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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 10 (24): 4339-4353, 2007
ISSN 1028-8880

The Use of Certified Seeds of Improved Wheat Varieties in Farms and the Contributions of Certified Seed Usage to Enterprise Economies: The Case of Ankara Province in Turkey

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Abstract: In this research, the use of certificated seeds of improved wheat varieties in farms of Ankara, which have an important share in wheat production of Turkey and the contributions of the certified seeds usage to enterprise economy have been evaluated by using data collected from farms via a questionnaire. The low level of use of certificated wheat seed in farms is associated with many factors, such as price of the seed (cost), yield gains and suitability of the varieties for the farming aims of producers. Average productivity is 49.5% and average net profit is 39.7% higher in the production of wheat with certificated seeds of improved varieties in farms in comparison to farming with traditional varieties. Average productivity in wheat production with uncertified seeds of improved varieties is 24.9% and net profit per unit area is 24.3% higher than wheat production with traditional varieties. The net economic benefit of wheat production using certificated seeds of improved varieties and that of wheat farming with uncertified seeds has been estimated at $ 102.40 and $ 62.70 ha^{-1}, respectively. Some $ 6.4 benefit is generated in return for $ 1 of expense in wheat farming with certificated seeds of improved varieties instead of traditional varieties. In the absence of state subsidies for certificated seeds the use of uncertified seeds seems to be advantageous for producers. While the amount of subsidy per hectare will be a minimum of $ 101 for certificated seeds per hectare of planting area (as technological improvement), the support will be encouraging for usage of certified seeds. Many variables, such as farm size, use of certified seeds, topography of land, production system, education level and frequency of visiting the agriculture organizations of the producers influence the level of gross profit per unit area in wheat farming. Low level of use of certificated seed in farms decreases the economic benefit of new varieties which are developed as a result of long term research and development studies and with a large amount of expense and causes the return of expenses to take a long time, if ever.

Key words: Wheat, seed, certified seed usage, production costs, profitability, producer preferences

INTRODUCTION

As the lands to be allocated to farming reach a limit, meeting the basic food demand of a steadily increasing population will be possible only by increasing productivity per unit area. It is quite hard, or maybe even impossible, to make amendments in ecological conditions that will affect the quantity and quality of yield in agriculture. However, increasing the yield through the improvement of growing techniques is an easier and shorter term approach to a solution. The use of certificated seeds of improved varieties is one of the basic factors towards increasing productivity and quality in crop production, consequently raising the income of the farmer. It is possible to increase the yield by 20-30% in self pollinated varieties and by 2-3 times in cross pollinated varieties (Şehirali, 1989; Akdoğan, 2005).

Of the arable land in Turkey, which amounts to approximately 18.5 million hectares, 9.4 million hectares (50.8%) is allocated for wheat cultivation. Wheat is one of the indispensable sources of nourishment for animals and human beings and is produced in varying quantities of between 19-20 million tons depending on the year in Turkey. Many wheat varieties have been improved through studies carried out particularly by public and in recent years by private institutions. Wheat farming using traditional varieties of seed is being replaced with varieties improved in accordance with natural and economic conditions, with the influence of the green

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revolution after the 1950s. The process of substituting improved varieties with traditional varieties of wheat still exists in highlands and mountain villages, where land is scarce, labor is abundant, working capital is insufficient and where subsistence farming is implemented in Turkey.

Certified wheat seeds are predominantly produced by the General Directorate for Agricultural Enterprises (GDAEs-State Economic Enterprise) and distribution is carried out by public institutions, cooperatives and by private firms. However, the use of certified seeds in wheat farming is at a low level and the coverage ratio of the distributed seeds of the needs of the country is around 22% (MARA, 2006). Allocation of the seeds, for self pollinated varieties and for wheat especially, from the preceding year's crop by the farmers results in a deterioration of the purity of varieties of the harvested crop, causing a decline in quality and productivity in time. Providing farmers can be made aware of the advantages of using certified seeds of varieties compatible to their regions of higher quality and efficiency and as long as use is encouraged through various means, then raw material supply at the quality demanded by the flour and flour product sector will be served, alongside an increase in productivity. Through the widespread use of certified seeds of improved varieties in farms it will be possible both to contribute to the economy of farms and to provide high quality and constant domestic supply to agro-industry enterprises.

There are 102 species of bread wheat in Turkey; 99 of which are registered and three of which are subject to a production license (MARA, 2003). Of these varieties, 15 are prominent and have been generally improved and registered by public institutions. The fact that only 15% of the new varieties developed over a long period, taking into account labor force and cost, have been taken to production makes if almost impossible to recuperate research and development expenses and thus the efficiency of research and development studies remain at a low level. Use of high quality seed in crop production is assessed in terms of such indicators as yield gain, costs, received prices by the farmers and profit derived per unit area and/or product. These factors become the most significant agents limiting the widespread growth of improved varieties, besides environmental limitations. Widespread cultivation of new varieties on farms is not only an economic event, but at the same time is closely related to the demands and tendencies of the growers and the allocation of space for animal husbandry activities in the enterprises. It is essential to give priority to the compatibility of varieties to be developed according to the demands and tendencies of the industrialist, to plan certified seed production taking into account the demands of the farmer and provision of a positive contribution by new varieties to the enterprise economy in producer conditions before initiating studies the development of species by research institutions.

Cereals, potato and cotton comprise approximately 95% of the total seed production in Turkey. After the 1980s, private firms also have started to produce, supply and distribute seeds, which began under the leadership of public institutions. Nearly all wheat and barley seed production is made by public institutions and despite legal regulations that have been made, national and international seed firms do not emphasize production of cereal seeds adequately. The results of a scientific research carried out at a farm level indicate that except for vegetable and industrial crops, generally, the production process of certified seeds is not given sufficient importance (Şelli *et al*., 1999; SPO, 2001). The ratio of quantity of seeds produced and distributed under these conditions remains at a low level to cover the needs of the country.

The aim of this research is to analyze the use of certificated seeds of improved wheat varieties in the farms of Ankara, which have an important share in the cereal production of Turkey and contributions to the enterprise economy. In the study, wheat varieties grown in farms, the supply of seeds, production costs of farming made using traditional and improved wheat varieties and gross and net profit per unit area have been examined in a comparative way. The contribution of improved wheat seeds to the enterprise economy has been analyzed via a cost-benefit analysis and an econometric analysis of factors affecting the change in gross profit in wheat farming has been made. Consequently, some significant findings have been reached indirectly for the evaluation of agricultural research and development studies in terms of productivity and profitability.

MATERIALS AND METHODS

The material used in the research comprises data collected via a questionnaire of farms in the selected villages of Çubuk, Bala, Kızılcahamam, Elmadağ and Akyurt districts of Ankara province, where enterprises producing wheat using at least two of the traditional varieties, certified and uncertified seeds of improved varieties at the same time are dense. The data comes from 32 farms producing wheat from traditional varieties of seed and from 41 farms using certified and uncertified seeds of improved varieties, determined through the random sampling method (Yamane, 1967). The data necessary for the research has been collected through a survey of sample farms. Physical data related to wheat

cultivation practices, costs, yield, consumption and sale quantity has been collected to cover at least three production terms with the aim of minimizing affects on the results from extremities in weather conditions and financial values over the 2003-2004 production terms. The results, calculated in the national currency unit, have been converted to US$ at the Turkish Republic Central Bank's mean rate of exchange of the term.

