

Agricultural History of Yakima County



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Cover Photographs, from top

Luscious grapes from irrigated lands, Yakima, 1920-1930, Asahel Curtis, Conservation Department, Planning and Development Division, Lantern Slide Shows, 1908-1939, Washington State Archives, Digital Archives, <http://www.digitalarchives.wa.gov>, accessed 2 July 2013.

Yakima Winesap orchard in full bloom, 1920-1930, Asahel Curtis, Conservation Department, Planning and Development Division, Lantern Slide Shows, 1908-1939, Washington State Archives, Digital Archives, <http://www.digitalarchives.wa.gov>, accessed 2 July 2013.

Dairy herd and dairy barn in the Yakima Valley, 1920-1930, Asahel Curtis, Conservation Department, Planning and Development Division, Lantern Slide Shows, 1908-1939, Washington State Archives, Digital Archives, <http://www.digitalarchives.wa.gov>, accessed 2 July 2013.

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ONE

General background and history

Bumping River Falls¹



¹ Bumping River Falls, 1950-1960, Ozzie Martin, State Library Photograph Collection, 1851-1990, Washington State Archives, Digital Archives, <http://www.digitalarchives.wa.gov>, accessed 2 July 2013.

Early agriculture in the Yakima Valley

Yakima River between Ellensburg and Yakima²



Although the Yakima Valley receives little rainfall (on average, 8 inches each year), precipitation in the Cascade Mountains supplies significant water resources in the form of the rivers and creeks that run through the valley. The first time irrigation was documented in the region was in about 1845, on Ahtanum Creek west of the present day city of Yakima. At that time Chief Kamiakin and his relatives were irrigating gardens growing potatoes, squash, pumpkins, and corn, and also grazing herds of cattle and horses. In 1852, when Catholic Missionary Oblates of Mary Immaculate

established St. Joseph's Mission on Ahtanum Creek, they diverted water for irrigation, with the help of Chief Kamiakin and other members of the Yakama Tribe. The result was a large irrigated garden growing wheat, corn, melons, potatoes, pumpkins, and peas.

The next fifty years would bring a number of changes in official boundaries, the rapid expansion of ranching and then farming in the region, and the development of many more irrigation networks in the Yakima Valley. The Oregon Territory was divided to establish the Washington Territory in 1853. When Oregon became a state in 1859, the boundaries of the Washington Territory were expanded to include all of present day Idaho, as well as parts of Wyoming and Montana. 1859 was also the year that Ben Snipes first drove cattle through the Yakima Valley; five years later he returned and eventually established the Snipes & Allen Company, grazing 40,000 – 50,000 head of cattle in the region. In 1861 Fielding Mortimer Thorpe arrived to graze cattle and established a permanent residence in the Moxee Valley. Several years later, in 1865, Augustan Cleman drove in the Yakima Valley's first herd of sheep. Other ranchers soon followed, and between the 1860s and the 1880s ranching was the dominant agricultural industry east of the Cascade Mountains. By the 1880s, when ranching was at its peak in the Yakima Valley, it is estimated that there were 200,000 cattle, 350,000 sheep, and 125,000 horses

Rosa Dam, Yakima River³



² Yakima River between Ellensburg and Yakima, 1950-1970, Photographer unknown, State Library Photograph Collection, 1851-1990, Washington State Archives, Digital Archives, <http://www.digitalarchives.wa.gov>, accessed 2 July 2013.

³ Rosa Dam, Yakima River, 1936-1946, Asahel Curtis, State Library Photograph Collection, 1851-1990, Washington State Archives, Digital Archives, <http://www.digitalarchives.wa.gov>, accessed 2 July 2013.

grazing in the Yakima valley.

The early success of farming

By the late 1860s farmers were diverting water from the Yakima and Naches Rivers and Ahtanum Creek to irrigate crops of wheat and alfalfa. During the next 20 years, with the rapid expansion of private irrigation systems, the variety and yield of crops grown in the Yakima Valley increased dramatically. By 1870 John Beck had established an orchard of 50 pear and 50 apple trees, and wine grapes had been grown successfully in the region. Wheat production was expanding and mills were being built along streams and rivers throughout the valley. In 1872 Charles Carpenter grew hops at a farm on Ahtanum Creek, having brought cuttings from his father's farm in New York. By this point, the town of Yakima City had begun to develop near Ahtanum Creek, and in 1887 a mill was built at Prosser Falls on the Yakima River to serve dryland wheat farmers in the Horse Heaven and Rattlesnake Hills.

In 1863 the Idaho Territory was formed, reducing the boundary of the Washington Territory to the current boundary of Washington State. Two years later Yakima County was established, although

Yakima Valley Transportation Co. train car⁵



Northern Pacific Railroad in the valley and the completion of the route through the Cascade Mountains in 1887 and 1888 secured access to outside markets and the region began to attract

Yakima County fruit exhibit⁴



the area was significantly larger than the present-day area. In 1883 Kittitas County was formed out of Yakima County, and in 1905 Benton County was formed out of Yakima County and Klickitat County, leaving Yakima County with its modern boundaries. Washington became the 42nd state in 1889.

Railroads and irrigation

In 1884 the Northern Pacific Railroad established the city of North Yakima, offering large incentives to businesses and citizens willing to move the four miles from Yakima City. The arrival of the

⁴ Yakima County fruit exhibit, 1908, Charles Libby, Charles Libby Collection, Washington State Archives, Digital Archives, <http://www.digitalarchives.wa.gov>, accessed 2 July 2013.

⁵ Yakima Valley Transportation Co. train car, 1969, Werner Lenggenhager, State Library Photograph Collection, 1851-1990, Washington State Archives, Digital Archives, <http://www.digitalarchives.wa.gov>, accessed 2 July 2013.

farmers in increasing numbers. During the 1880s and 1890s, a large number of private canal and ditch companies were active in the Yakima Valley. In addition, the Northern Pacific Railroad was working to develop irrigation networks to increase the value of land it had been granted by the federal government. In 1890 the Yakima Canal and Land Company (partly owned by the Northern Pacific Railroad) began construction on the Sunnyside Canal under the direction of Walter Granger; 42 miles were in operation by 1892. By 1905 the system consisted of more than 700 miles of canals and laterals.

By 1901, farming had largely replaced livestock ranching in the easily irrigated areas of the valley. A wide variety of crops were being grown, but tree fruits, wheat, and alfalfa were very widespread. The reason for rapid expansion of farming is clear: in 1901 alfalfa production could be 3-4 cuttings each year, with an average yield of 5 tons hay/acre, corn could yield 40-50 bushels per acre, and wheat grown in the upland areas could yield 30-40 bushels/acre.

The Yakima Valley was also leading the state in both sheep and hops production, with 13,980 bales of hops produced in 1901. By the early 1900s the Yakima Valley was known for its apple production, and in 1910 Yakima County produced more apples than any other county in the nation.

Another factor that affected the rapid expansion of farming in the Yakima Valley was the advent of widespread rail transportation to bring crops to distant markets. In 1905 the North Yakima & Valley Railway Company was incorporated: in 1914 it was sold to the Northern Pacific Railroad Company. In

1907 the Yakima Valley Transportation Company was incorporated, two years later it was sold to the Union Pacific Railroad. These local lines brought crops from farms into the cities for packing and transfer to the transcontinental rail lines of the Union Pacific and Northern Pacific Railroads, reaching markets across the United States, and providing access to coastal ports and sales overseas.

Rapid expansion of farming

In 1901 a state survey notes the following crops grown in the Yakima Valley:

- apples, pears, prunes, plums, cherries, apricots, peaches, and grapes
- alfalfa, corn, wheat, barley, oats, rye, flax, broom corn, other grasses including brome, orchard, tall meadow fescue, timothy, red top, and red clover
- melons, potatoes, garden vegetables, hops, and sugar beets

By 1917 another survey tallied the following crops and agricultural products:

- strawberries, cherries, prunes, apples, peaches, pears, apricots, grapes, cantaloupes, and watermelons
- onions, turnips, green corn, carrots, rutabagas, cabbage, asparagus, tomatoes, green peppers, squash, pumpkins, beans, potatoes, hops, and sugar beets
- alfalfa hay, wheat, oats, and barley

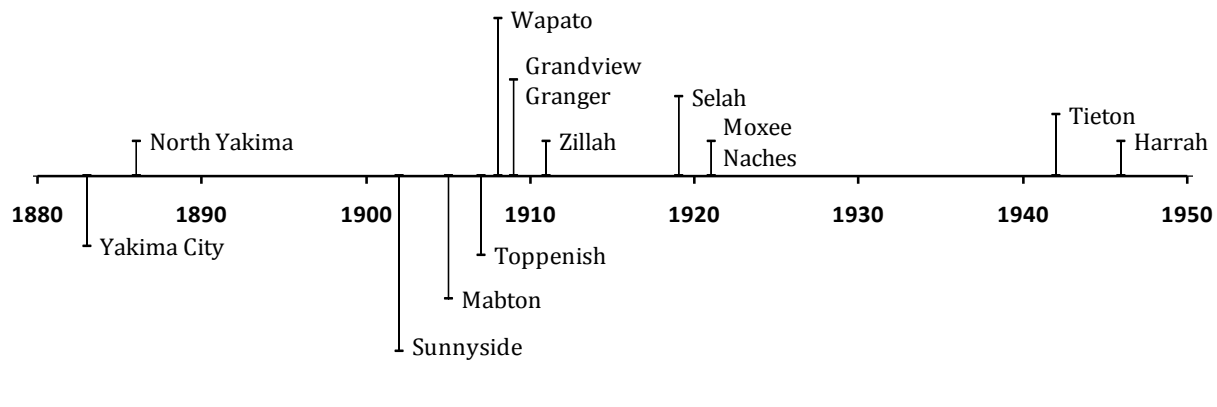
The Yakima Project

By August of 1905, 55 different canal systems were diverting water from the Yakima and Naches Rivers, resulting in record low flows in the Yakima River. The demand for water resources led to significant conflict between private irrigation companies about water rights and diversion amounts. In 1902 the federal government had passed the Reclamation Act, which paved the way for federal assistance with irrigation projects. After extensive study, in 1905 the Yakima Valley was chosen as the first work area. The project would involve the purchase and improvement of existing canals, new canal and ditch construction, and the development of storage reservoirs at the headwaters of the valley's rivers. The first objectives were the Sunnyside, Tieton, and Storage Divisions.

Construction on the Sunnyside Division began in 1906 and included replacement of the Sunnyside Diversion Dam and expansion of the Sunnyside Canal. Although water was available for irrigation by 1907, work continued between 1910 and 1925 to extend the Sunnyside Canal, create extension canals, and make improvements to existing distribution systems. When completed the Sunnyside Division contained 103,600 acres of irrigable land north of the Yakima River. Construction on the Tieton Division began in 1907 with work on the Tieton Canal; by 1911 it was conveying water to 27,271 irrigable acres west of the city of Yakima. The capacity of the Tieton Canal was increased in 1914, expanding the irrigable acreage of the Tieton Division to 32,000 acres.

Private irrigation companies had already developed some dams at the headwaters of the Yakima River and its tributaries; during the Yakima Project the U.S. Bureau of Reclamation (known from 1902 to 1923 as the U.S. Reclamation Service) improved on these and added additional storage capacity. Between 1910 and 1917 dam construction and improvement took place at Bumping, Kachess, Keechelus, Clear Creek, and Cle Elum Lakes. Storage was later increased with construction at Rimrock Lake (completed 1925) and Cle Elum Lake (completed 1936). With this expansion in irrigation migration to the area increased: during the work on the Yakima Project more than half of the census-recognized cities and towns in Yakima County were established (Figure 1.1).

Figure 1.1. Year of incorporation of cities and towns in Yakima County⁶.



⁶ In 1918, at the request of the United States Post Office, Yakima City became known as Union Gap and North Yakima, the county seat, became Yakima.

After the initial phases of the Yakima Project were completed, the Bureau of Reclamation continued developing additional irrigation divisions to expand the amount of irrigable farmland in the valley.

The Kittitas Division of the Yakima Project was under construction from 1927 to 1931, eventually supplying irrigation water to 59,582 acres of farmland. The Roza Division combined about 45,000 acres of gravity irrigation with a power plant supplying electricity to pump water to 27,000 additional acres of farmland. Work was stopped during World War II, but the Roza Division was completed in 1948. The Kennewick Division was incorporated into the Yakima Project in 1930. The Bureau of Reclamation rehabilitated the existing Prosser Diversion Dam, enlarged distribution systems, and replaced the Prosser Power Plant with the Chandler Power and Pumping Plant. The work was completed between 1932 and 1956 and provided water to irrigate 19,171 acres south of the Yakima River. In 1982 the Kennewick Extension added 6,300 irrigated acres to the Kennewick Division.

Rimrock Dam, Yakima River⁷



The Yakima Project eventually irrigated parts of Franklin, Benton, Yakima, and Kittitas counties. The early accomplishments of the Yakima Project allowed the rapid expansion of farming that took place in the Yakima Valley in the first half of the twentieth century. Private irrigation companies were irrigating about 120,000 acres in 1902. By 1939 the early phases of the Yakima Project had increased that total to 420,000 acres. When the Kennewick Division was completed in 1957, there were 464,000 acres of irrigable land in the region.

