FORGOTTEN FIELDS:

COCONINO COUNTY'S 100-YEAR AGRICULTURAL HISTORY, AND THE EVENTS THAT CAUSED ITS DECLINE

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ABSTRACT

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COCONINO COUNTY'S 100-YEAR AGRICULTURAL HISTORY,
AND THE EVENTS THAT CAUSED ITS DECLINE

MEREDITH A. HARTWELL

Coconino County, Arizona, had a rich agricultural history that started during the mid to late-1800s and lasted through the early 1960s. The history can be divided into time periods that define certain eras when a particular set of crops or events took precedence. This thesis examines the ways in which agriculture started, flourished, was affected by specific local and national factors, and declined as a result of those factors. Commercial agricultural production of four primary crops, potatoes, beans, grains, and fruit, are examined as major contributors to the local economies and food system of Coconino County.

The major factors leading to decline of agriculture in Coconino County were: an intense drought during the 1950s, the Soil Bank Program, the Federal Aid Highway Act, and the construction of Glen Canyon Dam. Two of these factors—the Soil Bank Program and Federal Aid Highway Act—had national repercussions that were also acutely felt on a local level. The Soil Bank Program paid farmers to 'retire' their land for five years to mitigate against farm bankruptcy due to wide-spread drought in the West and Midwest. The Federal Aid Highway Act increased connectivity of Coconino County towns to major cities, thus facilitating mass food transport and food purchases. The construction of Glen Canyon Dam for hydropower increased land development and land prices ten-fold, thus magnifying the incentives to sell farmland during a difficult period of drought. All of these factors happened concurrently, during the mid to

late 1950s. The national and local socio-cultural shifts had been profound enough that farming did not return even though the drought ended in the 1960s. This thesis seeks to illuminate the successes and agricultural abundance of Coconino County from the late 1800s to the 1960s, as well as to offer a counterpoint to the view that precipitation and climate alone caused agricultural decline. Instead, this research offers a more complex and nuanced view of how national socio-cultural and policy events combined with local challenges had broad, lasting effects on the agricultural landscape of Coconino County.

"In the stilled place that once was a road going down

from the town to the river, and where the lives of marriages grew

a house, cistern and barn, flowers, the tilted snow of borders,

and the deeds of their lives ran to neglect,

and honeysuckle and then the fire overgrew it all,

I walk heavy with seed, spreading on the cleared hill the beginnings

of green, clover and grass to be pasture.

Between history's death upon the place and the trees that would come,

I claim, and act, and am mingled in the fate of the world."

~ Wendell Berry, Farming: A Hand Book, "Sowing." ~

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First, I want to acknowledge that this thesis would not have existed without the experiences and study engendered within a Sustainable Communities agriculture class in the spring of 2009, during which we researched the history of recent agriculture within Coconino County. The discoveries our class made during that time kept coming back to me, and, after several changes in thesis focus, finally dragged me down the rabbit hole of history. Without that class, I would not have recognized my fascination with historical "detective work," photographic archives, and research. So, a big thank you to Dr. Patrick Pynes, teacher of that class, and chair of my committee. And many thanks for wading through successively less disorganized chapters and for your patience with my very long process of synthesizing the information I found.

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Thank you to Hattie Braun, of the Coconino County Extension Office and Master Gardener course coordinator. Without your support in numerous ways large and small, including putting up with my questions during the long hours

and many weeks while I typed up the archives in the Extension office, this thesis would not have the detail and scope that it does.

A big thank you to roommates and dear friends who, no matter how long I was away from them and despite my absence from social activities during this year-long process, stayed friends. I dearly appreciate you. And, a big thank you to my parents, Ash and Trish Hartwell, who stayed supportive and encouraging during the long four years it took me from start to finish. My appreciation for your guidance and support is immense! To my boss at USGS, Lara Schmit—your tolerance and unwavering flexibility this year by giving me as much time off as I needed to complete this task—has made it possible for me to remain sane. For that, I sincerely thank you. And a big thank you to Becca Roseman and Kyrie Fry for detailed proofreading and copy-edit suggestions. The thesis reads more smoothly with their help.

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INTRODUCTION

This thesis is an examination of Coconino County, Arizona's commercial agricultural history and the factors that caused agricultural change from the middle of the 19th century (1851) through 1965. I chose this particular time span since it covers the period when commercial agriculture began (post homestead settlement) and ended (1960s) in the county, and I wanted to illuminate the full picture of how and why agriculture started and ended in this area: the factors that precipitated its start and demise. The thesis starts with a discussion of the history and factors that influenced early American settlement and agriculture in the county in the 1850s.

My primary thesis research sources on farming in the county are Extension Service agricultural reports. These annual reports were first written in 1918 and end in 1960. Commercial agriculture had largely declined by 1960, and thus my study ends then, though the factors that precipitated agricultural decline continued. This thesis discusses the primary crops that were grown, the challenges and issues that farmers faced, and the national policies and events that affected agricultural change in the county. The goal of this thesis is to reveal the history (what happened) and reasons for the changes (why it happened) in agriculture in Coconino County that occurred during those years. The questions this thesis addresses are these: how and when did agriculture flourish, and when and why did it decline? Which national trends, agricultural policy acts, and regional climatic factors changed agriculture through time in Coconino County? I chose to address these questions because this issue has not been written about in great depth; I could not find any comprehensive, written analyses of the factors that caused agriculture to decline so drastically. I wanted to understand

whether the commonly held belief—that climate was to blame for the lack of farming —was true. In fact, the answer is much more complicated than that. Although lack of precipitation during the 1950s was certainly to blame for agricultural decline, national trends and federal agricultural policies had more sustained impact.

I have long been interested in local food sustainability efforts and permaculture, and have participated as a food grower in my work and in my garden as well as within the community through nurseries, CSAs (Community Supported Agriculture), and non-profit organizations, both in Tucson and Flagstaff. The history of agriculture in the place that I live is not an abstract concept—the beliefs held about a region's history can influence current perception. I wished to bring the "real story" of regional agricultural history to light, so that we can be accurate about the reasons for farming's absence. Another inspiration for this research was to understand exactly what the motivators and challenges were within farming from the point of view of the people (or at least person: the Cooperative Extension Agricultural Extension Agent) who lived during the time periods of this thesis.

The anchor of my thesis and primary source materials were Agricultural Extension Service archival records. These records are not publically accessible (in other words, they are not yet digitized or available at a library), and are only available by appointment with the Extension office. To complement the information I found within these reports, I read historic transcripts of interviews conducted with farmers from Cline Library's Special Collections to provide me with stories of farmers and farming, focusing on details that described change, which provided me with factors for further analysis. And, I researched climatic

drought records and any other matters that affected Coconino County's farmers, crops, and agricultural commerce, such as labor issues, transportation, and modernization of the national food system. Ultimately, I thought it was important simply to discover and share a story about this landscape's recent past with particular respect to agriculture.

I structured the thesis chronologically, examining core themes during the period covered in each chapter so that each is defined by a particular agricultural time period or era. These eras mark the years when an agricultural trend or crop was most prominent. The first three chapters can be called, in short, the 'settlement,' 'potato,' and 'bean' eras. The final chapter covers the four factors that caused rapid agricultural decline. As a result of my research, I determined the core factors that produced agricultural change within Coconino County as: settlement patterns, federal policy, developments in transportation, war, crop types, weather (precipitation and water availability), soil fertility, and the mechanization of agriculture (or the absence of it, during pre-industrial farming).

The most important factors that induced change are different over the course of each chapter:

- In Chapter 1, from 1851 to 1917, settlement, soil fertility, precipitation, transportation (via train), and federal policies are key.
- In Chapter 2, from 1918 to 1929, the most important drivers of change were settlement, soil fertility, precipitation, and mechanization.
- In Chapter 3, from 1930 to 1955, the primary drivers were federal policies, mechanization and labor, WWII, and precipitation.

- Finally, in Chapter 4, from 1956 to 1965, federal policies, precipitation, mechanization, transportation, and a shift in the national socio-cultural paradigm (also called the popular opinion or zeitgeist) that accompanied increased modernization of U.S. culture defined lasting local agricultural change.

The themes that are the major drivers of change within each time period vary, though certain ones are consistent throughout the 100 years covered in this thesis: soil fertility, precipitation, federal policy, and mechanization (or technological innovation). If a particular theme did not significantly affect agriculture or was not a significant driver of change during the time period covered in a chapter, it was omitted in my discussion.

It should be noted that the objectivity of this study was somewhat restricted by the source material. My primary source records, the Extension Service annual reports, have some limitations. They were written entirely by the Extension Service Agent on duty[a] (rather than, for instance, by farmers) and it is unclear who the intended audience was. It appears from the tone of the reports that they were a summation and record (and perhaps a justification of how funds were spent) of the work that the Agent and Extension Service conducted. The reports provide a historical record of the projects conducted from year to year and probably served as informational records for farmers, other agencies, and future Extension Agents. It is inevitable that the Agent's philosophical perspectives, training, and personal history affected the language of the Extension reports. Still, I have chosen to accept the written voice of the Agricultural Agent to be truthful, and when I have found discrepancies or other

[a] From 1918 to 1960 there were six Extension Agents. Each served consecutively. Some Agents served for just a few years, some for as many as twenty years.

information that requires clarification of the Agent's account, I discuss it in this study.

Methods

To understand the factors at play in the rise and decline of commercial agriculture in Coconino County, I read through, recorded, and analyzed the narrative and data contained within forty-three annual Extension reports, which began in 1918 and ended in 1960. These reports and their photographs are the only agricultural sources I found for Coconino County that provide detailed and relatively consistent information for almost each year from the end of WWI past mid-century (although there is information contained in other historic notes that covers shorter periods of time). The Extension annual reports are housed as archives at the Cooperative Agricultural Extension Service in Flagstaff, where they were "re-discovered" about six years ago by Hattie Braun, the current Master Gardener Program Coordinator. Without the Extension reports, this in-depth analysis of Flagstaff's historic commercial agriculture would not have been possible. There has thus far been almost no analysis of or comprehensive writings of these reports, besides a few exceptions: Flagstaff cultural historian Susan Olberding's thesis[b] and her book[c] based on the thesis have some discussion about parts of the reports. And teams within the Sustainable Agriculture course in 2009 taught by Dr. Patrick Pynes (which I attended) researched a selection of the reports for historic agriculture class papers. The projects developed during that class ultimately inspired this thesis. However, to date, most publically-available published works that provide information about

[b] Olberding, Susan Deaver. 1993. *A history of Fort Valley, Arizona and its forest experiment station:1850-1992*. (M.A.Thesis, Northern Arizona University.)
[c] Olberding, Susan Deaver. 2002. *Fort Valley, Then and Now: A Look at an Arizona Settlement*. Flagstaff: Fort Valley Publishing.

Flagstaff's agricultural history discuss it in broad and generalized ways, and there is, to my knowledge, no published work besides Olberding's 2002 book on Fort Valley within Flagstaff that references the reports.

In general, the reports' content covers these topics: farm crops, small grains, orchards, soils and green manures, climate and rainfall, truck (vegetable) crops, pest issues, plant diseases and treatment recommendations, pesticides and herbicides, livestock, rodent and predator control, county and state fairs, 4-H programs, marketing of crops, agricultural policies (such as agricultural conservation programs like the Soil Bank), labor issues, and WWII war activities. All of these topics are not discussed in the thesis; instead, I chose the ones that were most pertinent to the study. Though the information in each of the Extension reports is extensive, it is not necessarily always quantitative, nor is each report structured in the same way (though they are very similar). The reports are an Agent's narrative account of his and the Extension Service's work. They do not always provide an exhaustive record of the total yields of every crop grown, which farmers grew the crops, or what area each crop was grown in; however, they do provide plenty of description and detail from which I could derive patterns and conclusions. For example, one year an Agent may have discussed the number of acres of potatoes that were fertilized or sprayed for insect problems as well as the number of acres harvested in a particular area, but did not disclose the total number of potato acres sown in Coconino County. However, the following year, the Agent might reveal the total potato yield or total acres sown. To offer another example: within the Agent's yearly narrative on orchards, there was always a discussion of the number of apple trees that were sprayed to prevent pests, but the total number of orchards or yields harvested were not included in each year's report. In order to develop accurate

conclusions and to ensure that this thesis was as thorough as possible, I read each report in great detail, and paid careful attention to changes of key factors, such as crop yields or types, soils, federal policies, and drought from year to year, as well as any documentation of total harvest, yields, and acres. However, the results of my research are largely qualitative, rather than quantitative.

I synthesized this information into a database that summarizes and organizes the information in the reports into distinct categories (e.g. potatoes, beans, labor, marketing, soils, precipitation, and so on, but not animal husbandry, ranching, or home-keeping). The information can be viewed by year or by category. Creating the database before writing the thesis, though it was somewhat of a monumental task, gave me a tool with which I could more easily examine and analyze changes within each agricultural category in the Extension reports through time.

Next, because precipitation is so important to agriculture, I matched the historic narrative accounts in the Extension reports to precipitation records available from the National Oceanic and Atmospheric Administration (NOAA)[d], and created a table that shows the relative extent of precipitation and drought for each month from 1918 to 1965. Finally, to analyze the data on federal agricultural policies that affected land use in Coconino County, I researched materials about Congressional agricultural laws that were enacted during the time period of this study, and paid special attention to any discussion of these and their effects in the Extension reports, so as to match local change with national policy. Lastly, I discussed which elements were "drivers" or caused local agricultural change during the period of time of each chapter. Thus, I have developed a history of the

[d] The National Weather Service is one agency within NOAA, however, the precipitation records came directly from NOAA online archives.

primary factors that were significant elements of the county's agricultural history, especially those that caused agriculture to go through cycles of fruition and decline, in an effort to show how and why agricultural land use changed over time.

Theoretical perspectives

Ultimately, this thesis is not a "story" about a regional, sustainable, enduring, agricultural past that we should emulate now. Instead, it is an attempt to piece together and share part of the history of this place—Coconino County—that is largely forgotten and certainly not readily visible. This thesis does not intend to relay the message that the agricultural patterns practiced up through the 1960s were sustainable. But, perhaps the knowledge that agriculture was widespread and that it surrounded many of the communities within Coconino County will help to inspire current local food-growing efforts. It is outside the time scope of this thesis to quantify that more food was grown and eaten "locally" pre-1950 or '60 in Coconino County than at present; however, it is clear from the reports that this was likely the case. A great deal of food was grown commercially, purchased, and eaten here—the food cycle, from seed planting to composting, was regional—much more than at present.

Why is this agricultural history important, if it was not sustainable and had a relatively short lifespan, compared to, for instance, indigenous agricultural traditions? My perspective is that understanding the history of a place connects a person to that locale more fully, especially if that history (or part of it) is invisible. Since large farms have largely disappeared from the area around Flagstaff, Sedona, and beyond, having reverted to grassland and forests and developed as subdivisions, it is difficult to envision the extent of historic

agriculture in this landscape without prior knowledge of its existence. Without a complete knowledge of this history, we have a distorted vision of the past. This distorted vision has led to the incorrect assumption that the challenging short-season and variable climate was to blame for farming's demise. That assumption may influence belief, attitude and behavior towards a place. It may influence the belief that sustainable agriculture is not possible here, while other arid (and high elevation) areas in the Southwest have demonstrated otherwise.