In the cost analysis, data related to labor demand and machine power in the production activities of the farms, production practices, input usage, quantity of production and farmers' received and producers' paid prices have been taken as a basis. Costs have been determined on the basis of the quantity of inputs used by the producers in wheat farming and the cost paid in return. In the determination of the gross production value, principal and by-product sale prices received by the farmer and the average amount of wheat and by-product have been taken into consideration. Farms generally engaged in both crop and livestock farming and as wheat straw is commonly used in animal husbandry, straw is traded off at a higher price than the regional average. Since the two significant products of straw and grain are harvested in wheat farming and these two products have comparatively higher shares in total gross production value and hence, as it is hard to separate the products as grain (principal) and straw (by-product), product cost per unit has been determined using the relative sale value method (Açıl, 1976; Bursal and Ercan, 1992; Kıral *et al*., 1999; Tanrıvermiş and Gündoğmuş, 2001, TEAE, 2001).

The cost, productivity and profitability levels of wheat farming using traditional varieties and certified and uncertified seeds of improved varieties are examined in the comparative analysis. The contribution of wheat farming to the welfare of the producer has been evaluated through a partial budget or activity analysis (Turner and Taylor, 1998). Net profit has been calculated by subtracting the production costs from the gross production value; while gross profit has been calculated by subtracting the variable costs (Açıl and Demirci, 1984, Erkuş *et al*., 1995; Bülbül and Tanrıvermiş, 2002). Indicators such as gross and net profit per unit area, ratio of net profit obtained from per unit to the average sale price received by the farmer, ratio of gross and net profit to gross production value have been used in the assessment of the economy of production activities. In this research, the implementation of the cost-benefit analysis to a specific event is employed. The net economic benefit of using improved seed has been calculated by making a comparison between the cases with project (net profit of wheat farming with use of certifies seed) and without project (net profit of wheat farming with traditional varieties in same/similar conditions) and a cost-benefit analysis has been used with this aim (Gittinger, 1984; Webster and Bowles, 1996; Tanrıvermiş, 2000).

The results of verbal questions related to the producer demands and tendencies have been generally given as a proportion. Wheat varieties used in farms, factors influencing the variety preferences of producers, supply of seeds, use of certified seeds, characteristics sought in the varieties that are desired to be produced and the tendencies of the producers towards the use of certified seeds have been assessed. One of the factors that producers consider important in determining whether to use improved seed and the relative profitability of the seed is the key indicator for decision-making. Relative profitability is defined as the increase in the net income received by using improved varieties instead of the producers' current varieties or traditional ones (Saín and Martínez, 1999).

An analysis of the factors that influence the decisions of the producers regarding the use of certified seeds have been tested with different models and the most appropriate one has been reported here. In order to explain the variation in gross profit per wheat planted area (hectare) among the farms, Ordinary Least Square (OLS) estimations were made using Gross Profit (GP) as the dependent variable and a range of socio-economic and demographic factors influencing producers in using certified seeds and traditional varieties. The OLS model is given below (Snedecor and Cochran, 1980):

$$GP = \alpha+\beta_1 LINKS+\beta_2 AGE+\beta_3 EDUC+\beta_4 FARMSZ+\beta_5 OFFAC+\beta_6 CSU+\beta_7 TOP+\beta_8 TRAC+\beta_9 FIN+\beta_{10} DIS+\beta_{11} SYS+\mu$$

Where, LINKS defines technical linkage expressed in the number of institutions the farmer visited in a year (1: not visited, 2: rarely visited and 3: frequently visited); AGE expresses the age of the farmer in years; EDUC is the education of farmer expressed in number of school years; FARMSZ is the total farm size in hectares; OFFAC states as a dummy variable for off-farm activity (1: if either farmer or spouse receive income from off-farm activities and 0: otherwise); CSU is identified as a dummy variable for certified seed use (1: if either farmer used and 0: otherwise); TOP is variable which defines topography classified into three groups such as: (1) is used for lands the slope of which is less than 2%, (2) is used to define the slope between 2 and 12% and (3) is used to define the slope which is more than 12% of wheat land; TRAC represents ratios of farms owning tractors and equipment (1: if either farm owner of the tractor and equipments and 0: otherwise); FIN is a dummy variable that takes the value

1 if the farmer uses some source of external financing for wheat production and 0 if not; DIS represents the distance, in kilometers, from the farm to the nearest district and/or province where the farmer obtains inputs and sells the farm products and SYS is a dummy variable that takes the value 1 if the farmer is defined as market-oriented and 0 if the farmers are classified as subsistence farmers. The equation describing the relationships between gross profit and the explanatory variables was therefore postulated, where, α and $\beta_1 \ldots \beta_{11}$ were regression coefficients and μ an error term. The economic and statistical validity of the estimated model and parameters will be tested and all the results will be evaluated together.

RESULTS AND DISCUSSION

Production of wheat seed, use, distribution of improved and traditional varieties: Turkey, owing to the advantages of its ecological conditions, has characteristics that lend to the production of many crops and their seeds. Cereal, potato and cotton crops compose 95% of total seed production. As crop insurance enforcement is inadequate, the government distributed seeds to be used in the forthcoming years' production in the period between 1952 and 2001 as a subsidy to producers that suffered under natural disasters. When this practice ceased in 2001, the demand for cereal seeds decreased and wheat seed production declined to 44,000 tons in 2001 from 116,083 tons in 2000 (Table 1). Certified wheat seed production rose to 101,101 tons in 2003 and to 176,202 tons in 2005 as a result of the works carried out by the Ministry of Agriculture and Rural Affairs (MARA) with the aim of increasing the use and production of certified wheat and barley seeds.

Almost all wheat and barley seeds are produced by the GDAEs and are marketed by the GDAEs, the provincial or district directorate of MARA, by seed retailers and agricultural cooperatives. When the average of the last 6 years is taken, the share of public institutions in seed production is 92% for wheat and 84% for barley. It is seen that studies to improve the varieties are also carried out by public institutions. There are 102 species of bread wheat, 99 of which are registered and three of which are under production license in Turkey (MARA, 2003). The share of the first 15 of these varieties, which are predominantly produced, in the aggregate bread wheat seed production varies between 90 and 95% depending on the year.

The total annual certified wheat seed requirement is around 620-650,000 tons, of which the amount of seeds distributed corresponds to just 22-30% of the requirement. Low demand from the farmers for certified wheat and barley seeds and the high price of the seeds, among other factors, are influential, in that the amount of seed distributed is below the demand. In general, the use of certified seeds has not been adequately encouraged through agricultural policy tools and thus the use of certified seeds has not been raised to the desired level. The MARA, with the aim of encouraging use of technology, pays area-based subsidies to producers registered on the Farmer Registry System if they cultivate using certified seeds in the varieties after 2005. In 2005, $ 12,240,670 in certified seed subsidies was paid to 67,826 farmers, covering 540,507 hectares of land. In 2006, $ 22.38 ha^{-1} of certified seed subsidy was given for triticale, barley, rye and oat and $ 37.29 ha^{-1} for wheat (MARA, 2006). The Agricultural Bank of Turkey and Agricultural Credit Cooperatives grant 1-year termed and 50% low interest credits to enable farmers to make certified wheat and barley seed production easier. The interest rate for seed credits was 16% in 2004 and 11.5% in 2005 and when the productivity and income advantage of the certified seeds in wheat production are taken into consideration, it appears that the interest rate of the seed credit is suitable.

