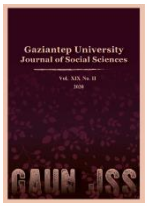

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Effects of The Change in Wheat Varieties as a Result of The Green Revolution on Culinary Culture[1]

Yeşil Devrim Sonucu Buğday Çeşitlerindeki Değişimin Mutfak Kültürüne Etkileri

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ABSTRACT

Meeting the need for nutrition has been an important issue from past to present. Structural changes in the production of "wheat," a fundamental food product in meeting nutritional needs, have led to negative reflections in areas such as health, the environment, genetic diversity, and culinary culture. This study aims to determine how Turkey, a country with a rich diversity of wheat production, has been affected by the Green Revolution and the reflections of this impact on its culinary culture. Data obtained from a review of relevant literature were used in conducting the study. Scientific articles, books, graduate theses, and related scientific research reports were utilized to gather the necessary data. The concept of the "Green Revolution" covers topics such as the structure, history, nutritional content, production, and trade of wheat. This study analyzed the effects of the Green Revolution in terms of areas such as "wheat diversity, public health, and the natural environment." The findings indicate that wheat production, one of the most important agricultural products, increased after the Green Revolution, with both positive developments and certain negative outcomes observed. It is noted that local wheat varieties may be suitable for sustainable agriculture, beneficial for diets related to diseases such as diabetes, and that these varieties have adapted to their regions for centuries, serving as a good source for bakery products. Although many studies have been conducted on the changes in wheat production following the Green Revolution, it has been determined that there is a limited number of comprehensive studies examining the impact of production increases on culinary culture. Sustainable food production is essential to ensure the continuity of culinary culture.

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ÖZ

Geçmişten günümüze beslenme ihtiyacının karşılanması önemli bir konudur. Beslenme ihtiyacının karşılanmasında temel gıda ürünü olan "buğdayın" üretiminde yaşanan yapısal değişimler; sağlık, çevre, genetik çeşitlilik ve mutfak kültürü vb. alanlarda olumsuz yansımalara neden olmuştur. Bu çalışmada buğday üretimi açısından zengin bir çeşitliliğe sahip olan Türkiye'nin, Yeşil Devrim'den nasıl etkilendiği ve mutfak kültürüne yansımalarının ne olduğunun tespit edilmesi amaçlanmaktadır. Çalışmanın yapılmasında ilgili literatürün taranmasından elde edilen verilerden yararlanılmıştır. Gerekli verilerin elde edilmesinde bilimsel makalelerden, kitaplardan, lisansüstü tezlerden ve ilgili bilimsel araştırma raporlarından yararlanılmıştır. "Yeşil Devrim" kavramıyla buğday bitkisinin yapısı, tarihçesi, besin içeriği, üretimi, ticareti vb. konular ele alınmaktadır. Bu çalışmada Yeşil Devrim'in etkilerinin ne olduğu "buğday çeşitliliği, toplum sağlığı, doğal çevre" gibi alanlar açısından analiz edilmektedir. Araştırmadan elde edilen veriler sonucunda "Yeşil Devrim" sonrasında tarımsal üretimin en önemli ürünlerinden biri olan buğday üretiminde artışların olduğu, üretimde çeşitli olumlu gelişmelerin yanı sıra olumsuz bazı sonuçların da görüldüğü anlaşılmıştır. Yerel buğday çeşitlerinin sürdürülebilir tarım anlayışına uygunluğu diyabet vb. hastalıkların diyetinde faydalı olabileceği, yerel buğday türlerinin bulundukları bölgeye yüzyıllardır uyum sağlamış türler olduğu, unlu mamullerin yapımı için iyi bir kaynak olabileceği belirtilmektedir. "Yeşil Devrim" sonucunda buğday üretimindeki artışta yaşanan değişim üzerine birçok çalışma yapılmış olmasına karşın, üretimdeki artış durumunun mutfak kültürüne etkilerini kapsamlı olarak inceleyen çalışmaların sınırlı olduğu saptanmıştır. Mutfak kültüründe devamlılığın sağlanabilmesi için sürdürülebilir gıda üretimine ihtiyaç bulunmaktadır.

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Introduction

Nutrition is the behavior of taking the nutrients (carbohydrate, protein, fat, water, vitamins and minerals) needed for the continuation, protection and development of vital activities in a sufficient and balanced manner at the appropriate time. The problem of hunger, one of the most important problems of human history, has always existed. The world population is expected to reach 10 billion by the 2050s and today's agricultural production should increase by 70%, but it is stated by FAO and UN that these rates cannot be reached as a result of changes in agricultural production, industrialization, increased drought, depletion of water resources and air pollution.

Wheat (*Triticum aestivum*) is an annual herbaceous and self-fertilizing plant belonging to the *Poaceae* family. It has adapted to a large part of the earth. Since the beginning of the history of mankind, wheat has been easy to cultivate, tasty and cheap, which has made its production and consumption continuous. It is also used to meet the nutritional needs of 30 per cent of the world population. It has become a symbol of fertility and has been preferred in various religious ceremonies and special days. The first examples of studies on the domestication of wheat can be found in Turkey. The traces of the ancestor of today's wheat, known as Siyez or Kaplıca, were found 10 thousand years ago in Diyarbakır Karacadağ. It is known that the introduction of Mexican wheat into Turkey, which is the centre of wheat and its wild relatives, and the intensive use of inputs it brought with it, resulted in a decrease in local wheat varieties. While local wheat species were intensively cultivated until the Second World War, the cultivation of local wheat species gradually started to decrease in the following periods.

