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TURKEY WHEAT: THE CORNERSTONE OF AN EMPIRE

This is the one-hundredth anniversary for Turkey wheat. This variety more than any other established the hard red winter wheat industry, answered for all time the critics who doubted the future of wheat as a crop on the Plains, and was the standard of quality on which the grain and milling industry of the Southwest was based. Turkey, like a famous herd sire, has contributed an ancestral stamp to modern varieties, for no variety of hard wheat grown in the Southwest today lacks this lineage—Triumph, Scout, Kaw, Wichita, Lancer, Warrior, and Sturdy all have Turkey ancestry.

In 1972, Russia purchased 400 million bushels of hard red winter wheat from the United States to supplement their supplies. Most of this grain was a blend of modern varieties, the offspring of the original Turkey brought here from Russia so long ago. The Agricultural Experiment Stations of Colorado, Illinois, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, and Texas and the Agricultural Research Service, U.S. Department of Agriculture, released a new variety in 1971, named Centurk to commemorate a century of Turkey wheat in this country. At several places in the Midwest, plans are under way for celebrations to commemorate the original introduction, and so it seems appropriate that at this symposium the story of Turkey be reviewed.

Both authors are agronomists and grew up on farms in south central Kansas when Turkey was the leading variety of wheat grown. We worked as student assistants in wheat breeding while we were in college and then spent many years breeding and testing wheats for the hard red winter wheat region of the United States. Turkey and Kharkof, a similar but later introduction, were the standards used in our yield tests. We have personal reasons for being nostalgic about a great wheat variety—Turkey. In this paper we will look at the Turkey story from an agronomist's viewpoint. We have studied events as recorded by many historians

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and early crop scientists. From such knowledge and our years of experience, we will try to analyze and explain what took place, and why.

The main part of the hard red winter wheat region includes all of Nebraska south of the Platte River, the western three-fourths of Kansas, the western two-thirds of Oklahoma, the Panhandle and Northern Rolling Plains of Texas, and eastern Colorado. Hard winter wheat was not grown over all of this area at first, but it moved west with the settlers and, in many cases, made it possible for settlers to move west. It proved to be the crop that could be grown with reasonable expectation of success in the semiarid regions of the Plains and in the Inter-Mountain districts of our western states. In fact, not long after 1900, hard red winter wheat, most of it the Turkey type, was grown on more than 20 million acres extending from Texas on the south, to Illinois and Iowa on the east, to Montana, Idaho, Oregon, and Washington on the west and north. A vast empire!

Early Wheat Growing on the Plains

Wheat was first grown in Kansas in the 1830s and early 1840s. The Delaware Indians living on the north bank of the Kaw, close to its mouth, are reported to have grown wheat as early as 1835.[1] A few years later, in 1839 or 1840, a crop was grown on the Shawnee Methodist Mission in Johnson County.[2] In 1843, some 320 acres were grown on the Shawnee Friends Mission; and in 1844, the wheat on the Sac and Fox farm in Doniphan County was almost ruined by rust.[3] The first white settlers came to Nebraska in 1853 or 1854, but there was little farming until after 1870.[4] In Texas, the first wheat was grown about 1833 near Sherman, and the acreage expanded greatly in north central Texas after 1850.[5]

Walter Prescott Webb refers to the early settlement of the Plains as the "Battle of the Plains." In a lecture delivered before the Association of American Geographers, he stated, "The American people who were to take the Plains came from an entirely different kind of land. These Americans had had no previous experience with a land so treeless, so

[1] Floyd B. Streeter, *The Kaw: The Heart of a Nation* (New York: Farrar and Rinehart, 1941), 221.

[2] Homer E. Socolofsky, "Kansas Wheat History," in *Marketing Kansas Wheat: A Report of the Kansas State Board of Agriculture* (Topeka, 1959), 37.

[3] Louise Berry, *The Beginning of the West, 1540–1854* (Topeka: Kansas State Historical Society, 1972), 493,528.