In the Central Anatolia Region of Turkey, Bezostaya-1, which is a widespread improved variety of seed for dry and irrigated conditions, is being sown. This variety was brought from Russia and registered in 1970. It is a first class quality wheat variety which is short, stringless, with

Table 1: Production and distribution of wheat and barley seed in Turkey (Tons)

	Wheat		Barley		Total (wheat and barley)		Coverage ratio of distributed seeds of
Years	Production	Distribution	Production	Distribution	Production	Distribution	the requirement (%)
1998	163,592	166,228	21,126	20,579	184,718	186,807	21.57
1999	140,952	145,000	24,314	25,000	165,266	170,000	19.63
2000	116,083	101,833	19,203	19,666	135,286	121,499	14.03
2001	43,915	58,956	6,818	6,062	50,733	65,018	7.51
2002	80,107	80,089	4,376	4,127	84,483	84,216	9.72
2003	100,101	99,101	11,194	11,458	111,295	110,559	12.77
2004	223,094	229,029	19,074	18,499	242,168	247,528	28.58
2005	176,202	173,386	22,307	21,643	198,509	195,029	22.52

Source: Adopted from MARA (2006)

hard-red grains, highly resistant to cold, low resistant to drought. Other species improved in enterprises are Gun-91 and Gerek-79. Gun 91 is a medium early maturing variety which has been improved by the Ankara Central Research Institute for Field Crops and registered in 1987 and which is stringy, with red elliptical grains, resistant to drought and cold. Gerek 79 has been improved by the Eskişehir Agricultural Research Institute and was registered in 1979. It is a secondary group bread quality variety which is long, stringy, with soft, white grains and is resistant to cold and drought. Traditional varieties are known as Manilya, Sünter and Kadrolu. Manilya is produced at high altitudes, in the mountain villages of Elmadağ and Bala and is preferred for bulgur (boiled and pounded wheat), yarma and bread making in the region. Due to the fact that it has soft grains, it is widely used as cattle and poultry feed and its straw, which is preferred because of its high productivity. The Kadrolu variety is produced in a few mountain villages of the Elmadağ district and has lost its purity. It is preferred in the region due to the fact that its bread has a long shelf life. Sünter, produced in the same district, is a variety for summer and early maturing. Its short harvest time and high quality of bread are the main reasons for its popularity. The higher damage of pigs to stringless varieties in the region compels the enterprises to produce stringy varieties.

Farms producing wheat with certified seeds are quite immense in the Çubuk and Akyurt districts in the research area. Wheat agriculture using traditional seed varieties is widespread, especially in the mountain villages and high altitudes of Elmadağ, Kızılcahamam and Bala and traditional and improved varieties are produced together in the same villages and even in the same enterprises, though sowing areas and production quantities vary. According to the districts, 63.5 and 90% of the farmlands are allocated to field crops and 50.2 and 75% of these are allocated to wheat farming. Wheat continues to be the primary product grown in dry conditions in terms of such indicators as production area and its share in the value of crop production.

Availability and use of land in farms and wheat farming: The average operating land of farms producing traditional wheat varieties and in enterprises producing improved varieties have been calculated as 10.3 and 25.2 ha, respectively (Table 2). Some 75.2% of the operating land in the farms producing traditional varieties is owned land, with the remaining 24.8% being rental land or crop-sharing land. In farms producing improved varieties, 81.1% of the operating land is owned and 18.9% is rental or crop-shared land. As the availability of land in farms is low, it is seldom rented or given for crop-sharing. The average operating land in farms producing wheat using traditional varieties is 2.4 times lower than farms producing improved varieties. Operating land in farms producing traditional varieties is made up of more pieces, with an average parcel size lower in comparison with the farms producing improved varieties. The researches show that the size of farm is one characteristic that is most related to the adoption of new technologies. It is expected that the larger the farm, the smaller the financial and land restrictions for the adoption of new technologies will be and the greater the probability of adopting improved seed (Saín and Martínez, 1999). In addition to this, the area sown to wheat and sown land in total operating land may be an indicator of adoption of new technologies.

Table 2: Land resources of farms and the ownership (ha)

Enterprise group	Owned land	Rental or crop-sharing land	Operating land
Farms producing traditional varieties	7.75	2.55	10.30
Farms producing improved varieties	20.39	4.76	25.15

In the farms producing improved wheat varieties, 60% of operating land is allocated to wheat, 5.5% to barley, 6.5% to chickpeas, 2.5% to vetch, 4.3% to triticale, 2.1% to corn, 1.4% to sunflower agriculture and 17.7% left fallow. In farms producing traditional wheat varieties, 50.1% of the operating land is allocated to wheat farming and chickpeas (17%); followed by barley (6-0%) and vetch (3.5%). Not cultivating leguminous seeds such as chickpeas and lentils in farms where improved varieties are produced results in a quite high share of uncultivated land, accounting for 23.4% of operating land. More than 50% of the operating land is allocated to wheat farming in both groups. In a similar way, the share of the wheat in the value of crop production in farms is more than 50%.

Population, labor force and education levels in farms: In farms producing traditional wheat varieties, the average household population is 4.6 people with a labor force availability of 3.3 Men Work Units (MWU). However, the average household population and labor force availability are calculated as 4.4 people and 3.2 MWU in farms producing improved varieties. The household labor force in farms producing wheat using traditional varieties is higher than on farms producing improved varieties, which is especially significant in terms of meeting the labor force demand of the activity from the family. Around 70.2% of the farms producing traditional varieties and 46.8% of the farms producing improved varieties, employ hired labor. The machine power requirement of wheat farming is met through the owned machine and its equipments of the farms and the share of farms meeting their machine power demands through renting system is nearly 50%, in

especially in the highlands. There may be a relationship between the size of the household and the adoption of new technology. It is expected that smaller households will have a higher probability of using improved seed (Saín and Martínez, 1999), in which case, in addition to the emphasized reason, household size is correlated with the labor requirements of the cultivated traditional and improved wheat varieties.

The age of the producer is one of the characteristics frequently mentioned in the studies as a factor in the adoption of new technologies. In addition to the farmer's age, the education level is another characteristic that the studies frequently associate with greater rates of adoption of new technologies (Saín and Martínez, 1999). Of the population in farms producing traditional varieties, 12% are below school age and illiterate, while 3.3% are literate; 64.1% have primary education, 15.2% secondary education and 5.4% higher education. However, in farms producing improved varieties, 10.7% of the population is below the school age and illiterate, 42.9% have primary education, 16.0% have secondary education and 30.4% have higher education. The literacy ratio in the households is below the average level of districts, owing to the fact that the households examined are usually in the highlands. The average age of producer cultivating improved varieties of wheat is 38.41 year, whereas the age of farmers' producing traditional wheat varieties is 49.06 year.