⁷ Rimrock Dam, Yakima River, 1945-1955, Jack R. Whitnall, State Library Photograph Collection, 1851-1990, Washington State Archives, Digital Archives, <http://www.digitalarchives.wa.gov>, accessed 2 July 2013.

TWO

Land use and crops grown

Hops ready to harvest in Yakima⁸



⁸ Hops ready to harvest in Yakima, 1950-1960, J.W. Thompson, State Library Photograph Collection, 1851-1990, Washington State Archives, Digital Archives, <http://www.digitalarchives.wa.gov>, accessed 2 July 2013.

Total farmland and farmland use

With the completion of the early stages of the Yakima Project in the 1920s and continued expansion of irrigation in later years, farming developed rapidly in Yakima County. The number of farms and the area being farmed both increased quickly during the early 1900s, then stabilized briefly during the 1940s. In the 1950s, the total number of farms began to decrease while the land in farms increased dramatically. Between

the 1960s and the early 2000s, the land in farms was relatively steady at about 1.75 million acres.

Figure 2.1. Total land in farms and total number of farms in Yakima County: 1925-2007.

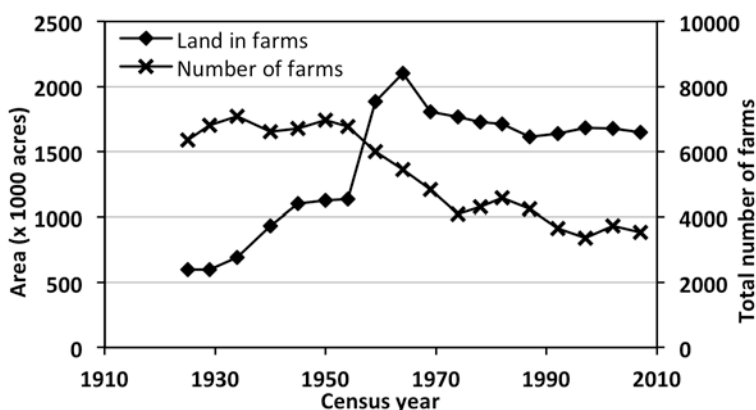
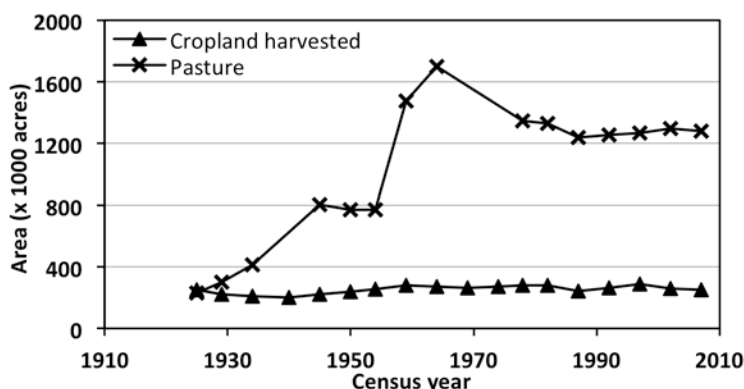


Figure 2.2. Cropland harvested and land used for pasture in Yakima County: 1925-2007.



Despite the dramatic increase in the land in farms between 1925 and 1964, the area of cropland harvested has consistently remained between 200,000 and 250,000 acres. The main contribution to the increase in land in farms has been an increase in the land used as pasture⁹ over the years. Land used as pasture includes a number of different subcategories: woodland pasture, cropland used only for pasture or grazing, and any other permanent

pasture and rangeland. Woodland pasture includes all woodland used for pasture or grazing, but does not include woodland used under a per-head grazing permit. Cropland used only for pasture or grazing includes any land used only for pasture that could have been used to grow crops without any further improvement. Other permanent pasture or rangeland includes any other grazable land – it may range from high-quality pasture to barely grazable land. The categorization of farmland has been inconsistent in the agricultural censuses; as a result other farmland uses were not included in this figure (cropland failed, land idle or fallow, land used for buildings, roads, and ponds, and wasteland).

⁹ Total land used as pasture was not available for 1940, 1969, or 1974.

Summary of crops grown

Although the total area of cropland harvested was relatively stable between 1925 and 2007, there has been variation in the types of crops grown in Yakima County. The agricultural censuses of 1935, 1959, 1982, and 2007 were reviewed in detail: crops were divided into broad categories based on divisions in the agricultural censuses. The categories used were orchards, corn and other small grains, hay and other forage, other field crops (which included potatoes, sugar beets, mint, hops, dill, and dried herbs), vegetables, field seeds and grass seeds, legumes, and berries.

Orchards

In Yakima County, orchards have been composed almost exclusively of tree fruits and grape vines, rather than nuts. Apples represented the largest component in each census year studied. In 1935 apples, cherries, peaches, pears, plums and prunes, and grape vines were enumerated. By the 2007 agricultural census the fruits enumerated still included apples, cherries, peaches, pears, plums and prunes, and grape vines, with the addition of apricots, nectarines, pluots, and English walnuts (all in very small quantities). Land in orchards is discussed in more detail in Figure 2.17.

Figure 2.3. Land in orchards in Yakima County in 1935, 1959, 1982, and 2007.

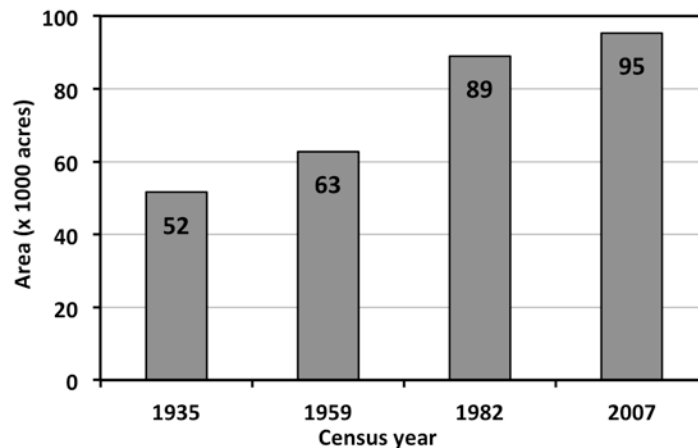
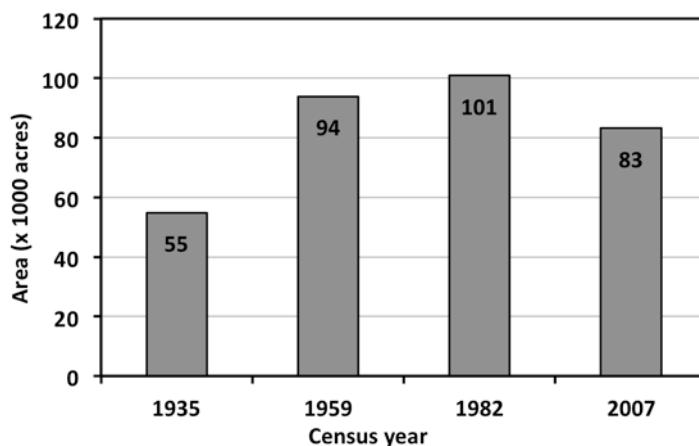


Figure 2.4. Corn and small grains in Yakima County in 1935, 1959, 1982, and 2007.



Corn and small grains¹⁰

Corn and small grains (wheat, oats, barley, rye, and, in 2007, triticale) have consistently been widely grown in Yakima County. All four of the censuses reviewed tallied grains cut for forage and grains cut for hay separately; only crops used for grain production are included here. Wheat and corn have always been the most widely grown, followed by oats (1935) and barley (1959 and 1982). Corn is discussed in more detail in Figure 2.21.

¹⁰ Acres of oats and acres of barley grown were withheld from the published census data in 2007, to avoid disclosing information about individual farms.

Hay and forage

Assorted hay, forage, haylage, and silage have also been widely grown in Yakima County. Alfalfa, timothy, clover, small grains cut for hay, wild hay, sorghum cut for silage or greenchop, and other haylage are all included in this category. Amounts of hay and forage grown decreased between 1935 and 1982 (from 71,054 acres to 32,207 acres), but increased again in 2007 to 52,295 acres. In each census studied in depth, the main crop harvested for hay has been alfalfa.

Figure 2.5. Hay, forage, and silage in Yakima County in 1935, 1959, 1982, and 2007.

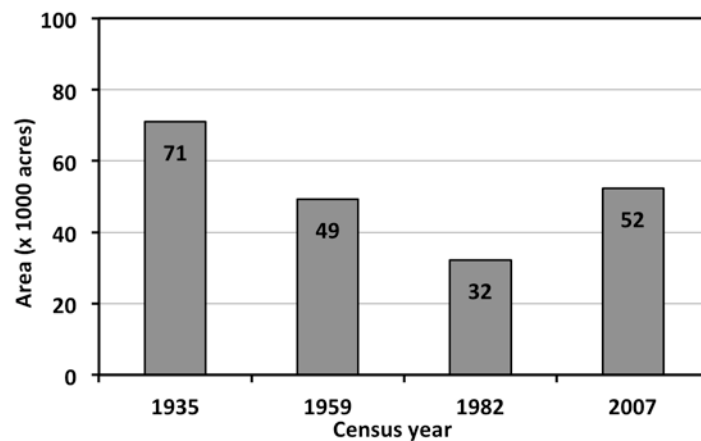
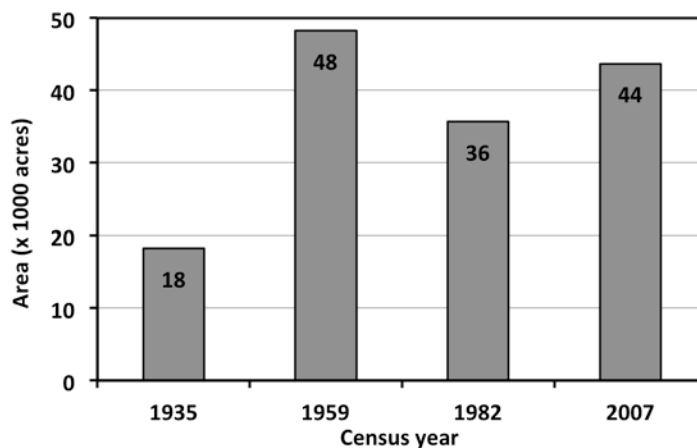


Figure 2.6. “Other field crops” in Yakima County in 1935, 1959, 1982, and 2007.



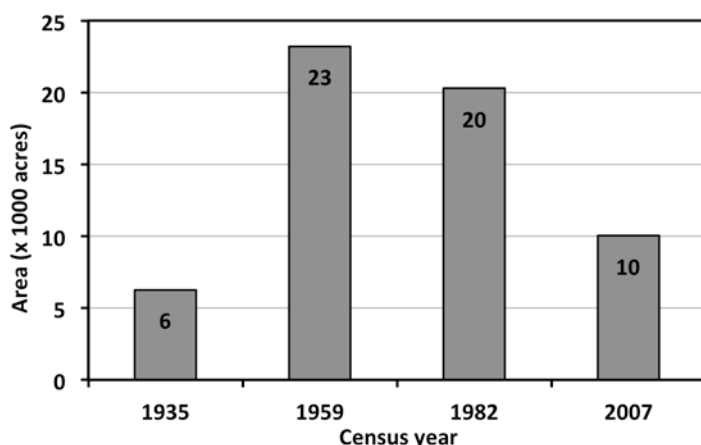
Other field crops¹¹

The category “other field crops” includes potatoes, sugar beets, mint, hops, dill, and dried herbs. Hops, mint, sugar beets, and potatoes are presented in more detail in Figures 2.25, 2.26, 2.27, and 2.28, respectively. A number of these crops have at times been widely grown in Yakima County. In 1935 the only crops enumerated in this category were potatoes and sugar beets, and of that, 96% of the acreage

was used for potatoes. By 1959, only about 10% of the acreage of “other field crops” was used for potatoes, with the remainder fairly evenly distributed between sugar beets, mint, and hops. By 1982, no sugar beets were harvested in Yakima County, and hops made up 67% of the acreage of “other field crops”. In 2007, hops were 42% of “other field crops” (18,587 acres), followed closely by mint (29%, or 12,451 acres). In addition, both dill and dried herbs had been added to the category of “other field crops” and were harvested in Yakima County, although quantities grown were not disclosed.

¹¹ The areas planted in dill, dried herbs, and potatoes were withheld from the published census data in 2007 to avoid disclosing information about individual farms.

Figure 2.7. Vegetables in Yakima County in 1935, 1959, 1982, and 2007.



Vegetables

Although the total cropland devoted to the census category of vegetables in Yakima County has been relatively small (23,223 acres at its peak), the cropland used for vegetables nearly quadrupled between 1935 and 1959. In the 1982 and 2007 agricultural censuses, total acreage devoted to vegetables decreased, while at the same time there was an increase in each census in the variety of

vegetables enumerated. In 1935, the vegetables tallied were snap and string beans, cabbages, sweet corn, tomatoes, and watermelons. In the 2007 census, 25 different types of vegetables were counted, with the most widely grown being sweet corn (36%) and asparagus (25%), which are presented in more detail in Figures 2.23 and 2.24, respectively.

Figure 2.8. Field seeds and grass seeds in Yakima County in 1935, 1959, 1982, and 2007.