Landscape-scale historical knowledge imparts a sense of place. Field ecologist Daniel Janzen, quoted in '*Cultures of Habitat*,' by Gary Nabhan, says "what escapes the eye is the most insidious kind of extinction—the extinction of interactions" (Nabhan 1997, 259). What is missing is "commonly-held" (or dare I say it, mainstream) knowledge within this community about a whole suite of interactions that happened between farmers, the land, and the community for at least 100 years. While there is extensive publically-available information and analysis on regional indigenous agriculture, there is a significant lack about more recent, commercial agriculture. In fact, farming was integral to this county during the 20th century, and deserves the same recognition as ranching and logging. Southwest author Gregory Cajete writes, "Human interactive relationships with places give rise to and define human cultures and communities. […] Understanding orientation to place is essential in order to grasp what it means to be related" (A People's Ecology 1999, 7 and 18). I contend that we become deeply related to a place, and can appreciate it and our part within it, by understanding its cultural, ecological, agricultural, and social history. This thesis seeks to bring to light the agricultural heritage of the recent past.

I hope that other advocates of local and regional food cultivation will be heartened to know that 25,000 acres of potatoes, beans, grains, fruit and many other vegetables were grown under conditions that are much more challenging than we have now. Granted, the climate is equally as variable now as it was then, and the challenges and cycles of abundance and lack are likely always going to be part of the local agricultural landscape. However, farmers of the past century did not have irrigation, greenhouses, row covers, cold frames, organic pest controls, or our current knowledge about compost, the benefits of manures or the enduring success of indigenous agriculture. There are many aspects of modern life, including quick access to information, that make small-scale farming easier now than then.

This thesis shows that the practices of monoculture, soil depletion, and commercial-scale farming—as discussed during the period that this thesis covers—are not sustainable. Continuing them, especially in the face of rapid societal change and land degradation they caused would not have been possible, even if drought had not ensued. However, the "new" understanding that agriculture was so fundamental, widespread and often very successful—even using often unsustainable practices—in Coconino County should create a sense of possibility. The goal of this thesis, after my research uncovered the full agricultural local story, is to counter the belief that "it is not possible here." The point is not that we should explicitly replicate that history. It is to show, even with challenges farmers faced, that farming was abundant, fruitful, and certainly widespread, especially around Flagstaff, Sedona, and Williams, as well as farther north and south of these towns within Coconino County. It was integral to community life. With current sustainable farming knowledge—as well as important elements such as irrigation and soil-building practices—many of the

problems farmers faced then would be alleviated now. Agricultural decline during the conditions of the late 1950s through 1960s should not be the future predictor of its success. Farming's disappearance from this land at that time had less to do with the often-expressed concept that it "was just too hard, and thus it didn't last." Rather, there was a confluence of events that led to its decline: a harsh, yet temporary, drought, federal policies that created rapid change, and socio-cultural shifts in the national zeitgeist. Combined, these prevented commercial agriculture's continuation in Coconino County as it had existed. But, prior to this rapid change, it was possible, it did happen, and advocates of sustainable, regional, food system renewal—especially using sustainable, organic, permaculture methods—can find encouragement in this history.

CHAPTER I: 1851 to 1917—Homesteads and settlement

"Beautiful scenery and agriculture are neighbors in Coconino County."
~Agricultural Extension Service report~

I. Introduction

Chapter 1's time period unfolds in 1851 and extends to 1917. It starts with the beginnings of U.S. land settlement and exploration in Arizona Territory (then New Mexico territory) in the 1850s, and covers the first federal land law passed in 1862 that enabled settler land ownership—and thus the beginning of settler farming and development of towns in Coconino County[e]. This chapter ends with the inception of some of the first Congressional policy acts, several of which created the Agricultural Extension Service, from which the primary research records for this thesis came. Transportation via trains also began during this era. In 1882, the railroad through Flagstaff was established—the first mode of mass transit in the U.S. The railroad led to population growth due to increased ease of travel, and it supported agricultural commerce by enabling transport of seeds and crops to and from population centers. The train was a primary catalyst in the large-scale production of local food, since for the first time significant quantities of crops could be shipped fairly quickly over a distance. Thus farmers could, and did, profitably expand. This chapter also covers early colonial settlers' subsistence homestead settlement, which later developed into commercialized farms. The primary elements during this time period that affected agricultural history and its change are federal land act policies, transportation (rail), settlement, and the types of crops grown by new residents.

To give some information about this locale, Coconino County is Arizona's largest county and the second largest county in the United States, with an

[e] Indigenous agriculture in northern Arizona had been in existence, of course, for thousands of years.

expanse of 18,661 square miles, or 11,943,040 acres. It sits at the top of the state, bounded to the north by Utah, and to the east and west by Navajo and Mohave counties (Figure 1). Directly to the south, Coconino is bordered by Yavapai and Gila counties. Coconino is home to many indigenous peoples: Indian reservations encompass 46 percent of the county—lands of the Hopi, Navajo, Paiute, Havasupai, Yavapai and Hualapai tribes. The word "Coconino" is derived from "Cosnino," the Hopi name for Havasupai and Yavapai peoples (Barnes 1960).

Flagstaff and Sedona are the areas in Coconino County around which this study is primarily focused because of their historic population size and level of agricultural production. Flagstaff is now the county seat. Within a larger bioregional view, Flagstaff sits in the southwest of the Colorado Plateau (Figures 1 and 3), on the Mogollon Rim. The Rim's escarpment stretches in a southward line along the Plateau and extends for about 200 miles in length (Figure 2). It is characterized by higher elevations than most of Arizona, averaging 7,000 feet, and has the largest range of ponderosa pine forest stands in the U.S. (Grahame and Sisk 2002). On the Rim, Flagstaff is nestled below the San Francisco Peaks, a mountain range with six peaks that reach in height from 11,460 to 12,637 feet (Figure 3), and sacred to thirteen Native American tribes. The original name for the tallest peak and mountain in Arizona, now called Humphreys, is *Nuvateekiaovi*, Hopi for "Place of snow at the very top," or the "Kachina Place." Navajos call it *Dook'o'oosłííd*, translated as "sacred mountain of the west."

Before American colonial settlement, low-intensity fires occurred along the Mogollon Rim every two to fifteen years. The fires kept the forests around the Peaks relatively open and benefitted native grasses. Beautiful grass-filled

fields between forest stands under tall mountains was the sight that greeted homestead settlers and farmers upon their arrival (Grahame and Sisk 2002). Some of the extensive meadows and grassland parks, like Hart Prairie, Doney Park, and Black Bill Park (now part of the Timberline area), began prime areas for farming and ranching.

II. Federal land settlement policy and land act laws

Several Congressional Acts that were passed during the second half of the twentieth century are important to this historical time period, enabling settlement and agriculture. These laws were some of the first national federally-mandated acts that caused dramatic land use change in the western U.S., and Flagstaff was no exception. The laws encouraged white settlement of the West and facilitated the early beginnings of pioneer[f] agriculture in Arizona (Figure 4). On May 20th, 1862, the year before Arizona became a territory (its lands were separated from New Mexico's), President Lincoln passed a new law which opened up so-called "unreserved and unappropriated public lands"[g] in the West, under the Homestead Act (Forbes 1911). The Homestead Act of 1862 paved the way for homestead acquisition. It effectively promoted extensive settler land ownership and land use (for farming, ranching, mining, etc.). Private land ownership was now legalized. The Homestead Act granted legal land ownership

[f] I want to acknowledge that the word "pioneer" has the subtle assumption that white people were the first to explore these lands, which is entirely false. From a colonial perspective, white Americans were indeed pioneers. From a native perspective, they were invaders. The word "settler" is more accurate—because indeed, white Americans did settle—and I will use that word in this thesis, but my use of "settler" does not in any way imply that white people were the first settlers, or that they had more right to land ownership here or anywhere else.

[g] "While distributing much land to farmers at minimal cost, homesteading took place on lands on which Native people had recently lived and had been forcefully driven off. Economically, the program was a large scale redistribution of land from autonomous tribes to taxpaying farmers, a process carried out directly when Indian reservations were broken up into holdings by individual families." (http://en.wikipedia.org/wiki/Homestead_Act#Dispossession_of_Native_Americans)

status to white settlers, making the land transfer from indigenous to white people official. Citizens over the age of twenty-one were granted private ownership to 160 acres, if they could prove fourteen months of continual residence with a fee of $1.25-$2.50 an acre, or five years intermittent residence, and a fee of $10. The Act required that "improvements" were made on the land, such as farms and structures, though rarely was this checked when a deed was filed (National Archives 2011).

Also in 1862, and in 1890[h], Congress passed the Morrill Acts. These statutes created land-grant universities nationwide for the purpose of teaching agriculture, engineering, and military tactics (military tactics were added to the bill after the vote failed the first time in Congress). Land-grant universities were critical for the expansion and development of commercial agriculture in the U.S. In 1887, the Hatch Act was passed, giving states federal funding to establish agriculture experiment stations, which were associated with the newly-developed land-grant universities (California Agricultural Experiment Station 1914, 217)[i]. From 1913 to 1914, twenty-six "cooperative demonstrations" through the agriculture stations began in Arizona, using State Legislature appropriations. With the passing of the historic Smith-Lever Act in 1914, Arizona gained federal funding to standardize cooperative extension work in partnerships with the University of Arizona, and on July 1, 1914, the Agricultural Extension Service was formed.

[h] The second Morrill Act was also called the Agricultural College Act of 1890, and was somewhat like an affirmative action education mandate, directed at previously Confederate States.

[i] Other federal laws passed during this period include the Adams Act, or Second Experiment Station Act of 1906, which increased annual appropriation funding for agricultural experiment stations within each state. (California Agricultural Experiment Station 1914, 217).

In 1917, three years after the Smith-Lever Act was passed, Flagstaff and its burgeoning farming community got their Agricultural Experiment Station (now called the Coconino County Cooperative Extension). The Extension is a State agency with County offices,[j] which acted (and still acts) as a central hub of information while providing professional assistance to farmers, ranchers and county residents. State cooperative extensions were established to provide information about "new developments in agriculture and food, home and family, the environment, and community economic development" (Arizona Cooperative Extension 2011). Extension Agents were tasked with conducting agricultural research and demonstration farm plots that examined and shared the latest knowledge of that time. Agents negotiated prices for commercial crops with buyers and federal agencies (federal agencies purchased crops during WWI, the Great Depression, and WWII), helped organize produce shipments and other aspects integral to commercial agriculture, and became liaisons between farming communities across Coconino County and beyond.

III. Settlement and railroads: the beginnings of mass transit

In 1851, the Kendrick-Sitgreaves expedition guided by Antoine Leroux traveled through the area we now call Flagstaff; the first official party to document travels through the high desert, pines and meadows of northern Arizona. It was a time when bighorn sheep, deer, grizzlies, wolves, wild turkeys, coyotes, and prairie dogs were abundant (Ashworth 1992, 12-13). Native Merriam's elk, however, were almost extirpated as a result of over-hunting by that time, and were gone by the late 1800s, while the elk that are now present are

[j] The Coconino County Cooperative Extension is a partnership with the U.S. Department of Agriculture, University of Arizona land-grant College of Agriculture and people in the community (Coconino County Cooperative Extension website: http://www.coconino.az.gov/coopext.aspx?id=233).

more recent transplants from Yellowstone National Park (Britt, Western Association of Fish and Wildlife Agencies 1982). Thus there is no discussion about crop damage from elk in the Agriculture Extension reports, although to the dismay of farmers, deer occasionally enjoyed the grain fields.

Exploration parties like the Kendrick-Sitgreaves expedition were part of a national drive to create routes across the U.S. from the east to the west coast. In 1853, a Corps of Topographical Engineers party led by Lieutenant A.W. Whipple crossed over the Colorado Plateau and through Flagstaff. In 1857, a group led by Lieutenant E.F. Beale followed, using an improbable herd of twenty-two camels as pack animals—complete with riders from Greece and Turkey (Ashworth 1992, 13)—and surveyed a wagon road to aid settler emigration to California. The wagon road building started two years later and "became a popular emigrant trail during the 1860s and 1870s". The general route of the Beale Wagon road wound west from Canyon Diablo, passed by Leroux Springs, traveled over Switzer Mesa, and skirted the base of the San Francisco Peaks. Its traces can still be seen at Flagstaff's Buffalo Park. Much later, U.S. Route 66, the Santa Fe Railway, and Interstate 40 traced some of the same trail (Jonas 2001).

Despite these initial surveys, Flagstaff remained relatively unpopulated by American settlers until after the end of the Civil War in 1865, though prospectors and explorers moved through the area throughout the 1860s and 1870s, bringing sheep and cattle to forage in the deep, horse-belly-high native grasses and relatively abundant water (Ashworth 1992, 14). That would change within two decades, as a result of the signing of the Railroad Act, six months after the Homestead Act was passed (U.S. National Archives and Records Administration, n.d.). In 1869, John Wesley Powell made his historic and well-documented

Colorado River expedition. And that same year, during a Midwest-to-coast railway survey, General William Palmer recorded his enthusiasm about the abundance of natural resources around Flagstaff, noting that the old-growth pines on Woody Mountain near the site of the present-day Arboretum, were "200 feet high and ten feet in diameter" (Palmer 1869, cited in Ashworth 1992, 14). With spring melt, the Fort Valley floodplain (then Leroux Park) was a shallow lake, and the Rio de Flag (then Antelope Creek) was in high flow (Ashworth 1992, 14).

Palmer gave very positive assessments of the landscape's potential:

> "…we have the finest country met with, perhaps, on our entire route…magnificently timbered, well watered, and covered with the most nutritious grama grass. Its soil, black and rich from the decomposition of the lava […] will provide, without irrigation, wheat, barley, oats and potatoes, in the heaviest crops. The summit and slopes of this range are dotted everywhere with beautiful little grassy parks, openings in the virgin forest of gigantic pines which cover the mountain"[k] (Ashworth 1992, 14).

However, nine years later, the Deputy Supervisor for the U.S. Geological Survey would have an entirely different evaluation, judging the landscape to be unsatisfactory for farming, with poor soil and "broken" land (Palmer 1869, cited in Ashworth 1992, 15). As land was furrowed over the next 100 years, both appraisals—of abundance and hardship—would prove to be true for farmers.

In 1853, after these investigative explorations, Congress authorized funds to finance a survey for a cross-country railroad as part of the extensive Pacific

[k] Donna Ashworth's *Biography of a Small Mountain* was my primary source for insightful writings and quotes about pre-settlement exploration parties, and she uses Palmer's quote on natural resources and farmland potential, which I excerpted here. I also consulted the original materials by Palmer for historic accuracy (Ashworth, Donna. 1992. Biography of a Small Mountain. Flagstaff: Small Mountain Books).