Selection of varieties by producers and their attitude towards use of seeds: The tendency to produce with improved seeds in farms more or less associated with a number of social factors, aside from variables such as amount of operating land, characteristics of the land in terms of agricultural production (such as; topography, deep of the soil, irrigation availability), climate conditions, population and availability of labor, ease of obtaining seeds and incentives. In particular, the frequency that producers visit agricultural institutions and communication characteristics come to the forefront. Some 56.3% of the producers growing traditional varieties and 7.3% of those growing improved varieties rarely visit agricultural institutions (Province or District Directorates of MARA, research institutes, GDAEs, agriculture cooperatives, chambers of agriculture, etc.). Those visiting agricultural institutions several times in a year are 82.9% for those producing improved varieties, which is quite high in comparison to those who produce traditional varieties 34.4%.

In the selection of wheat varieties to be produced in farms, the leading farmers in the village and the decisions of the head of the household are rather effective. In 90.2% of the farms producing improved varieties, the head of the household is effective in the selection of the varieties to be produced, while in 7.3% the head of the household and leading farmers of the village take the decision jointly. In 2.5% of the cases selection is decided collectively within the family. In general, it is the head of the household (98.2%) and rarely the leading farmers (1.8%) that make the seed selection decisions in farms producing traditional varieties. All the producers questioned stated that they had knowledge of the wheat varieties produced in their villages; however none have produced new varieties within the last five years. On the other hand, none of the producers had knowledge of the recommended wheat varieties for their region. Producers generally obtained initial information about the improved varieties from their neighbors and relatives.

The study showed that 40.6% of the farms producing traditional varieties preferred sowing seed allocated from the previous year's yield after passing the selector and applying pesticides; 25.0% preferred buying seed which had been passed from selector and applied pesticides seed; 18.8% prefer garbling and applying insecticide themselves and 15.6% preferred sowing without making any transactions. On farms where certified seeds of improved varieties, where farm technology is relatively better implemented, are used, uncertified seeds that are set apart from the yield of certified varieties are passed from selector, insecticide is applied and the seed is then sown.

Some 92.7% of the producers using certified seeds of improved varieties change their seeds once every 2-3 years; however 7.3% of the producers purchase certified seeds every year. For those obtaining certified seeds of improved varieties, it is common to allocate from the previous year's yield and obtain uncertified seeds from other farmers. Certified seeds can usually be obtained from agricultural cooperatives, GDAEs, Province or District Directorates of MARA and partly from private institutions. Of the farms not using certified seeds, high price was the reason given by 68.8% of the farms, whereas economic and technical difficulties in obtaining certified seeds and the lack of knowledge on the significance of using certified seeds was the main factor for 31.2%.

Manilya, which is a traditional variety, has become the most produced variety in 87.5% of the farms producing wheat through traditional varieties; and Bezostaya-1, which is an improved variety, has become the most produced variety in 62.5% of the enterprises to date. Except for these, Sivas and Gerek-79 (certified) and Kadrolu and Sünter (traditional) are the other varieties produced. Bezostaya-1 is produced in all the enterprises using certified seeds of improved varieties and varieties such as Gerek-79, Kunduru-1149 and Çakmak-79 are the other varieties produced. Better productivity and quality, high yield price, resistance to temperature and drought and appropriateness to agriculture using machines leads

Bezostaya-1 to be preferred in all farms producing improved varieties. The resistance of Gerek-79 to negative climatic conditions and the demand for Çakmak-79 and Kunduru-1149, which are durum varieties, by the pasta-making sector in the region, are the reasons why they are preferred. Despite the fact that there are many new wheat varieties developed for the dry conditions of the Central Anatolia Region, such as Bayraktar 2000, Demir 2000 and Konya 2002, still, widespread production of Bezostaya-1 in farms indicates that a review and evaluation of the contributions of agricultural research and development studies to enterprise economy and national economy are mandatory.

According to 38.8% of the producers, traditional varieties are preferred due to household consumption (family needs); while according to 24.7% such varieties are preferred because of their suitability as animal feed, being soft grained and providing a high straw yield. According to 14.1%, traditional varieties are preferred for their resistance to disease and pests in the region, while 12.9% said they are preferred as they can be sold easier and at a higher price in the region. Other reasons were given by 9.4% of the producers that included paternal habits, good accordance of traditional varieties to the region and decreasing the harm of the pig on the yield due to traditional species being stringy (like in the mountain villages of Kızılcahamam) (Table 3). There are farms which never use improved varieties in the mountain villages of the Elmadağ province, with inadequacy of technical knowledge and low levels of working capital being the main reasons given for not using improved varieties.

While all producers in the regions using improved varieties expressed that improved varieties are satisfactorily superior to traditional varieties, 87.5% of the producers in the regions where traditional varieties are produced stated that improved varieties are superior, while 12.5% expressed that improved and traditional varieties are at the same level. Bezostaya-1 is a variety which all producers stated they would never want to give up producing in farms growing improved varieties, whereas for farms producing traditional varieties Mamlya and Sünter are the indispensable varieties.

In the districts of Ankara province where certified seeds of improved varieties are produced in dry conditions, the production of traditional varieties has all but died out since 1985, however, in regions where production of traditional varieties continues, producers have the tendency to continue wheat farming with these varieties. In villages where traditional varieties have been produced over the last 15 years, wheat farming has been carried out with some improved varieties, but in the villages where improved varieties are commonly produced; market-oriented production of traditional varieties has not been made for 25-30 years. In parallel to the widespread use of improved wheat varieties in Ankara where many traditional wheat varieties exist, the mentioned traditional varieties have almost disappeared. This change should be evaluated, especially, in terms of in-situ or on-site conservation of genetic sources and endangered wheat varieties should be protected by suitable means. Araia and Haile (2006) stated that *in situ* conservation is related to the farming system implemented in an area in which conservation is practiced.

Table 3: The reasons behind preference of traditional varieties in farms*

Reasons of preference	Quantity	Ratio (%)
Convenient for household consumption (own consumption)	33	38.82
Soft grained and contributing to animal feeding owing to a higher level of straw yield compared to improved varieties	21	24.71
Resistance to disease and pests	12	14.12
Potential for easier sale at a higher price	11	12.94
Other reasons	8	9.41
Total	85	100.00

*: As the producers preferred more than one alternative, the total is more than the total number of farms that were surveyed

Working capital is an important factor in the decisions taken on the farm, as it is expected that access to credit will facilitate the use of inputs purchased from outside the farm, such as improved seed (Saín and Martínez, 1999). The credit use rate of farms producing wheat through improved varieties is higher than on farms using traditional varieties, which is one of the criteria behind the higher relation of the producers of improved varieties with the market. Some 66.7% of those using traditional seeds and 84.6% of those using improved varieties have expressed that they would prefer credit purchase of seeds, provided that a 50% discount credit can be given by credit institutions for the use of certified seeds. It is apparent that the use of certified seeds remains at a low level due to the fact that producers cannot obtain an adequate amount of working capital in the sowing season.