With the Green Revolution, Japanese and American scientists under the leadership of Dr Borlaug developed high-yielding Mexican wheat varieties with short stature and full spike structure in Mexico. With the increase in the use of inputs in agricultural activities, productivity increased and provided resources to many nations experiencing hunger problems after the Second World War. Countries such as India and Pakistan solved their hunger problems by importing Mexican wheat seeds at a time when hunger problems arose due to population growth. Turkey started to experience changes in agricultural production with mechanization in agriculture, input use and the introduction of Mexican wheat with the Marshall aid received after the Second World War. The introduction of commercial wheat varieties started in the Mediterranean Region. The increase in productivity has pleased the farmers, but the shrinkage of local wheat varieties and local wheat variety cultivation areas has limited production. It has also led to the forgetting of dishes prepared from local wheat varieties. High-yielding wheat varieties are not suitable for sustainable agriculture and damage the integrity of nature with the environmental problems they create. It causes various environmental problems, especially the risks it poses to human health. The negative consequences of the green revolution also affect our culinary culture

The concept of self-sufficiency has gained importance with recent global events such as Covid-19 and the Russia-Ukraine war. In addition, the new understanding of agriculture, which leads to a decrease in biodiversity, makes food systems vulnerable to future climate changes, pests and diseases. By ensuring food security, existing hunger problems can be solved and future hunger problems can be prevented. Since the preservation of culinary culture depends on food security, biodiversity and healthy food, local wheat species should be preserved. In this study, the reflections of the positive and negative effects of the Green Revolution on culinary culture were analyzed.

Conceptual Framework

Agriculture

According to TDK, the definition of agriculture, which includes all kinds of animal production as well as plant production, which is needed to meet our nutritional needs, which is considered one of our basic needs; production of plant and animal products, increasing their quality and yield, protection under appropriate conditions, processing and evaluation and marketing, agriculture, culture (Sözluk.gov.tr, 2025).

In the region known as the Fertile Crescent, which extends from Egypt along the Mediterranean coast to the southeast of Turkey and from there along the border between Iran and Iraq, it is known that human beings, who met their food needs by hunting and gathering in the period of 10.000 BC, collected wild grains. The fertile soil and climate structure of the region made it rich in edible plant resources and wild animals. This richness contributed to the start of agricultural activities in the region. As a result of the excavations, it was understood that the first plants cultivated were wild wheat and barley

The transition to agricultural activities did not take place in the same period in all regions. Communities started agricultural production in different periods and times independently of each other. For example, agriculture was practiced in the Near East in about 8500 BC, in China in about 7500 BC, and in Central and South America in about 3500 BC.

Some views on the transition to agriculture are as follows; The fruit in the story of Adam and Eve's expulsion from paradise by consuming the forbidden fruit is the transition to agriculture, unlike the fruit we know. Another source of inspiration is the interest in beer, which was discovered by the accidental fermentation of cereal grains. The positive and negative aspects of people's transition to agriculture continue to be a subject of debate (Standage, 2016).

The transition to settled life and agriculture are related issues. Agricultural activities have a great impact on the transition from nomadism to settled life. With the transition to settled life; population increase, settlement units, management, commercial activities, safe environment, orientation to different fields; science, art, culture, etc. initiated and accelerated progress (Standage, 2016, p. 19).

Change in Agricultural Production

Artificial Fertilizer

In the 1770s, scientists investigating air properties realized that nitrogen is a basic component of air and corresponds to 78% of it, which increased interest in nitrogen-related studies. Nitrogen is a building block of plant and animal tissues, a nutritive substance that forms the protein content of the cereal group and provides plant growth. The understanding of its role in meeting the nutritional needs has made nitrogen more valuable. As a result of the first studies, it was understood that it was an air component and non-reactive. In 1836, French chemist Jean-Baptiste Boussingault showed that the effectiveness of fertilizer types is directly related to the nitrogen in them.

> Plants need nitrogen and some microorganisms in the soil take nitrogen from the atmosphere and make it available for plants. However, microorganisms in the tubers on the roots of legumes also contribute to nitrogen production, which acts as a second nitrogen store that plants can utilize (Standage, 2016, p. 253).

Attempts to increase agricultural production started in the same period with the information on nitrogen. After 1850, the increase in population resulted in the opening of new areas for agricultural production. The idea that the areas opened to agriculture should have an end necessitated the need to meet the food supply with more yield from the unit area. Meeting the need for nitrogen with natural fertilizer led to more animal production and the need for food

for animal production led to a vicious circle and as a result, it became clear that nitrogen had to be supplied by different methods. By 1840, there was a search for nitrogen and solidified bird droppings from tropical islands became a good source for South America. A source of sodium nitrate discovered in Chile was demanded for artificial fertilizer.

The fact that these resources are limited and the increasing need for nitrogen has revealed that different methods should be found to meet the nitrogen. These methods are as follows;

By heating the coal in an oxygen-free environment, nitrogen was formed as ammonia, but the amount obtained was very limited.

The idea of making the nitrogen in the air more reactive by utilizing artificial lightning and high voltage was abandoned due to the high energy of nitrogen and the lack of a cheap electricity source for the continuation of production.

Fritz Haber carried out studies to synthesize ammonia from hydrogen and nitrogen, the two basic elements of ammonia, and it was understood that the results obtained were not very useful in practice. Haber, who continued his studies, made a presentation to BASF chemical company and his work was appreciated by the company and chemist Carl Bosch from BASF company was assigned to convert it into an industrial process.

Haber's original methods and Bosch's engineering combine to produce ammonia with nitrogen from the air and hydrogen from coal, and Haber's contributions to agriculture led to the Nobel Prize in Chemistry.

After 1920, methane gas obtained from natural gas started to be used instead of coal. Between 1910 and 1938 world fertilizer use tripled. Since ammonia is used both as a fertilizer and as an explosive, the number of plants for production increased during the Second World War and the end of the war increased fertilizer production capacity.

Seed Breeding

Increased use of artificial fertilizer has caused changes in the physiological structure of the seed. Since the seed heads are now heavier and larger, the increase in yield has led the farmer to use more nitrogen fertilizer.

