheat yield in dry and irrigated areas before and after support (%).

Dry Area Yield Amount (kg/ha)			Irrigated Area Yield Amount (kg/ha)		
Yield Range *	Before (%)	After (%)	Yield Range *	Before (%)	After (%)
2000	23.2	2.4	4000	11.8	9.1
2010–2500	35.5	22.5	4010–5000	28.2	26.4
2510–3000	35.2	28.0	5010–6000	50.0	33.6
3010	6.1	47.1	6010	10.0	30.9
Total	100.0	100.0	Total	100.0	100.0

* As yield increase was higher in irrigated areas, yield range was not taken at same level in dry and irrigated areas.

Amount of certified seeds used before and after support

The effect of certified-seed use on yield is 25.0%–30.0% on average, and we aimed to determine the level of this effect in the research region. We compared certified- and uncertified-seed yields, and Table 2 shows the yields of used wheat varieties before and after support. As seen from Table 2, the increase in production after the use of certified seeds in both dry and irrigated areas was found to be statistically significant ($p < 0.05$). In dry areas, an average of 2467 kg/ha was obtained before certified-seed support, and this amount increased to 3059 kg/ha after support, with an average increase in production of 592 kg/ha (3059–2467 kg/ha). This value was evaluated in 2018 current prices, and the amount of profit per hectare was calculated. According to December 2018 wheat prices (Turkish Grain Board (TMO) sales: \$0.22), this amount showed that \$130.24 (592 kg/ha x \$0.22) more income is generated per hectare (kg/ha). In production in irrigated areas, an average of 5323 kg/ha was taken before support, and after support, this amount increased to 5685 kg/ha. Accordingly, certified-seed support has a positive effect on production in both dry and irrigated areas (Table 2). The average increase in efficiency after support is 362 kg/ha. When compared to wheat prices in December 2018 (TMO sales: \$0.22), \$79.64 more income was generated per hectare. Certified-seed support, therefore, increases the production amount and, thus, the income in both dry and irrigated areas. A study conducted in Nigeria found that rice production

increased by 18,5% and household income increased by 2.3% as a result of supported certified seeds. This increase contributed to the reduction of existing rural poverty (Awotide *et al.*, 2011). Another study supported quickly providing quality seeds to farmers, and stated that the production income increased by 3.5% in 2006/7 and by 4.0% in 2007/8 (Srinivas *et al.*, 2010). In our study, there was an increase in production income and a decrease in production inputs with the use of certified seeds. In wheat production, wheat yield and operating income increase with the adoption and use of productive varieties (Barkley *et al.*, 2010). In their study, Hagos and Hsdush (2017) determined that the obtained yield from certified wheat seeds was 50% higher than that from traditional seeds. Farmers pay more for certified seeds than local and old varieties to obtain quality seeds. However, the additional obtained income with quality seeds is much higher than their cost (Hue *et al.*, 2009). Our findings are similar to those mentioned above.

