

ANALYSIS OF THE SOCIO-ECONOMIC DETERMINANTS OF GOVERNMENT-SUBSIDIZED CERTIFIED SEED USE: A CROSS-SECTIONAL STUDY ON TURKISH POTATO FARMING

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Abstract

Potato is one of the important agricultural products in the fight against malnutrition and poverty. It is also very important for the economy of countries with its contribution to employment and foreign exchange earnings in the production process. The use of certified seeds increases yield in potato production. Potato production costs are decreased due to increased yield. For this reason, certified potato seed use is encouraged by the government in Türkiye since 2005. This study, it was aimed to analyze the socio-economic determinants of government-subsidized certified seed use. To achieve this aim, the socioeconomic and technical characteristics of the farmers using certified seed and farm-saved seeds were compared. This study was conducted with 80 potato farmers. According to the research findings, it was determined that both the farm size, the potato production area and the potato yield of the farmers using certified seeds were higher than the farmers using farm-saved seeds. It is determined that the factors that farmers give importance to when purchasing potato seeds are the seed is cheap, resistant to diseases, and high yielding, respectively. The most common problem faced by farmers in the use of seeds is that the seed is expensive for farmers using certified seeds; It has been revealed that there are diseases and pests in farmers using farm-saved seeds. Considering that certified seeds use is one of the main factors that increase the potatoes yield supporting the use of certified seeds is important for the continuity of potato production and profitability.

Key words: potato farming, certified seed use, farm-saved seed, seed subsidy policies, Türkiye

INTRODUCTION

The agricultural sector is the main sector that provides nutrition to people and fights hunger by increasing food production. In addition, it has an important role in the economy of countries with the formation of GDP, foreign exchange earnings, raw material supply to food industry, reducing poverty, and contributing to employment [25]. Potatoes, one of the important crops, constitutes one of the four crops (rice, wheat, corn) that meet 50% of the world's food needs [11]. For this reason, it is an important product to be considered within the scope of combating malnutrition and malnutrition [32]. The International Year of Potatoes was declared in 2008 by the United Nations due to its contribution to food security and poverty eradication, as it is the most important non-

grain food in the World [10, 18]. In addition, it takes its place among the crops preferred by the farmers due to the large amount of product obtained from the unit area, the possibility of storage, the short product life cycle, and the ability to be converted into a cash source in the short term [16]. In addition, it is a low-fat and energy-giving food, rich in carbohydrates and vitamin C [6, 15]. According to 2020 production data in the world, in a total area of 16,494,810 hectares, 359,071,403 tons of potatoes were produced. The first five countries that are important in production are respectively: China (21.77%), India (14.29%), Ukraine (5.80%), Russia (5.46%), and the USA (United States) (5.23%). These countries meet 52.56% of the total potato production in the world. Türkiye accounts for 1.45% of world production with 5,200,000 tons of potato production and ranks 16th [12].

Considering the climatic conditions, ecology, and soil structure of Türkiye, potato production can be done in almost every region of the country [34]. When Türkiye's 2000-2020 potato production period is examined, although there is an increase in potato yield over the years, there are fluctuations in the production area and amount. This is because; increases in potato prices in the market; increase the potato cropping areas in the next year, and the decrease in prices may cause a decrease in cropping areas [34]. This situation is expressed as the Cobweb Theorem in economics. Seed has a very special place in the agricultural production [23]. The importance of using seeds in potato production is more than other crops [16]. Farm-saved seeds and certified seeds are used as potato seeds in the potato production. Farm-saved seeds can be produced on the farm or market, neighbour, etc. can be purchased anywhere. Certified seeds are seeds purchased from specialist breeders through a seed certification program whose seed quality is usually formally established by government agencies. In some studies, it has been stated that farm-saved seeds, which are used informally, cause the spread of diseases and lead to low yields [8, 13, 18, 27]. The use of certified seeds in crop production provides an increase of about 20-30% in yield, depending on other production conditions. The use of certified seeds in crop production reduces the unit cost with high yield. Therefore, the use of certified seeds in crop production provides important gains both for agricultural management and for the economy of the region and the country [1, 20, 33].