[4] Verne S. Sweedlun, "A History of the Evolution of Agriculture in Nebraska, 1860–1930" (Ph.D. diss., University of Nebraska, 1940), 21.

[5] I. M. Atkins et al., *Wheat Production in Texas,* Texas Agricultural Experiment Station Bulletin 948 (College Station, 1960), 3.

level, so arid. They came to it in almost complete ignorance of it, and they had to invent, adapt, and devise quickly or perish."[6] These settlers brought with them the crops that they had been growing, including wheat, and many of them were not adapted to the Plains.

The first wheats grown in Nebraska were the spring varieties Java, Fife, and Bluestem, and these same varieties were grown to some extent in eastern Kansas. The soft red winter varieties grown in Kansas (given in general order of importance), were Red May, Mediterranean, Lancaster, Fultz, Zimmerman, and others grown under various local names. Red May was the first variety grown in Texas.[7] In Kansas, the soft winter wheats were more dependable than the spring wheats, but in some eastern counties of the state more spring than winter wheat was grown until about 1875.[8]

For many reasons, wheat farming was not an outstanding success in these early days. The settlers were not equipped with the proper implements, they had little knowledge of the best cultural practices for the Plains, and they did not have adapted varieties. Early agronomists, M. A. Carleton, W. M. Jardine, C. R. Ball, T. A. Kiesselbach, and others, as well as farmers, reported a formidable array of hazards of winter wheat production including drought, wind and dust storms, winterkilling, both leaf and stem rust, chinch bugs, grasshoppers, worms, and, occasionally, migratory ducks and geese. Farther west on the Plains, because of a lack of fences, there was damage from trail herds of cattle. The spring wheats did not suffer from winterkilling but, being later in maturity, they tended to suffer from rust damage in wet years and from heat and drought in dry years. Some of the winter wheats escaped rust by being early in maturity, but because they had no real resistance, they were damaged in some years. Available winter wheats were not especially cold hardy, and they lacked drought resistance.

Among extensive wheat growers in Kansas in the 1870s was T. C. Henry, a real-estate dealer who later became a "Wheat King." Henry started farming winter wheat in 1871 and claimed that he grew 500 acres of Red May in 1873 along the Kansas Pacific Railroad, east of Abilene. Henry expanded production until in 1877 or 1878 he had nearly 10,000 acres, mostly in Dickinson County, Kansas.[9] Many of Henry's fields were

[6] *History as High Adventure* (Austin: Pemberton Press, 1969), 59.

[7] Atkins et al., *Wheat Production in Texas*, 3.

[8] James C. Malin, *Winter Wheat in the Golden Belt of Kansas* (Lawrence: University of Kansas Press, 1944), 96–101.

[9] Homer E. Socolofsky, "History of Wheat," in *Wheat, Field to Market: The Story of the Golden Crop*, ed. Kansas Wheat Commission (Chicago: Wheat Flour Institute, 1969), 9.

along the railroad, so they were pointed out to the passengers who might be potential land buyers.[10]

In January 1878, Henry spoke to the Farmer's Institute at Manhattan on the subject of Kansas wheat culture. He stated that Red May was the best variety and said: "I do not advise much further experimentation in new varieties. We have a sufficient number already introduced that are adapted to our soil and climate."[11] So far as is known, he had not tried Turkey at that time, but soon after this date he did shift to Turkey.[12]

The Introduction of Turkey Wheat

Most of the records agree that the main introduction of Turkey wheat into the United States was made by the Mennonites in the early 1870s. There are differences of opinion as to the exact date, the place where it was first grown, and the persons responsible. The history of the Mennonite people has been written at length in many places, but it might be worthwhile to give a brief summary of their activities that involved Turkey wheat.

In 1762 and 1765, Russia offered the German Mennonites freedom of worship and freedom from military service for one hundred years. In 1783, the Turkish Government ceded the Crimea to Russia, so more colonists were sought and the Mennonites thus attracted were offered the same freedoms. When, in 1870–1871, the amnesty was withdrawn, the Mennonites began to look for a new home in the United States to which many migrated.[13] By 1875, many families had settled in the Central Plains, principally in Kansas.