Although this situation seemed to be favorable for the farmer at first, problems of plant breakage due to weight emerged. In the 19th century, Norin 10 was obtained by crossbreeding the local Japanese wheat Daruma with Red Winter Turkish wheat. After the Second World War, the variety hybridized at the Norin Breeding Station in Japan was brought to the USA. Norin 10, which is shorter than normal, responded well to nitrogen fertilizer. The new wheat species are shorter, high yielding and more fertilizer sensitive than the cultivated species. Hybridization with local species in the region of cultivation has started and developed countries have started to produce grain surplus with both nitrogen fertilizer and Norin10 wheat species (Türkiye'nin Buğday Atlası, 2016, p. 6; Atar, 2017, p. 4 and Standage, 2016).

In 1952, Dr Borlaug added the Norin 10 variety to his studies on wheat in Mexico. By crossing the local American wheat variety Brevor and Mexican wheat with Norin 10, Borlaug developed new wheat varieties that are insensitive to day length, have high disease resistance, respond well to nitrogen fertiliser and have twice the yield compared to traditional Mexican varieties (Türkiye'nin Buğday Atlası, 2016, p. 6; Atar, 2017, p. 4 and Standage, 2016).

Norman Borlaug, an American agricultural expert who took newly developed wheat varieties to developing countries, made these varieties widespread first in Mexico and then in India with the support of the Rockefeller Foundation. After Mexico, the studies carried out in

India and Pakistan led to an extraordinary increase in Indian production. This situation increased the interest in the new wheat species, namely high-yielding dwarf wheat. In Turkey, cultivation trials were carried out for the first time in the Mediterranean region after 1960. It was found successful by farmers and public institutions and paved the way for its importation.

In 1968, William Gaud of the United States Agency for International Development, in a speech in which he appreciated the developments in agriculture, referred to the impact of the new species as the 'Green Revolution', and the concept of 'Green Revolution' was soon accepted all over the world (Standage, 2016).

In 1970, Norman Borlaug was awarded the Nobel Peace Prize for his contribution to agricultural production in Mexico and India. Within a short time, new wheat varieties became widespread in Asia, Latin America, the Middle East and Africa.

Studies conducted in the 1970s showed that the cultivation areas of local wheat species were shrinking. In the following periods, studies revealed that high-yielding wheat species are not suitable for sustainable agriculture (Shiva, 2010).

Wheat

Wheat (*Triticum aestivum*) is an annual herbaceous and self-fertilizing plant belonging to the *Poaceae* family. Local wheat varieties are resistant to heat and drought with a tendency to show wide adaptation, have high grain quality and survive by natural selection. Today's commercial naked durum and bread wheat varieties are the result of natural selection and human modification of wild species.

Wheat, which is an important source of carbohydrates, is processed into flour and serves as raw material for many floury foods, especially bread. Another area of use is bulgur, a nutritious product popular in Anatolia. Pasta, biscuits, semolina are also wheat-based products. For animal production, the bran and stalk parts are used as feed. The stem part of today's wheat is different from local varieties. In wheat production, firstly in commercial varieties, care is taken to ensure that the stalk and spike parts are of the same quality, but recently the stalk part has been in the second place.

Wheat grain is divided into three parts: husk (pericarp), germ (embryo) and endosperm. Endosperm constitutes 85% of the grain and flour is obtained from this part. Bran is obtained from the husk and is mostly used in the feed industry. The husk constitutes 12-14% of the grain. The germ (embryo) is rich in protein, oil, vitamins and minerals. The ratio of embryo in the grain is between 2-3% (Badem, 2021).

The composition of wheat grain contains 12% water, 70% carbohydrate, 12% protein, 2% fat, 2.2% cellulose and 1.8% ash (ZMO, 2018).

As a result of the researches on wheat, the first traces of wheat were found in the Mesopotamia region about 10 thousand years ago. This region between the Euphrates and Tigris Rivers is called the "Fertile Crescent". The region, which includes Iran, Iraq, Turkey, Syria, Palestine and Israel, has been home to many nations.

Archaeo-botanical studies show that agriculture started in this region and explains agriculture as the start of conscious agriculture as a result of the accidental growth of seeds collected for consumption. The oldest agricultural products are Einkorn wheat, Emmer wheat, barley, pulses such as lentils and peas, and flax. As a result of the studies, Einkorn wheat was first cultivated near Diyarbakır Karacadağ 10 thousand years ago (Atar, 2017, p. 3; Özberk et al., 2016; Türkiye'nin Buğday Atlası, 2016, p. 14; Işın, 2018).

Siyez (*T. mococcum*) and Gernik (*T. dicoccon*), the primitive forms of wheat

cultivated, are the result of mutations and human interventions of two wild species, Wild Siyez (*Triticum boeoticum*) and Wild Gernik (*T. dicoccoides*).

Cultivation of the primitive forms took place in the triangle of Gaziantep, Şanlıurfa and Diyarbakır in the Southeastern Anatolia Region.

Since the spine parts of the wild forms are fragile, damage to the stem with the ripening of the grains causes the seeds to fall. This situation negatively affects the amount of product. The fact that the grain structure of primitive forms is larger than the wild ones and the spikes are not fragile has facilitated the widespread cultivation.

Wild wheat forms; Wild Siyez (*Triticum boeoticum*), Urartu wheat (*Triticum urartu*), White wheat (*Aegilops speltoides*), Rosary wheat (*Aegilops tauschii*). Wild Gernik (*Triticum dicococides*), Urartu Wheat (*Triticum urartu*) and White wheat (*Aegilopos speltoides*) were hybridised in nature. Wild Gernik is the ancestor of the primitive gernic form. Triticum durum is the ancestor of today's naked durum wheat. The ancestors of Spelt wheat (*Triticum aestivum*) are Spelt Gernik (*Triticum dicoccon*) and Rosary wheat (*Aegilops tauschii*). The ancestor of bare bread wheat (*Triticum aestivum*) species is spelt wheat (Atar, 2017, p. 3; Özberk et al, 2016; Türkiye'nin Buğday Atlası, 2016; Işın, 2018). Table 1 shows the primitive cultivated wheats, variety groups and ploidy levels.

Table 1: Primitive cultivated wheats, variety groups and ploidy levels.