The establishment of the necessary organizations related to seed certification in the world started in the early 1900s [3]. In Türkiye, the entry into force of Law No. 308 on "Registration, Control and Certification of Seeds" in 1963 is one of the important steps taken on certified seeds. Since 2005, Certified Seed Use Support has been given to farmers by the Turkish government to encourage the use of certified seeds [5]. With the support given, the use of certified seeds has increased. Potato seed sector in Türkiye mostly works in

the form of marketing the imported rootstock stage seed once in the country. In case of insufficient certified seed production, farmers use potato tubers as seeds, which they compulsorily separate from their own crops or obtain from others. The use of farm-saved seeds causes the spread of many disease factors, as well as low yield, and causes the sustainability of our potato production to become threatening. While the rate of certified seed usage is 95-100% in developed countries where potato farming is carried out, this rate is around 25-30% in Türkiye [24].

In order to increase certified potato seeds production and use in Türkiye, disease-free and high-yielding certified production of certified potato seeds and the use of certified potato seeds are supported by the government. With the potato seed policy implemented by the government, in order to ensure the development of the seed sector in accordance with international competition, in species where domestic seed production is insufficient, a support payment per kg is made to authorized seed organizations that produce/produce and certify certified seed domestically and sell them domestically. Certified seed usage support is paid to farmers who use domestically produced and certified seeds and who crop on lands registered in the Farmer Registration System in the relevant year. With an increase of 18 TRY in 2005 and 11.1 times in 2022, the amount of support has reached 200 TRY [2]. This study, it was aimed to examine the socio-economic determinants of the use of government-supported certified seeds in Ödemiş District of İzmir province. In order to achieve this goal, the socio-economic and technical characteristics of farmers using certified seeds and farm-saved seeds were compared. In addition, the problems faced by the farmers in the potato production process were determined.

MATERIALS AND METHODS

The study was carried out in the Ödemiş district of İzmir province, which has an important share in potato production in

Türkiye. The data of the study; ranks first in potato production in Ödemiş district of İzmir province with a share of 83.3%; The original quality data obtained by the survey method with potato farmers in Kazanlı, Karakova, Günlüce, Cumhuriyet, Tekke, Çaylı, Gereli, Kaymakçı, Birgi, Anafartalar, Atatürk, Balabanlı, Büyük Avulcuk, and Kurucuova neighbourhoods. As a result of the negotiations with the Ödemiş District Directorate of Agriculture and Forestry, it was determined that there were 1,700 potato farmers in the Ödemiş district of İzmir province in the production period of 2018. The formula “Simple Random Probability Sampling Based on Population Ratios: Finite Population” was used to determine the sample size [22]. As a result of the calculations, the sample size was found to be 80 ($n=80.11$) with a 9% part of the error in the 90% confidence interval. The surveyed farmers were determined randomly and 80 farmers were interviewed in the study area. In the selection of sample neighbourhoods, criteria that can represent the district in terms of socio-economic terms were taken into consideration.

$$n = \frac{Np(1-p)}{(N-1)\sigma^2 + p(1-p)} \dots \dots \dots (1)$$

In the formula presented above:

n = Sample size

N = Population size (1,700)

p = Estimation rate (0.05 for sample size)

σ^2 = Population variance.

The data obtained from the farmers as a result of the survey were analyzed in the statistical program (SPSS Statistics) and the socio-demographic and technical characteristics of the farmers and farms were determined. In addition, related variables between farm-saved and certified seed selected among potato farmers were revealed by the chi-square test. Also, simple average, the absolute and relative distributions were calculated in the analysis of the data. The obtained findings were interpreted with tables.

RESULTS AND DISCUSSIONS

Farmers plant potato in January and February in Ödemiş district. The harvest date is between May and June. Potatoes are planted as a second or third crop in August and harvested in November-December. While the early potato production in the research area is made as table, the second or third product potato is produced as seed. In addition, some farmers sow forage crops within two-three months after the early potato harvest and turn them into silage. Then they crop the third crop, seed potatoes [14].

Information on the socio-demographic and technical characteristics of potato farmers and farms is given in Table 1. 25% of the surveyed farmers use certified seeds. The age range of farm owners using farm-saved seeds in potato production ranges from 29 to 70 years, with an average age of 51.4 years. The age range of farm owners using certified seeds varies between 28 and 77 years, with an average age of 55.1 years. It was concluded that farm owners using certified seeds are older than farm owners using farm-saved seeds. The average education level of farm owners using farm-saved seeds and certified seeds was determined as 5.9 years and 6.1 years, respectively. Türkiye's average education level in 2018 was 7.7 years, according to a United Nations Development Program report [29]. In this study, it was determined that the average education level of farm owners is below the average in Türkiye. In farms using farm-saved seeds, agricultural production experience was determined as 28.8 years and potato production experience as 22.0 years. In farms using certified seeds, the average experience of agricultural production is 30.6 years, and the average experience of potato production is 21.3 years. In another study, it was determined that potato farmers had an average of 23.3 years of agricultural production experience [4]. Daniel et al. [7] determined that the agricultural production experience of the farmers was 14 years. A study in Kenya found that potato farmers have an average of 14 years of experience in production [18]. The average land size was calculated as 4.3 hectares, the average potato land size was 2.0 hectares in the farms using