Railroad Survey conducted from 1853 to 1855. It was "the first attempt of the government at a comprehensive, systematic examination of the vast region lying between the Mississippi River and the Pacific Ocean" and these exploration and railway survey expeditions increased the rate of east-to-west migration (Albright 1921, vii; Ashworth 1992, 13).

After the Civil War, several cross-country rail tracks were completed. Among them, Union and Central Pacific railroads ran the 42nd parallel, and Southern Pacific ran the 32nd parallel. The 42nd parallel route eventually became the first transcontinental track and connected California with the rest of the country (Ashworth 1992, 21). General Palmer recommended that the 35th parallel route run by the Atlantic and Pacific Railroad (A&P), be laid south of the Peaks on a path through Coconino County. He got his way, and in late summer of 1882, after the "nationwide panic and [economic] depression" of the 1870s had passed, Flagstaff's first train rumbled into town, over railroad ties[l] cut from native pine (Cline 1994, 7). The building of the railroads shortened travel time across the U.S. from many months to weeks, and helped to drive settlement from east to west, and thus the A&P Railroad substantially accelerated population growth in Flagstaff. The U.S. National Archives state that, "homesteaders who persevered were rewarded with opportunities as rapid changes in transportation eased some of the hardships" (U.S. National Archives and Records Administration, n.d.). The new railroads provided a quicker, safer, and easier mode of travel for homesteaders, and new immigrants were lured westward by railroad companies who had engaged in land speculation, and were eager to sell off land at inflated prices.

[l] A railroad tie is used as a base for steel railroad tracks. Traditionally, ties have been made of wood, now concrete is commonly used. The ties are laid cross-wise under the tracks to support and hold them in place.

Coconino County was at that time part of Yavapai County, and the county seat was in Prescott. Tired of the tax revenues going to Prescott (most significantly those garnered from the railroad), the Northern Arizonan 16th Territorial Assembly won an election in 1891 that carved Coconino from Yavapai, ensuring more tax income for the new county seat, in Flagstaff (Arizona Department of Commerce 2009). Flagstaff's development as a town was underway, and it became settled for similar reasons as other small, non-gold-rush Western towns of the era: logging, ranching, and farming (including subsistence homesteading). A few weeks after Flagstaff's first train arrived in 1882, a second historic whistle blew, which marked the opening of the first sawmill (Cline 1994, 7). The importance of the railroad to Flagstaff's development cannot be overstated (Ashworth 1992, 24), since it provided quick transportation and boosted logging within Flagstaff, thus providing jobs at the sawmill. Logging was one of the first industries in the town's development, and cutting wood for the railroad tracks kept the sawmill busy. Development of the railroad meant that for the first time, wagons were not the only means of transport to and from northern Arizona. In the same way cars started to revolutionize human movement across the land 30 years later, trains began to expand the possibilities that were available, from individual travel to merchant shipping. The train brought and sent mail, newspapers, freight, livestock, food, books, and even bicycles (Ashworth 1992, 24), and transported travelers from the east (Cline 1994, 7). Rail transport also enabled the sale and delivery of "thousands of pounds of potatoes" grown in Coconino County to other regional towns as well as south to Phoenix, Arizona's largest city (Arizona Champion newspaper 1891). Railroad travel was the beginning of rapid, public mass transit, and it was one of the first major drivers in transforming agricultural land use from homesteading to commercial farming in Coconino County. It drove the

economics of agriculture, and was an important industry it its own right. Once the railroad and sawmill were established and running, they created a core of commercial industry in Flagstaff that supported the town's growth. Ranchers' cattle and sheep herds grew large, and the train carried wool from Flagstaff's sheep as far away as Boston. As settlers arrived to homestead lands in and around Flagstaff, they started food gardens and cleared land with horse and plow to sow grain for livestock feed. One early prominent family who helped establish businesses in Flagstaff, the Babbitt brothers, ran a firm that became the primary wholesale/retail business in town, bringing in up to four freight cars worth of supplies each week. The town became a hub for settlers in Coconino County: a "supply point and market" for local crops, building supplies, food, and merchandise (Cline 1994, 29). "The new rail lines provided ready access to manufactured goods, and catalog houses like Montgomery Ward offered farm tools, barbed wire, linens, and even weapons, delivered via the rails" (U.S. National Archives and Records Administration, n.d.).

By 1900, Flagstaff's population had reached 1,271 residents, which was about a fourth of Coconino County's total population of 5,344 (U.S. Census Bureau 1900). The first motor car arrived by rail in 1904, and by 1911, there were twenty-five car owners in Flagstaff. The town incorporated in 1928. However, long-distance travel and shipping was still by rail in the early 1900s, since the infrastructure for car travel had not yet been developed. The mechanization of farming—and even timber removal—had yet to arrive; both farming and logging were still largely human and horse-powered after the turn of the century.

The first Homestead Act land patents were filed in 1881 for the Fort Valley area (Olberding 1993, 28). By the end of 1882, 90 to 100 settlers had each received

160 homestead acres. Root crops, especially potatoes, along with hay or "small" grains such as spring wheat, oats and barley, corn, and other vegetables were grown as staples. Farmers were, even before the turn of the century and without soil amendments, yielding five to six tons of potatoes per acre from the high elevation, arid land. Flagstaff was well on its way to becoming the "potato capital of Arizona"(Pioneer Museum Historical Society 2009).

IV. Conclusions

From the period 1851 to 1917, Coconino County and Flagstaff were established and populated by early colonial settlers and farmers who emigrated from east to west. Homestead ownership was facilitated by the passing of the federal Homestead Act. Once the railroad was built, the movement of people and goods into Flagstaff increased, and commercial sale of crops from local to regional markets became possible. Some of the first national farm policy acts were ratified, notably the Hatch Act in 1887, that created the Agricultural Extension Service. The Service provided critical support and information that helped to increase commercial farming in Flagstaff. Commercial farming started just after the railroad was built, and the Extension Service—also called the Agricultural Extension—helped farmers to expand their acreage (see Chapter 2).

CHAPTER II: 1918 to 1929—Potatoes and commercial farm development

I. Introduction

Chapter 2 extends from 1918 through 1929, during the era when potatoes were the most successful commercial crop in Flagstaff. The agricultural factors or drivers of change during this time period were settlement, climate and precipitation, soil fertility, and local and national policies that affected farmers. The predominant crops during this era included potatoes, small grains (such as wheat, oats and barley), lettuce and other vegetables, and fruit from Sedona.

This chapter covers the first period of time during which the Agricultural Extension Service created records of commercial agriculture in Coconino County. From the period of 1918 to 1960, Extension Service Agents documented their efforts to build farming in Coconino County through a series of yearly reports. The annual reports document the Extension's programs, the Extension Agents' recommendations to farmers, the Agent's efforts to increase farmers' success and productivity through education and demonstration farms, and the problems farmers encountered, among other agricultural subjects. They provide an illuminating account of the crops that were grown, the issues farmers faced, the weather, and other factors that influenced or changed farming in Coconino County over time.

The first annual report was written at the end of 1918, and for this reason, Chapter 2 starts in this year. It is also the same year that World War I ended, and the two "great" wars influenced national concern about food supply. During WWI, Extension Service offices around the county worked extensively on expanding their capacity from one area—education—to individualized services

and help for farmers, communities, and associations, while promoting and marketing local crops. In Coconino County, the Service was involved in and provided assistance in almost all aspects of farming, ranching, and animal husbandry businesses, such as poultry-raising. As of WWII (Chapter 3), a second Extension program was started in a category called "Women's Work." Home Agents—all women—conducted trainings for families on a variety of homemaking topics. These included food preservation activities such as cooking, storing, canning and drying, mattress-making, and even morality and ethics classes for children. All this is to say that the federal government provided funding at the local level through the Extension Service for a variety of services that directly influenced and affected home life and subsistence, in support of rural families. While a discussion of the home "economics" aspect of the Extension's work captures the scope of the Extension's programs and shows the level of its influence in rural communities, the primary focus and the rest of this thesis will be on the agricultural aspects of the Extension Service's work.

II. Settlement and crops

During the period in the "teen" years and 1920s, settlements and farm establishment in Coconino County continued to increase. Across the U.S., rural families on farms were the largest household demographic. In Coconino County, the Agricultural Extension Service provided outreach and assistance to farming communities, especially those within 30 miles of Flagstaff, which included all but one (Table 1). The most distant community in the county, called Fredonia, was difficult for the Agriculture Extension Agent to reach in those days, since the Extension Service office was located in Flagstaff and transportation to remote areas by horse or early motor car was slow and time consuming. The Extension

reports describe the primary areas around Flagstaff and Sedona where farms and farming communities were clustered. A list of all the communities and their historic farming acreage is as follows:

Table 1. Coconino County farming communities (Extension Service report 1953)[m].

Area	Acres	Location relative to Flagstaff (see map, Figure 5)
Doney Park	8,000	10 miles northeast of Flagstaff
Black Bill Park	7,000	12 miles northeast of Flagstaff; adjoins Doney Park
Kendrick Park	2,000	21 miles north of Flagstaff
Corley Park	500	Between the San Francisco Peaks and Kendrick Park
Garland Prairie	1,250	28 miles east of Flagstaff, 10 miles southwest of the small town of Parks
Red Lake & Pitmann Valley	2,500	Near Parks, 22 miles west of Flagstaff (north of Williams) and 8 miles east of Williams, respectively
Munds Park	1,000	23 miles south of Flagstaff
Hay Lake area	2,000	Approx. 23 miles south-east of Mormon Lake, 20 miles east of Happy Jack as the crow flies, and directly south of Tremaine, Long and Soldier Lakes.
Oak Creek, Sedona	150	30 miles south of Flagstaff
Fredonia	1,200	200 miles north of Flagstaff

[m] The full citation for "Extension Service report" in the references is: "Coconino County Cooperative Extension Service. 1918 through 1960. *Annual narrative reports.* Flagstaff: Coconino County Cooperative Extension Service." I used "Extension Service report" and the individual year in the body of the thesis for the sake of brevity and clarity. Some of the reports do not include page numbers; therefore I have not used page numbers in the report citations.

In 1920, Coconino County's population was 9,982, and increased to 14,064 by 1930. By contrast, Flagstaff's population in 1920 was 3,186, and just 3,891 in 1930 (U.S. Census Bureau, Arizona Counties 1995). The USDA (U.S. Department of Agriculture) agricultural archives show 280 farms in the county in 1900, and 656 farms in 1910 (Table 2). Arizona's farms, between 1920 and 1930, were increasing more rapidly than any other state during that decade.

The farms in the Plateau country around Flagstaff were situated at elevations of 6,900 to 7,300 feet, while Sedona's Oak Creek Canyon orchards and farms, located 30 miles south of Flagstaff, were between 4,500 to 5,500 feet elevation. The mountain climate of the Plateau makes for a short growing season of 90 to 100 days. Oak Creek's lower elevation, warmer temperatures, wind protection provided by the canyon walls, and a growing season that is double the length of Flagstaff's, makes fruit production possible. Thus, while Flagstaff had its root crop and grain farm fields, Oak Creek had its apple and stone fruit orchards. Some orcharding families sold their fruit locally in Sedona, while larger orchards shipped to bigger markets in Arizona. Fruit growing, especially apples and peaches, helped to grow the early Sedona economy, while potatoes and grains were the primary agricultural crops of the high country.

The primary growing months in Flagstaff were (and still are) June, July and August. Late frosts can occur in mid-June, and early frosts in late August or early September. Occasionally an ideal growing year will occur, when frosts end in May and don't arrive again until October. Farmers usually started summer crops in May, and harvested in October or early November. On the Plateau, the difference between daytime and nighttime temperatures can fluctuate 30 to 40 degrees during the summer, and strong spring winds can evaporate winter's

moisture from the soil. The harsh climatic conditions, arid climate, and soil structure determined the types of crops that could be successfully grown on a commercial scale—since most farms at that time did not have irrigation, and of course none had mechanization or any modern facilities such as greenhouses or other crop protectors (for example, row covers). Farms during this time period did not have electricity or running water, and few farmers had yet built cisterns, wells or piping. Nevertheless, for all but five years of the entire period recorded by the Extension annual reports—from 1918 to 1955 (the reports stop in 1960)—the total farming acreage was fairly consistently over 25,000 acres—up to a high of 27,033 acres in 1945. In comparison, there are now no working farms currently around Flagstaff (in 2011). It is very likely that the reasons for large farming acreages in the county (40 acres and more per farm) were not <u>despite</u> the conditions—they are <u>because</u> of the conditions: "Because of the dry climate, western farmers needed to work a great deal of land to make a profit" (Library of Congress, History of the American West 2011). Commercial farmers during this historic period in Coconino County were not, as a whole, trying to make their living from small, dense, irrigated, mulched, intercropped plots.[n] They were dry farming large parcels of open, arid lands. The farmers that wanted to produce large commercial-scale quantities of crops had to have enough acreage to survive crop losses from farming on the Plateau due to the vagaries of precipitation, frosts and fluctuating crop prices, and due to the way they farmed: most without irrigation, mulch, and soil amendments. It was difficult to consistently produce enough quality and quantity of each crop, so more acreage helped to hedge

[n] However, there are still working farms in Coconino County. The USDA 2007 agriculture census lists 772 acres in the county as 'land used for vegetables' (USDA 2007). This is in comparison to ~25,000 acres farmed during the time period of this thesis. Then as now, there were many 'truck' or 'market' gardeners around Flagstaff and especially in Sedona, and many farmers had smaller kitchen gardens for home use. These did have their place as a secondary income source, and they played a larger economic role for families during WWII.

against—at times—unfavorable climatic conditions, lower yields from lack of soil fertility, diseases, and insects. While it was not explicitly stated in the reports, it is clear in the discussions about crop loss from drought or disease: that if a farmer lost 40 percent of a crop, the larger the acreage, the more chance a farmer had to break even financially. Farmers also had multiple fields, but it is not clear in the reports whether they were located in different microclimates (as in Hopi farming). Farmers were, and are, persistent, hardworking, and tenacious. These qualities were requirements for farming in Coconino County and, generally, in the arid southwest. Nevertheless, even with these challenges, the quantity of crop yields were, in many years, quite large.