Species	Turkish names	Variety group	Ploidy* Level
T. monococcum L.	Hot spring= Siyez	*Siyez*	Diploid
T. turgidum L.	Gernik= Çatal Spa, Çatal Siyez	*Dicoccon*	Tetraploid
	Durum wheat	*Status*	Tetraploid
	Actual pasta	*Durum ssp.commune*	Tetraploid
	Durum wheat spelt	*Durum ssp. duro- compactum*	Tetraploid
	Coarse wheat (= coarse grain)	*Turgidum*	Tetraploid
	Cranesbill wheat	*Polonicum*	Tetraploid
	Eastern wheat	*Carthlicum*	Tetraploid
T. timopheevi	Russian wheat	Russian wheat	Tetraploid
T. aestivum L. em Thell spelta	Kavuzlu wheat	*Spelt*	Hexaploid
	Branched wheat	*Vavilovi*	Hexaploid
	Bread wheat	*Aestivum*	Hexaploid
	Topbaş bread wheat	*Compactum*	Hexaploid
	Dwarf wheat	*Sphaerococcum*	Hexaploid
	Maha wheat	*Macha*	Hexaploid

Source: Kün 1981, Taken from Buğday Atlası.

Ploidy (polyploidy) level: The level at which somatic cells carry several integer multiples of the basic number of chromosomes (2n= 2x=14 diploid, 2n=4x= 28 tetraploid and 2n=6x= 42 hexaploid).

Changes in the Agriculture Sector in Turkey

Our country has around 12,000 plant taxa and about 1/3 of them are endemic species (Şenkul and Kaya, 2017, p. 109). Turkey is rich in terms of product diversity and active agricultural activities with its fertile land structure. As a result of the excavations, it was determined that the first traces of agricultural activities started in the Fertile Crescent region, including the Southeast region of Turkey.

The products cultivated are Emmer wheat, Einkorn wheat, Barley, Lentil, Pea and Flax. It is known that wheat was consumed by people before agricultural production. With agricultural activities, the amount of wheat in nutrition has increased and become widespread. Anatolian lands have hosted many nations and fertile lands have always attracted people.

Our country, which is the homeland of wheat, has a rich source of both local and wild relatives. This situation contributes to the provision of wheat culture varieties. In revealing this diversity with data, it has been reached as a result of researches carried out by both scientists of our country and scientists from other countries.

As a result of the studies conducted on wheat by Mirza Gökgöl, a scientist of our country, in 1930s, 18 thousand types and 256 new varieties were obtained. Russian scientists Vavilov and Zhukovsky carried out studies between 1925 and 1926. It was understood that two of the eight regions where the wild relatives of the cultivated plants identified by Vavilov grow naturally, the Mediterranean Origin and the Near East Origin regions, were in Turkey. US scientist Harlan collected 2112 wheat village varieties and 55 wheat wild relatives during his researches in Turkey in 1948 (Türkiye'nin Buğday Atlası, 2016, p. 38; Akgün and Altındal, 2015; Atak, 2017, p. 8).

After the proclamation of the Republic, the transformation of the agricultural sector in Turkey took the following course: After the First World War, our country, which was trying to adapt to the decrease in the male population, economic problems and the changing world order, relied on agricultural production, and wheat production was limited to production for the domestic market due to the very low production due to all these problems.

With the awareness that agricultural production is important for the development of the country, many institutions were established and the improvement of the conditions of the agricultural sector was prioritized. In 1925, innovations were started to be made in agricultural production by abolishing the Ashar tax that farmers had to pay, and then the process of establishing institutions supporting agricultural activities was started.

For the first time in 1924, the Ministry of Agriculture ceased to be affiliated to other ministries and was transformed into an independent structure.

In 1925, a seed breeding station was opened in Eskişehir.

Alpullu and Uşak Sugar Factories were established in 1926. In the same period, Animal Breeding Law was adopted.

Dry Farming Experiment Station was established in Eskisehir in 1929 and studies were carried out with the institute to meet the wheat variety needs of the region. The development of hard wheat varieties, which are sown in autumn and are not damaged by winter cold during the germination phase, and the development of bread wheat varieties, which develop slowly with spring rains and fill their grains without being damaged by the bambul beetle at this stage, are among the first studies carried out.

The fact that more than 60 per cent of Turkey's agricultural land is not at a level to be irrigated has made dry farming effective and has led to the importance of dry farming studies. Agricultural engineer Ali Numan KIRAÇ conducted the first research on dry farming and his results set an example for the whole world (Eriş, 2018; Yıldırım, 2024).

After the First World War, the economic depression between 1929 and 1935, which affected the whole world, intensified state control over agricultural production and self-sufficiency in agricultural production came to the fore.

In 1935, the law on Agricultural Credit and Agricultural Credit Cooperatives was

enacted.

Agricultural Combines were established in 1937. Agricultural combines provided farmers with the necessary tools, machinery, seeds and resources for animal production. Since the outbreak of the Second World War and the subsequent events negatively affected agricultural production, the importance of agricultural combines increased. Turkey did not participate in the Second World War, but the army was kept ready and the needs of both the people and the army were tried to be met.

Under the control of agricultural combines, 13 state production farms were established and the production in the farms was useful in providing the resources needed by the country.

In the first half of the 20th century, 80 per cent of the population lived in rural areas and engaged in agriculture. In 1940, the Law on Village Institutes aimed to improve the socio-economic conditions of the rural population (Yurtoğlu, 2018).

The Turkish Grain Board (TMO) was established in 1938 for the collection, storage and preservation of the products obtained.

After the Second World War (1939-1945), the USA, which gained the most from the war, provided financial support to many countries, especially European countries, under the name of Marshall Aid. Our country is a beneficiary of these aids and the aids started during the Adnan Menderes period. Financial support was received between 1948 and 1952. The loans and grants provided to the country to be used in agriculture and military fields under the name of Marshall aid ended in 1952, but then the USA continued to provide loans and grants. A large part of the aid received was transferred to agriculture in order to ensure that 80% of the population of our country made a living with agriculture and to export agricultural products to European countries. With the aids received; breakthroughs have started to be made to change agricultural production, which is far from modern agricultural methods, has limited irrigation facilities and agricultural knowledge, and is based on the intensive use of human and animal power. It is known that the majority of the support given to agriculture in this period was used for mechanization in agriculture. The number of agricultural machinery, tools and equipment purchased from the USA was 73.036 at the end of 1956. The number of tractors, which was 1750 between 1948 and 1952, reached 31,415 and this number increased to 43,727 at the end of 1956. Wheat, potato, lentil, cotton and rice production increased with a 60 per cent expansion in production areas (Karaman and Yavuz, 2016).