The tendencies of the producers, market conditions and climate and soil conditions should be evaluated together in seed improvement studies and registry of the varieties which are able to correspond to these conditions at an optimum level and introduction to the market, should be given priority. In the study, 55.1% of the farms producing traditional varieties desired the wheat varieties they produced to be more productive, 26.3% wanted higher resistance to drought and 18.6% wanted higher resistance to cold. Some 71.9% of the producers producing improved varieties wanted the wheat varieties they produced to be more productive, 14.8% wanted higher resistance to drought and 13.3% higher resistance to unsuitable conditions.

The ratio of own consumption in total wheat production varies between wheat producing farms using certified and traditional seeds. The survey showed that 73.2% of the wheat production on farms using traditional varieties is allocated for household consumption and animal feed (own consumption), with the remaining 26.8% usually sold to other farmers in the village. In improved varieties, most of the yield (89.1%) is marketed and the remaining 10.9% is consumed within the household. Wheat production on farms producing improved varieties is rarely used as animal feed and essentially the seed requirement for the production of next year's crop and annual flour and flour products demand of the household is generally met from the product allocated.

Wheat farming with traditional and certified seeds: input usages, costs and profitability: In wheat farming with traditional varieties, the demand of labor force per hectare (119.0 h ha^{-1}) is 1.8 times higher than that of wheat farming with uncertified seeds of improved varieties and 4.7 times higher than wheat farming with certified seeds. In a similar way, demand for machine power in wheat farming with traditional varieties is also higher. The reason behind the high level usage of labor force and machine power is that harvesting is commonly carried out by hand, rarely by reaper and harvest transactions are made by harvest machine. While 39.6 h ha^{-1} of labor and 10.1 h ha^{-1} of machine power is needed for harvesting in enterprises producing wheat with traditional varieties, this need is 4.1 h ha^{-1} of labor force and 4.1 h ha^{-1} of machine power on farms where certified seeds of improved varieties are used and where harvesting is carried out using a harvester (Table 4). On farms where production is carried out using traditional varieties of seed, the labor force and machine power demand per unit area is quite high when related to factors such as low parcel size, slope of the land, use of low-power tractors and the distance from the farms to the districts or city centers where the product is sold.

The use of certified varieties of improved seeds in wheat production is calculated as 209.2 kg ha^{-1}, while with uncertified varieties this amounts to 224.8 kg ha^{-1}. In wheat production using traditional varieties this figures is 224.70 kg ha^{-1}. Renewal in three years is taken as a basis by the MARA for wheat seeds and use of 200 kg ha^{-1} is recommended. The sowing of purchased certified seeds in the second or third years has resulted in a decline in the purity of the varieties and the use of more seed than recommended. Nearly 7% less seeds have been used in wheat production with certified seeds in comparison to wheat production with traditional seeds. More chemical fertilizer is being used by unit area in wheat agriculture than the amount recommended by research and extension institutions. Use of fertilizer in villages is not dependent on the varieties, or whether the producer is using certified or uncertified seeds. Fewer amounts of chemical fertilizer and pesticides are used than recommended on most of the farms in Kızılcahamam, where traditional varieties are produced, since working capital is inadequate and extensive farming techniques are carried out. On average, 1.0 kg ha^{-1} of pesticides are used as commercial preparation in the struggle against diseases and especially weed on farms where traditional wheat varieties are produced and 1.9 kg ha^{-1} of pesticides are being used in enterprises where certified seeds of improved varieties are used (Table 4).

All producers using certified seeds of improved varieties gave a reply to the question of: Do you see any difference between the yield obtained from traditional varieties and improved varieties? as Productivity is higher with improved varieties by around 38%. Some 53.1% of the farmers producing traditional varieties stated that the yield produced with improved varieties was better, while 15.6% stated that yield produced with traditional varieties is better. While 12.5% of the producers expressed that they saw no difference between yield of traditional and improved varieties, 18.8% expressed that the difference varied, depending on the varieties produced. Additionally, 94.1% of the producers farming wheat with improved varieties denoted that they had observed a decline in quality and productivity when using seeds obtained from the yield they produced every year. The average productivity loss in yield has been calculated as 122.3 kg ha^{-1}, according to the producers, in the use of seed allocated from the previous year's yield. According to the input-output data set formed at the parcel level, the average grain yield is 2,464.10 kg ha^{-1} in wheat agriculture using traditional varieties, 3,079.4 kg ha^{-1}

Table 4: Use of physical input in wheat farming and productivity

Indicators of input use and productivity	Production with traditional varieties	Production with uncertified seeds	Production with certified seeds
Seed (kg ha^{-1})	224.70	224.80	209.20
Chemical fertilizer (kg ha^{-1})	220.90	264.60	294.80
Pesticides (kg ha^{-1})	1.00	1.00	1.90
Labor force (h ha^{-1})	119.00	65.60	25.40
Machine power (h ha^{-1})	51.60	37.30	24.40
Harvest technique	Hand and reaper	Reaper and harvester	Harvester
Grains yield (kg ha^{-1})	2,464.10	3,079.40	3,682.70
Straw yield (kg ha^{-1})	4,135.30	3,358.00	3,277.80

using uncertified seeds of improved varieties and 3,682.7 kg ha^{-1} in wheat agriculture using certified seeds (Table 4). The average productivity in wheat farming using certified seeds of improved varieties is 49.5% higher than production with traditional varieties; while the average productivity in wheat farming with uncertified seeds is 24.9% higher than production with traditional varieties and 19.6% higher in production with certified seeds in comparison to production with uncertified seeds.

One of the reasons why producers prefer wheat production using traditional varieties is expressed as the high straw yield of those varieties, the validity of which has also been tested. The average straw yield in wheat agriculture with traditional varieties is 20.7% higher than production with certified seeds of improved varieties and 18.8% higher than production with uncertified seeds. Reaping is carried out by hand and/or using a harvesting machine. On some of the farms carrying out wheat farming using uncertified seeds reaping is made with a reaper and harvesting with a harvest machine; while on most of the farms this is carried out using a harvester in wheat farming with certified seeds (Table 4). It must be noted that one of the fundamental reasons behind the difference in straw yield is related to the technology used in the reaping and harvesting. If reaping is carried out using a harvester in all three production activities, straw yield is 3,222.0 kg ha^{-1} in production with traditional varieties, 2,957.8 kg ha^{-1} in production with uncertified seeds and 3,277.8 kg ha^{-1} in production with certified seeds. Consequently, the straw yield in wheat farming with certified seeds will be 10.8% higher than production with uncertified seeds and 1.7% higher than production using traditional varieties. This conclusion shows that production of traditional varieties due to their high straw yield is not a consistent factor. However, it will be necessary to examine the straw quality of both traditional and improved wheat varieties and the importance of this in terms of animal feeding.

Data on the relative prices and yield gains indicate that improved varieties are more profitable when compared to traditional ones. Profitability, however, is only one of the factors that small-scale farmers consider in the process of adoption of new technologies (Byerlee *et al*., 1979; CIMMYT, 1988; Saín and Martínez, 1999). According to the producers the main reason why wheat seeds are not regularly changed is the high price of seeds. Wheat seed is sold at a price 1.5-2 times higher than product price, depending on the year. The average product price received by the producer is $ 0.22 kg^{-1}, while the price of the certified seed is $ 0.36 kg^{-1}, 1.6 times higher than the product price. An analysis of by how many times an increase in this average will seed purchased at a price 1.6 times higher than the product sale price be able to provide in yield productivity and thus the relative profitability level of the seed, will be necessary.