The series of annual narrative reports, created by Coconino County's Agricultural Extension Service as mentioned before, tracked the Agricultural Extension Agent's work from 1918 to 1960. These often rambling narrative archives—written by the Agent in third person—list the programs and issues each Agent was engaged in throughout his[o] tenure. Historical documents can both reveal and conceal, and the reasons why an Agent may have chosen to include or neglect certain information is unclear. From 1920 to 1924, Agent F.A. Chisolm recorded the number of farmers the Extension Service worked with in each yearly report. From then forward, the total number of farmers in Coconino County was not listed again. Whether this was an oversight, or a re-prioritization, since after 1924 only Farm Bureau Committee members were listed almost yearly, is unknown. Thus we know that in the first half of the 1920s, the Agent worked with between 100 and 250 farmers south of the Colorado River. That number varied depending on how many farm issues (soil, pests, etc.) the Agent was called to assist with. Tenant farmers may have required more

[o] All the Agricultural Extension Agents were men during the period from 1918 to 1960.

assistance than permanent farmers who better understood the land and climate. North of the Grand Canyon in the town of Fredonia, 50 to 100 farmers grew corn, alfalfa, grains, and other vegetables for home use. The Agent only visited that area occasionally, since it is north of the Colorado River (also called the 'strip'), the road consisted mostly of wagon tracks, and the journey in the 1920s took three days travel from Arizona to Utah and then south again to the town. There is little information about these homesteaders as a result.

USDA historic archives (Table 2) show that most farms in Coconino County were run by those who owned the land, and through the early 1900s, most were owned outright (perhaps purchased through Homestead Act agreements). Most animal husbandry on farms was for family subsistence—a look at the poultry, eggs, milk, butter and cheese sold shows that only a fraction of what was produced was sold for income (USDA County Agriculture Census 1910). Beekeeping was active even in those early years, with over 1,700 pounds of honey generated in 1910.

Table 2. USDA Arizona County Agriculture Census, 1900-1910: Comparative agricultural data, county tables. (Not all information was gathered in 1900; where it is not listed, it is not available.)

Coconino County statistics	1900	1910
Population:	**5514**	**8130**
Number of all farms:	**280**	**656**
Farms operated by owners:	256	636
Percent of all farms (operated by owners):	91.10%	97%
Degree of ownership: Farms consisting of owned land only		626
Degree of ownership: Farms consisting of owned and hired land		10
Farms operated by tenants:	7	19
Percent of all farms (operated by tenants):	2.5	2.9
Form of tenancy: share tenants		4
Form of tenancy: share-cash tenants		0
Form of tenancy: cash tenants		6
Form of tenancy: tenure not specified		9

Farms operated by managers	1	18
For all farms operated by owners: number free from mortgage debt		610
For all farms operated by owners: number with mortgage debt		10
For all farms operated by owners: number with no mortgage report		16
Poultry: raised		1789
Poultry: sold		409
Eggs (dozens): produced		3528
Eggs (dozens): sold		791
Number of farms producing dairy products:		113
Number of farms producing dairy milk:		112
Gallons of milk produced:		16,520
Gallons of milk sold:		471
Pounds of butter produced:		2169
Pounds of butter sold:		230
Pounds of cheese produced:		100
Pounds of cheese sold:		0
Number of colonies of bees:		41
Honey produced (pounds):		1725
Beeswax produced (pounds):		60

III. Climate and precipitation

Coconino County's first commercial farmers grew their crops without irrigation. They relied upon an understanding of the climate and rainfall patterns for their harvests. Farmers had to contend with a short growing season and sometimes unpredictable late frosts in spring and early frosts in the fall. They had to plan for dry weather during late spring and early summer, and sometimes torrential rainfall during mid- to late summer. Flagstaff has a cold semi-arid climate[p], with four seasons, and annual average precipitation levels of about 22 inches, though a range of between 9 and 39 inches per year is possible. Snowfall is about 97 inches in an average year, and can be much more, or much less. The weather is generally low in humidity during most of the year except during the summer monsoons, and overall, there are about 275 days with no precipitation

[p] A semi-arid climate describes climatic regions that receive precipitation slightly below potential evapo-transpiration.

(or about 90 days per year of rain or snowfall). Most of the moisture comes during the summer, in early to mid-July and August, with often intense afternoon downpours and thunderstorms, making the appellation "monsoons" apt. The monsoon months are the prime growth period for crops. Winter's snow brings the second largest amount of moisture to the region, with lesser amounts of precipitation in spring and fall. May and June are the driest of the warmer months. The spring dry season is accompanied by increasing air temperatures, low humidity, and persistent winds. A second dry season usually occurs in the fall, an ideal pattern given that farmers harvest and dry their crops then (Grahame and Sisk 2002).

IV. Soil fertility and green manures

Coconino County farmers needed to be able to work with arid, 'thin' soils. Most of Flagstaff's soils are relatively shallow and rocky or have an abundance of clay, and just one to two percent organic matter. The soil tends to be alkaline, with a pH of about 7 to 7.3 (Flagstaff Master Gardener course, personal experience, 2010). For ideal crop growth, soil should have about five percent organic matter or humus, and the optimum soil pH for vegetables and grains is usually between the values of 5.8 and 6.8.[q] While there are adequate mineral levels in the county's soil, an alkaline soil pH can make it more difficult for plants to draw up nutrients, since the higher the soil pH is, the less soluble nutrients are, meaning that they are less available to plants (Agro Services International 2011). Thus, soil tests can show adequate mineral content, but the alkalinity can cause plant micronutrient deficiencies, and slow growth. The

[q] pH measurement is not a linear scale, it is a logarithmic scale. That is, a soil with a pH of 8.5 is ten times more alkaline than a pH of 7.5, and soil with a ph of 6.5 is a hundred times more acidic than the 8.5 pH soil (Call, Master Gardener Manual 1999).

county's soils also tend to be low in nitrogen, partly due to the lack of organic matter. Potatoes, the primary commercial crop during the 'teens' and 1920s, are heavy feeders of nitrogen, phosphorus, and potassium. Running out of soil nitrogen by August is a common potato problem. And nitrogen stress pre-disposes the crop to early blight as well as other problems (Whiting, Colorado Master Gardener Program 2009). During the 'potato era,' (1918-1929), crops yields were very high on unfarmed soils, but once the land had been farmed continuously with the same crop for several years (mono-cropped) without any addition of soil amendments, issues due to alkalinity and lack of humus contributed to less vigorous potato crops over time (as is common with any crop grown continuously on the same land).

Because soil became depleted within several years of farming a single crop like potatoes, the Agricultural Extension Service made soil conservation and improvement part of its mission. The Extension Agent assisted farmers by showing them ways to increase soil fertility and crop abundance and to decrease erosion. The Agent did this by working with farmers who were who were interested in a cooperative partnership with the Extension Service to grow test plots that demonstrated crop rotations and used legumes and 'green manures' on land with farmers. The Agent also helped procure nitrogen fertilizers for farmers (Extension Service reports 1918-1929). "Soil improvement" was one of the most important programs of the Coconino County Extension. Each year the County Extension Agent recorded his recommended soil conservation methods for farmers to use: plant and plow in cover crops such as rye or clover, and add manure. Both methods boost soil humus and nitrogen levels. Pre-1920, it appears from the reports that homesteads and most farms may not have had enough livestock to cover much of their acreage with manure, since this time period was

still pre-mechanized farming. It was likely too labor-intensive to apply manure over dozens or hundreds of acres so growing green manures was a viable option, if the Extension Agent could persuade farmers to do so. In 1918, the Agent purchased 300 pounds of field peas from Colorado as a green manure rotation crop to be sold to farmers to increase crop yields and build the health of the soil as part of the Service's soil improvement program. Later (1930s and onward), as technological innovations produced more machines, soil improvement methods also included terracing and contour plowing.

Even in the early years of the Extension Service in Coconino County, soil conservation was at the forefront of Extension work. In the Extension report of 1919, Agent F.A. Chisolm said, "In my estimation the soil problem is probably the greatest one we have to contend with, because of the fact that the soil is shallow and contains very little humus. In only a few cases has there ever been a cover crop grown for green manure. The scarcity of livestock is responsible for the lack of manure ... and where land is five years old it has shown a marked decrease in productiveness." And in 1921 he mentioned,

> "The nature of soil in most parts of this county is such that three years cropping without manure, of some kind, is all the soil can stand. Farmers are advised to summer fallow and plow under some green vegetation for next year's potato crop. This was practiced in a few instances with splendid results. Sweet clover was tried in a few instances and it was almost impossible to get a stand, however attempts are being made to keep up the work. Two methods are being advised at present and until a legume of some kind is found to grow well: 1) Summer fallow part of the ground each year and grow potatoes followed by grain; 2) follow potatoes with grain for two years, at the end of the third year grow a legume or plow in lots of stubble deep early in the fall" (Extension Service report 1921).

In the mid 1920s, one report indicated that demonstration farms that plowed in green manures and rotated between potatoes, beans, grains and corn showed a 300 percent increase in their yields. However, it appears that perhaps the ease and moderate success of monoculture, at least for the three years before the soil became depleted, made it the common practice. By 1926, only between fifteen and twenty farmers were following soil-building methods with great success out of the 250 farms that worked with the Extension Service (Extension Service report 1926). Was the reluctance to diversify farming techniques and practice methods to increase soil fertility due to a fixed mindset, or was it because the time, labor, and financial realities of most farmers (some of whom were tenant lessees) prohibited planting anything but a cash crop? It is not clear from the report archives which issue dominated—and perhaps they both were factors.

V. The primary commercial crops of Coconino County

1. Potatoes

There are several reasons that potatoes were a good choice as a food and commercial crop for the farms in Coconino County. Potatoes grow well in most climates, altitudes, and soils, and are relatively inexpensive to grow. They are high in starch and provide a denser source of calories than grains, and combined with dairy or meat from domestic livestock, provide an economically feasible and nutritionally adequate diet (Messer, Cambridge World History of Food 2000). In particular, potatoes grow very well in high elevation climates like the farms in the Plateau country around Flagstaff.[r] They, and other root crops such

[r] Potatoes were first domesticated from wild potato species 7,000 to 10,000 years ago by indigenous peoples in southern Peru, high in the Andes Mountains.

as carrots and beets, as well as peas, lettuce, greens, and cole crops (cabbage, cauliflower, broccoli, and kale), are well suited for a short growing season and high elevation climate because they are cool season plants, preferring temperatures of 60 to 65 degrees to grow well (Call, Arizona Master Gardener Manual 1999). Since root crops become established underground, they are more tolerant of light frosts. Flagstaff's short growing season and late spring frosts make potatoes an ideal choice for a commercial crop. However, they need regular moisture to fully develop, at least 17 inches annually, or about 1 inch per week during a 90 to 120 day growing season (Call, Arizona Master Gardener Manual 1999). Adequate precipitation for most crops—warm or cool season—is important for a farm to thrive. By and large, most farming in Coconino County was dry farming, with the exception of Oak Creek orchards, which were situated in close proximity to the perennial, spring-fed creek. Some farms put in water catchment and pipeline infrastructure; however, most relied on rainfall. Nevertheless, when rainfall was regular and a farm's soil was relatively fertile, potato crop yields were abundant.

In 1918, Kendrick Park, with an elevation of 8500 feet, about twenty-one miles from Flagstaff northwest of the Peaks (via what is now Fort Valley Road), 26 homesteaders dry-farmed oats, barley, and potatoes. Settlers in the Fort Valley area also farmed potatoes and oats, beginning in 1908 or perhaps even earlier (Olberding 1993). In 1919, 25,000 acres were already developed as farm land in the county; 12,000 acres were within a 10-mile radius of Flagstaff and of these, 2,400 acres were potatoes[s]. From 1918 through approximately 1929, potatoes

[s] Note: In the Extension reports of the 1920s the largest number of potato acres listed is 2,400. However, in the 1943 Extension report, the Agent mentions that "Extension Circular no. 48" from 1924 lists "3,000 to 4,000 acres" of potatoes planted in the early '20s. This report has been lost to time, and the annual report of 1924 does not give a total acreage. However, it's safe to assume that several thousand potato acres were being worked in the 1920s.

were the most financially successful commercial crop. Grains such as oats, wheat, and barley were also abundantly grown and were an important commercial crop, largely utilized locally for animal feed and to be sent to Flagstaff's mill for grinding and sale as flour. Potatoes were planted in May and harvested in September or October, and yields would vary dramatically depending on the amount and timing of the rain, or the intensity of problems caused by diseases and insect pests. Exact yearly numbers of the total acreage of potatoes harvested in Coconino County, or the total train cars that were filled for shipping each year (train cars were sometimes listed in lieu of pounds harvested), are difficult to quantify since they are listed in just a few Extension reports between 1918 and 1930. However, it is clear that potatoes were the number one cash crop up until 1929. The reports do say that in 1920 and 1922, farmers produced between 50 to 100 train cars of potatoes for sale outside of Flagstaff. And in the intervening years—1919 and 1921—the rains were plentiful and the yield was even greater: between 130 and 200 train loads were filled for regional buyers (Extension Service reports 1918-1922). The reports do not say how many pounds were sold locally, although they do say that residents purchased local crops from the markets. Both potatoes and grains were shipped from Flagstaff to regional markets, but the reports say that potato production and shipping was greater than all other crops before 1929. In the Agricultural Extension report of 1920, DeLore Nickels, Coconino County's first Agricultural Extension Agent, wrote that the "general perception was that farming in the area was still in its infancy, and had great promise."

The Agricultural Extension Service worked diligently to help farmers increase productivity. One of the ways they did this was by introducing new machinery that could be pulled by horses or tractors, such as 'potato diggers,'

and by procuring potato sorters for most farms. A potato digger is a farm tool that was used to speed harvesting. It unearths one or two rows at a time, and spreads the potatoes on the top of the soil where they can be more easily hand-picked and put into sacks.

Before potato sorters or 'graders' were used, Coconino County had a reputation for poorly graded stock and small potatoes. The sorters graded the potato crop so that farmers could receive top dollar for No. 1 (large) potatoes. Before potato sorters were used on the farms, all the potatoes were sorted by hand. Sorters meant the farmers could pack the potatoes according to grade and conserve a great deal of labor. The local Farm Bureau, in cooperation with the County Extension Agent, established a marketing committee to improve potato sales. They succeeded in establishing a better reputation for Coconino County potatoes once the potatoes were graded. The Extension Agent wrote, in the 1918 report, "Reputation means a future market." In the years when potato harvests were especially abundant, farmers needed to be able to store their crop for later sales. Arrangements were made in 1919 for storage in one of the large warehouses on the tracks, which was especially convenient for loading potatoes to be shipped out. When crop prices were good, most of the crop was sold at harvest rather than being stored. However, because of the need for storage, two potato storage houses were built in 1934 from plans the Extension Service furnished.

Another activity of the Extension Service was to test crop varieties for suitability in Flagstaff's climate. Certified seed tests for early potato varieties such as Irish Cobbler, Early White Rose, Bliss Triumph, Early Ohio, White Pearl, and Netted Gem were conducted by farmers in collaboration with the Service.

White Pearl and Cobbler were well suited to higher elevations and heavier soils, whereas the Bliss Triumph was more valuable as an early potato on lighter and "cindery" lands. Netted Gem did not produce much yield. Dunnick and Hinds potato varieties were favorites, and considered "mortgage lifters," because they produced so well. Peachblow was another standard variety; it is a late-maturing potato for lands that were considered "light," and was especially grown in the farming sections east of Flagstaff, such as Doney and Black Bill Parks. Potatoes were grown for food as well as for seed. The Agricultural Agent mentioned in the 1922 report that there was demand "throughout the Southwest" for seed from early-producing varieties grown in Northern Arizona.