Meat and Fish Institution was established in 1952 to develop domestic production and support animal husbandry activities. Feed Industry (1956), Soil Water, Milk Industry Institution (SEK) 1963, and various institutions for agricultural control were established (Yıldırım, 2024).

The Green Revolution, which caused a great repercussion all over the world, where productivity reached its peak with pesticides, chemical fertilizers and improved seeds, also affected our country after 1960. After 1960-1970, when agricultural subsidies were intensive, subsidies started to change and decrease. 28 After the First World War, market price support was applied in the agricultural sector where state support was intensive. With this support, the state determines the price at which the products will be purchased and the organization that will make the purchase. The first market price support was applied for wheat. The first purchase of wheat was made by Ziraat Bank. With the establishment of the Turkish Grain Board (TMO), the duty of purchasing wheat was transferred to TMO.

The 24 January 1980 "Stabilization Decisions", the Stabilization Programme implemented on 5 April 1994 and the Stand-by agreement signed with the International Monetary Fund (IMF) in December 1999 negatively affected the agriculture of our country

(TKV, 2022). During the prime ministership of Süleyman Demirel, the 24 January Decisions were announced as a solution to the economic problems of the country with the efforts of Turgut Özal, Undersecretary of the Prime Ministry. As a result of these decisions, the protectionist attitude in domestic markets was abandoned. An economic understanding according to neoliberalism was demanded. With the government established after the 12 September coup, this understanding became definite. As of 1985, there was an unprecedented increase in imports.

The 1980s, when the effectiveness of liberalism increased, was a period when many countries started to privatize their public enterprises. Following the results obtained, privatization started in Turkey and state-owned enterprises (SOEs) were privatized. The 26 products within the scope of agricultural support were reduced to 9 in 1994. State subsidies in agriculture were gradually reduced. The reform implementation project in agriculture; the supports provided by the IMF and the World Bank are aimed at reducing the state support in agricultural production in our country as much as possible. This project has completely changed the support given to farmers through direct income support. The same support is also applied in European countries, but there are differences in terms of implementation in our country. In our country, support is based on land size. This prevents small farmers from benefiting. Support does not change according to the amount of production and product (Aslan, 2013, p. 185).

In 2006, the Agricultural Law, the Seed Law and the Biosafety Law were enacted in 2010. With the Seed Law, seed exchange other than the sale of certified seeds is prohibited, but farmers can still exchange seeds among themselves.

Wheat Cultivation in the World and Turkey

Wheat is one of the most common cereal crops in crop production. The fact that it does not cause problems to the farmer in terms of climate and soil requirements makes it preferred for cultivation. The fact that it is cheap and durable increases the tendency towards wheat in production and consumption. Recent global events such as Covid-19 pandemic, Russia-Ukraine war and global warming affect the amount of food production. It shows that an external dependent structure in agricultural production creates a danger. In addition, it has shown that food security should be ensured and the preservation of diversity as much as possible is the basis of plant existence. With the effect of global warming, extreme temperatures cause problems such as imbalance in precipitation, etc. and negatively affect agricultural production. For example, early heat waves in 2022 reduced wheat production in India and the country had to ban wheat exports for a short time. The ongoing war between Russia and Ukraine has led to a decrease in Ukraine's wheat production and an increase in wheat prices. EU countries and African countries importing Ukrainian wheat were adversely affected by this situation. On 22 July 2022, with the initiatives of the UN and Turkey, a Grain Corridor Agreement was signed between Russia and Ukraine. Thus, Ukrainian grain met the grain needs of European and African countries. The agreement ended on 17 July 2023 when Russia withdrew from the agreement. As a result of this agreement, 40% of the grain exported was to European countries, 33% to Asia, 13% to Turkey, 12% to African countries and 5% to Middle Eastern countries (Yıldırım, 2025).

Due to reasons such as the Covid-19 pandemic, the ongoing Russia-Ukraine war and climate change, export prices increased by 70% from 236 $/ton in 2018/19 to 401 $/ton in 2022/23 (TEPGE, 2023).

After the First World War, wheat cultivation in Turkey was limited to a very small production for domestic consumption. Issues such as mechanization, irrigation and spraying in agriculture were provided with grants and loans received after Marshall Aid, and product efficiency increased with the introduction of fertilizers, pesticides and Mexican wheat. We also

see the effects of the Green Revolution in Turkey after 1960. Semi-dwarf varieties such as Penjamo-62, Pitic-62, Lerma Rojo-64, Super-x, which were obtained from the cross of Norin 10/Brevor and local varieties, pioneered significant changes in wheat production. Due to their high yields, they have been easy to spread and have surpassed local wheat varieties. With these new semi-dwarf wheat varieties, the use of inputs in agriculture has increased considerably. The deficiencies in yield and quality of local varieties have led farmers to Mexican wheat. The cultivation that started in the Mediterranean Region has negatively affected the preference of local wheat varieties in the region over time and has led to the oblivion of most of these varieties in the process until today. The use of inputs increases with modern varieties. Cultivation can be done in proportion to the support given to the farmer. The area available for wheat cultivation in Turkey is known to be 8 million hectares, but after the 2000s, despite the increase in inputs (fertilizer, diesel oil, seed, credit) due to the preference for seed, with the decrease in support, at least 1 million hectares of land is not produced in our country and this situation leads to a loss of at least 3 million tonnes of wheat production per year (Aslan and Çabuk Kaya, 2013, p. 273; TKV, 2022). As a result of the low response of local species to nitrogen fertilization, their high stature and sensitivity to some leaf diseases, they remain in the background compared to modern varieties. In our country, local varieties and cultivation areas, which were used as the only source until the Second World War, are decreasing (Atak, 2017, p. 10; Kaplan Evlice and Akkaya, 2019). Zerun, White Wheat, Red Wheat, Yellow Wheat, Karakılçık, Siyez, Koca Wheat, Topbaş, Şahman, Kırik and Üveyik are the local wheat varieties with the largest cultivation area (Özberk et al., 2016, P. 222).