In 1872, four young men, including Bernard Warkentin, from Malatschna, traveled to North America seeking new land.[14] They spent some time in Illinois, near East St. Louis, where a number of Mennonite families had settled earlier, but their search carried them at least four hundred miles farther west. Kansas was the choice of these influential scouts. Warkentin, a miller, settled in Newton, and was instrumental in bringing Mennonites to Kansas. But others must be recognized as well.

10 Malin, *Winter Wheat,* 71; Stuart Henry, *Winter Wheat in the Golden Belt of Kansas. A Reply and Critique by an Eyewitness* (Douglaston, New York: The Author, 1946), passim.

11 Malin, *Winter Wheat,* 75.

12 Socolofsky, "History of Wheat," 9.

13 Margaret Whittemore, *Historic Kansas* (Lawrence: University of Kansas Press, 1954), 106–7.

14 Herman Steen, "Chain of Events That Established Hard Red Winter as a Top Wheat Began with the Arrival of Bernard Warkentin in Kansas in 1870's," in *The Southwestern Miller* 48 (August 1969): 26.

Christian Krehbiel, first a farmer and later on (1886) a miller at Moundridge, and C. B. Schmidt, Immigration Agent for the Santa Fe Railroad, also deserve credit for encouraging settlers.[15] In fact, Schmidt made several trips to Russia looking for colonists, and for a time Warkentin was stationed in New York to help direct the people to Kansas. The first settlements of Mennonites in Kansas were made in 1873 near Newton, Halstead, and Moundridge by people from northern Taurida, the Crimea proper, and from Ekaterinoslav. Each family brought a small amount of seed wheat, a few pounds to a bushel or two, and probably from this seed was grown the first crop of Kansas hard red winter wheat.[16] We do not know the quantity of seed that was imported, but one account indicates that 4,200 pounds of Turkey wheat were imported in 1874.[17]

In October 1874 a larger group of Mennonites bought 100,000 acres of land in Marion County, Kansas; one of their new villages was named Gnadenau (Grace Meadow).[18] (This village was north and east of Newton, and plans are under way for a celebration in the area in 1974.) In the spring of 1874, Anna Barkman, then an eight-year-old girl living in Caslov, Russia, handpicked 250,000 kernels (2 gallons) of Turkey wheat. This seed was brought to Marion County, Kansas, by the Barkmans; sown in the fall of 1874, and harvested in 1875. They claimed this was the "grandfather" of all U.S. hard winter wheat,[19] but we think it might not have been the first.

The most complete accounts of the Mennonite migrations and their association with Turkey wheat are the reports of David V. Wiebe, Cornelius Krahn, and James C. Malin.[20] They give abundant evidence that insofar as the Kansas Mennonites are involved, Turkey seed wheat was introduced and first sown in 1874 in Harvey and Marion Counties. By

15 Mark A. Carleton, *Hard Wheats Winning Their Way,* U. S. Department of Agriculture Yearbook Separate 649 (Washington, 1914), 399.

16 Ibid.

17 Joanna K. Wiebe, "Turkey Wheat Centennial Plans Ripening for 1974," in *Wichita Sunday Eagle and Wichita Beacon,* 11 June 1972.

18 Mary H. Wires, "Wheat—Its Part in the Development of Kansas," in *The Santa Fe Magazine* 27 (April 1933): 25–27; Wiebe, "Turkey Wheat Centennial."

19 Herbert F. Friesen, *History of Turkey Hard Wheats in U.S.A.* (Dodge City, Kansas: privately printed by High Plains Publishers, 1961), 1.

20 See David V. Wiebe, *They Seek A Country: A Survey of Mennonite Migrations With Special Reference to Kansas and Gnadenau* (Hillsboro, Kansas: Mennonite Brethren Publishing House, 1959); idem, *Grace Meadow: The Story of Gnadenau and Its First Elder, Marion County, Kansas* (Hillsboro, Kansas: Mennonite Brethren Publishing House, 1967); Cornelius Krahn, "From The Steppes to the Prairies, Part II," *The American German Review* 11 (December 1944): 30–34, 37, 39; Malin, *Winter Wheat.*

the end of 1874, Wiebe states, 600 families went to Kansas, 80 to Nebraska, 200 to Dakota, 15 to Minnesota, 230 to Manitoba, and 150 remained in the east. No specific instance was given of sowing Turkey in the other states, but it is unlikely that Kansas settlers were the only ones bringing seed to America.