Field seeds and grass seeds

Field seeds and grass seeds did not appear in the 1935 agricultural census at all. They were grown in only small amounts in 1982 and 2007. In 1959, 10,022 acres of grass seeds were grown, consisting almost exclusively of alfalfa seed, which is presented in more detail in Figure 2.19.

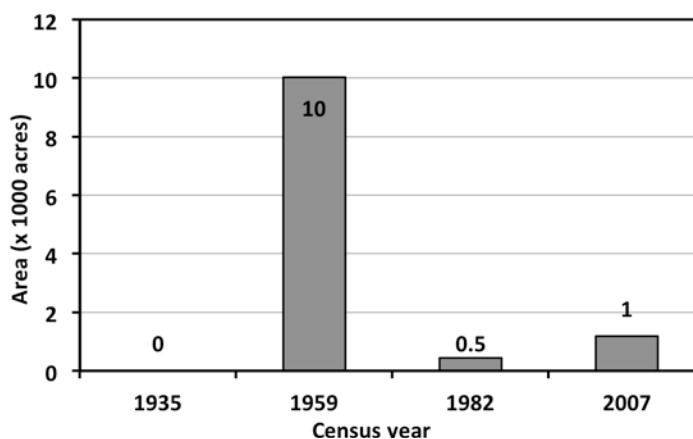
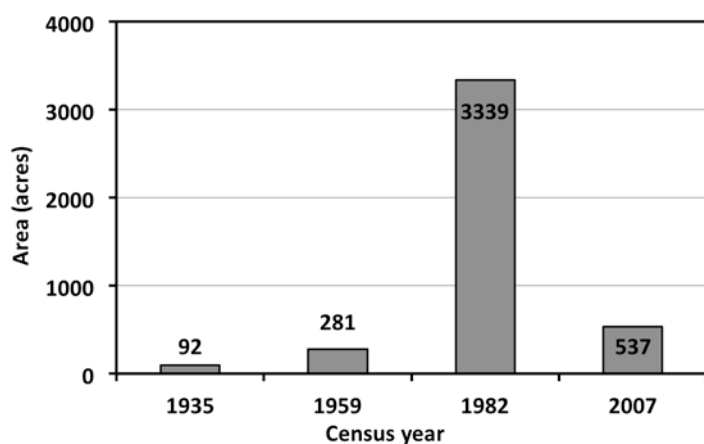


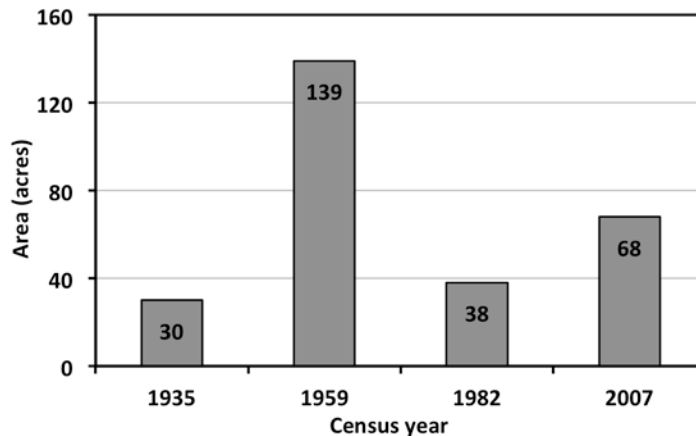
Figure 2.9. Legumes in Yakima County in 1935, 1959, 1982, and 2007.



Legumes

Legumes were harvested in relatively small quantities in Yakima County: 1982 was the only census year studied in detail when land in legumes exceeded 1,000 acres. (Cover crops planted but not harvested are not included in this category).

Figure 2.10. Berries in Yakima County in 1935, 1959, 1982, and 2007.



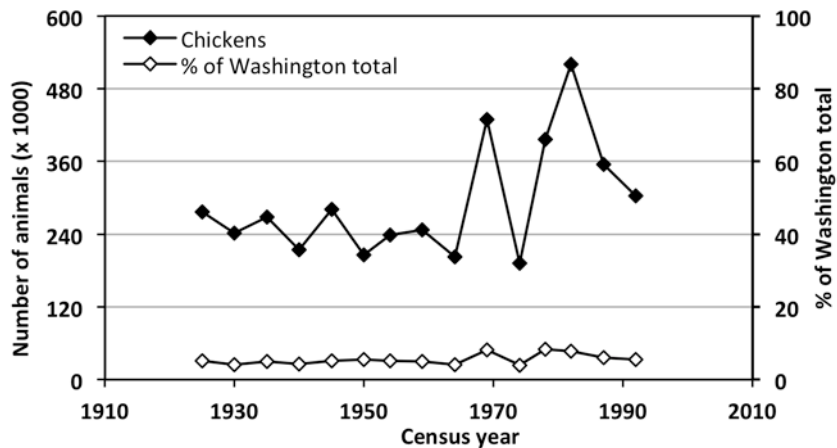
Berries

Berries have also been only a small component of Yakima County agriculture; at their peak in 1959, only 139 acres of berries were cultivated.

Livestock

All livestock in Yakima County were reviewed for each agricultural census between 1925 and 2007. The numbers for cattle, dairy cows, swine, horses, sheep, and chickens are reported here: other types of livestock were present in only small numbers and are not discussed. In addition, animals in each category in Yakima County were compared to the total number of animals in Washington State; this is noted on each figure as “% of Washington total”.

Figure 2.11. Chickens in Yakima County: 1925-2007.



Chickens¹²

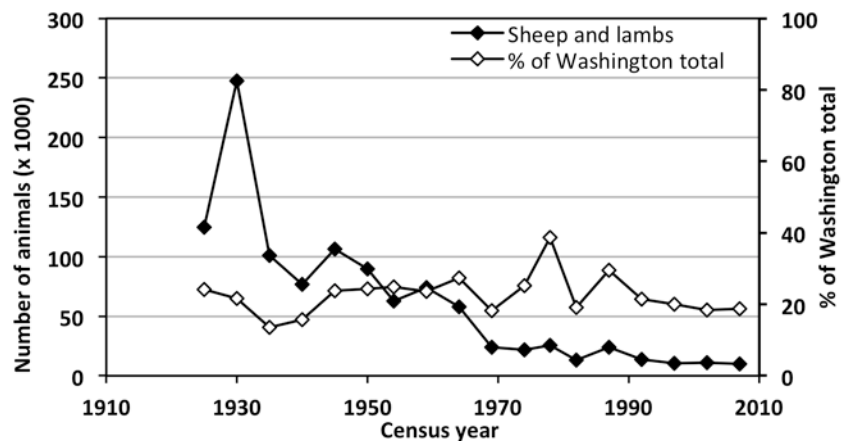
The number of chickens stayed between 200,000 and 300,000 animals between 1925 and 1964. After 1964 there were some large fluctuations in animal numbers, with increases to 428,895 animals in 1969 and 520,194 animals in 1982. Since 1982 the number of

chickens has decreased again, to 302,746 animals in 1992 (numbers since 1992 have been withheld by the census).

Sheep

Between 1925 and 1930 the number of sheep in Yakima County more than doubled, then dropped to 101,218 animals in 1935. After 1935, the number of sheep in Yakima County generally followed a decreasing trend, dropping to 9,971 animals in 2007.

Figure 2.12. Sheep and lambs in Yakima County: 1925-2007.



¹² There has been significant variation through the years in how chickens have been enumerated in the census. In 1925 and 1945 all chickens were reported. In 1930, 1935, and 1969-1992 chickens 3 months of age and older were reported. In 1950-1964 chickens 4 months of age and older were reported. In 1997, 2002, and 2007 layers 20 weeks old and older were reported, but Yakima County chicken totals were withheld to avoid disclosing data for individual farms.

Cattle

The census category “all cattle and calves” includes all cattle and calves of all types.

Although there were large fluctuations in 1964 and between 1992 and 2002, the number of cattle raised in Yakima County increased from 45,403 animals in 1925 to

212,762 animals in 2007. Dairy cows are also enumerated separately (Figure 2.14) in the census. Beef cattle have not been enumerated separately in the census, and the category “all cattle and calves” cannot be used to reliably estimate beef cattle numbers, as it includes too many other classes of cattle other than milking dairy cows and beef cattle.

Figure 2.13. All cattle and calves in Yakima County: 1925-2007.

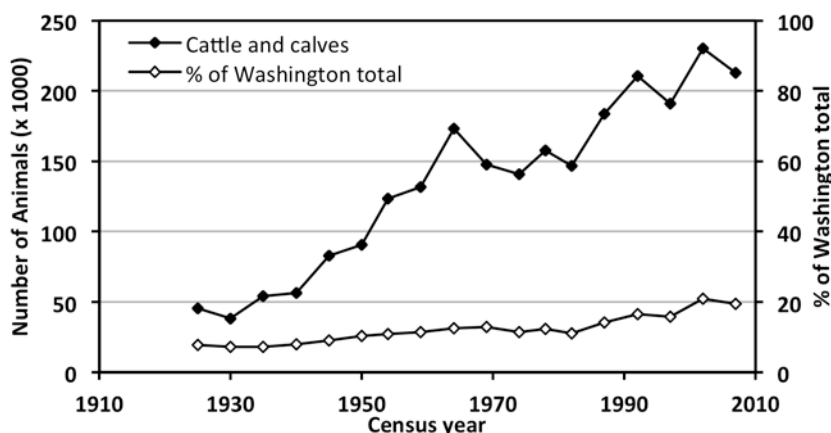
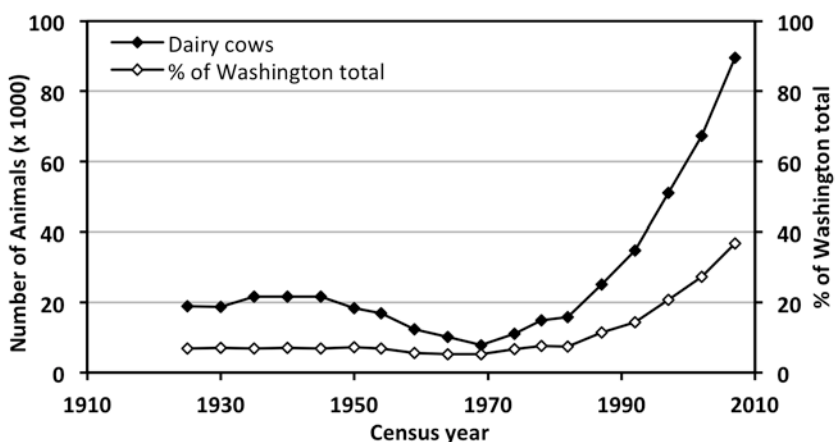


Figure 2.14. Dairy cows in Yakima County: 1925-2007.



Dairy cows¹³

The number of dairy cows in Yakima county was stable at about 20,000 animals between 1925 and 1950. The number decreased during the 1950s and 1960s, reaching a low of 7,868 animals in 1969. After 1969 the number of dairy cows began to increase, a trend that

continued until the 2007 agricultural census, when there were 89,575 dairy cows in the county. The increase in total cattle and calves (Figure 2.13) between 1974 and 2007 is due to this increase in dairy cows in Yakima County.

¹³ Between 1925 and 1945 dairy cows were enumerated as “total number of cows milked”, which may have included beef cows as well. After 1945 the number of dairy cows was specifically enumerated in the census.

Hogs and pigs

In 1925 there were 20,737 hogs and pigs in Yakima County. After an increase in 1940 to 22,987 animals the number of hogs and pigs dropped and remained close to 15,000 animals until 1959. The 1964 agricultural census notes another abrupt

decrease, to 9,327 animals. This represents the beginning of a decreasing trend which has continued until 2007, at which point there were only 528 hogs and pigs enumerated in Yakima County.

Figure 2.15. Hogs and pigs in Yakima County: 1925-2007.

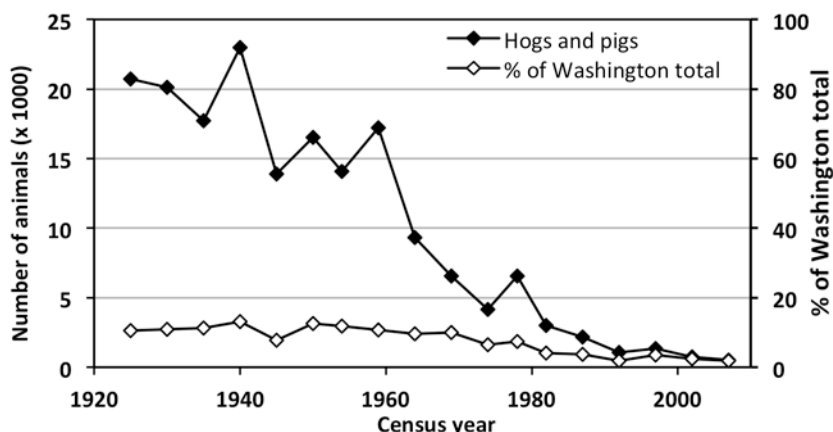
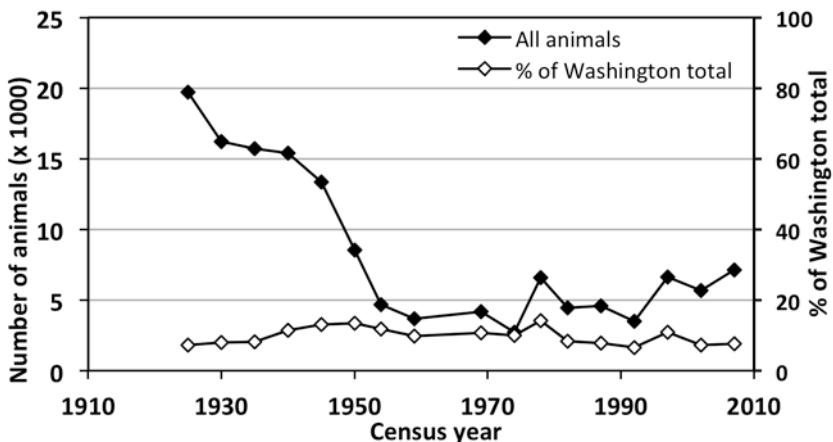


Figure 2.16. Horses, mules, burros, and donkeys in Yakima County: 1925-2007.