farm-saved seeds, the average land size was 7.8 hectares and the average potato land size was 4.9 hectares in the farms using certified seeds. It was determined that the farms using certified seeds were larger in terms of average land size and average potato land size (Table 1). In another study, the average land size was found to be 2.5 ha [7]. Tolno et al. [28] determined the size of the farm as 1.5 ha and the potato cultivation area as 0.9 ha. Potato yield; It was determined as 32,250 kg/ha on average in farms using farm-saved seeds, and 36,725 kg/ha on average in farms using certified seeds. Seed use per hectare was calculated as 3,333.3 kg in farms using farm-saved seeds, and as 3,622.5 kg in farms using certified seeds (Table 1). In a study, it was determined that the used of seeds and yield in potato production were 3,377.8 kg/ha and 36,580 kg/ha, respectively [17]. In another study, it was figured out that the farmers used 1,592.10 kg/ha of seeds and 10,730.5 kg/ha yield [7]. For farms using farm-saved seeds, the average fallow area was 0.03 hectares, the average irrigated land was 4.3 hectares, and

the average dry land was 0.02 hectares. The average irrigated land area was calculated as 7.8 hectares in the farms using certified seeds, and it was revealed that there was no fallow land and dry land area in these farms. It was determined that the farmers did not have agricultural adviser in the farm using farm-saved seeds, and 10% of the farms using certified seeds had agricultural adviser. It was realized that 1.7% of the farms using farm-saved seeds while 5.0% of the farms using certified seeds had agricultural insurance. It was found out that 46.7% of the farms using farm-saved seeds had non-agricultural income, 66.7% benefited from agricultural supports, and 5% received training in potato farming. It was determined that 30.0% of the farms using certified seeds had non-agricultural income, 80.0% benefited from agricultural supports, and 15% received training in potato farming (Table 1). In another study, it was stated that less than 40% of potato farmers were aware of the existence of training and research institutes to improve their production activities [21].

Table 1. General characteristics of the farms and farmers

Characteristics	Farm-saved seed used farms (N=60) Min	Farm-saved seed used farms (N=60) Max	Farm-saved seed used farms (N=60) Mean	Std. Dev.	Certified seed used farms (N=20) Min	Certified seed used farms (N=20) Max	Certified seed used farms (N=20) Mean	Std. Dev.
Age (years)	29.0	70.0	51.4	10.7	28.0	77.0	55.1	11.9
Education level of farmers (years)	5.0	12.0	5.9	2.2	5.0	12.0	6.1	2.6
Population (person/family)	2.0	5.0	3.6	0.8	3.0	6.0	4.2	1.0
Experience in farming (years)	8.0	50.0	28.8	11.0	4.0	50.0	30.6	12.3
Experience in potato production (years)	8.0	35.0	22.0	7.1	4.0	35.0	21.3	7.6
Farm size area (hectare)	0.5	27.0	4.3	4.5	1.5	21.0	7.8	4.9
Potato area (hectare)	0.5	9.0	2.0	1.7	1.0	18.0	4.9	4.1
Other crops production area (hectare)	0.0	24.5	2.2	4.2	0.0	12.5	2.9	3.6
Potato yield (kg/ha)	25,000.0	36,000.0	32,250.0	2,919.1	30,000.0	40,000.0	36,725.0	2,844.5
The use of seed (kg/ha)	2,500.0	4,000.0	3,333.3	366.7	3,000.0	4,000.0	3,622.5	249.5
Number of parcels	1.0	16.0	4.7	3.8	1.0	24.0	5.9	6.4
Fallow land (hectare)	0.0	2.0	0.0	0.3	0.0	0.0	0.0	0.0
Irrigated land (hectare)	0.5	27.0	4.3	4.5	1.5	21.0	7.8	4.9
Dryland (hectare)	0.0	0.5	0.0	0.1	0.0	0.0	0.0	0.0
Own property land (hectare)	0.0	27.0	2.7	3.8	0.0	16.0	3.8	3.8
Rent land (hectare)	0.0	10.0	1.6	2.2	0.0	15.0	3.9	4.0
Agricultural consultancy of farmers (%)	-	-	0.0	-	-	-	10.0	-
Farmers taking out agricultural insurance (%)	-	-	1.7	-	-	-	5.0	-
Non-agricultural income (%)	-	-	46.7	-	-	-	30.0	-
Benefiting from agricultural support (%)	-	-	66.7	-	-	-	80.0	-
Training about potato farming (%)	-	-	5.0	-	-	-	15.0	-