There is no authentic record of the first Turkey wheat grown in Nebraska.[21] However, Mennonites camped on the Fair Grounds at Lincoln in 1873, and some of these people settled in southeast Nebraska. Most of them went to Kansas. According to another report, the introduction of Turkey wheat began in southeastern Nebraska after 1890.[22] In the literature there are various references to 1873 or 1874 and to earlier years as the date when Turkey was introduced. There are reports that Turkey wheat was introduced in Iowa from Illinois before it was introduced in Kansas. This is plausible because Mennonites lived in Illinois before 1870, and no doubt they had some Turkey wheat.[23] There is also a record of a small colony of French settlers in Marion County, Kansas, who raised hard winter wheat before 1873.[24] But these two early attempts do not appear to have had much impact on the growing of hard wheat. (No attempt is made to list here all of the reports or references in the literature that suggest when or where Turkey was first introduced.) Possibly small amounts of Turkey were brought to the United States in 1873 and before, and some may have reached Kansas. However, little came of these introductions. The first important introduction was into Marion and Harvey Counties, Kansas, in 1874. In 1874, 1875, and later years, large numbers of Mennonites came to Harvey, Marion, McPherson, Reno, and adjacent counties in Kansas, and some settled in Nebraska. Most of the families brought seed wheat in small amounts.

The Mennonites were able to succeed as farmers on the Plains while many other American colonists failed. Mennonite advance agents had sought land and climate similar to that of their home country in Russia, and they found these in Kansas and Nebraska. They had experience in farming on prairie land and, therefore, were not dismayed by what they found. They brought along some suitable equipment, know-how, and, in the case of wheat, seed of a type that was well adapted to the environ-

21 T. A. Kiesselbach, *Winter Wheat Investigations,* Nebraska Agricultural Experiment Station Research Bulletin 31 (Lincoln, 1924), 16.

22 E. G. Montgomery, *Wheat Breeding Experiments,* Nebraska Agricultural Experiment Station Bulletin 125 (Lincoln, 1912), 2.

23 Carleton, *Hard Wheats Winning Their Way,* 404.

24 H. P. Coultis, "The Introduction and Development of Hard Red Winter Wheat in Kansas," *Report of the Kansas State Board of Agriculture* 39 (September 1920): 217.

ment. No single family or small group of families should be given exclusive credit for the introduction of Turkey wheat. Surely there is nothing wrong with passing deserved credit around.

Characteristics of Turkey Wheat

Because Turkey came to the United States from Russia, it may be unfortunate that the name Turkey became so generally used for this wheat. The Mennonites called the wheat Turkey because it first grew in a little valley in Turkey where they first got it.[25] It came into this country under many local names, including, for example, Crimean, Malakof, Red Russian, Red Winter, Tauranian, Turkey Red, and Kharkof. All of these (and twenty-one other names) were considered to be synonyms of Turkey[26] and although all are similar morphologically, no doubt there are differences among them due, in part, to the places of origin. In other words, all of them did not come out of the same sack. Therefore, we should consider Turkey as a type rather than a specific variety with narrowly definable characteristics.

Turkey is a winter wheat, considered to be mid-season for maturity—late when compared with the varieties being grown now. The stems are white at maturity, slender, and weak, with a tendency to lodge if growth is heavy. The leaves are narrow and dark green, and the plants are winterhardy and drought enduring. The heads are bearded and have predominantly white chaff. The grain is dark red in color and hard in texture. The variety is not resistant to common diseases, but some selections have some resistance to bunt or stinking smut, and to rust. The variety is susceptible to Hessian fly damage. A similar type, Kharkof, introduced in 1900 by M. A. Carleton for the U.S. Department of Agriculture, came from farther north in Russia. It was thought to be more winterhardy than Turkey and grew better in Montana and Wyoming.