In 1925, the rains were absent for much of the year (Table 8 and Extension Service report 1925), and much of the potato crop failed. However, since there was a 32 percent national shortage of potatoes that year, potato prices increased, and farmers who had managed to have some potato production were able to sell their crop easily. In 1927, though the rains returned in some areas, Doney Park's 8,000 acres stayed mostly dry, and the potato yield was not plentiful there. However, the value of increasing soil fertility was effectively demonstrated that dry year, since one Doney Park farmer, Ernest Burrus, had plowed in rye the previous fall as a green manure crop, and even with less rain had a good yield (although the report does not specify the exact quantity). Ernest and his relative Charley Burrus' families were originally from Alsace, France, and they were consistently some of the most successful farmers in Coconino County, perhaps using methods they had developed in Europe (though this is somewhat unclear in the reports). From the start, they grew and plowed in green manures, rotated their crops, and were some of the earliest farmers to experiment with other soil improvement methods such as contour terracing, once the machinery was

available. When their farm's soil was depleted by potato monocropping, they set an example by switching to soil-building legumes on part of their acreage. If national bean prices (see Chapter 3) were low at harvest time, they plowed the legumes under—thus preparing for the future by improving their potato, grain or corn yields and recovering financially the following year. The Extension Service frequently mentioned that the Burrus' farming was exemplary, and used their methods to educate other farmers about good soil conservation.

Dry weather during the early part of 1927 required farmers in Black Bill and Doney Parks to haul water for domestic and stock use; these farmers later built cisterns for rainwater catchment. In those days, there was no running water or electricity on farms. Rainwater—or hauling water from a local source—was crucial for farmers to have water for their homes and animals. In 1928 and much of 1929, precipitation was again scant, though in 1929 there were some localized heavy, but short-lived thunderstorms (Olberding 1993). Rain returned somewhat in '30 and '31, but it was not until 1932 that the whole area had ample and extensive moisture. Extension Agent C. G. Lueker wrote in the 1930 annual report, rather dispiritedly, that "potatoes have proven nearly a failure unless the rains start early in July and continue through August. This year the rains ceased in the middle of August, and consequently the potato yield was not up to normal." During this time of drought and other challenges, farmers needed to be able to survive financially, and to do so, they either had to stop farming, or find other crops that, when the rains returned, would allow them to recoup. It is hard to know how many farmers moved on or stayed, since the Extension reports don't discuss this. It is likely that farmers with long-term investments in the land simply held out and planned to pay off any accrued farm debt when conditions improved.

By the five year stretch from the late 1920s to early 1930s, potatoes' heyday had ended. Lack of soil fertility increased the disease and pest issues that plagued potato farming, and this, along with drought during this period, led to potato's demise as a commercial crop. Though they were still an important commercial and home-subsistence food, a successor (beans) was beginning to advance onto the farming scene and it proved better suited to the alkaline and now-depleted soils (see Chapter 3).

1a. Potato diseases and pests

Some of the main disease and pest issues that plagued potatoes, no matter the level of precipitation, were a soil fungus called rhizoctonia or "root rot" (the same fungus that causes damping off in onions, or 'black scurf' in potatoes) (Colorado State University Extension 2011); "scab," a bacteria that spreads rapidly in dry alkaline soils (University of Rhode Island Extension); a fungus called 'blight;' and insect pests such as psyllids, Colorado potato beetles, flea beetles, and blister beetles. Unless farmers sowed green manures and rotated crops, soil became depleted rapidly, and this meant that the plants had less resistance to disease and pests. It was difficult for farmers of that time to easily fertilize their soil, especially with non-chemical methods that built soil fertility and organic matter (and thus strengthened plants). Chemical NPK fertilizer (nitrogen, phosphorus, and potassium) had become available during the 1920s, but it was an expensive purchase for farmers with limited funds, and had to be spread over wide areas at a time when farming was pre-mechanized—and mostly accomplished with horse-drawn equipment—which was time-consuming.

Farmers could purchase the chemicals to dip and "treat" the seed before planting to deal with diseases, and spray with pesticides once the crops were fully grown, but these options may not have been feasible unless the farmer was financially established. Eventually, the lack of rain in the late 1920s, coupled with "early blight" and "damage by psyllids" to the crops in the early '30s, reduced the potato fields in the county to less than 125 acres, down from 2,400 acres. Grasshoppers and prairie dogs also created considerable damage to farm fields, and to aid farmers and ranchers, each year the Extension Service (later, the U.S. Biological Survey, which became the Fish and Wildlife Service) provided toxic chemicals and poison grain to kill insects and eradicate prairie dogs, gophers, jackrabbits, and even porcupines (which ate corn crops). The campaigns were conducted annually and were extensive, so much so that many areas that historically had robust populations of prairie dogs now have none—which was the goal.[t] Prairie dogs in particular were considered a bane to commercial farming, since they could, within a few days, eat a quarter of a farm field. The eradication methods, though we now would consider them cruel and environmentally inappropriate, were at that time considered necessary. The methods were largely effective.

2. Small grains

[t] Prairie dog population numbers were far higher than today (judging from the number of holes, acreage and amount of time the Extension Service put into extermination efforts). The "dogs" were opportunistic, and could quickly eat through a third of a farm field in a matter of days. The prevailing mindset was that these creatures were pests (and this extended to coyotes, rock and ground squirrels in Sedona) and needed to be completely eradicated. Many hundreds of thousands pounds of poisons were used each year, even on forest lands where only grazing occurred, such as Anderson Mesa, and park lands around the Grand Canyon. The extermination effort was aided, and finally entirely supervised, by the Biological Survey, which later became the Fish and Wildlife Service (Coconino County Agricultural Extension Service Annual Reports). The role that prairie dogs play in ecosystem/habitat health was not recognized in the sciences until many decades later. It is still legal to poison prairie dogs and gophers in Flagstaff, though in some areas (Northern Arizona's Navajo Reservation) they are endangered (personal communication, Ben Kessler, biologist).

While potatoes reigned as the top cash crop up until the late 1920s in Coconino County, wheat production came in second. "Small grains" such as spring wheat, oats, and barley were mostly grown for local sale and stock feed. The county produced large enough amounts of wheat to fill many train cars—up to 130 in a good year, as reported in the 1919 Extension annual report.

The average number of rail cars filled with grains to be shipped out in most years was between 30 and 50. Nevertheless, it was a substantial amount of grain to be produced in Coconino County's arid, high-elevation landscape, and that amount does not include what was sold or utilized locally. The Flagstaff Milling Company purchased and milled over 90 percent of the wheat grown in the county, which it then also sold locally. One of the primary purposes for growing other small grains besides wheat (oats, barley, and rye) was local hay production for livestock, since ranchers purchased the hay for winter stock forage. Horses rather than tractors pulled plows and other farm machinery, and farmers needed to feed them and other livestock.

Before commercialization of potatoes, small grains were actually the most abundantly-produced crops. The 1930 Extension report discussed grains' importance during the earliest years of farming and settlement around the turn of the century in Coconino County:

> "While cattle ranching was the original industry in Coconino County, and lumbering followed soon afterwards, the first agricultural effort was oat hay farming. The yield varied from one-half to three tons per acre. This found a ready market in the lumbering camps until the horse was surpassed by the truck and tractor. Oats, especially in the higher elevations where it does not always mature, will perhaps have to be replaced more and more by potatoes and barley."

And indeed, within a few years, oat yields were surpassed by potatoes and wheat, and wheat remained the grain planted in the most abundance. In general, 'hard spring' varieties of wheat were most commonly planted because 'winter' varieties were not as successful. Winter wheat is planted in late August until late November, weather permitting. The monsoon summer rains arrive in July, at the time winter wheat is ready, making the ground and grain often too damp to harvest, thresh or store it. Spring wheat, in contrast, is sown during the third week in May, between the 23rd and 25th (except in Fredonia, when it was planted in March and April), and harvested in October (Extension Service reports 1947, 1954). In 1918, the first year of the Extension reports, over 275 acres of Marquis and Defiance spring wheat varieties were grown and yielded well, up to 25 bushels per acre. 5,000 lbs of Marquis wheat were sent to the mill that year. Also in 1918, over 800,000 lbs of seed oats were planted for livestock grain and hay, as well as smaller amounts of barley, corn, beans, sweet clover and alfalfa. It was, overall, a highly productive year—250 sacks of barley went out in train shipments to regional markets. Still, all of the grain fields at various times were afflicted with a fungus called 'smut,' which could occasionally devastate some farmers' fields. Treatment with chemicals—and planting with certified seed that had been verified free of the disease—were the remedies that the Extension Agent advocated, and these methods usually resulted in almost doubling farmers' yields. Oats, an important hay crop for livestock fodder, went from 50 bushels an acre to 80 or 90 bushels an acre after treatments. A type of grain called 'sudan' was introduced in the 20s, and along with a mixture of oats and rye, was used on a small scale for dairy cattle feed. Rye, another "small grain," was not sold commercially. It was mostly used for green manures and to create pasture for dairy livestock.

In the late 1920s, wheat output went through a decline, partly due to the drought that also devastated potatoes, and partly due to a decline in commercial market prices, since there was a national wheat surplus and an economic downturn during the beginning of the Depression. During World War I, wheat was grown in larger quantities to ship overseas to the troops and to help relieve Europe of food shortages from the war (Figure 6). Once this period had passed, there was a national surplus that drove down prices and reduced demand. As a result of all these factors, wheat acreages were reduced in Coconino County. Farmers changed their strategies and grew it for seed or sold the grain for chicken food to the local poultry industry, rather than for production as cash crop. By 1930, only a few hundred acres of wheat were grown, mostly the Marquis variety. Small grains of all types, however—wheat, oats, barley and rye—persisted through time in Coconino County, and did not disappear from the farming landscape until the 1960s.

3. Lettuce

Lettuce, a cool-season crop, was grown for home use, for local markets, and for commercial sales by a few Coconino County farmers. Although it was not as extensively grown as potatoes or grains, it was a main salad crop that sold well. Experiments with dry farming and irrigating lettuce were both conducted in Coconino County, and the dry farmed lettuce fields failed. The irrigated lettuce, however, was very successful. In 1925-26, two well-irrigated farms in Fort Valley and Spring Valley produced enough that "several train car loads" (refrigerated, no doubt) could be shipped to Phoenix. In 1929 through 1931, farms in Hay Lake, Hart Prairie, Kendrick Park, and Mund's Park all produced lettuce, with relative success, depending on how much and how consistently

they irrigated. Much of the lettuce produced had a local destination: "the ready demand of the summer tourist trade, with room for increased production" (Extension Service report 1925), although some was sold to the Fred Harvey restaurant at the Grand Canyon, and some was shipped to Winslow and Prescott.

4. 'Truck' or market garden vegetables

Market gardens or 'truck' farms[u] started to become established in Flagstaff and Sedona after the turn of the century, and their numbers continued to grow for many decades. A 'truck' crop is often the word used for produce that comes from market gardens, and is directly sold by the farm or gardener to individuals, business or restaurants. After 1900, Flagstaff's businesses started to purchase a variety of vegetables grown on farmers' garden plots. 'Truck' or market gardens usually have smaller acreage and denser vegetable diversity compared to large commercial farms.

While the Extension reports do not specify the size of the truck gardens, they were probably between a half acre to five acres in Flagstaff, and up to 50 acres in Sedona, where produce was often grown between young fruit trees before the trees matured. Some truck gardens were small enough to be watered by cisterns provided there was regular rainfall and the home had enough 'domestic' water to spare. Many residents and farmers had a few (or a few dozen) chickens and turkeys that provided them with eggs, meat, and manure for their gardens. Market gardeners had a ready sales outlet in downtown Flagstaff and Sedona's stores, and farmers from both locations supplied a variety of vegetables for residents to purchase. When rain was scant and farmers' dry-

[u] 'Truck' is a word used previously for trade, barter, or exchange.

farmed crops failed, they would sometimes find financial success in their 'backyard' efforts. In 1924, Agent Chisolm said, "There is a splendid local market for vegetables, and each year a few more farmers see the benefits derived from their own gardens. Probably the fact that the farmers are learning to supply their own food is the greatest influence [in increasing the number of farmers who grow vegetable gardens], and the surplus can easily be disposed of for cash" (Extension Service 1924). Some of the 'truck' vegetable crops common at the markets were beets, carrots, cabbage, lettuce, and fresh green beans. Dried pinto beans were grown throughout the 1920s, and at that time they were mostly cultivated for home use and to be sold locally. Later they became a large-scale commercial crop (Chapter 3). Warm season crops like sweet corn and tomatoes were transported up "the hill" from Sedona for sale in Flagstaff.

5. Sedona's fruit and agriculture

Many families homesteaded and farmed the Oak Creek Canyon area in Sedona, 30 miles south of Flagstaff during the same time period (late 1800s through late '20s) that homesteads and early farms were becoming established in and around Flagstaff (Schnebly Heidinger and others 2007, 11-48 and Johnson 2008, 3-38). With abundant and perennial water from Oak Creek, an elevation range between 4,500 and 5,500 feet, a warm high-desert growing season of about six months (April to mid-November) and frost-free dates from early May to November (Sedona Ranger STN 2010), Oak Creek Canyon is ideal for fruit growing. Apples, peaches, and other stone fruits were grown in vast abundance from the turn of the century through the late-'50s (the period of decline was the same for Sedona as it was for the rest of the agricultural areas in Coconino

County). Though Sedona has late freezes, they occur at an earlier time in the year than in Flagstaff, so it has a higher chance of tree fruiting success.

Early settlers in Sedona, as in Flagstaff, focused on food subsistence farming. Water was carried from Oak Creek to irrigate their vegetable patches and fruit trees. Extra produce was sold seasonally to markets in Flagstaff and to the (then large) mining town of Jerome. During the turn of the century through the 1920s, thousands of fruit trees were planted and several large commercial orchards developed along the upper and lower extent of Oak Creek Canyon (Schnebly Heidinger and others 2007, 35-48). Fruit was shipped by wagon, car or train to Sedona, Jerome, Cottonwood, Clarkdale, Flagstaff, Winslow, and Holbrook. Fruit growing—particularly apples and peaches—was the earliest primary driver of the early Sedona economy (Sedona Historical Society 2007).