Efficient use of scarce resources is important to ensure competitiveness in production. From this perspective, it is important to determine the effect on production cost of the used resources in wheat production. In Turkey, the cost of wheat-seed production is 15.0%–20.0% on average. Therefore, this ratio is an important part of production cost. Seed amounts used before and after support were determined, and these results are shown in Table 2. As seen from Table 2, the decrease in the amount of used seeds after certified-seed support in both dry and irrigated areas was found to be statistically significant ($p < 0.05$). In dry areas, 235 kg/ha of seeds was used before support in production, while this amount after support decreased to 207 kg/ha. Thus, the use of seeds in dry areas after certified-seed use decreased by an average of 28 kg/ha (235–207). When this amount is evaluated according to average wheat-seed prices of 2018 (trader: \$0.38), \$10.64 more savings were achieved in terms of production costs. In production in irrigated areas, 229 kg/ha of seeds was used before support, and this amount decreased to 198 kg/ha after support. Thus, the use of seeds in irrigated areas after certified-seed use decreased by an average of 31 kg/ha. In other words, according to average wheat-seed prices (trader: \$0.38) in 2018, there are \$11.78 savings in production costs. Accordingly, certified-seed support reduces the amount of seed used in both dry and irrigated areas, and hence the cost of production. In a previous study on this issue, the average yield obtained from the use of certified seeds in wheat production was determined to be 22.5% higher than that of production with uncertified seeds. When certified seeds were used, gross profit was 36.0% higher than that of uncertified seeds. When certified seeds were used, net profit per hectare was also 26.5% higher than that with uncertified seeds (Sofijanovna *et al.*, 2012). With the use of certified seeds, a 33.0% increase in yield in irrigated areas and 28.0% increase in average yield were reported (Kugbei, 2011). A similar study found that average yield was 24.9%, and net profit in the unit area increased by 24.3% with the use of certified seeds in wheat production (Tanrıvermi and Akdoğan, 2007). There is, therefore, a similarity between the results obtained in our study and other studies on this subject.

Table 2. Comparison of wheat yield and seed amount in dry and irrigated areas.

Condition	n	Wheat Yield (kg/ha)				Seed Amount (kg/ha)				
		Mean	SD	t	p	Mean	SD	t	p	
Dry areas	Before	292	2467	42.62	-47.5 **	<0.001	235	1.39	37.6 **	<0.001
	After	292	3059	46.70			207	1.45		
Irrigated areas	Before	107	5323	81.36	-15.6 **	<0.001	229	1.00	27.1 **	<0.001
	After	107	5685	91.58			198	1.04		

** Statistically significant at 1% level.

Although wheat production increased after support, and the used-seed amount decreased, examination of production according to used seeds gives healthier results. Therefore, the amount of increase or decrease in wheat production before and after support was determined, as well as the amount of increase or decrease in dry and irrigated areas. In this study, we calculated yield in terms of Yield = Production per hectare (kg)/Seed per hectare (kg). The yield values of farmers before and after using certified seeds in irrigated and dry areas are compared in Table 3. As seen from Table 3, the increase in yield after certified-seed use in both dry and irrigated production was found to be statistically significant ($p < 0.05$). In the production of dry areas, while 105 kg/ha per 1 kg of seed was obtained before certified-seed support, this amount increased to 149 kg/ha after support. With the use of certified seeds, there is a 41.4% increase in the total production per hectare in dry areas. In the production of wheat in irrigated areas, while an average of 235 kg/ha was obtained per one kg of seed before support, this amount increased to 290 kg/ha after support. The rate of increase in total production was 23.8%. Accordingly, certified-seed support has a positive effect on the yield of both dry and irrigated areas, and this effect is greater than that of production in dry areas.

Table 3. Comparison of yield before and after certified seeds (kg/ha)

Condition		n	Mean	SD	t	p
Dry Areas	Before	292	105	1.96	-54.55 **	0.000
	After	292	149	2.56		
Irrigated Areas	Before	107	235	3.83	-24.32 **	0.000
	After	107	290	5.32		

** Statistically significant at 1% level.

CONCLUSIONS

According to the obtained results for the amount of product per hectare before and after support, the use of certified seeds increased the production amount and, thus, the income in both dry and irrigated areas. The increase in production after support was 592 and 362 kg/ha for dry- and irrigated-land areas, respectively. In the performed analyses for the amount of seed per hectare before and after support, with the use of certified seeds, the amount of used seeds, and thus the cost of

production, in both dry and irrigated areas decreased. After the use of certified seeds, the average use of seeds in dryland decreased by 28 kg/ha, while this value was 31 kg/ha in irrigated fields. Therefore, farmers, researchers, traders, non-governmental organizations, and enterprises operating in the seed industry should co-operate. In this context, the continuation of certified-seed support for wheat seeds is important for the use of certified seeds by producers.

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