Horses¹⁴

Although this figure represents horses, ponies, mules, burros and donkeys, whenever individual numbers were available horses represented more than 90% of the animals enumerated in this category. The most notable trend in the number of horses in

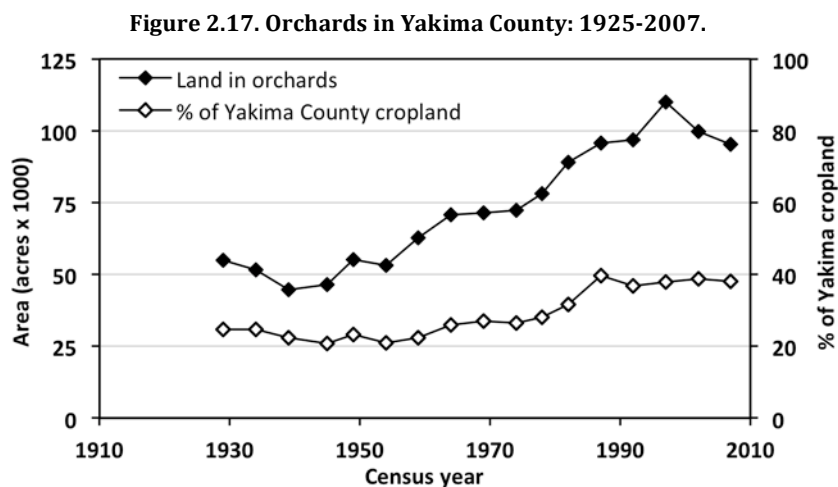
Yakima County was the steep decline between 1940 and 1954, as horses were replaced with tractors for farming purposes. After 1969 there has been a slight upward trend, bringing the number of horses from just over 4,174 animals to just over 7,134 animals.

¹⁴ Between 1925 and 1959, only horses and mules were reported in the census. In the 1964 census, no numbers were reported for horses, mules, or donkeys. In the 1969 census only horses and ponies were reported, and in the 1974 census only horses were reported. Since 1978, the total number of horses and ponies was reported separately from the total number of mules, burros, and donkeys; they have been added together for this figure.

Selected crops in detail

In the following graphs, area harvested for selected crops is presented in detail. Crops were chosen for detailed analysis if they had been cultivated, at some point, on more than 10,000 acres of cropland in Yakima County. The figures show total land area for each crop cultivated in Yakima County, and the percent of Yakima County's harvested cropland dedicated to each crop.

Orchards



Tree fruits and grape vines¹⁵

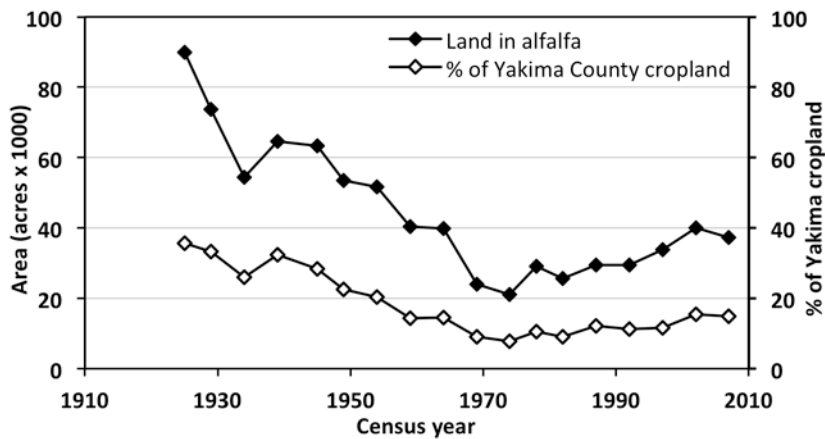
Between 1925 and 1954 orchards occupied about 50,000 acres of cropland in Yakima County. Between 1959 and 1997 land in orchards increased from 62,784 acres to 109,940 acres of harvested cropland. After 1997 land in orchards decreased, falling to 95,351 acres in 2007. Variability in census

data makes it difficult to compare different orchard crops. Depending on the year, orchard crops have been tabulated in number of trees or vines, both the number of trees or vines and the number of acres planted, or, more recently, only the number of acres planted. In each year, apples have represented the most cultivated tree fruit, at more than 40% of all trees or vines in 1935 (followed by pears at 31% of all trees or vines), with grapes representing only 9% of trees or vines. By 2007 (in acres) 58% of the land in orchards was dedicated to apples, and the next most widely cultivated orchard crop was grapes, occupying 20% of the land in orchards. Other widely grown fruits were cherries (11%) and pears (9%). The remaining fruits enumerated in the census, combined, were grown on only about 2% of the land in orchards in Yakima County.

¹⁵ Land in orchards from 1969 is from farms with \$2,500 or more in sales; the rest of the data is from all farms.

Hay and field seeds

Figure 2.18. Alfalfa in Yakima County: 1925-2007.



Alfalfa¹⁶

Acres of alfalfa harvested in Yakima County decreased rapidly between 1925 and 1934, from 89,982 acres to 54,340 acres. Alfalfa grown increased slightly in 1939 and 1945, but began to decrease again in 1949, and decreased steadily until 1974 when it reached a low of 20,986 acres. Between 1978 and 2007 alfalfa

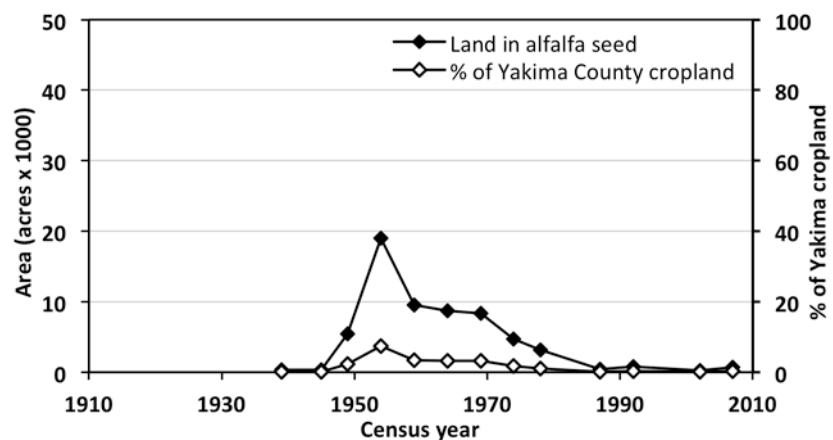
grown in Yakima County increased to a total of 37,363 acres, almost 15% of Yakima County's harvested cropland.

Alfalfa seed¹⁷

Alfalfa seed was not listed in the censuses of 1925, 1929, or 1934. In the first two censuses that included alfalfa seed (1939 and 1945), the amount grown in Yakima County was very small (295 and 296 acres, respectively). After 1954 the area of alfalfa seed harvested in Yakima County increased dramatically: in

1954 it was 18,987 acres. After 1954 the amount of alfalfa seed harvested in Yakima County decreased again: from 1987 onward land in alfalfa seed was consistently less than 750 acres.

Figure 2.19. Alfalfa seed harvested in Yakima County: 1925-2007.



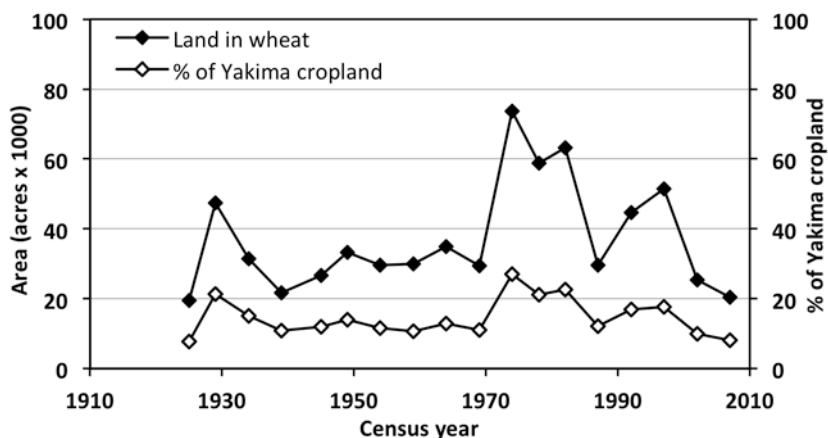
¹⁶ Land in alfalfa from 1969 and 1974 is from farms with \$2,500 or more in sales, the rest of the data is from all farms.

¹⁷ Land in alfalfa seed from 1969 and 1974 is from farms with \$2,500 or more in sales, the rest of the data is from all farms. Yakima County land in alfalfa seed from 1982 was withheld to protect information from individual farms. There was no report of alfalfa seed harvested in Yakima County in the census of 1997.

Grains

In the following figures, wheat and barley reported includes only crops harvested for grain. Small grains harvested for hay have not generally been reported individually in the censuses. Figure 2.21 (corn) includes both corn grown for grain and corn grown for silage.

Figure 2.20. Wheat in Yakima County: 1925-2007.



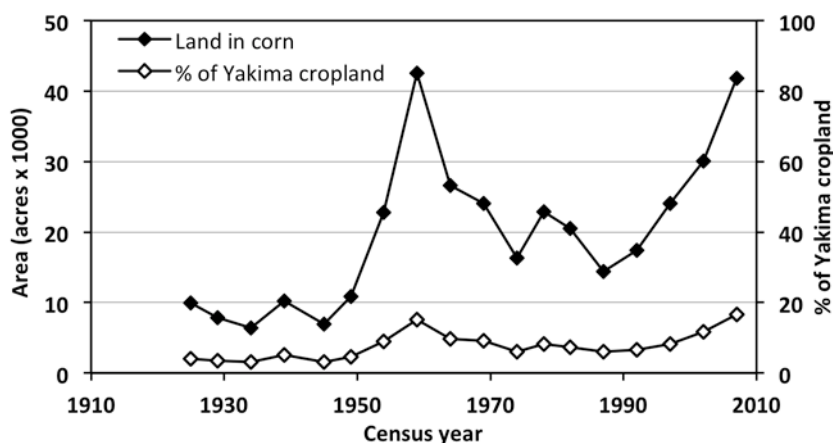
Wheat

Between 1935 and 1974, wheat was grown on 20,000 to 35,000 acres of Yakima County farmland. This increased to 73,718 acres in 1974, and decreased again to 29,508 acres in 1987. Wheat harvested increased again in 1992 and 1997 to 50,430 acres, and then dropped to 20,427 acres in 2007.

Corn¹⁸

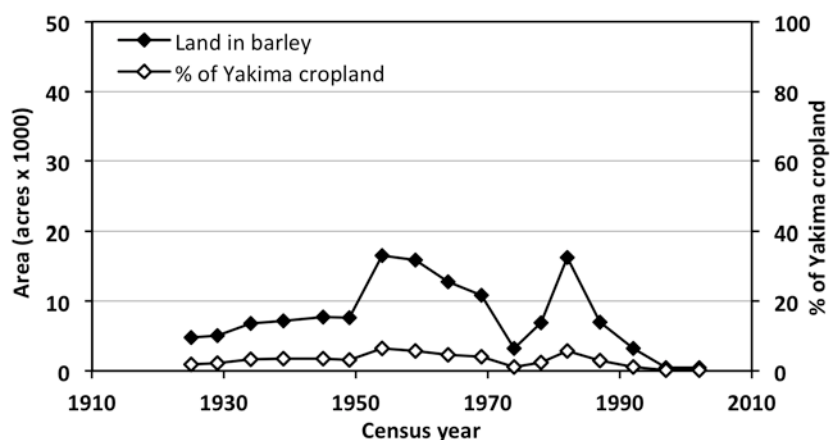
Figure 2.21 includes both corn grown for grain and corn grown for silage. Between 1925 and 1949, corn was grown on roughly 10,000 acres of Yakima County cropland, between 3% and 5%. Between 1949 and 1959 there was a large increase in the amount of corn grown, to 42,572 acres (more than 15% of Yakima's harvested cropland). This was followed by a decrease between 1959 and 1987, but since 1987 the amount of corn harvested has increased again to levels similar to 1959: in 2007 more than 41,802 acres of corn were harvested in Yakima County, occupying about 16.5% of Yakima's harvested cropland.

Figure 2.21. Land in corn in Yakima County: 1925-2007.



¹⁸ Between 1982 and 1997, totals for "corn for grain or seed" and "corn for silage or greenchop" were added to determine all land in corn. In 2002 and 2007, "corn for grain" and "corn for silage or greenchop" were added to determine all land in corn.

Figure 2.22. Barley in Yakima County: 1925-2007.