One prominent orchardist and farming family, the Jordans, drove their fruit to Phoenix, Jerome, Prescott, and Wickenburg, and shipped it via train to Seattle, San Francisco and St. Paul, Minnesota (Sedona Historical Society 2007). The Jordans grew 600 peach trees, and had an orchard of 1,500 fruit trees (Schnebly Heidinger and others 2007, 35). Sedona's Historical Society describes the irrigation methods that the Jordan's (and other orchardists) used, and the store that they established:

> "Walter and George Jordan took over from their father in 1930. One of the most difficult tasks was getting water to the orchard. Walter and George blasted out an irrigation ditch, and installed a turbine to pump water from Oak Creek to the trees. It also supplied minimal electricity to their two homes. George later added wells and pumps; his system was the first commercial water supply to residents. Sedonans purchased fruit at George's retail store, (which is now Sedona Landmark #5). Walter and his wife Ruth Jordan sold most of their land in 1972, and the remainder is

now Jordan Historical Park. George Jordan's packing shed is now the Sedona Art Center"(Sedona Historical Society 2007).

Another prominent orcharding family was the Scheurmans. Their ranch near Cathedral Rock grew apples, peaches, apricots, quinces, grapes for Zinfandel wine—for which they were well known—and raised bees for honey (Schnebly Heidinger and others 2007, 37-40). Henry Schuerman, Jr. specialized in peaches grown near Red Rock Crossing (Sedona Historical Society 2007). Other Sedona residents known for their fruit production include the Ratliff and Dumas families. Truman Ratliff and his wife specialized in dwarf and semi-dwarf trees, and sold apple cider (Sedona Historical Society 2007). The Dumas family grew peaches, apples, apricots, plums and blackberries, in addition to tending large gardens. Their farm is now known as Crescent Moon Ranch.

Frank Pendley was one of the most prolific, diversified and (to this day) well-known orchardists of Oak Creek. He grew over 800 apple trees, and peaches, pears, apricots, walnuts, blackberries and strawberries in his extensive orchards. He called his company "Falls Brand Fruit." Pendley also had large gardens and raised mules for pulling plows, horses, cattle, hogs, chickens, turkeys, and rabbits (Schnebly Heidinger and others 2007, 38). Frank Pendley's son Tom continued the orcharding family tradition, and much later, in 1987, the property became Slide Rock State Park, at a time when tourism had become more important to Sedona's economy than agricultural production (see Chapter 4). The Pendley, Jordan and Scheurman orchards were some of the largest in Oak Creek, though there were many others. Each orchard produced thousands of boxes of fruit each year (Schnebly Heidinger and others 2007, 35). The Schnebly brothers, some of the earliest settlers in Sedona, helped to fund road building between Oak Creek Canyon and Flagstaff, now known as Schnebly Hill Road. The road

enabled the transport of fresh fruit and produce to Flagstaff from the brothers' store (Northern Arizona University (NAU) Cline Library, Ellsworth Schnebly Collection). During the mid-20s, Coconino County—and later, the state of Arizona—appropriated enough funds for a paved road through Oak Creek Canyon north to Flagstaff (now 89A) to be built. It was fully paved by the late 1930s. This road facilitated the transport of train-delivered goods and some produce, south from Flagstaff to Sedona, and sent fruit and warm-season vegetables like tomatoes northward, from Sedona to Flagstaff, a bioregional flow of foods.

VI. Water infrastructure development on the Plateau, 1920s

Collecting and retaining enough water for domestic (household) and livestock use, especially when there was minimal rainfall, was a problem in most of the farming areas in Coconino County with the exception of Sedona's Oak Creek farms and orchards. Some homes and farms on the Plateau built cisterns, catching the rainfall drainage from house and barn roofs to partially solve the "water difficulty." One project that provided some relief east of Flagstaff was the development of a Water Users Association in Doney Park, in 1921. Doney Park farmers filed for rights on some of the water that drained, as snow melt, from San Francisco Peak's Schultz Pass. They applied for a $2,000 bank loan to complete the project, and piped the water to an area[v] they called "Grand Canyon Road," halfway between Doney and Black Bill Parks. (A road with that name no longer appears on maps in the Doney and Black Bill Park area, however some rusted piping is still visible in Shultz Pass.) This infrastructure development reduced the distance that farmers had to haul water for their homes and

[v] The 1921 Extension report does not specify whether the location the water was piped to was a tank or reservoir.

livestock; previously they hauled from a temporary community well using horses and wagons, which was a five- to ten-mile trip, depending on where their farm was located (Extension Service report 1923).

VII. Labor on the Plateau's large farms

Farm labor, especially harvesting, was done largely by hand throughout the time period in Chapter 2 (1918 to 1929). The Extension Service helped to gather men for the harvest by creating a temporary employment bureau. If crops were not harvested quickly, they could freeze in the fields, and the farmer would lose the entire season's worth of investment and work. Up to 200 men were hired during harvesting, most of them Navajo, Hopi, and Mexican people hired at the reservations with assistance from the Superintendent at Tuba City, and driven to farms around Flagstaff. The wage scale for labor was $3 per day including board, or $4 per day without board.

National or global circumstances often had the potential to affect harvesting success. In later years, the war draft reduced the numbers of men available for short-term hire. In this chapter's time period, just as the Extension Service was finding its legs in its first year in Flagstaff, the Spanish flu epidemic was sweeping through Europe and the U.S. The flu lasted from 1917 to 1920 worldwide, and made the Coconino County harvest in 1918 more challenging, since so many—even in somewhat isolated but not immune Flagstaff—were very ill, and many young men were still fighting or returning from World War I. In the 1918 Extension report the Agent mentioned, "The harvesting was pushed to the limit and the men moved from one farm to the other until the work was done in spite of the raging epidemic." However, even under duress since they were short-handed, farmers were able to get the crops harvested before they froze in

the fields: "Potatoes and other crops were harvested with no serious losses [to the harvest due to frost]" (Extension Service report 1918).

VIII. Marketing, crop prices, and the role of the Agricultural Extension Agent

One of the most important tasks for Agricultural Extension Agents was to keep a file of "marketing reports" on hand for farmers to review at the Extension Service. The reports were updated frequently and contained national and regional prices for primary commercial crops. In 1928, the Agent wrote, "from time to time the prices of beans and potatoes that are shipped into Phoenix and mining communities from competitive sections such as California, New Mexico, and Colorado are ascertained." The Extension Service maintained daily market reports and current national prices for grain, hay, eggs, and butter from information received in government reports and over the radio. These reports helped farmers determine how much to plant, based on what they could reap financially from what they sowed.

VIIII. Local agricultural tax policy and national events, policies and prices

In 1926, the Coconino Farm Bureau was able to advocate effectively for a local tax policy change, so that agricultural lands would be valued at a lower rate and save farmers some hard-earned money. According to the Extension report for that year, this change gave farmers considerable financial relief (but does not give the number of dollars). Farm lands (and presumably, the property taxes on them) were assessed that year at 20 percent less. The Extension Agent mentioned that the Farm Bureau was attempting to make the tax reduction permanent. The geographic extent of the re-valued area is not disclosed, but it is probable it was county-wide (Extension Service report 1926). There is no other mention of how

this affected farmers or their property, or if the tax reduction was permanent. It is the first mention of a local tax benefit for farmers, which does imply that by 1926 farmers had representation (by the local Farm Bureau committee members) with at least some political standing.

Up through the end of 1918, when World War I came to an end, agriculture was at a peak, locally and nationally. The war had boosted agricultural prices of commodities (including wheat) because of Europe's need for food, since the war had diminished the Allies' food production capacity. Potatoes were considered a valuable 'home' wartime food (Figure 6). A poster by the U.S. Food Administration called 'Potato Possibilities' reads, "The potato, as truly as bread, may be called a 'Staff of Life.' It furnishes fuel for the body. It gives mineral salts which help to keep the blood in good condition. It is easily digested. It is a good food all the time—but it is an especially good war time food for Americans, because the use of the potato means the saving of other foods which can be more easily shipped to our own troops and our Allies" (U.S. National Archives and Records Administration, Food Administration WWI poster). Post-war, once exports dropped off, the U.S. ended up with food surpluses, which resulted in some price declines. In Coconino County, through the period of the war and up until 1925, most crop production was high and precipitation was relatively regular. When agricultural prices started to decline slightly, coupled with a dry year in 1925 and drought late in the decade, farmers' economic hardship increased.

National pressure from farmers who appealed for subsidies eventually led President Hoover to create a National Farm Board in 1929, through the Agricultural Marketing Act (Saloutos and Hicks 1951, 372-403). The Farm Board

restricted crop production so that only enough yields for domestic use could be grown, and stockpiled crops to drive up prices (Koerselman 1977). Locally, signs of farmers' challenges were captured in notes written in the Extension Agent's reports, saying that in 1927 many of the farmers who were Extension members had moved or left the county (number not given in report), and in 1928 the Extension membership fee had been dropped (the implication is that farmers could not pay it). The 1929 Agricultural Marketing Act (AMA) was ultimately ineffective, since it was not able to regulate how much farmers grew and it could only have somewhat of a band-aid effect at a time when the economic depth of the Depression had more profound effects on farmers than could be addressed with the AMA. The money used to buy up surpluses was quickly depleted and later, the law was abolished (U.S. Legal 2010).

The Great Depression, which fully materialized with Black Tuesday's stock market crash in 1929, coupled with local drought and potato harvest challenges, created the need for farmers to change to a different cash crop. The end of the 1920s and thus correspondingly, the end of this chapter, mark a period just before a slew of federal farm policies were enacted with the intent to help rural farmers. The end of this era also marks the end of Flagstaff's first cash crop's heyday: potatoes were still persistently grown, but another plant—a legume—fared better in a variety of ways during the upcoming years.

X. Conclusions

The period from 1918 to 1929 was, overall, a time of great promise for the settlers and farmers of Coconino County. Potatoes were the primary cash crop and were produced in the most quantity up through the mid-1920s. Potatoes were valued primarily as commercial crops as well as a subsistence food, and

were shipped in large quantities to towns outside Flagstaff. The five year period from the mid- to late-'20s, however, was a variable and then uncertain time for both harvests and precipitation. During the late 1920s, drought, disease, and soil nutrient depletion created barriers to success in potato production.

Small grains, primarily wheat, barley, oats, and rye were also grown and produced in very large quantities in many of the farming communities in Coconino County. However, much of the grain yields were utilized by the farmers for range cattle and other livestock fodder, as well as for sale to the local milling company, to be ground into flour. Some grains were shipped to regional markets, especially during the early 1920s and in years when the rain and temperatures cooperated and yields were very high. The late 1920s was a time of many challenges for Flagstaff's high altitude farmers with the onset of drought, soil depletion, potato crop failures, and crop prices that had declined or become stagnant due to crop surplus and the Great Depression. Farmers had to look for other crop varieties to regain economic solubility, and thus the era of legume growing, once national bean prices rose in the early 1930s, was soon at hand.

Labor on farms during the time period of Chapter 2 was largely accomplished by horse and plow, except during harvests when hundreds of temporary workers, who were usually Native American men, had to be hired quickly for just a few weeks of work. Harvesting was largely done by hand, until threshers (for grains) and potato diggers were developed in the late 1920s. Even then, the effort to pick the potatoes that the digger brought to the soil surface, or to gather and stack threshed grains, took much hand-labor which was fulfilled by short-term hires, mostly Navajo and Hopi men. During 1918 through 1929, there were many developments in farming nationally as well as in Flagstaff, such

as projects to build infrastructure that would capture or carry water, efforts to combat disease and pests, and the establishment of local markets for truck vegetable crops and fruit. The Extension Service played an important role in connecting farmers to regional markets, educating farmers about the latest developments to improve their farming success, testing new varieties of crops, and keeping farmers abreast of nationally-set crop prices. The Service often acted as a liaison between government agencies and local farmers, and certainly was a critical information source. The Extension Agent developed market reports that listed national and regional prices for crops so that farmers could plan for their financial success as much as possible (climate, soil and pest issues aside). And in 1926, there was at least one effort to relieve some of farmers' property tax burden at the county level, which shows that they were organizing themselves and had advocacy on their behalf from the local Farm Bureau committee. During 1929, the last year of this chapter, the Agricultural Marketing Act, a federal farm bill intended to raise crop prices, was passed with mixed success.

By the time the rains returned in 1930 (Chapter 3), farmers had started to devote more acreage to another crop. Beans fields were gradually being established towards the end of the '20s, although potatoes were still somewhat of a cash crop once the rains returned well after national bean prices increased in the mid-1930s. The switch from one primary crop to another was not immediate. The process was gradual, over a period of about five years, and no crop was ever fully discontinued. What changed was the quantity of production of each, rather than any one crop being phased out entirely. However, once the Depression fully started to take hold, local farmers in Coconino County had turned to another crop—pinto beans—for economic redemption.

CHAPTER III: 1930 to 1955—Beans and New Deal policies

"Beans are a roof over your stomach. Beans are a warm cloak against economic cold."
~John Steinbeck, Tortilla Flat~

I. Introduction

It should be noted that one of the differences between Extension Service reports through the 1920s as compared to reports from the early 1930s and later, was the relative amount of quantitative information they contained, which affects the level of detail between Chapter 1 and 2 versus Chapter 3. Reports from 1918 through 1932 provided much less data about the yields, acreages, price per pound, and total amounts the farmers were compensated for crops. This information started to show up with increased regularity in the reports from 1933 through the 1950s. Perhaps the reason that the reports contained more information and were better written was that the Extension Service and Agent were becoming increasingly organized and professional, though this is speculative. Another reason may be that additional agricultural data in Coconino County was being gathered by the Agricultural Adjustment Agency (AAA), which was established in 1933. Although the reports do not mention specific interactions between the AAA office and the Extension Service office, the data compiled by the AAA led to more comprehensive reporting in the Extension Service reports, since they would cite AAA-gathered information. The Extension Agent probably found it helpful to have another agency gathering information, since some of the report summaries state that the Agent was spread thin from assisting farmers and projects over a very wide geographic area.

During the time period covered in Chapter 3—1930 through 1955—pinto beans became the most financially successful commercial crop in Coconino

County. There were several reasons why beans rose to prominence. Potato harvests had suffered devastating losses during the latter part of the 1920s, due to disease, soil depletion from lack of crop rotation and green manures, and drought. The Depression had caused stagnation of crop prices partially due to national crop surpluses and partially due to the downtown in the economy. The convergence of these factors—national economic hardship, drought in Coconino County in the late 1920s, and potato crop failures, meant that farmers needed to find other primary cash crops (National Drought Mitigation Center 2006). Pinto beans had already been grown successfully in other parts of Arizona and in the southwest, including New Mexico and Colorado, and could tolerate being dry farmed. They matured within Flagstaff's short summer growing season. Once the rains returned in 1930 and were fairly regular throughout the '30s (with the exception of 1934, late in '39, and in 1940), and bean prices rose, farmers changed their primary focus to legume agriculture, but also continued to grow potatoes, though on a smaller scale. Small grains (wheat, oats, and barley) were still grown as staples for farm and ranch livestock fodder and local sale to the mill. Fruit, primarily apples and peaches from Sedona's well-irrigated and lower elevation Oak Creek Canyon continued to be a major contributor to the local economy of Sedona, and much produce was driven up the hill to be sold in Flagstaff's markets, even as Sedona was becoming more connected because of developments in road building, and growth from tourism.