Source: Authors' own calculations based on survey data.

It was determined that the average farm land size was between 1-2.5 hectares in 41.2% of the farms, between 2.6-5.0 hectares in 22.5%,

and 5.1 hectares and above in 36.3%. In terms of farm land size, the difference between farms using farm-saved seeds and those using

certified seeds was found to be statistically significant ($p < 0.01$). It was determined that the average potato planted land size was between 1.0-2.0 hectares in 58.7% of the farms, between 2.1-4.0 hectares in 22.5%, and 4.1 hectares and above in 18.8%. The difference between the farms using farm-saved seeds and those using certified seeds in terms of potato planted land size was found to be statistically significant ($p < 0.01$). In a study conducted in Kenya, it was found that farmers have an average of 1.7 hectares of farm size and potatoes production on an average of 1.3 hectares [18]. In addition, it was noticed that the size of the land did not have important as statistical on the use of certified seeds. In a study conducted in Türkiye's Afyonkarahisar province, it was determined that the average potato land size of the farms was 10.5 hectares [16].

It has been determined that 56.3% of the farmers do not have a membership in any agricultural cooperative. A statistically significant difference was found between the farms using farm-saved seeds and those using certified seeds in terms of agricultural cooperative membership ($p < 0.05$). In another study, the rate of potato farmers being a member of any cooperative was stated as 25% [26]. Daniel et al. [7] stated in their studies that 42% of the farmers are members of any producer association, while Kadakoğlu [17] stated that 63.3% of the farmers are members of agricultural cooperatives. It was determined that 21.3% of the farms used agricultural credit. In terms of agricultural credit use, a statistically significant difference was found between farms using farm-saved seeds and enterprises using certified seeds ($p < 0.05$). In another study, it was stated that only 35% of farmers had access to agricultural credit [7]. Tolno et al. [28] determined the rate of farmers who have access to credit as 54% in their interviews with farmers. It was determined that 7.5% of the farms were engaged in contract farming. The difference between farms using farm-saved seeds and farms using certified seeds was statistically significant ($p < 0.01$). In another study, it is stated that only farmers

who are financially stable and who can take the risk of loss make contract production, while farmers with less stability in terms of income stay away from contract production by making subsistence production [30]. It was determined that 70% of the farms benefited from the agricultural supports given by the Ministry of Agriculture and Forestry in Türkiye for potato production. Kadakoğlu [17] found that 67.1% of potato farmers benefited from agricultural supports. In addition, 38.0% of potato farmers benefiting from agricultural supports stated that they received certified potato seed use support. Bağcı and Yılmaz [3] also stated that support for the use of certified seeds increased the rate of use of these seeds. The percentage of farmers that state that it is important to be cheap when purchasing potato seeds is 85.0%. The percentage of farmers that state that it is important to be resistant to diseases is 43.8%. The rate of farmers that state that it is important to have high yield is 15%. The difference between the farms using farm-saved seeds and the farms using certified seeds was found to be statistically significant in terms of cheapness and high yield when purchasing seeds ($p < 0.05$). In addition, the difference between farms using farm-saved seeds and farms using certified seeds was found to be statistically significant in terms of the resistance of potato seeds to diseases ($p < 0.01$). In a study, it was determined that the production type, cooking method, resistance to diseases, and yield characteristics were effective in determining the seed selection preferences of the farmers [19]. In another study, the factors affecting the selection of seed potatoes by farmers are respectively; yield level, price, and ease of sale after production, germination power, resistance to diseases and pests, being an early variety, and physical characteristics of the seed [14]. It was determined that 50% of the farmers had irrigation problems in potato farming. The difference between the farms using farm-saved seeds and the farms using certified seeds was found to be statistically significant in terms of experiencing irrigation problems ($p < 0.05$).