Barley¹⁹

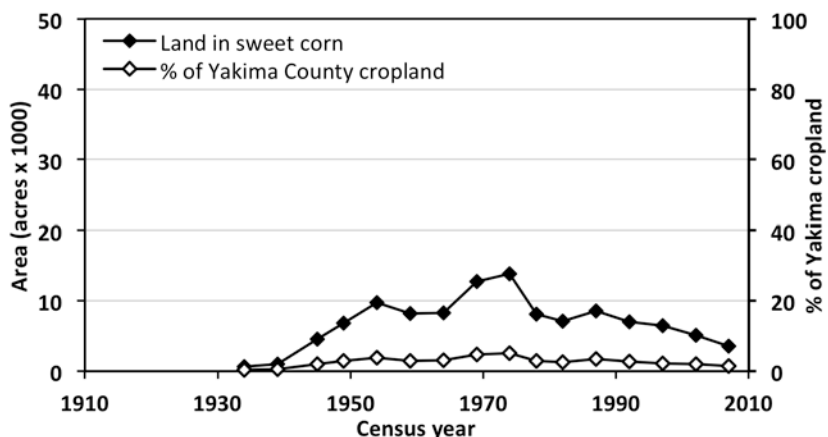
Yakima county land in barley increased slowly from 4,781 acres to 7,635 acres between 1925 and 1949. In 1954, land in barley increased to 16,552 acres. After 1954, it decreased again until 1974, reaching a low of 3,267 acres. Between 1974 and 1982, the number of acres in barley increased quickly

to 16,291 acres, decreased just as suddenly to 502 acres and 452 acres in 1997 and 2002, respectively. At its two highest points (in 1954 and 1982) 6.5% and 5.8% of Yakima County's harvested cropland was planted with barley.

¹⁹ Barley data from 1969 and 1974 is from farms with more than \$2,500 in sales; the rest of the data is from all farms. Yakima County barley data from 2007 was withheld to avoid disclosing information about individual farms.

Vegetables

Figure 2.23. Sweet corn in Yakima County: 1925-2007.



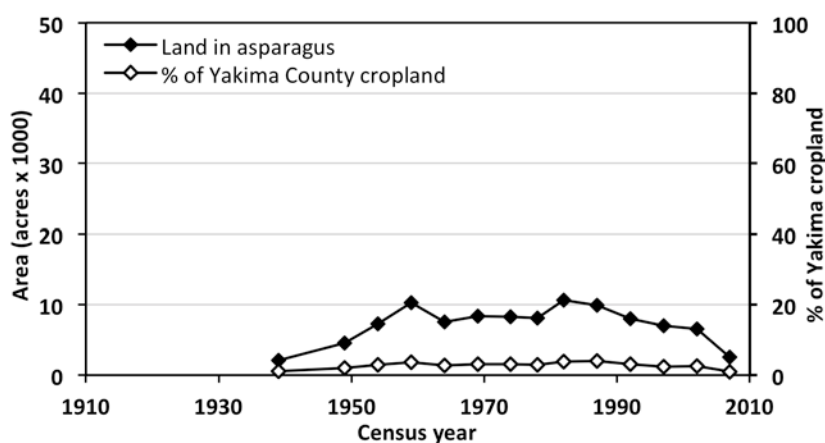
Sweet corn²⁰

Growth of sweet corn in Yakima County increased slowly from 1934 to 1974, reaching a maximum of 13,850 acres. After 1974 the number of acres in sweet corn decreased again, to 3,589 acres in 2007. At its peak sweet corn was grown on only 5% of Yakima County's harvested cropland.

Asparagus²¹

There were only two years in which asparagus was grown on more than 10,000 acres of cropland in Yakima County: 1959 and 1982. In general, the acres in asparagus increased between 1939 and 1959, then remained between 7,500 and just over 10,000 acres until 1992. After 1992, the land in asparagus decreased steadily, to 2,540 acres in 2007. Asparagus has never been grown on more than 4% of Yakima County's farmland.

Figure 2.24. Asparagus in Yakima County: 1925-2007.



²⁰ Land in sweet corn from 1969 and 1974 is from farms with \$2,500 or more in sales; the rest of the data is from all farms.

²¹ Land in asparagus from 1969 and 1974 is from farms with \$2,500 or more in sales, the rest of the data is from all farms. Asparagus was not enumerated separately from other vegetables in the censuses of 1925, 1930, 1934, or 1945.

Other field crops

Hops²²

The cultivation of hops was first documented in the agricultural census in 1939, with cultivation increasing from 4,242 acres in 1939 to 18,940 acres in 1964. Between 1964 and 1978 the number of acres in hops was roughly 20,000. After 1964, land in hops was more variable, ranging between 16,813 acres and 27,449 acres. Hops have generally been grown on only 5%-10% of Yakima's total cropland.

Figure 2.25. Hops in Yakima County: 1925-2007.

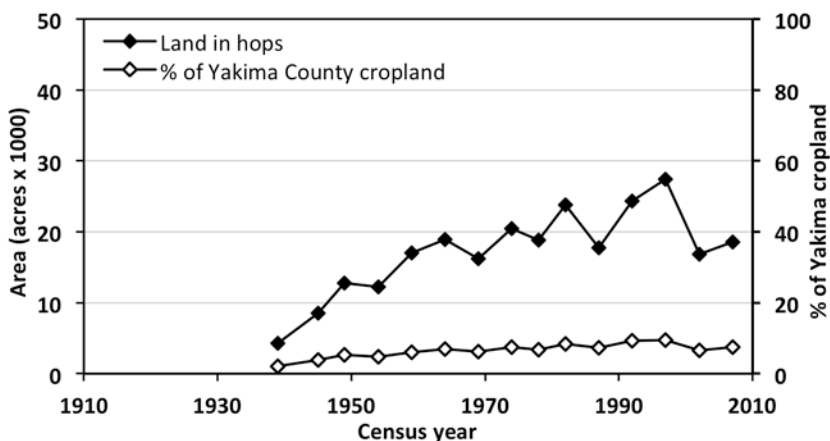
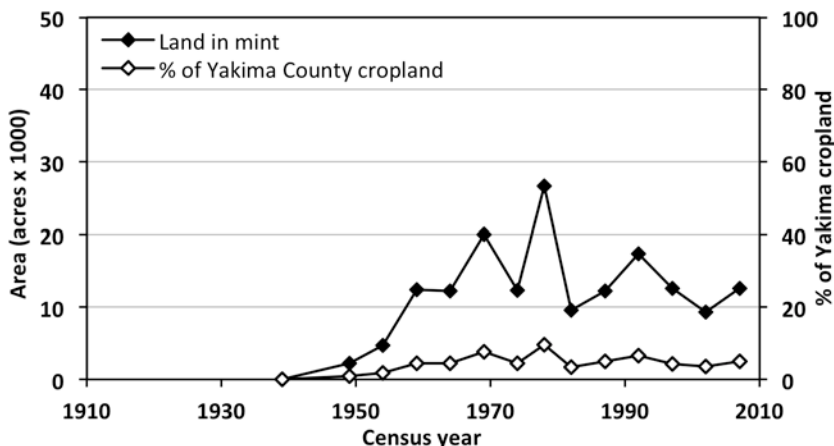


Figure 2.26. Mint in Yakima County: 1925-2007.



Mint²³

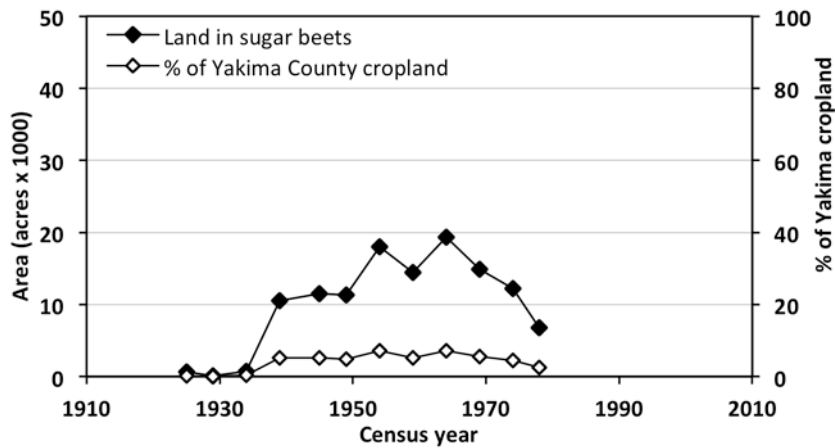
Mint cultivation in Yakima County was first documented in the 1939 agricultural census. Since then, mint has occupied between 10,000 and 20,000 acres of Yakima County cropland, with the exception of 1978, when 26,705 acres of mint were harvested. This

has represented between 4% and 10% of Yakima County's harvested cropland.

²² Land in hops from 1969 is from farms with \$2,500 or more in sales; the rest of the data is from all farms.

²³ Land in mint from 1969 is from farms with \$2,500 or more in sales; the rest of the data is from all farms.

Figure 2.27. Sugar beets in Yakima County: 1925-2007.

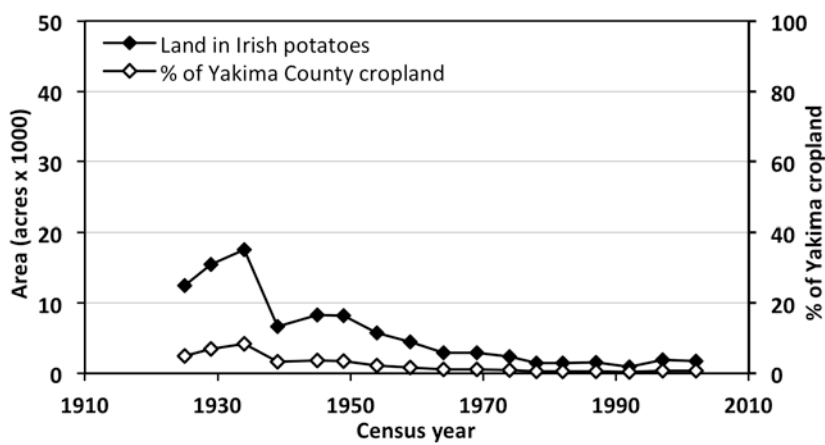


Sugar Beets²⁴

Sugar beet cultivation took place in Yakima County until the 1978 agricultural census. During their peak between 1954 and 1964, sugar beets were grown on close to 20,000 acres of cropland, representing about 7% of the harvested cropland in the county. With the

exception of 1997 and 2007 (when 17,626 and 2,076 acres of sugar beets were harvested, respectively), no sugar beets have been harvested in Washington State since 1978.

Figure 2.28. Irish potatoes in Yakima County: 1925-2007.



Irish potatoes²⁵

Between 1925 and 1934 the amount of land on which Irish potatoes were farmed increased from 12,472 acres to 17,563 acres. After 1934, the land in potatoes went through a fairly consistent decrease, to 1,737 acres in 2007. At their peak in 1934 potatoes were grown on 8.4% of Yakima County's harvested

cropland.

²⁴ Land in sugar beets from 1969 and 1974 is from farms with more than \$2,500 in sales; the rest of the data is from all farms.

²⁵ Land in potatoes from 1969 is from farms with \$2,500 or more in sales; the rest of the data is from all farms.

THREE

Irrigation

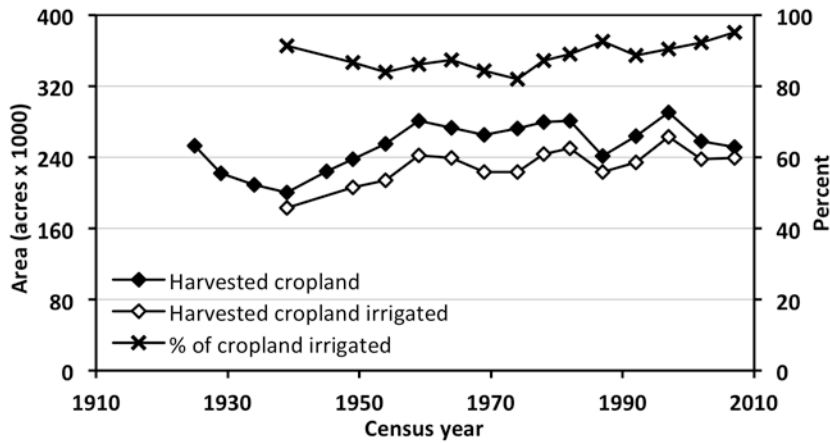
Irrigation canal and farm, 1908.²⁶



²⁶Irrigation canal and farm, 1908. Location not stated, 1908, Charles Libby, Charles Libby Collection, Washington State Archives, Digital Archives, <http://www.digitalarchives.wa.gov>, accessed 25 August 2013.

Irrigated cropland

Figure 3.1. Irrigated cropland in Yakima County: 1925-2007.