II. National policy acts of the 1930s: New Deal, AAA, SCS and soil conservation

The most significant national agricultural policies that were passed during the period of this chapter—1930 to 1955—were during a period called 'The New Deal' in the mid-1930s. In 1933, Franklin D. Roosevelt became president, when

the effects of the Depression were at their worst. FDR was an optimist who championed reform programs, calling for "relief, recovery, and reform" during his campaign. During his first 100 days in office, he enacted several different measures to provide assistance to the unemployed, to farmers and to agriculture which included the AAA[w] and the Farm Credit Act—as well as economic recovery plans through public works such as the CCC (Civilian Conservation Corps), transportation funding, and emergency banking reform, among others. Collectively, these programs were called 'The New Deal.' The AAA was the first Farm Bill that manipulated prices and created subsidies. The AAA's intent was to raise farmers' incomes by restricting production by about 30 percent nationally (artificial scarcity) and thus increasing the value of crops (U.S. History, n.d.; Vogeler 1981, 270). This was necessary because agriculturally-derived incomes had decreased while their costs had increased: "After World War I, prices received by farmers fell while the prices farmers paid for seeds, fertilizers, and machinery rose. […] What ensued was a farm crisis" (Vogeler 1981, 164). Farmers were paid subsidies by the AAA to leave some of their land unplanted, under an acreage allotment program. The funds came from taxes levied on companies that processed crops and fibers to make foods and clothing, such as mills, who passed the extra cost on to the consumer (U.S. History, n.d; Pryor 1979.)

Although the intent was to benefit small rural farmers, instead the largest farmers had more advantage, since larger farm sizes meant higher acreages and yields, thus higher subsidies (an early echo of today's state of affairs). Vogeler, author of 'The Myth of the Family Farm,' points out that, "In the 1930s there

[w] The Agricultural Adjustment Act of 1933 created Agricultural Adjustment Administration and Agricultural Adjustment Agency. Since they are all abbreviated as 'AAA,' unless stated otherwise, AAA refers to the Act in this thesis.

were hungry people and desperate farmers, but the U.S. government did not put the latter to work feeding the former" (Vogeler 1981, 163). Because larger producers received a net higher gain, over time the "net impact of [federal farm programs] from the 1930s to the 1970s was to encourage increases in farm size (Vogeler 1981, 163)." While farm incomes increased nationally during the first three years of the AAA, over the decades small family farms and tenant farmers across the country were "driven off the land" because of this program. Though there was not a discussion of farmers having to leave the land in Coconino County's Extension reports after the AAA was passed, farming in the county was marginal for many growers—in other words, breaking even or making a profit required a great deal of hard work and a combination of favorable circumstances, like regular precipitation and good crop prices (and sometimes that meant national price supports). Vogeler contends that the federal farm programs that relied upon artificial or subsidized scarcity contributed to making poorer people more dependent on federal food handouts and resulted in the growth of agribusiness, which continued the cycle of driving staple crop prices down. This longer term trend was not evident in the Depression and AAA years, but its unintended results—a move towards agribusiness in the decades to come—transformed the national agricultural landscape and certainly had an effect in Coconino County in the 1950s and '60s (see Chapter 4 for a discussion of those years).

1. The AAA's acreage allotment program:

In Coconino County, acreage allotments played a role in determining the total area certain crops could be grown in order for farmers to receive the national support price for those crops. The acreage allotment program was a key

component of the AAA act to reduce national surpluses and boost prices. Overall, it established a mix of commodity-specific price and income support programs (Dimitri and others, USDA 2005). Under the program, farmers were restricted to a fixed acreage that could be planted in a particular crop each year (Vogeler 1981, 163). The total area that farmers could plant with an AAA crop (in Coconino County, wheat and potatoes, but not beans) was based on a formula that took their past cultivation area and "their" fraction of the yield that was needed nationally into account: "Acreage limitation is based on the acreage planted during a previous base period and is the farm's share of the national acreage needed to produce sufficient supplies of each crop" (Womach, Congressional Research Service 2005). Farmers voted in their counties to accept either, 1) acreage controls with enforced penalties for exceeding them and with high support prices, or 2) open production with freedom to grow all they want but with drastically lower support prices"(Vogeler 1981, 166). Most farmers chose the first option, because the second option would not allow them to break even. Beans did not face any restrictions in Coconino County, so this was another determinant of their success, especially when national legume prices increased.

From 1939 through 1941, when somewhat drier weather caused crops to suffer, it is indicated within the Extension reports that the allotment program may have influenced some of the farmers' thoughts about changing farming strategies. The Agent mentioned in '41 that, "recent pinto bean acreage extension and subsequent failures [from drought during '39 to '41], and limited wheat and potato acreage allotments will likely result in more forage, feed grains, and livestock [being raised] by the small operator." Nevertheless, the Agent's concern that farming would turn mostly to fodder-growing was alleviated by rainfall.

The bean fields, which were not under the allotment program, rebounded and continued to be the most financially productive of all crops into the next decade.

There is also some indication that the price support and marketing system did not always work perfectly. In the 1943 Extension report, Agent Lueker discussed the challenges farmers had that year to ensure they received the stated support price, and to sell crops to government agencies:

> "Last year arrangements were completed through which our bean growers could sample, receive a U.S. grade, and sell according to grade to the U.S. Surplus Commodity Corporation. Some beans were sampled and graded and some were were sold early this November and shipped out. This year the State Chairman of the AAA, in a meeting with 25 farmers, stated that the local AAA office would buy beans, cleaned, sacked and graded, f.o.b. Flagstaff, at a support price of $6.50. [f.o.b.: "Free on board" and the place of origin (Flagstaff) indicated that the buyer pays shipping cost, and takes responsibility for the goods when the goods leave the seller's premises. It was the best deal for the local sellers.] Now growers are asked to sell it privately. A local representative of a Phoenix brokerage is receiving and shipping most of the beans marketed at 25 cents under the U.S. support price. There is some grumbling but no concrete action taken to procure for the farmer what was promised. A large crop of potatoes is waiting in storage for a market outlet, and none is in sight. Potato prices are from $2.50 to $2.70 per 100 pounds. Two [train] cars have been contracted to the government at $2.60 per 100 pounds. Marketing of war crops and livestock constitutes a major problem" (Extension Service report 1943).

The table below shows that in Coconino County, from 1938 to 1942, between 938 and 1018 acres were under the wheat acreage allotment program. However, the total number of farmers participating in wheat allotments was low: just five or eight, from 1933 to 1935.

Table 3. Wheat acreage allotments. Agricultural Adjustment Agency figures. (Extension Service reports 1938-1942).

Northern Arizona Wheat Production Control Association figures					
Wheat allotments in Coconino County by year:		**Number of farmers participating:**			
		County	**1933**	**1934**	**1935**
1938	1018 acres	**Coconino**	**8**	**5**	**5**
1939	934 acres	Yavapai	3	3	3
1940	989 acres	Apache	13	12	13
1941	993 acres	Navajo	3	3	3
1942	938 acres (estimated)	Totals	27	23	24

In 1936, the Supreme Court decided in *United States v. Butler* that the AAA was unconstitutional. The Court ruled that the act invaded the reserved rights of the states, violating the Tenth Amendment (States' rights). Regulation of agriculture was deemed a state power (U.S. History, n.d.). (The AAA was later amended and reestablished in 1938.) The 1936 Supreme Court decision read, in part,

> "The regulation is not in fact voluntary. The farmer, of course, may refuse to comply, but the price of such refusal is the loss of benefits. The amount offered is intended to be sufficient to exert pressure on him [the farmer] to agree to the proposed regulation. The power to confer or withhold unlimited benefits is the power to coerce or destroy. If the … grower elects not to accept the benefits, he will receive less for his crops; those who receive payments will be able to undersell him. The result may well to financial ruin. The coercive purpose and intent of the statute is not obscured by the fact that it has not been perfectly successful. […] This is coercion by economic pressure. The asserted power of choice is illusory" (FindLaw, U.S. Supreme Court, U.S. v. Butler 1936).

Also in 1936, a federal law called the Soil Conservation and Domestic Allotment Act was enacted. It established the Soil Conservation Service (SCS, now called the Natural Resources Conservation Service) and connected soil conservation and commodity programs (Dimitri and others, USDA 2005),

through technical and financial aid to farmers who agreed to implement soil conservation practices (Adler and Lacy 1995, 2001). Farmers could receive aid by reducing production or "resting land," and planting "erosion-resistant" crops vs. "soil-depleting" crops. The SCS also provided specialized assistance to farmers to "conserve soil" through creating berms, contour plowing, strip cropping [alternating grains with other crops, on a contour or perpendicular to each other] and terracing (Adler and Lacy 1995, 2001). In Coconino County, the Extension Agent had, since the inception of the Extension Service, offered advice and assistance on soil conservation methods. However, the SCS had ample federal funds to purchase machinery and manpower to help farmers, and thus it may have been more beneficial for farmers to work with the SCS. These extended quotes below show the type of soil work (terracing, sub-soiling[x], and strip cropping) that was being accomplished, and that the methods benefitted farmers by increasing their yields. They are also a good example of the language used in the Extension reports that reflects the 'tone' or 'tenor' of the time (1940s):

> "The County Agricultural Agent recommends terracing to check sheet and gully erosion on all land in Doney Park. It took a long time to convince farmers of this. Nevertheless, through Extension efforts, 765 acres of farm land were terraced. Now, since all the good land that is subject to erosion is within the San Francisco Peaks Soil Conservation District, this activity has been taken over by that local SCS agency. The Agent's activities with respect to soil work has become restricted since the SCS has taken up headquarters here. They have men, money and equipment in abundance, and can do engineering free of cost. At first they emphasized terracing, strip cropping and listing [a type of furrowing]: soil conservation primarily and water conservation secondarily. Now listing is abandoned here [perhaps because of very arid soils], and the chief emphasis is sub-soiling. With bigger farm equipment a fair beginning has been made with respect to this practice. They use a large caterpillar tractor and sub-soil

[x] Sub-soiling is deep plowing that loosens the earth up to two feet below the surface, but does not turn the soil over.

> farms for a fraction of the cost that the farmer would pay to do it himself. In connection with the purely soil work which has shifted from soil conservation to soil moisture conservation and then to soil management, the SCS has chartered a course in farm planning and has entered upon written agreement with the farmer (a moral obligation, not financial). This agreement does include phases of crop production. It would seem therefore that the SCS may ask for undisputed rights in matters that pertain to the field of agronomy which concern its cooperators within the district and finally all affairs within the district. In Doney Park, two farms were sub-soiled, one 120.5 acres and the other 140 acres (200 acres of beans on the second Doney Park farm were not sub-soiled). A third 60 acre farm was also sub-soiled. The yields were on average 104 pounds more per acre. Total yields for each farm, respectively, were: 42,500 pounds per 120.5 acres (or 353 pounds per acre); 38,472 pounds total or ~375 to 485 pounds per acre; and 752 pounds or 422 pounds per acre" (Extension report 1944).

The Extension Service reports discuss soil conservation efforts in great detail and reveal that, at times, there were minor turf battles over the work. This section on soils from the 1947 Extension report shows that coordination was required between several different agencies whose work sometimes overlapped. It also shows that farmers greatly increased their planting efforts when bean prices were higher:

> "For years before the Soil Conservation Service came into existence, we {the Extension Service] recommended terracing lands in Doney and Black Bill Parks on slopes where land was washing. Before the SCS arrived, we had 765 acres terraced. It [terracing] is still the most important soil conservation project for this area. This project is taken over by the SCS. They have their technicians and equipment and are giving excellent service. But it would seem that much of their time has been diverted, to some extent at least, to overlapping activities of other agencies, such as the Extension Service, the Forest Service, and the Agricultural Adjustment Administration. The SCS personnel and Extension Agent work in harmony. The Extension Agent attended three SCS meetings. Incidentally, the Agent was asked by two farmers to assist them in planning and laying

> out terraces. Strip cropping was not as much in evidence this year as in years past. This perhaps is due to the bean prices last year, following which the farmers wanted to plant every possible bean-producing piece of land to beans. Sub-soiling become a general practice and is being extended more and more. This is accounted for because of large power equipment and the AAA payments. Even without government payments, the practice [sub-soiling] is more profitable than plowing [because it increases yields]" (Extension Service report 1947).

Farmers did not always receive payments from the AAA for strip cropping, however beneficial it may have been in preventing deep gullies from forming from monsoon rains: "The best example of [strip cropping] this year has been C.R. Monroe, who planted broad strips of barley across his field at right angle to the slope. The effect was good and it attracted attention. E. Burrus as usual continued strip cropping in his own way. None of this strip cropping meets the requirements of the AAA since the AAA specifications for strip cropping are not practical for Coconino County farmers" (Extension Service report 1942). It is unclear from the reports what the difference was between farmer Burrus' strip cropping methods and AAA requirements. Since Burrus was one of the consistently most successful farmers in the county over the decades, he probably had developed systems that were better for his lands, rather than more generic methods from the SCS.

During 1936 through 1942, between 33 and 112 farmers in Coconino County received payments from the SCS's association. The reports did not specify whether the farmers were leaving land 'idle,' or whether the payments were for growing a soil-conserving crop, such as a green manure or legume. In comparison, the number of ranchers who received payments for 'resting' their land from cattle grazing is also included in the table below (Table 4). The

numbers show that far more farmers than ranchers were participating during these years.

Table 4. Coconino County Soil Conservation Association participants, under the Soil Conservation Act (Extension Service reports 1936-1942).

Coconino County Soil Conservation Association		
Program year	**Number of farmers paid**	**Number of range payments**
***1936**	**62**	6
***1937**	**53**	13
1938	**33**	20
1939	**52**	23
1940	**80**	31
1941	**112**	26
****1942 (estimated)**	**80**	20

*The 1936 and 1937 payments were not on a wheat allotment, but rather for reducing the acreage of general soil-depleting crops. **The 1942 potato allotment is an additional 384 acres, and is assigned to 34 individual farmers.

III. The primary commercial crops of Coconino County

1. Beans: general information, yields, and acreage

Before 1930, any discussion of pinto beans in the Coconino County Agricultural Extension reports was scant. The few times beans were mentioned said only that different varieties were being tested for suitability in Flagstaff, and in 1921, the Extension Agent wrote that "Colorado pinto beans were primarily grown by 'Indians,' and harvesting and threshing was all done by hand." Just a few farms were growing pinto beans during the early settlement years—the turn of the century—through the mid-1920s, and then mostly as food for their families. By 1929, tests were being conducted by the Extension Service in collaboration with farmers to identify the most productive, drought-tolerant,

early-maturing strains of beans—varieties that would also produce sufficient seed to solve the problem of seed-purchasing expenses for farmers. In 1930, in the text of the Extension reports, legumes finally came alive: the Agent was effusive about bean growing, revealing that pinto beans had been grown on a small scale for several years, but as farmers started to cultivate them more actively, they had become "first as a money crop." From 1930 to 1955, beans were considered the most important cash crop for the county. Thus, in the Extension reports, more space was devoted to their growing requirements, yields, and the diseases and pests associated with them. Beans were often planted with various small grains, especially oats, to provide more nutritious wintering fodder for livestock.