Slow Acceptance of Turkey

Long-time records have shown that Turkey was a good variety for the hard red winter wheat region; however, the acceptance and spread of the variety was very slow compared with that of modern new varieties. In fact, Turkey did not become the leading variety in the region for almost a quarter of a century. One of the reasons given for this slow acceptance and spread of Turkey was the lack of sufficient seed. The first settlers brought small amounts, ranging from a few pounds to as much

25 Friesen, *History of Turkey Hard Wheats in U.S.A.*, 3.

26 J. Allen Clark, John H. Martin, and Carleton R. Ball, *Classification of American Wheat Varieties,* U. S. Department of Agriculture Bulletin 1074, rev., (Washington, 1923), 145.

as a bushel or two per family. A bushel was required to sow one acre. With these amounts, only small plots could be seeded, and no doubt most of each crop was needed for food and feed, rather than for seed increase alone. In the literature there are various statements that Bernard Warkentin sought to correct this situation by importing 10,000 bushels of seed from Russia either in 1882[27] or in 1885 or 1886.[28] The latter dates were traced back to the local newspapers: the *Newton Kansan,* the *Halstead Independent,* and the *Halstead Clipper.*[29] The Warkentins spent several months in Europe in 1885, and each of these papers reported their return in October, but there is no mention of any wheat seed. There is a clear record of some 15,000 bushels being imported in 1902.[30]

Turkey wheat was not mentioned in the Kansas newspapers until about 1880, and then not always favorably.[31] Because of different points of origin of the seed, all lots may not have performed alike, and we have very little information as to the location of the lots compared. Then there were reports of the seed "running out" or tending to become soft. This could have been either "yellow berry," not uncommon when hard wheats are grown under high rainfall, or mixtures of soft wheat creeping into the Turkey. At that time harvesting and thrashing equipment was often crude and seed inspection and certification were years away.

There was also the problem of the hard texture of the grain, which appeared different to the millers, accustomed to grinding soft wheat. When Turkey first came onto the market, millers were not well equipped to handle this hard wheat, so they discounted the price. No doubt this opposition had some effect on the popularity of Turkey; but with the increased yields usually obtained, the farmer made just as much money, if not more, by growing Turkey and taking the lower price. (We must remember that discounting the price of a certain class of wheat is not peculiar to the 1870–1880 period of history. Wheat is still discounted by the trade, depending on the supply and demand of the different types of grain.)

The hard versus soft wheat situation was explained by L. A. Fitz.

> When the millers attempted to grind hard Turkey wheat upon stone burrs then in use, they experienced considerable difficulty, and when housewives tried to make bread from the flour, they had even greater difficulty. Consequently, most

27 Herman Steen, *Flour Milling in America* (Minneapolis: T. S. Denison and Company, 1963), 316.

28 Coultis, "Introduction and Development of Hard Red Winter Wheat in Kansas," 219.

29 Socolofsky, "Kansas Wheat History," 42.

30 Carleton, *Hard Wheats Winning Their Way,* 405.

31 Malin, *Winter Wheat in the Golden Belt of Kansas,* 173.

millers rejected this Turkey wheat as unfit for milling purposes, but here and there a miller persisted in his efforts to solve the problem of making satisfactory flour from it. There were at least two prominent reasons for the millers wishing to grind Turkey wheat; it could be bought much cheaper at that time than soft wheat; chemical analyses indicated that it would make a flour of high gluten content. The latter quality caused a great demand for Kansas flour for export.[32]

Wheat Research

The period from the first wheat growing until about 1890 is referred to as the "pre-research era" by Salmon, Mathews, and Leukel.[33] During this time finding good cultural practices, pest and disease controls, and well-adapted varieties was mostly a matter of trial and error. These authors point out that spring wheats were not replaced by winter wheats for nearly twenty-five years and for even longer than that some farmers were not convinced that Turkey was better than the soft varieties being grown.