Irrigated cropland²⁷

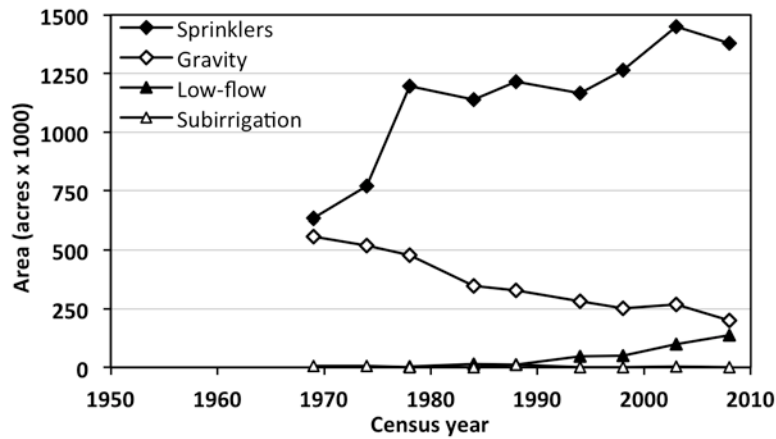
Total area of harvested cropland irrigated was tracked in the agricultural census starting in 1939. From that point on the area of harvested cropland irrigated has been high. The lowest amount of irrigated cropland occurred in 1974, when 82% of harvested cropland was

irrigated. In recent years there has been a slight increase in the percent of harvested cropland irrigated, reaching a high of 95% in 2007.

²⁷Harvested cropland irrigated from 1969 and 1974 is from farms with more than \$2,500 in sales; the rest of the data is from all farms.

Irrigation systems used

Figure 3.2. Irrigation systems in Washington State by number: 1969-2007.



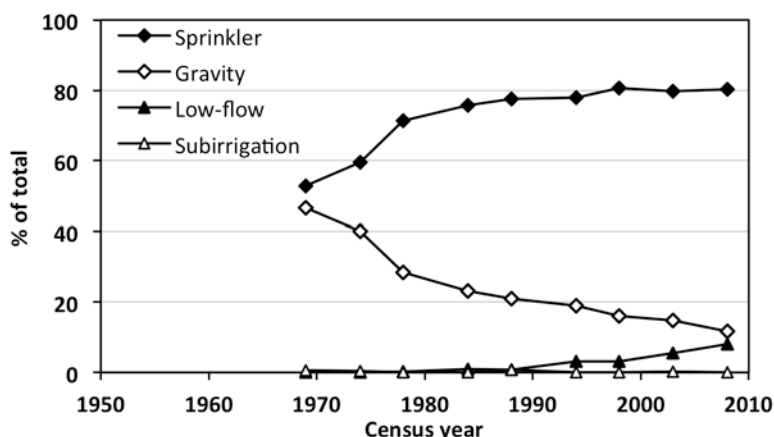
Washington State Irrigation Systems²⁸

The type of irrigation system used has been tracked at the state level in the agricultural census since 1969. It has not been tracked at the county level. Washington State data is presented, on the assumption that the irrigation equipment used is similar to the usage in

Yakima County. Although data prior to 1969 is not available, in 1969 there were no systems used other than sprinklers and gravity systems. The steep increase in sprinkler numbers between 1969 and 1979 suggests quick adoption of this technology. Before the development and adoption of sprinkler irrigation systems, all of the irrigation systems in Washington State (and Yakima County) would have been gravity (or flood) systems. Gravity systems, which include rills, furrows, ditches, and flood systems, have steadily decreased since 1969. Since 1978 there has been growth in the use of low-flow irrigation systems (which include drip, trickle, and low-flow or microsprinkler systems).

²⁸ Types of irrigation systems from 1969 and 1974 are from farms with \$2,500 or more in sales; the rest of the data is from all farms.

Figure 3.3. Irrigation systems in Washington State by percent: 1969-2007.

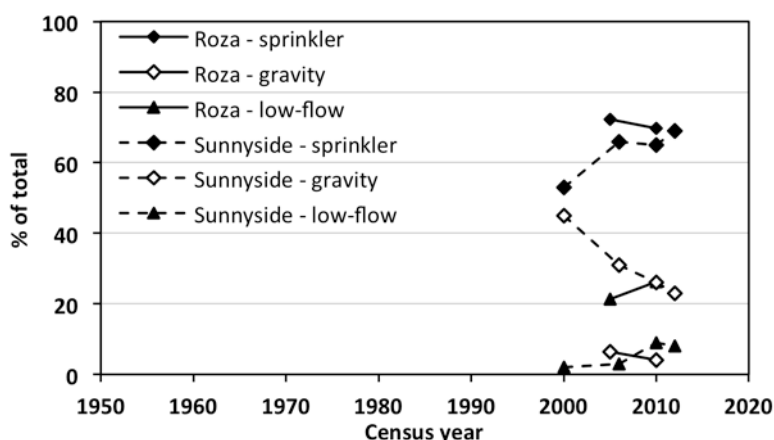


Between 1969 and 2007 the usage of sprinkler systems in Washington State increased from 53% to 80%. During the same time the percentage of land irrigated with gravity systems decreased from 47% to 12%. The first year that low-flow systems were noted in the census in Washington State was 1978, when they were used to irrigate less than 1% of cropland irrigated. By 2007 low-flow irrigation systems were used to irrigate 8% of all harvested cropland irrigated in Washington State.

Washington State Irrigation Systems by Percent²⁹

Between 1969 and 2007 the usage of sprinkler systems in Washington State increased from 53% to 80%. During the same time the percentage of land irrigated with gravity systems decreased from 47% to 12%. The first year that low-flow systems were

Figure 3.4. Irrigation systems in Roza and Sunnyside Valley Irrigation Districts by percent: 2005-2012.



Roza and Sunnyside Valley Irrigation Systems by Percent³⁰

Some data were available from the Roza and Sunnyside Valley Irrigation Districts on the irrigation systems used between 2005 and 2012. Sprinkler irrigation systems in both the Yakima region and Washington State have increased, with a corresponding decrease in

the gravity or rill irrigation systems, although the adoption of sprinkler irrigation is slightly lower in the irrigation districts than in the state as a whole. The adoption of low-flow (drip) irrigation systems in the Sunnyside Division has been similar to that in Washington State, but in the Roza Irrigation District the number had reached 26.16% by 2010, significantly higher than the 8% in Washington State. In 2010, the Roza Irrigation District supplied water to 72,491 acres and in 2012 the Sunnyside Valley Irrigation District supplied water to 94,614 acres of farmland.

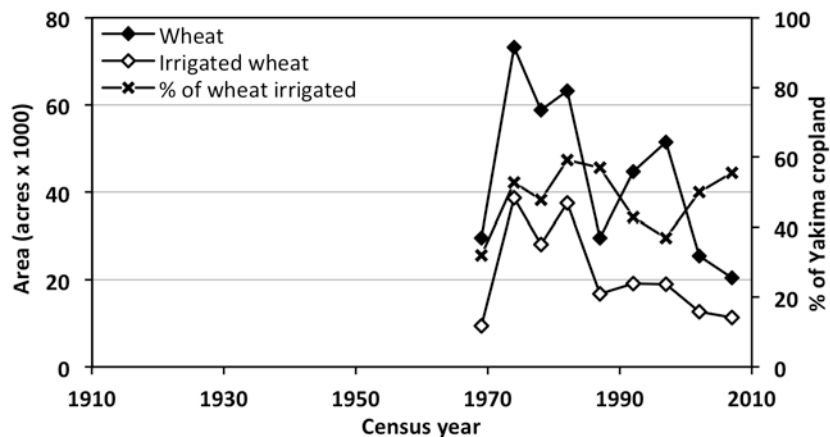
²⁹Types of irrigation systems from 1969 and 1974 are from farms with \$2,500 or more in sales, the rest of the data is from all farms.

³⁰Data was provided by the Roza Irrigation District and the Sunnyside Valley Irrigation Districts.

Crops irrigated

With the exception of wheat, crops grown in Yakima County have been irrigated. As a result, wheat is the only crop for which the area irrigated is presented.

Figure 3.5. irrigated wheat in Yakima County: 1969-2007.



Wheat³¹

The amount of wheat irrigated has ranged between 32% and 59% since 1969, when crops irrigated were first tracked in the agricultural census. In general, the amount of wheat irrigated increased from 32% in 1969 to 59% in 1982. After a decrease to 37% in 1997, the amount of wheat irrigated increased again, to 56%. The amount of wheat grown in Yakima

County has varied between 20,427 acres and 73,231 acres during that time, meaning that the actual area of wheat irrigated has varied between 9,408 acres in 1969 and 38,634 acres in 1974. Since 1974, the area of wheat irrigated has decreased in general, to 11,350 acres in 2007.

³¹ Land in wheat and irrigated land in wheat from 1969 is from farms with \$2,500 or more in sales; the rest of the data is from all farms.

FOUR

Fertilization

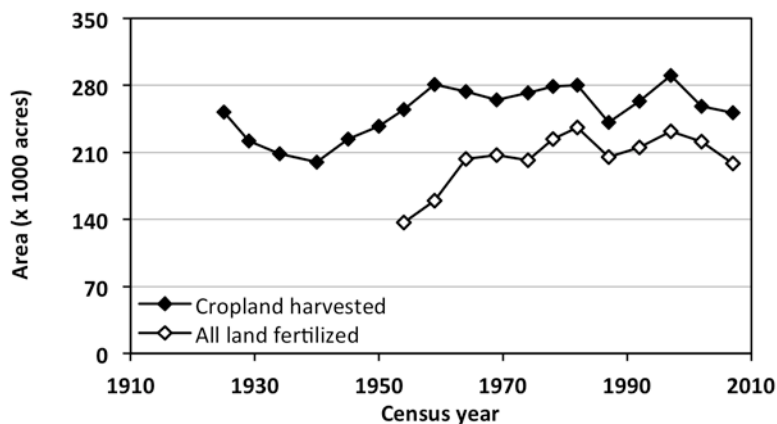
Wheat harvesting in Horse Heaven Hills.³²



³² Wheat harvesting in Horse Heaven Hills. 1965-1975, Photographer unknown, State Library Photograph Collection, 1851 - 1990, Washington State Archives, Digital Archives, <http://www.digitalarchives.wa.gov>, accessed 26 August 2013.

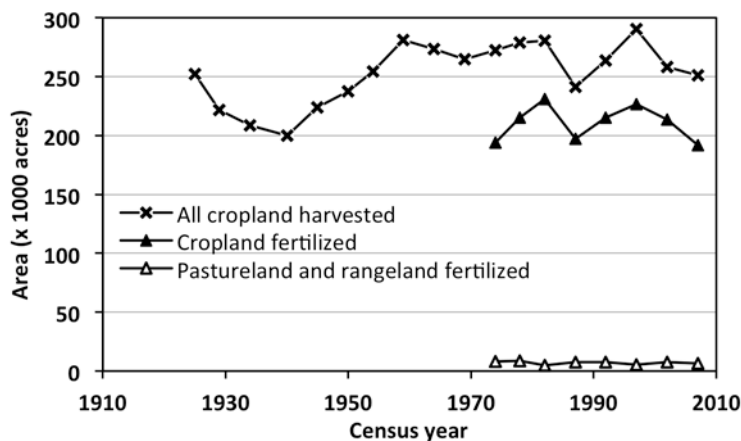
Fertilized cropland

Figure 4.1. Land area fertilized in Yakima County: 1964-2007.



203,062 acres in 1964, and then remained close to 200,000 acres until 2007. Land fertilized specifically with manure was not tracked in the census until 2002. In 2002 and 2007, 28,152 acres and 27,742 acres were fertilized with manure, respectively.

Figure 4.2. Cropland and pasture fertilized in Yakima County: 1974-2007.



231,212 acres. Pasture and rangeland fertilized never exceeded 9,000 acres between 1974 and 2007.

Fertilized land³³

The total amount of land fertilized in Yakima County has closely followed the amount of cropland harvested since 1954, when the agricultural census began tracking area fertilized. In 1954, 136,553 acres of land were fertilized in Yakima County. The area fertilized increased to

Fertilized cropland and pasture³⁴

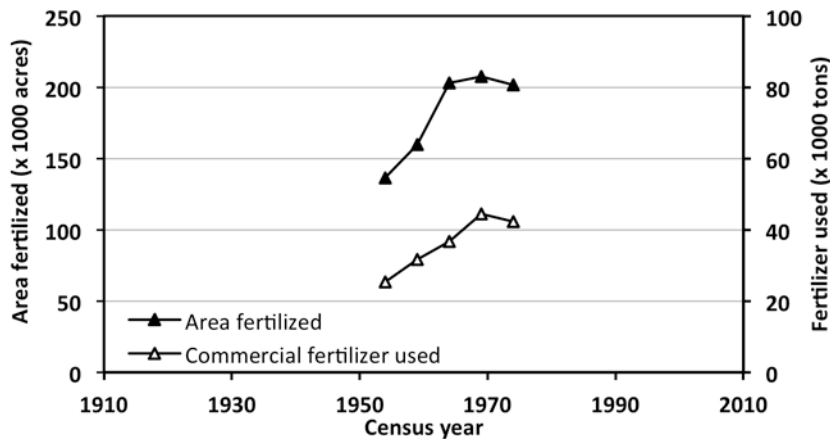
Between 1974 and 2007, the agricultural census tracked how much of the area fertilized was cropland and how much of the area fertilized was pasture or rangeland. The vast majority of farmland fertilized in Yakima County was cropland, ranging between 191,784 acres and

³³ Area fertilized from 1969 and 1974 is from farms with more than \$2,500 in sales; the rest of the data is from all farms.

³⁴ Cropland and pasture and rangeland fertilized from 1974 and 1969 are from farms with more than \$2,500 in sales, the rest of the data is from all farms.