The cost of seed per hectare is $ 48.9 in wheat farming with traditional varieties and the share of the cost of seed in variable costs is 8.3%. The cost of seed in wheat production using uncertified seeds of improved varieties is $ 54.1 ha^{-1} and the share of the cost of seed in variable costs is 9.0%. The cost of seed in wheat production with certified seeds of improved varieties is 65.0 $ ha^{-1} and the share of the cost of seed in variable costs is 9.9%. The cost per 1 kg of certified seed is $ 0.31, $ 0.24 for uncertified seed and $ 0.22 for traditional varieties. As certified seed is regarded as certified in the three years following the production term in which it was sown, the cost of 1 kg of certified seed is not $ 0.36, but rather $ 0.31, which is the average price of the three years. The cost of 1 kg of certified seed is 29.2% higher than that of uncertified seed and 40.9% higher than the cost of seed of traditional varieties.

The production costs of wheat farming on farms have been analyzed in a detailed way according to the wheat production made using seeds of traditional, certified and uncertified seeds of improved varieties. Variable costs in wheat production with certified seeds has been calculated as 654.4 $ ha^{-1}, in wheat production with uncertified seeds of improved varieties as 598.5 $ ha^{-1} and in wheat production using traditional varieties as 587.2 $ ha^{-1}. The total variable cost is 1.9% lower in wheat production using traditional varieties in comparison to wheat production with uncertified seeds of improved varieties and 10.2% lower in comparison to wheat production with certified seeds of improved varieties. In wheat production using certified seeds of improved varieties, the requirement for working capital will be nearly 2% higher than that using traditional varieties and 10% higher than production with uncertified seeds. Total production costs in wheat production using certified seeds is 785.8 $ ha^{-1}, using uncertified seeds of improved varieties 690.5 $ ha^{-1} and in wheat farming with traditional varieties 656.3 $ ha^{-1}. The total production costs in wheat production using certified seeds of improved varieties are higher when compared to wheat production made using uncertified seeds and traditional varieties. The variable costs and the costs related to labor, material and machine power and high land rent in wheat production using certified seeds are significant in these figures.

The grain and straw yield varies depending on the region and on whether the varieties produced are traditional-improved, the seed used is certified-uncertified. The method of relative sale value has been used in the analysis of unit product cost due to the widespread use of straw in animal husbandry and the high sale price. The

Table 5: Producer price of grain and straw, unit product cost and profitability indicators

Product	Varieties	Price received by the producer ($ kg^{-1})	Unit product cost ($ kg^{-1})	Net Profit (Price-cost) ($ kg^{-1})
Grain	Traditional	0.21	0.15	0.06
	Improved-uncertified	0.23	0.15	0.07
	Improved-certified	0.23	0.16	0.07
Straw	Traditional	0.10	0.07	0.03
	Improved-uncertified	0.09	0.06	0.03
	Improved-certified	0.09	0.06	0.03

Table 6: The economic benefit of wheat farming with certified and uncertified seeds of traditional and improved varieties

Indicators	Farming using traditional varieties	Farming using uncertified seeds of improved varieties	Farming using certified seeds of improved varieties
Variable costs ($ ha^{-1})	587.20	598.50	654.40
Cost of seed ($ ha^{-1})	48.90	54.10	65.00
Production costs ($ ha^{-1})	656.30	690.50	785.80
Gross production value (GPV) ($ ha^{-1})	914.50	1,011.30	1,146.40
Gross profit ($ ha^{-1})	327.30	412.80	492.00
Net profit ($ ha^{-1})	258.20	320.90	360.60
Unit cost ($ kg^{-1})	0.15	0.15	0.16
Prices received by the farmers' ($ kg^{-1})	0.21	0.23	0.23
Gross profit/GPV (%)	35.79	40.82	42.91
Gross profit as % of total costs	49.87	59.78	62.61
Net profit/GPV (%)	28.23	31.73	31.46
Net economic benefit of wheat farming with certified seeds of improved varieties ($ ha^{-1}),			102.40
Net economic benefit of wheat farming with uncertified seeds of improved varieties ($ ha^{-1})			62.70

unit cost in wheat farming using certified and uncertified seeds and in wheat production with traditional varieties ($ 0.15-0.16 kg^{-1}), have been found to be quite close. In a similar way, straw costs in all three production activities ($ 0.06-0.07 kg^{-1}) are also quite close. Although the price of the straw received by the producer is almost same ($ 0.09-0.10 kg^{-1}), the sale price of wheat produced using certified, uncertified and traditional varieties varies from between $ 0.21-0.23. Despite the fact that the unit cost in wheat farming with improved varieties is high, the net profit per unit product is higher, as the sale price of the product is higher. While the ratio of net profit to sale price is 28.6% in wheat farming with traditional varieties, this ratio is 30.4% when using certified and uncertified seeds of improved varieties (Table 5).

To measure economic efficiency, gross profit (output value minus variable costs) was used to assess profitability in wheat production. Gross profit in wheat production with traditional varieties is 327.3 $ ha^{-1}, for uncertified seeds of improved varieties 412.8 $ ha^{-1} and in wheat production with certified seeds 492.0 $ ha^{-1}. While the ratio of gross profit to Gross Production Value (GPV) is 35.8% in wheat production using traditional varieties, this ratio is 40.8% in production using uncertified seeds of improved varieties and 42.9% in production using certified seeds (Table 6). The high level of GPV in wheat production with certified seeds has enabled gross and net profit to be higher in production with certified seeds than in production with traditional varieties and uncertified seeds. Since fixed costs are related to the factors of production in wheat farming, the gross profit per hectare achieved from the activities has become an important indicator in the economic assessment made using a partial budget approach. Accordingly, wheat farming using certified seeds of improved varieties provides the highest contribution to the welfare of the producer.

Net profit is calculated as 258.2 $ ha^{-1} in wheat farming using traditional varieties, 320.9 $ ha^{-1} in wheat farming using uncertified seeds of improved varieties and 360.6 $ ha^{-1} in wheat production using certified seeds. The ratio of net profit to GPV is 28.2% in wheat production for traditional varieties, 31.7% in production using uncertified seeds of improved varieties and 31.5% in production using certified seeds (Table 6). Net profit per hectare in wheat farming using certified seeds of improved varieties is 39.7% higher than production using traditional varieties; in production using uncertified seeds it is 24.3% higher than production using traditional seeds; and in production using certified seeds it is 12.4% higher than production using uncertified seeds. According to the conclusions of the research, wheat farming using certified seeds makes the largest contribution to the welfare of the producer. In addition to this, positive gross and net profits are being achieved in wheat agriculture made using three different techniques on the farms. As the break-even point is being exceeded in production on the farms, the profit corner is also being turned and variable and fixed costs arising out of production activities are being met. It must be noted that the producer has advantages other than net profit, since provisions are made for investment of land, equipment, machinery, capital and the family labor force available to the producer.