The modern research era started soon after the passage of the Hatch Experiment Station Act in 1887, but the experiment stations needed time to get organized and working. Carleton (1900) reported on wheat work done by the USDA in 1895–1897.[34] He started with 1,000 wheats from all parts of the world and tested them in Colorado, Kansas, and Maryland. More than 30 of these wheats were from Russia and included many synonyms of Turkey. The Nebraska Agricultural Experiment Station began experiments with winter wheats in 1890 and had cooperative tests with farmers in about 1894.[35] Of the varieties tested before 1902, Turkey proved to be the best for yield, winterhardiness, and quality. The winter of 1896–1897 was very cold and only Turkey, Big Frame, and Currell survived.[36] In the winter of 1899–1900, Turkey was the most winterhardy, and in the fall of 1900 small tests of winter wheat, Turkey and Big Frame, were started north of the Platte River and west of the hundredth meridian. Of the 194 tests for which reports were received, in only 19 was the wheat killed. These results proved that winter wheat could be grown in that area.

In Colorado, a variety called Turkish and a soft wheat called Red

32 L. A. Fitz, "Some Kansas Milling History," *Report of the Kansas State Board Of Agriculture* 39 (September 1920): 203.

33 S. C. Salmon, O. R. Mathews, and R. W. Leukel, "A Half Century of Wheat Improvement in the United States," *Advances in Agronomy* 5 (New York: Academic Press, 1953): 13.

34 Mark A. Carleton, *The Basis for the Improvement of American Wheats,* U. S. Department of Agriculture, Division of Vegetable Physiology and Pathology Bulletin 24 (Washington, 1900).

35 Kiesselbach, *Winter Wheat Investigations,* 16.

36 T. L. Lyon, "The Adaptation and Improvement of Winter Wheat," *Annual Report of the Nebraska State Board of Agriculture for the Year 1902* (Lincoln, 1903).

Russian were reported in tests as early as 1893.[37] Theiss and Mennonite were Turkey types grown in Oklahoma in 1893.[38] In a later report,[39] Turkey, Crimean, and Theiss were listed as good varieties after tests of eight to ten years. Some 250 varieties of winter wheat were grown at McKinney and Wichita Falls, Texas, in 1894.[40] In these tests Mediterranean was the check, and Mennonite was included.

Wheat research work started at the Kansas State Agricultural College in 1874 and was transferred to the Experiment Station in 1887. Malin reviewed some of this work with varieties in considerable detail.[41] Turkey and other Russian wheats were reported in tests as early as 1881, and yields were reported for the period from 1890 to 1894. In 1891, yields of Hungarian and Red Russian were the highest of the varieties tested and those of Turkey were low. In 1892, the yield of Turkey was low again, but in 1893 and 1894 Turkey yields were the highest. During these years, yields of Currell, Fultz, and Zimmerman were also good. From 1894 through 1896 the winterhardiness of Turkey became recognized, and by 1898 the College considered Turkey to be the standard variety of hard wheat.

Malin criticizes the Kansas Station for taking so long to recognize the superior characteristics of Turkey. He states that "prolonged adversity worked a hardship on the state during the decade of the nineties, but apparently it was that painful era that was necessary to convince the agricultural experts that, of the three factors, yield, earliness, and winterhardiness, the last named was the most important."[42] Yet, in the light of present knowledge, we doubt that research workers should have been accused of anything more than being cautious. Possibly they were too cautious, but this new kind of wheat was a marked departure, and "testimonials" probably were as easy to get and as unreliable then as now. When we examine the yield data, we find that Turkey wheats were not overwhelmingly outstanding until the period of winter injury came along. Also, we should point out that these early tests were conducted at Manhattan, which nestles in the valley of the Kansas River where conditions are less rigorous than in the High Plains. The Kansas Experiment

37 Fred A. Huntley, "Report of the Arkansas Valley Experiment Station," *Sixth Annual Report of the Agricultural Experiment Station* (Ft. Collins, Colorado, 1894).