The first breeding studies in the history of the Republic started with the establishment of Eskişehir Agricultural Research Institute. In 1925, wheat was one of the most important plants investigated in these studies. Local wheat varieties were selected for the breeding of bread wheat and durum wheat varieties and adaptation and selection studies were carried out on the varieties (Atay, 2006, p. 2).

The studies were shaped according to the agricultural understanding and needs of the period. In the 1920s, local varieties were used for wheat cultivation. In this period when there was no mechanization, fertilizer and pesticide use, yield was low. In the first period of the studies, stem and grain yield was taken as a basis and efforts were made to breed varieties suitable for barren areas. As a result of the first studies, Yellow Wheat 710 durum wheat variety was obtained. Then Ak 702 was developed. These were followed by Sertak 52 and Yayla 305. In 1944, the first result of hybridization breeding studies was hybrid 13. After 1950, grain yield gained intensity in the studies and breeding studies were carried out for three different growing environments. After 1962, with the introduction of species with high sensitivity to fertilizer use, the provision of foreign varieties to the country by FAO and the Law No. 308, seed breeding studies have progressed differently from the previous period. Kıraç 66, Bolal 2973 and Bezostaja varieties made our country, which had to import in 1970, an exporter (Atay, 2006, p. 5; Türkiye'nin Buğday Atlası, 2016, p. 47).

Table 2: Registered as a result of selection studies from local varieties between 1926-1980

Year	Wheat variety	Breeding Research Institute
1931	Durum yellow wheat 710 Bread Ak 702 (It was obtained by the mixture of two lines selected from the topbaş in Eskisehir region. It is the first registered variety).	Eskisehir Seed Breeding Station

1936	Bread grade Sertak 52 (a mixture of two pure lines from the fields of Yamula village near Kayseri and Karahisar village in the Kelkit valley; suitable for biscuits) Bread maker sivas11/33 (suitable for biscuits)	Eskisehir Seed Breeding Station Ankara Agricultural Research Station
1939	Bread Yayla 305 (a triple blend composite variety from Eastern Anatolia). Bread Köse 220/39 (very good bread grade variety known as Zerun and Kırık). Bread Bread Hybrid 13 (Developed from Mentana x Kızıldil 706 and Mentana x Akdil 707 hybrids. It is the first variety obtained through hybridization).	Eskisehir Seed Breeding Station Ankara Agricultural Research Institute Eskisehir Seed Breeding Station
1944	Bread Ankara 093/44 Durum Akbaşak 073/44 and Kunduru 414/44	Ankara Agricultural Research Institute
1955	Bread Yektay-406 (Mentana x Ae. Variety obtained from Ovata hybrid. Rapidly spread due to its high yield)	Eskisehir Seed Breeding and Trial Station
1952-	Bread 4-11 (Selection from hybrid 13.	Eskisehir Seed Breeding and Trial Station
-1964	Cultivated in Central Anatolia for many years). Durum Yellow Bursa 7113 Ankara Agric.. Fak. Durum Karakılçık 1133 Yeşilköy Agric. Res. Ens.	Eskisehir Seed Breeding and Trial Station
1961-1963	Durum Fata "S "185-1 (selected from the local variety "Fata" from Burdur.	Eskisehir Seed Breeding and Trial Station
1966	Durum 4-22 (recommended for Central Anatolian temperate transition regions and Thrace). Bread P8-6, P8-8 (recommended for temperate transitional regions of Anatolia and Thrace)	Eskisehir Seed Breeding and Trial Station
1967	Durum Kunduru 1149 (obtained by selection from a village variety named "Bolvadin wheat" taken from a market place in Kadınhanı).	Eskisehir Seed Breeding and Trial Station
1958-1970	Bread Bread-66 (Yayla-305 x Florence hybrid compatible with poor soils) Bread Bolal 2973 (US origin variety obtained from Chynenne x Kenya-Mentana cross, suitable for rainy transitional regions of Central Anatolia) Bread Bezostaja-1 (Productive variety originating from Russia, suitable for winter, cold and moist soils). Sourdough Surak 1593-51. has good bread quality. It rivaled Köse 220-39.	Eskisehir Seed Breeding and Trial Station Eskisehir Seed Breeding and Trial Station Eskisehir Seed Breeding and Trial Station (the name agricultural research station was used after 1974) Ankara Agricultural Research Station

1976	Bread breed Badger-2800 (black rust susceptible variety selected by Rıfat Gerek from N10B/3/27-15/Rio/Rex/4/Burt cross originated from Mexico-USA).	Eskisehir Agricultural Research Station
1979	Breadbread Gerek 79 (Drought resistant variety, considered as one of the cornerstones of our wheat production, high yielding variety which is still being grown in Central Anatolia).	Eskisehir Agricultural Research Station

Source: Özberk and Özberk, 2016

Culinary Culture

Culture refers to all kinds of material and spiritual activities belonging to a society and continues to exist in our lives as a result of its transfer through generations. When it comes to culinary culture, it includes the entire process from growing to serving the products specific to that cuisine. Every society has a unique culture and maintains it; this includes culinary culture. Among the factors that shape the formation of culinary culture are factors such as natural factors (climate, landforms, etc.), accumulation of knowledge, interaction with other societies. Kitchen; It can be expressed as a place where the need for preparing, cooking, presenting and storing all kinds of food products necessary for cooking and cooking is met. The need for nutrition, which is one of our basic needs, has developed in parallel with the development of humanity and has become more than a need. The products cooked in the kitchen, the techniques used, presentation methods provide very important information about our culture. The discovery of fire and the transition to agriculture are very important for the formation of food culture. As a result of the discovery of fire in the Palaeolithic age, the number of consumable products increased.