Fertilizer used

Figure 4.3. Commercial fertilizer used in Yakima County: 1954-1974.



Commercial fertilizer used³⁵

The amount of commercial fertilizer used in Yakima County was included in five agricultural censuses between 1954 and 1974. The amount of commercial fertilizer used seems to closely follow the number of acres fertilized. The type of fertilizer applied was

not recorded in the census, just the total weight, and as a result applications of individual nutrient components of fertilizers may be significantly lower than weights reported here.

Fertilizer Recommendations

Recommendations for fertilizer applications produced by Washington State University were reviewed to determine what historical fertilizer applications in Yakima County might have been. Documents reviewed included fertilizer guides, recommendations, and booklets dating from 1913 through the present day. Many, but not all, of the crops widely grown in Yakima County were represented in these guides. Generally, in these guides, nitrogen applications are represented as nitrogen, however, in one guide (Commercial Fertilizers: Bulletin 110, 1913), nitrogen application amounts were presented as weights of commonly used commercial nitrogen fertilizers (nitrate of soda, sulfate of ammonia, and dried blood). In order to make comparisons with later fertilizer guides these numbers were converted using the nitrogen content of those commercial fertilizers, as reported in the 1913 guide, based on laboratory testing results of the nutrient content of commercial fertilizer samples.

³⁵ Commercial fertilizer used from 1969 and 1974 is from farms with more than \$2,500 in sales, the rest of the data is from all farms.

Alfalfa

1913

Apply 30-60 lb of nitrate of soda/acre, 25-50 lb of sulfate of ammonia/acre, or 50-100 lb of dried blood/acre. These are equivalent to **5-10 lb N/acre**.

1933

No nitrogen supplementation is recommended for alfalfa.

1972

Nitrogen supplementation of 30-40 lb N/acre is recommended for alfalfa seedlings. No nitrogen supplementation is recommended for mature plants.

1976

The 1972 recommendations were reprinted unchanged in 1976.

This guide is still in publication by Washington State University.

Asparagus

1913

Apply 120-240 lb of nitrate of soda/acre or 200-400 lb of dried blood/acre. These are equivalent to **20-40 lb N/acre**.

1933

Nitrogen supplementation for asparagus with 10-12 tons of farm manure/acre or 6-8 tons of sheep manure/acre is recommended, to be followed with 30-60 lb N/acre after cutting and 80 lb N/acre in the fall. If manure is not used, the apply 60 lb N/acre in the spring, followed by 80 lb N/acre during the growing season.

1946

If manure is used, apply 14 tons of manure and 80 lb N/acre. If no manure is used, apply 160 lb N/acre.

1971

Recommendations for new plantings of asparagus are dependent on the previous planting history. For established plantings, apply 100 lb N/acre each year.

<u>Previous cropping history</u>	<u>lb N/acre</u>
New land	220
Corn or small grain, residue removed	160
Corn or small grain, residue to be plowed under	200
Potatoes or sugar beets	140
Beans or peas	140
Alfalfa, no top growth	120
Alfalfa, considerable top growth to be plowed under	80
Vetch or other legume green manure	80

1982

Recommendations for new plantings of asparagus are dependent on the previous planting history. For established plantings, apply 100 lb N/acre each year for the first three years, and 40-80 lb N/acre after the first three years.

For new plantings

Previous cropping history	lb N/acre
New land	280
Corn or small grain, residue removed	220
Corn or small grain, residue to be plowed under	260
Potatoes or sugar beets	200
Beans or peas	200
Alfalfa, no top growth	180
Alfalfa, considerable top growth to be plowed under	140
Vetch or other legume green manure	140

This guide is still in publication by Washington State University.

1993

Recommendations for new plantings of asparagus are dependent on the previous planting history. In addition, the application of either 10 or more tons barnyard manure/acre or the use of a green manure crop such as alfalfa or vetch is recommended before planting. For established plantings, 100 lb N/acre was recommended each year for the first three years.

For new plantings

Previous cropping history	lb N/acre
New land	280
Corn or small grain, residue removed	200
Potatoes or sugar beets	200
Beans or peas	200
Alfalfa, no top growth	180
Alfalfa, considerable top growth to be plowed under	140
Vetch or other legume green manure	140

Corn**1913³⁶**

Apply 60-120 lb of nitrate of soda/acre, 50-100 lb of sulfate of ammonia/acre, or 100-200 lb of dried blood/acre. These are equivalent to **10-20 lb N/acre**.

1933

In 1933 the following recommendations are made for cereals: if planted following a legume, no N supplementation is required. If planted following a non-legume, top dress with 20-40 lb N/acre. For corn: increase the N application by 30-60 lb N/acre.

1946**Field corn**

If manure is used, apply 12 tons of manure and 20 lb N/acre. If no manure is used, apply 40 lb N/acre.

³⁶ The 1913 Commercial Fertilizer guide did not specify whether it referred to field corn or sweet corn: they have been combined in this table because of the similarity in the 1970 Fertilizer Guide recommendations for field corn and sweet corn.

1956**Field corn**

Recommendations for field corn are dependent on the previous planting history.

Previous cropping history	lb N/acre
New land	160-200
New land previously in dryland wheat	200-240
Following alfalfa	80-120
Following hairy vetch green manure	80-120
Following row crops	160-200

1970**Field corn**

Recommendations for field corn are dependent on both soil test N results and previous planting history.

Soil test N (ppm)	New land, or after potatoes, sugar beets, corn for silage or wheat with straw to be removed (lb N/acre)	After peas, beans, or alfalfa stubble (lb N/acre)	Alfalfa or other legume green manure plowed under (lb N/acre)
10	280	240	200
20	240	200	160
30	200	160	120
40	160	120	80
50	120	80	40
60	80	40	0
70	40	0	0

Note

Increase application rates by 40-80 lb N if corn stover or wheat straw is not incorporated before September 1.

1970**Sweet corn**

Recommendations for sweet corn are dependent on both soil test N results and previous planting history.

Soil test N (ppm)	New land, or after potatoes, sugar beets, corn for silage or wheat with straw to be removed (lb N/acre)	After peas, beans, or alfalfa stubble (lb N/acre)	Alfalfa or other legume green manure plowed under (lb N/acre)
10	280	240	200
20	240	200	160
30	200	160	120
40	160	120	80
50	120	80	40
60	80	40	0
70	40	0	0

Note

Increase application rates by 40-80 lb N if corn stover or wheat straw is not incorporated before September 1.

1979

Field corn

Recommendations for field corn are dependent on both soil test N results and previous planting history.

Soil test N (ppm)	New land, or after potatoes, sugar beets, corn for silage or wheat with straw to be removed (lb N/acre)	After peas, beans, or alfalfa stubble (lb N/acre)	Alfalfa or other legume green manure plowed under (lb N/acre)
10	280	220	160
20	240	180	120
30	200	140	80
40	160	100	40
50	120	60	0
60	80	20	0
70	40	0	0

Note

Increase application rates by 40-80 lb N if corn stover or wheat straw is not incorporated before September 1.

This guide is still in publication by Washington State University.

Hay & pasture: grass, legume, and mixed

1913

Grass pasture

Apply 90-180 lb of nitrate of soda/acre, 75-150 lb of sulfate of ammonia/acre, or 150-300 lb of dried blood/acre. These are equivalent to **15-30 lb N/acre**.

1933

Grass pasture

Rotation grazing is recommended to maintain pasture quality. Manure is recommended over commercial fertilizers. If manure is used, apply 6-8 tons farm manure/acre in fall or winter, followed by 20 lb N/acre in the spring, followed by another application of 20 lb N/acre in mid-spring, and a third application of 20 lb N/acre in May or June (if rotation grazing is practiced). If rotation grazing is not practiced, then apply 40 lb N/acre in May. If only commercial fertilizer is used, apply 15 lb N/acre in the fall or winter, then top dress with 20 lb N/acre two to three times during the growing season.

Legume pasture

N supplementation is not required.

1946

Legume hay/pasture

N supplementation is not required

Legume-grass mixed hay/pasture

Apply 40 lb N/acre

Grass hay/pasture

Apply 40 lb N/acre

1957

Irrigated pasture

A mixture containing orchardgrass or Alta fescue combined with Ladino clover, strawberry clover, or alfalfa is recommended for irrigated pastures. In combination with rotation grazing, apply 100 lb N/acre in three applications during the growing season.

1965

Irrigated pasture

A mixture of alfalfa and orchardgrass is recommended for irrigated pastures. Supply 30 lb N/acre to prepare the seedbed. Once the pasture is established, apply 30 lb N/acre on three occasions during the growing season, preferably during April, June, and August.

1970

Alfalfa or more than 50% alfalfa

N supplementation is not required for established stands. For new stands, apply 40 lb N/acre at the time of seedbed preparation. For older stands, apply 150 lb N/acre each year.

Grass pastures

A total of 200 lb N/acre, in three applications: early spring, June 1, and August 1.

Hops

1913

Apply 120-240 lb of nitrate of soda/acre, 100-200 lb of sulfate of ammonia/acre, or 200-400 lb of dried blood/acre. These are equivalent to **20-40 lb N/acre**.

1970

Recommendations for hop fertilization are dependent on soil test N results. If soil test results are unavailable, farmers should use the recommendation for the 20 ppm N level.

Soil test N results (ppm)	lb N/acre
10	140
20	100
30	60
40	30
50	0
60	0

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Mint

1970

Recommendations for mint are dependent on both soil test N results and previous planting history.

Soil test N (ppm)	New land, or after potatoes, sugar beets, corn for silage or wheat with straw to be removed (lb N/acre)	After peas, beans, or alfalfa stubble (lb N/acre)	Alfalfa or other legume green manure plowed under (lb N/acre)
10	300	240	200
20	240	200	160
30	180	160	120
40	120	120	80
50	80	80	0
60	40	0	0

Note

Increase application rates by 40-80 lb N if corn stover or wheat straw is not incorporated before September 1.

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Orchards and orchard cover crops

1913

Apples, pears

Apply 50-100 lb of nitrate of soda/acre, 40-80 lb of sulfate of ammonia/acre, or 80-160 lb of dried blood/acre. These are equivalent to **8-16 lb N/acre**.

Apricots, peaches

Apply 90-180 lb of nitrate of soda/acre, 75-150 lb of sulfate of ammonia/acre, or 150-300 lb of dried blood/acre. These are equivalent to **15-30 lb N/acre**.

Cherries, plums

Apply 60-120 lb of nitrate of soda/acre, 50-100 lb of sulfate of ammonia/acre, or 100-200 lb of dried blood/acre. These are equivalent to **10-20 lb N/acre**.

1933

Orchards

Orchards may be fertilized with 5-8 tons of farm manure per acre, or 1-2 tons of leguminous hay per acre. If the leguminous hay has a high proportion of straw, it may be supplemented with 20-30 lb N/acre. These recommendations should be combined with the growth of alfalfa or sweet clover as a cover crop. If a heavy cover crop cannot be cultivated, it may be supplemented with ½ lb N/tree. If tree growth is not vigorous, 1 lb N/tree or more may be added.

1946

Orchards and cover crops – mature pome fruit trees

If the orchard is planted with a legume cover crop, it may be fertilized with 16 tons of manure per acre. Fertilization with commercial nitrogen fertilizer is not necessary, even if manure is not used. If the orchard is planted in rye cover, it can be fertilized with 16 tons of manure/acre and 20 lb N/acre. If the orchard is planted in cereal cover, it can be fertilized with 50 lb N/acre.

Orchards and cover crops – mature stone fruit trees

If the orchard is planted in legume cover, no N supplementation is required. If the orchard is planted in cereal cover, supplementation with 40-80 lb N/acre is recommended.

1972

Orchard cover crops

Fertilize with between 50 and 150 lb N/acre each year: apply 40 lb N/acre at the time of seeding and up to 50 lb N/acre when crop has grown to 6 inches.

1972

Orchards

For young trees, apply 0.1-1 lb N per tree for each year of age, up to 1 lb N per tree each year. For mature trees, apply 80 lb N/acre each year, adjusting depending on pruning and size of crop.

Potatoes

1913

Apply 180-360 lb of nitrate of soda/acre, 150-300 lb of sulfate of ammonia/acre, or 300-600 lb of dried blood/acre. These are equivalent to **30-60 lb N/acre**.

1933

The use of a leguminous cover crop as a green manure is recommended before potatoes are planted. If the field has not been planted in alfalfa or sweet clover for three or more years, then 12 tons/acre of farm manure should be applied in the fall. In the second year, this should be supplemented with 40-80 lb N/acre. If potato yields are low, supplementation with 50-75 lb N/acre may be used.

1946

On irrigated sandy loam and silt loam soils, for early or late potatoes apply 40 lb N/acre. On nonirrigated mineral soils, for late potatoes after alfalfa or a heavily manured crop, apply 30 lb N/acre. For late potatoes after a lightly manured crop, apply 80 lb N/acre.

1971

Recommendations for potatoes are provided based on both previous cropping history and nitrogen soil test results. When potato yields are very high soil may require additional fertilizer and growers may add 50-100 lb N/acre to these recommendations on a trial basis.