While net profit per hour of labor force is recorded as $ 2.17 ha^{-1} in wheat production using traditional varieties, in which the labor force is predominantly used in the reaping and harvest, this profit has been $ 4.89 ha^{-1} in wheat production using uncertified seeds of improved varieties and $ 14.20 ha^{-1} in production using certified seeds of improved varieties, in which the reaping-harvest activities are carried out using a harvester. Net profit per hour of labor force in wheat production sing traditional varieties is 2.3 times less than production using certified seeds and 6.5 times less than the production using uncertified seeds (Table 6). Labor productivity is higher in wheat farming using certified seeds of improved varieties than other activities, as the demand of labor force per hectare is low and productivity is high.

A cost-benefit analysis is frequently utilized in the analysis of the effects of new technologies on production activity. This technique is used to select the optimum among two or more alternatives (Gittinger, 1984). The method is based upon a comparison between the case without project (use of traditional varieties) and the case with project (use of certified seeds) (Webster and Bowles, 1996; Tanrıvermiş, 2000). The net economic benefit of wheat production activities using certified and uncertified seeds of improved varieties has been analyzed by extending the cost-benefit analysis. Consequently-ceteris paribus- additional benefit to be provided by the $ 1 expense for certified seed to the economy of the enterprise has been displayed. The net economic benefit of using uncertified seeds of improved varieties in wheat farming is estimated as $ 62.70 ha^{-1} and $ 102.40 ha^{-1} for certified seeds. By enduring $ 16.1 ha^{-1} of additional seed expense by converting to wheat production using certified seeds of improved varieties from wheat farming using traditional varieties, $ 102.40 ha^{-1} of net economic benefit will be made and the net economic benefit of $ 1 additional seed expense becomes $ 6.36. Additionally, $ 62.70 ha^{-1} of net economic benefit will be generated by making an additional $ 5.2 ha^{-1} expense on seeds if farmers produce wheat using uncertified seeds of improved varieties, instead of traditional varieties. Accordingly, the net economic benefit of $ 1 additional expense for seeds is $ 12.06 (Table 6).

Despite the fact that there is no great difference between the cost of uncertified seeds and product sale prices in the research area, an important increase in prices depending on the availability level of the seeds on the market is seen, particularly in October, when wheat sowing is generally carried out. There is a necessity to purchase certified seeds at least once to produce uncertified seeds of improved varieties on farms. As lower economic benefit will be achieved in return for every $ 1 of expense for seeds made by the individual producers in the absence of government support, producers may prefer not to use certified seeds. Seed subsidy payments will need to be at a level that will enable the difference between economic benefit to be achieved per unit area in wheat farming using certified and uncertified seeds, or meet the difference between the prices of two seed types for support of certified seed use within the framework of technology incentives.

According to the conclusions of the research, wheat farming using uncertified seeds of improved varieties instead of traditional varieties provides a higher net economic benefit when compared to production using certified seeds and contributes more to a higher living standard for the producer. It is necessary for the government to encourage and support the use of certified seeds. When the $ 37.29 ha^{-1} of state subsidy given for wheat seeds since 2005 is also taken into consideration, the net e conomic benefit in using certified seeds will be $ 139.69 in total and the average benefit that every additional $ 1 of expense made on certified seeds will be $ 8.68. The certified seed subsidy, implemented the hectare of wheat planting area, with the aim of encouraging technology use in farms, should be revised. The subsidy will need to be a minimum $ 100.46 ha^{-1} to ensure replacement of the uncertified seeds of improved varieties with certified seeds in farms. For the de facto paid certified seed subsidy payment to be encouraging, the amount of subsidy payment per hectare should be increased by 2.7 times and thus the net economic benefit provided by every additional $ 1 expense to be made for certified seeds should be made higher than $ 12.06.

Analysis of the factors that affect income in wheat farming in farms: All of the producers to which the survey was applied have been arranged into groups and the factors effective in their seed preferences have been examined. Multiple logistic regression has been forecasted concerning the analysis of socio-economic factors that affect the seed preferences of producers, since there may be many variables which may be effective in the preferences of the producers and whether or not they will use the certified seeds. However, the results have not been regarded as coherent and so factors that affect gross profit in wheat farming have been analyzed. The main factors that may affect gross profit in wheat production in enterprises have been determined as: the relation of producers with agricultural and credit institutions, age of the farmers, education levels of the farmers, farm size, off-farm income opportunity, use of certified seed, topography of farmland, ownership of

Table 7: Analysis of factors affecting gross profit (OLS)

Variables	β	Standard error	t-value
Constant	41.48	9.28	4.47*
Relations with agriculture and extension institutions	0.90	0.11	8.18*
Age of producers (Years)	-0.94	1.43	-0.66**
Education of producers (Schooling years)	24.04	7.16	3.36*
Average enterprise size	57.90	12.56	4.61*
Off-farm income opportunity	17.84	14.47	1.23**
Use of certified seeds	35.55	8.23	4.32*
Topography of farmland	-10.71	2.42	-4.43*
Ownership of mechanical equipment	0.92	2.45	0.38**
Financing	0.71	1.26	0.56**
Distance to marketplace	-0.53	1.74	-0.31**
Production systems	5.92	1.39	4.26*
Adjusted R^2		0.6933	
F-Statistics		12.54*	

*: Statistically significant at 1% level; **: Not significant at 10% level

farm machine and its equipments, financing (external financing or equity capital), distance to marketplace and production systems (1 is used for market oriented farming and 0 is used for subsistence farming) (Table 7). Although factors such as the size of the household, presence of livestock activities, membership of producer organizations, wheat land and extent of owend land have been incorporated into the model, a meaningful model could not be obtained through the incorporation of these variables.

The results of the regression analysis showed that the institutional linkages of the producers had a positive impact on productivity in wheat agriculture. Provided that producers held links extension services and producers' organizations at a high level, the adoption of technological development occurred very easily and in a short period of time. Another factor that had a significant positive influence on yield was the level of education of the producers and farm size had a strong positive influence on the gross profit of wheat farming in the enterprises. The variable of enterprise size represented the total area of the producer cultivated with crops without considering the owership status of the land. The characteristics of seeds (traditional varieties and improved seeds, including certified and uncertified varieties) are major factors affecting the amount of gross income per hectare of cultivated land. Involvement in off-farm activities encourages the use of capital inputs (such as improved seeds, fertilizers, pesticides, etc.) and therefore affects the gross income of the enterprises positively. In fact, there is not a statistically significant relationship between off-farm income advantages and the amount of gross income per hectare of wheat sown land. On the other hand, the influence of the ownership of farm tractor and its equipment on gross income was not clearly significant and it is likely that there are a number of factors that contributed to this. No obvious conclusion could be drawn regarding the effect of the producer's age.