38 A. C. Magruder, *Test of Wheat Varieties,* Oklahoma Agricultural Experiment Station Bulletin 8 (Stillwater, 1893).

39 F. C. Burtis and L. A. Moorhouse, *Wheat Growing,* Oklahoma Agricultural Experiment Station Bulletin 65 (Stillwater, 1905).

40 J. H. Connell and James Clayton, *Field Experiments at McKinney, Wichita Falls, and College Station,* Texas Agricultural Experiment Station Bulletin 34 (College Station, 1895).

41 Malin, *Winter Wheat in the Golden Belt of Kansas,* 179–87.

42 Ibid., 187.

Station at Hays in the real hard wheat belt was not in operation until 1903.[43]

Changes in Milling

The history of flour milling in this country has been well told by Steen.[44] Some of his observations show the relation of Turkey and other hard wheats to changes in milling methods. Before 1860, American millers, bakers, and consumers preferred soft wheats, white grained if possible. Then there was a shift to red-grained varieties and still later to the hard spring wheats, especially in the northern states. The early mills used stone burrs for grinding. The burrs were set close together, and the grain was given a single grinding, called "low grinding." With the coming of hard red wheats, more power was needed for grinding and there were bran flecks in the flour.

In about 1865, "high grinding" was started, with the stones set slightly farther apart. The kernels were first crushed or broken and then passed between additional pairs of stones set closer together until all of the flour was extracted. Sieves were used to separate the bran from the flour, and various kinds of airblasts were used to facilitate the process. In 1873, some Minneapolis, Minnesota, millers went to Hungary to study roller mills in use there. The result of this visit was that steel rollers were put into a few mills in this country for the first steps of the milling process and by the late seventies for all of the grinding. With the use of rollers instead of stones, more uniform flour, increased yield of flour from the wheat, and increased capacity of the mills were possible. Middling purifiers further refined the flour. An upward current of air lifted off the small branny particles and resulted in a cleaner-appearing flour. With these developments, the ancient millstones became obsolete, larger mills became practical, flour was improved, and hard wheats began to be widely accepted. Also, commercial baking began to develop. In Steen's words, "The sum of these events constituted the most far-reaching revolution in all the annals of flour milling."[45]

Most of the milling changes started in Minnesota, forced at least in part by the hard red spring wheats grown there and the demand for better flour. Before this change, the millers discounted the price of hard wheat as much as 10 to 15 cents per bushel. Although Turkey may have helped to hasten the change to roller mills, it was not the primary cause. According to Steen, "Hard winter wheat milling is a relative newcomer

[43] J. G. Haney and O. H. Elling, *Experiments at Fort Hays Branch Station, 1902–04*, Kansas State Agricultural College Experiment Station Bulletin 128 (Manhattan, 1905), 270–71.

[44] *Flour Milling in America.*

[45] Ibid., 42.

to the milling scene, having appeared not much before 1880 and not becoming important until near 1900."[46]

The Legacy of Turkey Wheat

Acreage and production statistics regarding the spread of Turkey wheat before 1900 are fragmentary, at best, and scattered. In Nebraska, the variety was little grown by farmers until after 1890. About this time or soon thereafter, it spread rapidly northward to the Platte River, with some north of the river by 1900.[47] By 1900, 39 percent of the wheat acreage of Nebraska was winter wheat, mostly Turkey.[48] The progress in Kansas was more rapid, and there are reports that in 1892 Dickinson County had 75 percent hard wheat, Marion 90 percent, Harvey 95 percent, Sumner 50 percent, and Reno 100 percent.[49] Turkey wheat type spread into northwest Texas, starting about 1900.[50]

The first reliable survey of the acreage of Turkey was made on the 1919 crop.[51] At that time, the variety was estimated to be growing on 83 percent of the wheat acreage in Nebraska, 82 percent in Kansas, 67 percent in Colorado, 69 percent in Oklahoma, and 34 percent in Texas. It was reported from thirty-three states and made up 30 percent of the total wheat acreage and 99 percent of the hard red winter wheat acreage in the U. S. This amounted to over 21 million acres, almost twice that of any other variety grown that year. A most remarkable record!