Table 2. Chi-square analysis results of the relationship between seed use type and selected socio-economic characteristics

Characteristics	Farm-saved seed used farms (N=60)		Certified seed used farms (N=20)		Total (N=80)	
	N	%	N	%	N	%
Size of farmland area (ha)						
1-2.5	31	51.7	2	10.0	33	41.3
2.6-5.0	13	21.7	5	25.0	18	22.5
5.1+	16	26.7	13	65.0	29	36.3
Total	60	100.0	20	100.0	80	100.0
$\chi^2=12.468, p=0.002***$						
Size of potato production area (ha)						
1-2.0	42	70.0	5	25.0	47	58.8
2.1-4.0	12	20.0	6	30.0	18	22.5
4.1+	6	10.0	9	45.0	15	18.8
Total	60	100.0	20	100.0	80	100.0
$\chi^2=15.637, p=0.000***$						
Education						
Primary and Middle school	54	90.0	17	85.0	71	88.8
High school or university	6	10.0	3	15.0	9	11.3
Total	60	100.0	20	100.0	80	100.0
$\chi^2=0.376, p=0.540$						
Farming experience (years)						
1-30	36	60.0	10	50.0	46	57.5
31+	24	40.0	10	50.0	34	42.5
Total	60	100.0	20	100.0	80	100.0
$\chi^2=0.614, p=0.433$						
Potato production experience (years)						
1-25	40	66.7	14	70.0	54	67.5
26+	20	33.3	6	30.0	26	32.5
Total	60	100.0	20	100.0	80	100.0
$\chi^2=0.076, p=0.783$						
Cooperative membership of farmers						
Yes	22	36.7	13	65.0	35	43.8
No	38	63.3	7	35.0	45	56.3
Total	60	100.0	20	100.0	80	100.0
$\chi^2=4.893, p=0.026**$						
Use of agricultural credit						
Yes	9	15.0	8	40.0	17	21.3
No	51	85.0	12	60.0	63	78.8
Total	60	100.0	20	100.0	80	100.0
$\chi^2=5.602, p=0.018**$						
Contract farming						
Yes	1	1.7	5	25.0	6	7.5
No	59	98.3	15	75.0	74	92.5
Total	60	100.0	20	100.0	80	100.0
$\chi^2=11.772, p=0.003**$						
Number of irrigations						
1-7	37	61.7	12	60.0	49	61.3
8+	23	38.3	8	40.0	31	38.8
Total	60	100.0	20	100.0	80	100.0
$\chi^2=1.113, p=0.573$						
Benefiting from agricultural supports						
Yes	40	66.7	16	80.0	56	70.0
No	20	33.3	4	20.0	24	30.0
Total	60	100.0	20	100.0	80	100.0
$\chi^2=1.270, p=0.260$						
Using the same seed every year						
Yes	36	60.0	7	35.0	43	53.8
No	24	40.0	13	65.0	37	46.3
Total	60	100.0	20	100.0	80	100.0
$\chi^2=3.771, p=0.046**$						
I buy cheap seeds						
Yes	48	80.0	20	100.0	68	85.0
No	12	20.0	0	0.0	12	15.0
Total	60	100.0	20	100.0	80	100.0
$\chi^2=4.706, p=0.030**$						
I buy disease-resistant seeds						
Yes	34	56.7	1	5.0	35	43.8
No	26	43.3	19	95.0	45	56.3
Total	60	100.0	20	100.0	80	100.0
$\chi^2=16.271, p=0.000***$						
I buy high-yielding seeds						
Yes	12	20.0	0	0.0	12	15.0
No	48	80.0	20	100.0	68	85.0
Total	60	100.0	20	100.0	80	100.0
$\chi^2=4.706, p=0.030**$						
I'm having a problem irrigation						
Yes	26	43.3	14	70.0	40	50.0
No	34	56.7	6	30.0	40	50.0
Total	60	100.0	20	100.0	80	100.0
$\chi^2=4.267, p=0.035**$						

** $p \leq 0.05$, *** $p \leq 0.01$

Source: Authors' own calculations based on survey data.