The transition to agriculture in the Neolithic Age took place in the Mesopotamia Region and the cooking culture is based on Mesopotamia. The culinary culture spreading from here has contributed to the formation of other cuisines. Mesopotamian Cuisine; Asian and Chinese cuisine, Chinese; Japanese cuisine, Asian; Egyptian cuisine and Egyptian cuisine contributed to the formation of the culinary culture of Greek civilization. Rome was influenced by the ancient Greek cuisine, which was the civilization that preceded it, and played a role in shaping the cuisines of other European countries such as French cuisine and British cuisine (Düzgün and Özkaya, 2015, p. 43).

Method

The research method used in the preparation of this study is literature review, which is one of the qualitative research techniques. Published articles, books, thesis studies and other scientific publications were utilized to collect the necessary data. The concept of Green Revolution, the structure, history, nutritional content, production, trade, etc. of wheat plant and culinary culture were read. With the information obtained, the effects of the change in wheat production after the Green Revolution on culinary culture were analyzed. Based on the results of the analysis, the reflections of the impact of new wheat species on our culinary culture were evaluated and conclusions were drawn.

Findings

In order to ensure the continuity of culinary culture, factors such as ensuring food safety, sustainability of production, quality of the product in terms of health, preference in terms of flavor, taste and aroma are very important.

In studies evaluating commercial and local wheat species in terms of nutrients, it is

supported by many studies that commercial wheat species have lower values. Han and Ertop (2022), in their study on durum and bread wheat species and Siyez wheat, found that the mineral content of Siyez wheat was higher. (Akçura, Hocaoğlu, Kılıç ve Kökten 2013), in their study on registered species and local bread wheat species, stated that the elemental content of local bread wheat species is higher. Kızılaslan (2020) found that in baby biscuits produced with Siyez flour, glycemic index, slow and fast digestible starch values decreased and the amount of tryptophan increased as the amount of Siyez flour increased. In his study, Atak (2017) mentioned that the microelement content of local wheat species is high and stated that the production areas of local wheat varieties are gradually shrinking.

In terms of flavor, Özgören and Işık (2023) reported that Tulumba desserts prepared from Siyez, Dinkel, Kavılca and commercial baklava flour received the same score from the panelists in terms of flavour, smell and texture. It was also observed that protein and mineral content was higher in primitive wheat species. There are studies on the fact that some local wheat species can be a source for flour used in the preparation of products such as pasta and noodles. Koyuncu (2009), in his study on the durum wheat quality of local durum wheat varieties; Çalıbasan, Akçakale, Havrani and Sarı wheat were found to carry γ-gliadin 45 and LMW-2 glutenin proteins which showed superior pasta cooking quality. Sazak (2022), in his study on Gacer wheat, stated that the wheat type with low gluten ratio remained low quality for bread production, but mentioned that Gacer wheat gave better results in pasta, biscuit and bulgur production compared to other wheat types used in the study.

Indian Activist Vandana Shiva mentions that the Green Revolution encouraged pesticides and herbicides and monoculture agriculture. In many of her books, she talks about the intensive use of water resources in her country and the negative effects caused by pesticides. He also states that 25% of the world's carbon dioxide emissions, 60% of methane gas and 80% of nitrous oxide emissions are caused by agricultural production. He emphasizes that gene banks started to be established after the 1970s as a result of the effect of the decrease in seed diversity on biodiversity, and that large agricultural companies benefit from gene banks, and that companies producing seeds also produce pesticides

With the Green Revolution, the use of inputs in agricultural production has become quite widespread. Intensive irrigation activities deteriorate the structure of the soil and pave the way for erosion. Turkey is not a country rich in water resources and has 112 billion cubic meters of usable water resources. 73% of water resources are used in agricultural production, 16% in housing and living areas, 11% in industry, and agriculture is the most wasteful activity (Yıldırım, 2024, p. 49).

The use of pesticides is increasing in Turkey. The most intensive use is in the Mediterranean and Aegean regions. Arslan and Çiçekgil (2018) found that the use of pesticides increased year by year and the average annual increase rate was 1.2%

It is stated in many studies that a long-term production is not possible with the agricultural understanding brought by the Green Revolution. It is known that there should be an understanding of agriculture integrated with nature in order to protect the supply of food. It is known that today's commercial wheat species are not sustainable and have low sensitivity to organic agriculture. The wide adaptability of local wheat species and their low water and fertilizer requirements show that these wheat species create resources that can be used in terms of adaptation to organic agriculture. In their study, Tıraşçı and Erdoğan (2021) stated that climate changes as a result of global warming damage agricultural production, that the damage caused by global warming to the earth should be minimized, and that the livability of our planet is important in terms of providing food for living things. They also emphasized that the need for food can be met with sustainable agriculture.

Keçeli (2019) stated that studies examining the nature and human health of intensive input farming methods indicate that commercial wheat species are not sustainable and pose a threat to human health. He also stated that local wheat species are superior to commercial wheat species in terms of adaptation to organic agriculture.

In addition to the above-mentioned studies, in many studies examined, it was found that input utilization rates have increased, but agricultural supports given to farmers have decreased every year, agricultural lands cultivated in agricultural production have gradually shrunk, and imports have been used to eliminate the deficit in agricultural production.

Conventional agriculture approach causes soil erosion, inefficiency, water pollution and unnecessary use of water resources. According to the United Nations, approximately 2 billion people do not have access to safe water today and it is predicted that the global water problem will increase by 55% by 2050. The United Nations also states that wetlands have decreased by 64% in the last 100 years and 82% in the last 300 years.

It is stated in many sources that chemical pesticides destroy living organisms in the soil, pollute groundwater, harm agricultural workers during use and trigger the formation of greenhouse gases. It is stated that 98% of the pesticides and 95% of the herbicides used harm air, water, soil and living species outside the targeted area. In 2022, 518 notifications were made by the European Union, including 311 pesticide residues originating from Turkey.