In this first survey, twenty-eight local variety names were determined to be synonyms of Turkey, and these acreages were lumped together. At that time, almost no other hard red winter varieties were being grown. No doubt Turkey was being grown in areas where it should not have been, but the variety did have a very wide adaptation. In other words, it could produce satisfactory crops, although not necessarily outstanding ones, under a wide range of environmental conditions. Turkey continued to be the leading wheat variety in acreage in the United States until 1944 when it was replaced by Tenmarq. (Note that one parent of Tenmarq was a selection from Crimean, a Turkey type.)

The earliest improved varieties distributed to farmers were pedigree or bulk selections from Turkey and its aliases. The characteristics and behavior of these selections give credence to an earlier statement that the original Turkey was a variable type rather than a uniform entity. In 1939 a study listed sixteen new varieties developed by pedigree selection

46 Ibid., 103.
47 Montgomery, *Wheat Breeding Experiments*, 2.
48 Sweedlun, "A History of the Evolution of Agriculture in Nebraska," table 3.
49 Malin, *Winter Wheat in the Golden Belt of Kansas*, 202.
50 Atkins et al., *Wheat Production in Texas*, 7.
51 Clark et al., *Classification of American Wheat Varieties*.

from Turkey.[52] In Nebraska, a selection, Nebraska No. 60, released in 1918, was similar to Turkey but later in maturity and more winterhardy. Another selection, Cheyenne, released in 1930, had shorter and stiffer straw, more yielding ability, and a longer dough-mixing requirement than Turkey. A third, Nebred, released in 1938, had resistance to bunt. In 1969, Cheyenne was still being grown on over 1 million acres, but the others declined in acreage.

The Kansas Agricultural Experiment Station distributed Kanred in 1917, and in 1924 it was grown on more than 4 million acres. This selection from Crimean has some resistance to stem rust. Another Kansas variety is Blackhull, selected from Turkey by Earl G. Clark, Sedgwick, Kansas, a private breeder. It was distributed in 1917 and, as the name indicates, the glumes or "hulls" are usually black at maturity. The variety has a heavier weight per bushel than Turkey. In 1939, it was grown on more than 8 million acres. These few examples show some of the differences and benefits obtained from Turkey selections.

Although the subject is beyond the time limit of this Symposium, we should mention the value of Turkey as one parent in crosses made over the years to improve hard red winter wheat for winterhardiness, disease and insect resistance, earliness, stiffness of straw, yield, and quality. Turkey and its selected offspring have been used in thousands of crosses. In the varietal survey for the 1969 crop, there were eleven varieties of hard red winter wheat, each of which was grown on 1 million or more acres.[53] All of these have Turkey in their pedigrees, and the leading variety, Scout, grown on 7.7 million acres, is a selection from a cross in which four of the five parents are Turkey or Turkey derivatives. The new variety Centurk, mentioned earlier, is a selection from a cross having six varieties in the pedigree, including both Turkey and Cheyenne.

Much has been written about the "Green Revolution" wheats, the semidwarf wheats with short, stiff straw. The semidwarf characteristic was obtained from a Japanese variety called Norin 10. We were surprised to learn that one of the parents of Norin 10 was Turkey,[54] which the Japanese imported from us some time before 1892. So the legacy of Turkey, a great wheat, continues and will continue for years to come, even though it may no longer be grown on farms in the United States.

52 J. Allen Clark and B. B. Bayles, *Classification of Wheat Varieties Grown in the United States in 1939,* U. S. Department of Agriculture Technical Bulletin 795 (Washington, 1942).

53 L. P. Reitz, K. L. Lebsock, and G. D. Hasenmyer, *Distribution of the Varieties and Classes of Wheat in the United States in 1969,* U. S. Department of Agriculture Statistical Bulletin 475 (Washington, 1972).

54 L. P. Reitz and S. C. Salmon, "Origin, History, and Use of Norin 10 Wheat," *Crop Science* 8 (November–December 1968): 686.