The problems faced by the farmers in potato production at the examined farms are given in Table 3. The biggest problem experienced by farmers using certified seeds was; while the seed was expensive (70%), the farmers using farm-saved seeds stated that they had problems with disease (60%) and low yield (36.7%) (Table 3). Wasilewska-Nascimento et al. [31] determined the most important problems faced by potato farmers in tropical and subtropical regions; they stated that the farm-saved seed potatoes are of insufficient quality, the availability of certified seed is insufficient, and the cost is high. It has been determined that the rate of encountering diseases and pests is quite high for farmers using both certified and farm-saved potato seeds in the research region. The most common disease is *Phytophthora infestans*; the most common pests are *Macrosiphum euphorbiae* and *Agrotis spp.* (Table 3). In a

study conducted in Vietnam, the reason for the large yield losses in potatoes is *Phytophthora infestans*, *Liriomyza spp.*, and *Ralstonia solanacearum* [21]. Erdevil and Erkiliç [9] stated that the use of certified seeds and soil drainage should be given importance in order to reduce the incidence of *Rhizoctonia solani* disease, which is common in potatoes. It has been revealed that farmers using certified seeds have more irrigation problems (70%). These problems include insufficient irrigation water (40%) and high energy prices used in irrigation (40%). It was noticed that farmers using farm-saved seeds (73.3%) experienced more marketing problems than farmers using certified seeds (50%). Input costs were found to be high for farmers using both certified (70%) and farm-saved seeds (61.7%) (Table 3). Other studies [16, 34] found that seed costs were the most expensive factor in potato production.

Table 3. Problems in potato production

	Farm-saved seed used farms (N=60)		Certified seed used farms (N=20)	
	N	%	N	%
Seed*				
To be expensive	3	5	14	70.0
Disease	36	60	1	5.0
Low yield	22	36.7	0	0
Seed supply	2	3.3	1	5.0
Disease*				
<i>Phytophthora infestans</i>	59	98.3	19	95.0
<i>Ralstonia solanacearum</i>	17	28.3	2	10.0
<i>Erwinia carotovora</i>	8	13.3	4	20.0
<i>Streptomyces scabies</i>	21	35.0	4	20.0
<i>Synchytrium endobioticum</i>	8	13.33	3	15.0
Pests*				
<i>Phthorimaea operculella</i>	21	35.0	10	50.0
<i>Macrosiphum euphorbiae</i>	48	80.0	14	70.0
<i>Leptinotarsa decemlineata</i> Say	20	33.3	3	15.0
<i>Agrotis spp.</i>	47	78.3	14	70.0
<i>Gryllotalpa gryllotalpa</i>	11	18.3	2	10.0
Irrigation*	26	43.3	14	70.0
Insufficient irrigation water	10	16.7	8	40.0
High irrigation fee (High energy prices used in irrigation)	16	26.7	8	40.0
Infrastructure	7	11.7	3	15.0
Marketing	44	73.3	10	50.0
Input Costs	37	61.7	14	70.0
Harvest (Lack of labor)	17	28.3	7	35.0
Storage (Loss of crop)	3	5.0	1	5.0

*More than one option marked.

Source: Authors' own calculations based on survey data.

CONCLUSIONS

Potato is an important food product in human nutrition. In addition to supplying raw materials to countries, it provides foreign exchange earnings, a contribution to employment, and a competitive advantage in the fight against poverty. This study was conducted with 80 potato farmers in the Ödemiş district of İzmir province, which is an important production region for potato production. In this study, it was aimed to examine the socio-economic determinants of the use of seeds certified by the Turkish government. To achieve this goal, the socio-economic and technical characteristics of farmers using certified and farm-saved potato seeds were compared.

According to the results of the research, it was determined that both the land size and the potato production area of the farms using certified seeds with government support were higher than those of the farmers using farm-saved seeds. At the same time, it was revealed that the farmers using state-supported certified seeds had higher potato yields than the farmers using farm-saved seeds. It has been determined that farmers using state-supported certified seeds participate in agricultural extension activities related to potato production more than those using farm-saved seeds.

The factors that farmers pay attention to when buying seed potatoes are, respectively; that they are cheap, resistant to diseases, and provide a high yield.

The most common problems faced by farmers in potato production are; it was ascertained that the seeds were expensive for farmers using certified seeds, and diseases and pests were found in those using farm-saved seeds. In addition, it was determined that the input costs were high for farmers using both certified and farm-saved seeds.

One of the most important factors increasing the yield in potato production is the use of certified seeds. Increasing the use and support of certified seed production is important for the sustainability of potato production. In addition, agricultural extension activities

should be carried out on the benefits and importance of using certified seeds. In addition, bureaucratic and technical barriers should be reduced so that farmers can benefit more from certified seed use support.

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