The variable of financing is also an important factor in decision-making related to certified seed use. It is expected that the access to credit will facilitate the use of inputs purchased from outside the enterprise, such as improved seed. The distance, as well as the traveling time, is an important factor that determines the ease with which a producer can obtain agricultural inputs, sell farm products and receive technical assistance. As a life circumstance, this factor plays an important role for the producer in deciding whether or not to use improved wheat materials and other agricultural inputs. The greater the distance to the marketplace, the greater the costs of acquiring the seed and receiving information (technical advice) on its characteristics and management requirements. The relationship between access to financing and distance to the marketplace and the gross profit is not important, only reaching the 1%-level statistically. Producers living further from a municipality will be less likely to adopt certified wheat. It is expected that market-oriented producers will tend to use more improved seed than producers who make subsistence farming; however, there is no significant relationship between the gross profit and the production system adopted in farms. The results showed that gross profit reflects the producer's production response to technology (enterprise size, production system, education, technical linkages) and management factors (ownership, off-farm activities, education). In general, the findings of the study are consistent with those of other studies on the adoption of new technologies (Byerlee *et al*., 1979; Rahm and Huffman, 1984; CIMMYT, 1988; Brush *et al*., 1990; Saín and Martínez, 1999). In addition, there is a need for a comprehensive analysis of factors effective in the ratio of use of seeds of improved varieties.

CONCLUSIONS

The usage of certified seed in wheat farming affects productivity and thus it is the easiest factor to be altered

in cultivation process. On farms located in the highlands, where subsistence farming is common, agriculture of traditional varieties of seed is usually made for own-consumption, or wheat is produced with traditional varieties for own-consumption and with uncertified seeds of improved varieties for the market. Reasonable, high productivity, resistance to negative climate conditions and appropriateness to agriculture for machines stand out as reasons behind preferences of improved varieties on the farms. Allocation from the previous year's yield and obtaining seeds from other farmers are common practices in obtaining uncertified seeds of improved varieties. Certified seeds are supplied from cooperatives, GDAEs, MARA and partly from private firms. Manilya is the most produced traditional variety on the farms, followed by Sünter and Kadrolu. The main reasons behind the preference to use traditional varieties are that the bread and other products have a better taste, that the product is suitable as an animal feed owing to its soft grain and high straw yield and quality, its resistance to negative climate and soil conditions and its short vegetation term. Consideration of these producer preferences in crop improvement studies will contribute positively to increasing the use of certified seeds in the enterprises.

There are significant structural differences between farms carrying out wheat agriculture using traditional and improved varieties. On farms producing wheat of traditional varieties, operating land is small, almost all available land is dry, the land is made up of small parcels, the average parcel size is low and the integration level with the market is lower than that of farms using improved varieties. More labor and machine power are used in wheat farming using traditional varieties compared to wheat production using certified seeds of improved varieties. The high level of use of labor and machine power in regions where production is made using traditional varieties is related to the reaping technique. Meeting the labor demand from the household in wheat production using traditional varieties is meaningful in terms of decreasing open and hidden unemployment in farms. Farms using certified seeds of improved varieties are in a more close relationship with the agricultural institutions when compared to enterprises producing traditional varieties.

Producer preferences concerning the use of seeds in wheat farming is related to regional conditions and economic and social factors. The use of certified seeds is linked to availability and use of technology, among other factors. According to 68.8% of the producers not using certified seeds, the reason behind for this is that they believe certified seeds to be more expensive. The price of wheat seed is 1.6 times higher than the product price and the price of the seeds, being 1.5-2.0 times higher than the product price, could be accepted as normal. However, the fact that producers do not have adequate working capital in the sowing period is one of the main reasons behind the low ratio use of certified seeds. Low-interest credits given by credit institutions in the last two years to enable farmers to easily supply certified wheat and barley seeds has not yet spread to all provinces and districts due to a scarcity of resources and other reasons. When it is considered that 75% of the producers have the tendency to take advantage of these credits, it appears that the extension of the credits will have positive impact on use of certified seeds. The production costs in wheat farming with traditional varieties have been discovered to be lower than wheat farming using uncertified (7.8%) and certified (16.9%) seeds of improved varieties. The yield in wheat farming using certified seeds of improved varieties is 33% and in wheat production using uncertified seeds 19.6%, higher than production using traditional varieties.

The net economic benefit of wheat production using certified seeds of improved varieties and of wheat production using uncertified seeds in enterprises have been calculated as \$ 102.40 and 62.70 ha^{-1}, respectively. The net benefit of \$ 1 of additional expense for seed is \$ 6.36 if the certified seed of improved varieties use in the production process instead of traditional varieties and is \$ 12.06 if production is made using uncertified seeds of improved varieties instead of production using traditional varieties. As contribution of wheat production with uncertified seeds of improved varieties to the welfare of the producer under current conditions is higher than the contribution of certified seeds and traditional varieties, wheat production of producers using uncertified seeds is becoming widespread. The subsidy payments for certified seeds applied de facto in wheat farming are inadequate and it is necessary to increase subsidy payments per hectare by 2.7 times to make technology support encouraging. The contribution of certified seed use to the welfare of the producer will be higher than wheat agriculture using uncertified varieties, provided that the minimum state subsidy is \$ 101 ha^{-1} to replace uncertified seeds of improved varieties with certified seeds in enterprises.

It appears that the training and extensions carried out to make producers aware of the benefits of certified seeds are inadequate. Only a few producers were met who had discussed with extension staff about selection of the appropriate varieties and had attend events such as field days and demonstrations to promote varieties. Also, not all the producers know the wheat varieties that are recommended for their regions. Beside improvement of varieties, the productivity and quality characteristics of

which are high, cultivation of these varieties in suitable regions with suitable production techniques and inputs are also critically important. The formation of variety recommendation lists and encouragement to the farmers to use certified seeds suitable to their regions will raise the use of certified seeds. However, primarily the reasons why producers cultivate traditional varieties must be analyzed and the preferences of producers must certainly be met with improved varieties.

Institutions producing and distributing seeds and agricultural extension institutions should emphasize advertising studies of varieties suited to the regions that have high productivity and quality, can be sold at relatively higher price, have high resistance to negative climatic conditions and fit to the farming aims of the producers. Increasing the use of certified seeds on farms by showing that it will be economically advantageous will also be useful. However, the people who purchase certified seeds of self pollinated varieties market them by multiplying themselves or give to their neighbor. Although it is possible to prevent this through legal regulations, it must be noted that these regulations may also bring about negative consequences. As seed development research has progressively moved from the state institutions to the private sector, regulations on intellectual property and the right to use improved seeds have become increasingly complex issues (Gaisford *et al*., 2001). If intellectual property rights are not protected by law, the private sector will not orient towards comprehensive studies on the area of seed production and trade. However, if legal regulations are made and thus there are few firms in the market, a monopoly effect may be observed. On the other hand, traditional wheat seeds must be handled as a part of seed policy in studies concerning in-situ conservation.

ACKNOWLEDGMENTS

This study has been prepared using the data and conclusions of a graduate thesis prepared by Mr. Ilyas Akdoğan, under the supervisor of Associate Professor Harun Tanrıvermiş. We would like to deeply thank Dr. Sertaç Gönenç (Department of Agricultural Economics, Uludağ University), Professor Hasan Hüseyin Geçit (Department of Field Crops, Ankara University), Associate Professor Mevhibe Albayrak (Department of Agricultural Economics, Ankara University) and Umut Özkan (M.Sc. in Agricultural Economics) who contributed to this study with their views and recommendations; valuable researchers who read and delivered opinions on the early draft of the paper and lastly the anonymous reviewers who made valuable contributions by examining the study.

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