Previous cropping history	Early crop (lb N/acre)	Late crop (lb N/acre)
New land	280	320
Small grain, straw removed	200	240
Small grain, straw to be plowed under	260	300
Corn, stover removed	160	200
Corn, stover to be plowed under	220	260
Potatoes or sugar beets	160	200
Beans or peas	160	200
Alfalfa, no top growth	140	180
Alfalfa, considerable top growth	80	120
Vetch or other legume green manure	80	120

Note: If corn stover or wheat straw is not incorporated before September 1 add 40-80 lb N/acre to these recommendations, depending on the amount of residue remaining at the time of incorporation.

Soil test N results (ppm)	Early crop (lb N/acre)	Late crop (lb N/acre)
10	280	320
20	240	280
30	200	240
40	160	200
50	120	160
60	80	120
70	50	80
80	0	40
100	0	0

Small grains

1913

Barley

Apply 75-150 lb of nitrate of soda/acre, 50-100 lb of sulfate of ammonia/acre, or 125-250 lb of dried blood/acre. These are equivalent to **12-24 lb N/acre**.

Wheat

Apply 75-150 lb of nitrate of soda/acre, 60-120 lb of sulfate of ammonia/acre, or 120-240 lb of dried blood/acre. These are equivalent to **12-24 lb N/acre**.

1933

Cereals

If cereals are planted following a legume, no N supplementation is required. If cereals are planted following a non-legume, top dress with 20-40 lb N/acre.

1969

Winter wheat

Recommendations for winter wheat are dependent on both soil test N results and previous planting history.

Soil test N (ppm)	New land, or after potatoes, sugar beets, corn for silage or wheat with straw to be removed (lb N/acre)	After peas, beans, or alfalfa stubble (lb N/acre)	Alfalfa or other legume green manure plowed under (lb N/acre)
10	240	200	160
20	200	160	120
30	160	120	80
40	120	80	0
50	80	40	0
60	40	0	0

Note: If corn stover or wheat straw is not incorporated before September 1 add 40-80 lb N/acre to these recommendations, depending on the amount of residue remaining at the time of incorporation.

1970**Small grains (except Gaines wheat)**

Recommendations for small grains are dependent on both soil test N results and previous planting history.

Soil test N (ppm)	New land, or after potatoes, sugar beets, corn for silage or wheat with straw to be removed (lb N/acre)	After peas, beans, or alfalfa stubble (lb N/acre)	Alfalfa or other legume green manure plowed under (lb N/acre)
10	180	140	100
20	140	100	80
30	100	80	30
40	80	30	0
50	30	0	0
60	0	0	0

1976**Small grains (except Gaines wheat)**

The 1970 recommendations were reprinted unchanged in 1976.

1988**Winter wheat**

Recommendations for winter wheat in 1988 were the same as the recommendations made in 1969, with the exception of a note regarding yield. The nitrogen fertilization rates given are based on a 100-bushel yield, and the grower should add or subtract 2.7 lb N for every bushel expected above or below 100 bushels.

Sugar beets**1913**

Apply 120-240 lb of nitrate of soda/acre, 100-200 lb of sulfate of ammonia/acre, or 200-400 lb of dried blood/acre. These are equivalent to **20-40 lb N/acre**.

1946

For sugar beets grown on irrigated mineral soils apply 15 tons of manure/acre or 40 lb N/acre.

1947

Without crop rotations soil can accumulate excessive levels of sugar beet nematodes. Three to four years of alfalfa followed by three to four years of row crops such as sugar beets is the recommended rotation. In addition, for fields previously planted in alfalfa (or fields where 10-15 tons manure/acre has been applied), apply 40-80 lb N/acre. In the absence of manure applications or previous growth of alfalfa, apply 60-120 lb N/acre.

1954

Recommendations for sugar beets are dependent on the previous cropping history.

Previous cropping history	lb N/acre
New land with a moderate amount of native vegetation	160-240
New land previously in dryland wheat	240-300
Following alfalfa	80-120
Following other row crops	160-240
Following other row crops with 15+ lb manure/acre	100-180

Vineyards

1913

Apply 50-100 lb of nitrate of soda/acre, 40-80 lb of sulfate of ammonia/acre, or 80-160 lb of dried blood/acre. These are equivalent to **8-16 lb N/acre**.

1972

Recommendations for new vineyards are dependent on the previous planting history and the type of vines. For established plantings, apply 40-120 lb N/acre (depending on the growth and variety of the vines).

For new plantings

Previous cropping history	American (Concord, Cambell Early) (lb N/acre)	European (Vinifers) (lb N/acre)
New land	160	80
Corn or small grain, residue removed	120	60
Corn or small grain, residue to be plowed under	140	70
Potatoes or sugar beets	100	50
Beans or peas	100	50
Alfalfa, no top growth	100	50
Alfalfa, considerable top growth to be plowed under	60	30
Vetch or other legume green manure	60	30

1983

The 1972 recommendations were reprinted unchanged in 1983.

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Five

Changing Agricultural Practices Over Time

Joseph A. Reichartz's Orchard, Yakima.³⁷



³⁷Joseph A. Reichartz's orchard, Yakima. 1930, Photographer unknown, State Library Photograph Collection, 1851 - 1990, Washington State Archives, Digital Archives, <http://www.digitalarchives.wa.gov>, accessed 26 August 2013.

The expansion of input-intensive agricultural practices

During the first half of the twentieth century, farm sizes were relatively small, it was common for both crops and livestock to be raised on the same farm, and a much larger proportion of the population was engaged in agriculture. In 1925, there were 6,351 farms in Yakima County and 600,106 acres of land in farms (Figure 2.1). Farmers often produced their own livestock feed on-farm, and maintained soil fertility through crop rotations and the retention of manure and crop residues on-farm. Weeds, insects, and plant diseases were controlled largely through mechanical practices, crop rotations, and the use of natural predators. During this time the conversion from horse-powered farming to the widespread use of tractors was taking place. In Yakima County, the number of horses on farms was 19,713 animals in 1925. The number of horses dropped to 13,350 animals in 1945 and 3,691 animals in 1959 (Figure 2.16). This spread of mechanization made it possible for farmers to use agricultural practices like intensive inversion-based tillage that remove all cover from the soil and use large amounts of fuel. In addition, between 1900 and 1944 the use of synthetic fertilizers began to increase, and after World War II, the use of chemical pesticides as well.

After World War II, in the late 1940s and early 1950s, trends in U.S. farming began shifting from mixed crop and livestock operations to specialized monocultures; it became common to raise livestock separately on feedlots or isolated operations. With the decline in the use of crop rotations and reduction in easy access to livestock manure, the usage of commercial fertilizer and pesticides on farms increased. The last half of the twentieth century saw dramatic increases in yields of corn, wheat, and rice, as well as decreases in food prices. This increase in yield can be attributed to the large-scale mechanization of the process of tilling, planting, and harvesting, the availability of improved plant varieties, the development of irrigation infrastructure, the low cost of fertilizers and pesticides, and favorable commodity prices. Economies of scale in paying for expensive equipment led to individual farms increasing in size. By 2007, the number of farms in Yakima County had dropped to 3,540, while the land in farms had nearly tripled, growing to 1,649,281 acres. The competitive environment in the farming industry meant that the high-yield, intensive agricultural practices that had become common were required for farms to remain profitable.

The widespread adoption of agricultural practices like intensive tillage, the decline in systematic crop rotation, the removal of livestock manure and crop residue from farms, the practice of leaving soil exposed between crops, and the use of large amounts of synthetic fertilizer and agricultural chemicals has resulted in environmental degradation and a decline in soil quality in agricultural areas. Effects include soil erosion, nutrient runoff, desertification, acidification, soil compaction, crusting, organic matter loss, nutrient depletion by leaching, and, as a result, decreases in soil productivity.

Alternative agricultural practices

The era between the 1970s and the present represents a time of tremendous pressure for farmers; the expansion of government regulation, increasing pressure from populations expanding into farmland, and the challenge of maintaining crop yields at profitable levels have made the industry increasingly competitive. Drivers pushing these movements include declining soil quality on

agricultural lands, developing concerns about surface and groundwater contamination, and the rising cost of fossil fuels that affects the costs both of intensive tillage and synthetic fertilizers. In addition, since the 1970s there has been a rapidly growing demand for organically produced food in the United States. The farming practices that are being used to address these problems include conservation tillage, the use of crop rotations, the use of cover crops, catch crops, and green manures, the retention of livestock manure and crop residue on-farm, improved drainage, water conservation, and reducing the use of synthetic fertilizers and pesticides.

Compaction from conventional tillage increases soil bulk density, depletes soil organic matter, and weakens soil structure. The use of conservation tillage systems (which keep at least 30% of the soil surface covered by plant residues) reduces the amount of water and nutrient runoff from the surface, reduces erosion significantly over conventional tillage, promotes water infiltration, reduces water evaporation, protects soil aggregates, and as a result reduces soil compaction and protects soil organic matter. When conservation tillage is combined with the use of cover crops, reductions in nutrient loss and water runoff are even higher than for conservation tillage used alone.

The use of cover crops and green manures promotes soil health in a number of different ways. Cover crops protect the soil from the effects of wind and water erosion and provide living roots that stabilize the soil. They reduce nutrient leaching, add organic matter to the soil, suppress weeds, increase water infiltration, attract beneficial insects, reduce crusting, and can also serve to trap snow and improve soil moisture over the winter (acting as catch crops). When livestock manure and crop residue are also retained on-farm, nutrients and organic matter are returned to the soil, maintaining soil health and reducing the need for inputs of commercial fertilizers.

Additional important factors are water conservation and drainage improvement. Irrigation systems used in the Yakima Valley and elsewhere during the early stages of the Yakima Project were flood irrigation systems (also called gravity, rill, or furrow irrigation). Although these systems are inexpensive to develop and use, they can result in inexact and uneven water applications, as well as salinization, nutrient leaching, and inefficient water use. Sprinkler irrigation, which now represents the majority of the irrigation systems in the Yakima Valley, can be more expensive to install, but allows for much more precise water applications than flood irrigation, in addition to more efficient water usage. The usage of low-flow irrigation systems such as drip, trickle, or microsprinkler systems is growing in Yakima and elsewhere. The benefits of these systems are very low water usage and a high level of control over irrigation water applications. The trend in irrigation systems from flood irrigation to sprinkler and low-flow systems has resulted in both increased water conservation and improved soil quality. Improved drainage increases aerated soil volume, benefits plants, and can also allow for desalinization of damaged soil.

Use of Sustainable Agricultural Practices

Although there are a number of indicators that more sustainable agricultural practices are being adopted, they have not been tracked widely or comprehensively. The use of conservation tillage, cover crops, and double crops is not currently tracked in the agricultural census. The growth of triticale (used as a catch crop) appeared in the agricultural census in Washington in 1978, but was

not noted in Yakima County until 2002. In 2002, 655 acres of triticale were grown in Yakima County, and in 2007, 622 acres were grown. The 2007 agricultural census notes that 709 farms (20%) in Yakima County “used conservation methods” and 529 farms (15%) were practicing rotational or management intensive grazing (out of a total of 3,540 farms in the county). There were 105 farms in Yakima County producing organic products (with a total of 4,813 acres). The 2012 agricultural census has added more questions about conservation tillage: number of acres under no-tillage, number of acres under conservation tillage, and number of acres under conventional tillage. The results of these questions will be released in February, 2014.

Dairy Nutrient Management

One of the concerns, especially in Yakima County, is nutrient runoff from livestock operations, including dairy farms. The Dairy Nutrient Management Act (Chapter 90.64 RCW) took effect April 1, 1998 and initially gave regulatory authority to the Washington State Department of Ecology (Ecology). The legislation’s goal was to establish an inspection and technical assistance program for Washington dairy farms to protect the water quality of Washington’s surface and ground waters. All licensed dairy producers were required to register with Ecology, develop a dairy nutrient management plan, and have it approved and certified by their local conservation district to verify implementation by December 31, 2003. Ecology developed an inspection program and investigated any complaints or discharges. In addition, Ecology was granted the authority to assess civil penalties against producers for recordkeeping violations. In July 2003, all responsibilities under this regulation were transferred to the Washington State Department of Agriculture (WSDA) for administration and implementation.

Record keeping was included in the initial nutrient management plans, but WSDA found during routine inspections that producers often did not maintain adequate records to determine amounts of nutrients that were being applied to crop acreage. WSDA, in consultation with state and local agencies, established record keeping requirements and a compliance limit for soil test results of 45 parts per million (ppm) nitrate in 2006. In 2009, the dairy industry asked the legislature to amend Chapter 90.64 RCW to state that a failure to demonstrate that dairy nutrients were being applied at agronomic rates was a violation. The dairy industry followed up in 2010 to include a penalty for lack of record keeping. WSDA implemented rules in November 2012 (WAC 16.611) that specified producers’ obligations for testing and recordkeeping. Producers are required to meet specific requirements for soil analyses, and maintain records of all nutrient and irrigation applications.

It is important to note that the dairy industry is the only agricultural industry in Washington with recordkeeping requirements (including up to 5 years of historical records). Dairy producers are required to make records available at WSDA’s request. These records are reviewed during all routine inspections (approximately every 22 months), and when land applications of dairy nutrients result in a discharge to the waters of the state. WSDA’s Dairy Nutrient Management Program reports that 87% of Yakima’s dairy farms are in compliance with these standards. As of 2012, 57 of the 67 dairies in the Yakima Valley were exporting nutrients off the farm for more widespread nutrient applications. WSDA estimates that approximately 30% of the nitrogen produced on the Yakima dairies is being exported out of the watershed entirely.

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