In the Pesticide Atlas published by the Heinrich Böll Stiftung Association, it is stated that approximately 385 million pesticide poisonings occur in the world every year and 11 thousand people die due to pesticides (Buğday Derneği, 2023).

The rate of organic matter in the soil decreases due to the use of pesticides. It is a very important issue in terms of soil quality that the rate of organic matter in the soil does not fall below 3 per cent and this rate is found to be less than 3 per cent in 98 per cent of the soils in Turkey. Reasons such as urbanization and infrastructure investments have caused 3.5 million hectares of soil loss. 39 per cent of agricultural lands and 54 per cent of pasture lands are under the risk of erosion.

Many studies have shown that biodiversity is gradually decreasing, that it has become necessary to establish gene banks and that it leads to global warming. According to FAO data, 75% of the food consumed by the entire world population is supplied by 12 plants (wheat, rice, sugar cane, corn, soya, potato, palm oil, cassava and others) and 5 animal species (cow, chicken, buffalo, pig and goat).

After the Green Revolution, studies on chemical fertilizers, pesticides and high-yielding hybrid seeds started to attract more attention. The surplus in production increased international food trade and strengthened the food sector. It provided development in rural areas, but did not end the problem of hunger, which was the starting point, on the contrary, it caused it to increase even more. Developments in agriculture have not brought about a change in the African continent, where the hunger problem is the most intense. The Green Revolution is not limited to seed breeding, but is based on the availability of agricultural infrastructure, the use of chemical fertilizers and pesticides and the abundance of water resources in order to obtain high yields. The reasons why the hunger problem cannot be solved definitively are; supporting the big and strong farmer, carrying out studies in regions with infrastructure, and the main objectives of multinational agricultural companies are to generate income. According to FAO data, the chronic hunger rate was 7.9% in 2019 and this rate increased to 9.2% by 2022. In 2022, 691 to 783 million people suffered from hunger. The population most affected by hunger was Sub-Saharan Africa.

It has been emphasized in the studies that in our country, which is very rich in terms of local wheat varieties, a limited production is made and the foods prepared from local wheat varieties are limited and known by the local people.

Conclusion

Improving agricultural activities and increasing productivity has been an important issue for every period. In order to meet the need for food in response to the increasing population, the productivity obtained as a result of studies such as opening various lands to agriculture and increasing the use of animal fertilizers has remained limited. The Green Revolution includes the developments in agricultural production such as obtaining wheat species that provide full ears, resistant varieties and high yields through hybridization and breeding methods and supporting these seeds with the use of chemical fertilizers, pesticides and irrigation activities. In the early 20th century, the seed breeding studies have contributed to an increase in production efficiency in India, Pakistan and Mexico, which are countries struggling with food problems due to problems such as wars and population growth, and have contributed to partially solving the hunger problem for a certain segment of the population. The increase in productivity has directed the interest of farmers towards high yielding species.

After 1970, the damage to the environment caused by the new understanding of agriculture has been understood. However, the intensive use of inputs still continues. In order to preserve culinary culture, food should be sustainable, accessible, satisfying in terms of flavor-taste-aroma and should not pose a risk to health. Our country is very rich in local wheat species and is home to the remains of wheat cultivation and consumption of wheat in pre-agricultural periods.

Wheat, which has a rich nutritional content, is a cheap resource and can be cultivated in a large part of the world, is one of the three most widely used cereals to meet the nutritional needs of a large mass of people. The cultivation of high yielding wheat species in our country started after 1962. These species increased the use of chemical fertilizers, pesticides and water and led to the shrinkage of cultivation areas of local wheat species. Commercial wheat cultivation, which started in the Mediterranean region, gradually spread throughout the country. When local species and commercial species are evaluated in terms of sustainability, the cultivation of high-yielding species increases the need for irrigation. Our country is not rich in water resources and water wastage in agricultural production is quite high compared to other areas of use. Chemical fertilizers pollute groundwater, make the soil inefficient and cause aridification. While the pesticides used destroy harmful organisms, they also damage beneficial organisms and the emergence of organisms resistant to the pesticides used leads farmers to use higher doses and more effective pesticides. In addition, during the use of pesticides, workers encounter dangerous situations in terms of health.

The excess of inputs in conventional agriculture causes financial difficulties for producers and consumers. For sustainable agriculture, input use should be reduced and production should be integrated with the environment. Local wheat species are closer to sustainable agriculture. It has been stated in many studies that local wheat should be preferred for organic farming due to its less input use in production and high adaptability to harsh environmental conditions.

Although there is an understanding that commercial wheat species cause celiac disease, no results have been obtained to support this. It is known that some nutrients and protein ratios of commercial wheat species are low compared to local wheat species. Studies have shown that the decrease in nutrient ratios increases even more when commercial varieties are used to obtain varieties. It is supported by the studies that local species can be good sources for new variety

production in terms of being durable, having low input requirements and high nutrient content. Some studies examining the products prepared from local wheat varieties and commercial varieties in terms of flavor, taste and aroma indicate that local varieties have better quality, but there are also studies with similar results.

The recent Covid-19, the Russia-Ukraine war, and the decline in production due to global warming have recently caused India to stop wheat imports for a short period of time. All of these events reveal the importance of self-sufficiency in production and the need to protect biodiversity against other disasters that may occur. Our country's self-sufficiency in wheat production is 87.3 per cent and this rate is constantly decreasing compared to previous years. With monoculture agriculture, wheat varieties have decreased and continue to decrease.

The development of mass media, globalization and the awareness of people about good nutrition and sustainable agriculture are spreading faster. Restaurants where local products are reinterpreted and served attract great attention and such restaurants have achieved very successful results in promoting culinary cultures. Our country, which is rich in local wheat varieties, can benefit from this richness. With the changes that can be made, both producer and consumer satisfaction will be ensured. In order to protect the local wheat species and transfer them to future generations, the producer and consumer being more conscious will provide material and moral gain.

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