In 1930, thousands of acres of beans were planted. The total bean yield that year was 18,000 sacks. Each sack held 100 pounds, which meant that 1,800,000 pounds of pinto beans came from the farms around Flagstaff. C.G. Lueker, the Extension Agent from 1929 to 1949, wrote this about bean cultivation in the 1930 annual report:

> "It is important for the farmers to plow well and deeply in the fall of the year or very early in the spring, and to keep the weeds down before and after planting. When the ground is plowed late in the spring, and consequently is loose, the seedbed is dried out by planting time, and beans do not come up until after the July rains, and are too late to mature a good crop. Beans are planted May 20th to June 10th. They are planted deep in the moist seedbed so that they may come up and grow without injury from drought until the real growing season in July when the rains start" (Extension Service report 1930).

The Agent also mentioned the reasons he was advocating an increase in bean acreage: the bean economic market was healthy in Arizona, and both bean growing and bean eating were robust in the state. He wrote,

> "More beans are consumed per capita in Arizona than in the country as a whole. Consumption in the U.S. is nine pounds per capita. The production per capita in Arizona is six and a half pounds. Bean yields should be increased, and sold primarily to Arizona buyers, since the market here is very good. The average yield in the county is considerably above that of Colorado and New Mexico pinto bean growing sections [farming areas]. Our people have a freight advantage for Arizona. Pinto bean straw is being advocated for dairy and stock cattle feed" (Extension Service report 1930).

In demonstration plots—areas on farms where a farmer would cooperate with crop trials run in collaboration with the Extension Agent—140 bean plants in 1931 were selected from farms for "early maturity, high yield, and freedom from disease." Pinto, pink, and great northern beans did well in these trials. In 1936, Flagstaff's farmers produced a huge crop: 30,000 one-hundred pound bags—equivalent to 3,000,000 pounds of beans. That year's report said the sales added up to $125,000 for farmers. With the exception of a severe drought in 1934 (the middle of the Midwest's Dust Bowl years) and insufficient rainfall in '39 and '40, the '30s were excellent years for bean harvests, which was important given the Depression and sluggishness of the economy. In 1938, Extension Agent Lueker found that "the yield is much higher [in Coconino County] than in other pinto bean growing areas. On the most adaptable lands and in the hands of good farmers, eight to ten sacks of 100 pounds each is the usual crop in fair to good years. In recent years, the total yield has amounted to approximately 30,000 bags. This year the crop is estimated to reach 35,000 bags valued at about $140,000. Much progress has been made in handling of this crop in recent years."

The progress (and success) in bean farming that Agent Lueker was referring to had to do with improved soil management practices and the development of farm machinery that made farming easier, quicker, and less

labor-intensive. Although Lueker discussed a series of tests in 1936 and '37 that he spearheaded in collaboration with several farmers to evaluate the cost of horse-driven farming versus mechanized farming, the results of the test were, unfortunately, never reported in the archives. (See the next section for more on this—the implications of mechanization and WWII on bean farm labor.)

1939 through 1941 were somewhat rough for Plateau dryland farmers. Drought in 1939 and '40, and ample rain but an early fall frost in the fall of '41 decreased the bean acreage from 9,121 acres to 6,579 acres in 1942. The soil fungus rhizoctonia killed about 75 percent of the overall crop in '40—though for some farmers it was 50 percent or less—since beans were stressed from the drought. In previous years, the loss from the fungus was much less. In 1941, 7,000 acres of bean fields were chemically "treated" against the fungus, and 1942 saw a good results from the treatment in the fall bean harvest, though the overall acreage planted was less. The rains had returned in force by then.

In 1943, the number of acres devoted to pinto beans was still well below the 9,000 plus acres grown in the '30s—down to 6,101 acres. However, the fields were yielding well, with an estimated 100 sacks of beans per acre. The price was set at 6.25 cents per pound, which paid the farmers $245,750, all told. Bean acreage stayed slightly lower until WWII.

There were efforts by the Extension Service in the mid-'40s to find a bean variety that matured earlier than pinto beans, since pintos are very sensitive to frost damage. The goal was to extend the geographic area that beans were grown, if a variety could be found that was more frost-tolerant. Test plots of twelve new varieties on two farms were tried. The 1943 Extension report listed ten of these: White beans, Red beans, Early Pink California, Early Pink Hybrid-

California, Standard Pink 38, Italian Bird's Eye beans (Steele), Idaho pinto, Pinto Sel. 164 California, Wyoming, and Native (Colorado) pinto. The reports showed that on "Lewis Hoskin's farm," Idaho pintos only yielded a third as much as native pintos in '43, but in 1944 "the early Idaho pinto out-yielded the local pinto bean, perhaps because there was good moisture at the beginning of the growing season, and dry weather later in the season limited the full development of the local pinto," which took longer than the Idaho to mature. The results of the trials on the other beans were not mentioned in any reports.

In 1945, the early Idaho pintos were infected with "bacterial blight" (a soil bacteria that affects both roots and the above-ground portion of the plant) and the plants had to be taken off the fields and destroyed so the blight did not spread to native pinto beans. The Idaho variety matured two to three weeks earlier than the native pintos, but over several years of trials, the Extension Agent and farmers found that it yielded just a third of the harvest compared to native beans. It also tended to be more prone to blight. The Wyoming bean variety continued to be grown by a farmer called U.S. Crisp (which sounds like a brand of apple, but it is indeed his name). His farm was in "the far eastern part of Doney Park," which the reports said was lower and colder than other areas in Doney Park. Although the Wyoming variety grew less beans—eight sacks per acre compared to ten per acre of the native pinto strain—it could be harvested between one to three weeks earlier than native pintos. Growing fields of both native beans and Wyoming beans helped farmers hedge their bets against a poor harvest in case an early fall frost arrived. A side note about the farms' locations, and where we might find that land now: there are several roads clustered together north of Silver Saddle Road off of Campbell Avenue (west of Hwy 89) outside of Flagstaff, called N. Crisp Hill Rd., E. Crisp Hill Rd., and Crisp Hill

Circle (found on google maps). They likely mark the old Crisp farm area. Another road that is probably runs through historic farm property is E. Burris Lane, north of Townsend-Winona Road and west of Hwy 89. Perhaps it is where one of the old "Burrus" farms were—Ernest or Charley Burrus' farm fields—as mentioned in Table 5, below.

Table 5. Bean yields on two farms (Extension Service report 1944).

Farm	Area	Acreage	Yield
Lewis Stalhut's farm	Doney Park	120.5 acres	42,5000 of clean beans, or 353 pounds per acre. (The harvest yield was higher but a "large percentage of beans" were lost during the cleaning process.)
Ernest Burrus' farm	Doney Park	140 acres	60,340 pounds, or approximately 431 pounds per acre.
Ernest Burrus' farm	Doney Park	110 acres	Yields on this field averaged 618 pounds per acre, because barnyard manure was added to the soil. The soil texture from the manure accounted for a considerable increase in moisture-holding capacity.

World War II heavily influenced the push to increase crop output. Agent C.G. Lueker's 1944 report stressed that, "practically the entire Extension program can be regarded as a war activity at this time, since the emphasis is on abundant production and saving the crop from the ravages of disease and insects. The farm labor program is distinctly a war activity to the end that through it the Agent has been able to provide necessary timely labor to save the matured crops from wasting" (Extension Service report 1944).

Bean acreage in the mid-1940s was increased to 8,000 acres, and in 1945 farms expanded to the greatest number of acres (for all crops) recorded throughout the history of the reports—mostly due to war production. From the

years 1918 through 1955 (the reports end in 1960), the total farm acreage in Coconino County was listed as 25,000 acres, plus or minus 1,000 acres. In 1945, about 27,000 acres were farmed. That year, the pinto bean average yield was an extraordinary 600 pounds per acre. By 1947, 9,000 acres of beans were being grown and the Extension Agent stated, "During this year the yield was better than it has been in the past seventeen years, or ever, and the price likewise is better. This is all the land [that is] adapted to bean growing," which implied that farmers were growing full-out.

From 1947 to 1949, as part of the ongoing activities of the Extension Service to improve crops and yields, several additional new bean varieties, or strains as they were called then, were introduced to test their suitability to the Plateau climate. This is what the Extension Agent Lueker had to say about those varieties, as well as his thoughts on some of the issues with bean cultivation during that period of time: [In 1947], "three new pinto bean strains were introduced, and two of these out-yielded our native strain. The strains were developed by the New Mexico [Agricultural] Experiment Station. Two of the strains yielded 504 and 478 pounds per acre, and the native pintos yielded 450 pounds per acre." And in 1949:

> "One or possibly two new strains of pinto beans out of nine [varieties] from agricultural experimental stations in Colorado, New Mexico, and Nebraska, grown here in the last few years, may take the place of our native pintos. The San Juan, developed by the Colorado station, is said to be drought and disease resisting, heavy yielding, and fairly early. We have grown it here one year. If it does well, it will mean more money in the pockets of bean farmers in the years to come. Ike and Russell Fleming [bean farmers] think they are sold on it and are growing it more extensively this year. Pinto bean growing is the most important farm activity in Coconino County. It has proven to be the most profitable and is made with comparatively little labor. However, it has its hazards: frost at

> the beginning and end of the growing season may reduce the crop as it did in the past two years; rains immediately after planting can crust the top soil so that farmers have difficulty in securing a stand. They have done some scratching or harrowing of the top crust and in some instances have had to replant. Root rot, about every two to five years, has occasionally reduced the crop" (Extension Service report 1949).

Difficulties with temperatures and precipitation aside, pinto bean harvests provided most big farms on the outskirts of Flagstaff with their financial bread and butter. The 1940s through mid-'50s were productive farming years, and also the last period of time in Coconino County where farming was going full steam ahead.

The 1950s ushered in a number of years of severe drought in Coconino County, although a few of those years had ample rainfall, and in some months during those years the rainfall was plentiful. (For example, one year Black Bill Park might receive double the rainfall as Winona, or the town of Flagstaff proper might receive double the rainfall as Doney Park, and so on.)[y] In 1950, despite variable or dry weather in some areas, pinto beans were grown on 7,000 acres. They continued to be the primary cash crop, even though grains and "forage and pasture crops" were planted on double the acreage—14,000 acres combined. The Agent wrote the following on bean cultivation in 1950:

> "The beans were planted in late May and early June. The soil was drier than normal at planting and the seed had to be placed deeper in order to be set in moisture. The beans were cut in early September and threshed in October. The beans dried well and fast this year because we had no moisture in October. Yields varied from 200 to 12,000 lbs to the acre. The

[y] Because of the differences in rainfall between different farming communities, I reviewed drought records from NOAA and precipitation records from USGS for Coconino County and Flagstaff, respectively, to get an overall picture of the conditions in each year—or at least for every five year period—depending on whether records for individual years were available.

> county average was about 500 lbs to the acre" (Extension Service report 1950).

Likewise, 1951 was dry. It was the start of a period of less rainfall and great difficulty for Flagstaff's farmers, though they had a respite in 1952 through '54, with good rainfall and relatively good harvests. Agent William M. Brechan (Bill), who succeeded Agent Lueker in late 1949, wrote,

> "This year was one of great disappointment for the dirt farmers. Perhaps the driest June and July in the history of this area was experienced by the farmers. Good stands of beans and grain were almost completely ruined before the summer rains started in late July. Rains that normally come in mid-July did not come until August, and then they were spotty and light. The first good rain did not come until the last three days of August. This was too late to benefit the pinto beans. The varieties all stunted very badly and matured out early. By mid-September it was concluded that the varieties on an acre basis would not warrant cutting and threshing" (Extension Service report 1949).

Rainfall from 1952 through '54 was ample, though a severe frost in mid-September of 1952 killed about 50 percent of farmers' native Colorado pinto bean plants. However, early Idaho varieties that had already matured ten days early and been "cut and shocked" were not affected. The farmers that had grown the Idaho beans most extensively were: Mark Ferrell, who planted 3,000 pounds on 100 acres; U.S. Crisp, with 500 pounds on 20 acres; and P.E. Butler, with 100 pounds on about five acres. Up until 1952, most of the farmers saved enough of their native pinto bean seed to replant, rather than purchasing an Idaho variety. The early acute cold weather that year inspired many farmers to switch to Idaho beans thereafter, since good rainfall had enabled yields of about 1,200-1,300 pounds an acre of that variety, without frost damage. And in 1953, the overall tone of the Extension report was of encouragement and hopefulness. For the first

time in five years, all crops including beans matured, and yields flourished and sold well. In the Agent's writing, there was the sense that farms could recoup now that rains had returned, crop prices were healthy, and success in farming had returned. Until late summer in 1954, the weather cooperated. Rains stopped early that year, during the third week of August, about ten days too early for many pinto bean farmers to achieve their full harvests. Bean prices dropped too, dashing hopes for the "prospects of the largest yield in the history of Coconino County."

> "Pinto beans prices in 1954 were very poor. Most growers held the 1953 crop to be sold in the spring and summer of 1954. Pinto beans were selling in the spring and summer of 1952 for around $15 to $16 per cwt [centum weight, or 100 pounds]. The 1953 national crop yield was slightly below normal so everyone expected the same kind of price in the spring and summer of 1954. This did not occur. [There is no mention of why it didn't occur.] Many growers had to sell for $6.50-$7.50 per cwt in order to meet their financial obligations. Some growers still have their 1953 crop in storage along with their 1954 crop. Some beans have been sold for $7 per cwt in 1954 but there is very little demand at this time. About 90 percent of the 1954 crop is in storage" (Extension Service report 1954).

1953 was the last "banner year" for farmers in Coconino County. After the disappointment of 1954, 1955 brought uncertainty for farmers, ranchers, and even orchardists in Coconino County. "The majority of farmers experienced their worst season in many years. An extremely dry and cold spring resulted in poor soil moisture conditions during planting time. Continued cold temperatures well into July caused poor stands and growth on beans and small grains. Unusually heavy summer rains caused considerable erosion and stimulated root rot in the pinto beans" (Extension Service report 1955). The difficulties that farmers had experienced in 1949 to '51 had returned in 1955, and to make matters worse, the

pinto bean market demand and prices were down. In a very sad, lengthy section by Agent Brechan in the 1955 report he lamented:

> "The year 1955 was a fair year for the small grain and forage crop farmer but a very poor one for the pinto bean farmer. Soil moisture at planting time was poor. Seed had to be put six to eight inches into the soil to be in the moisture. A mid-June rain packed the cinder soil so hard that very few beans were able to force their way through the crust. Farmers were much in doubt as to replanting or leaving the poor stand of beans. Time was a key factor as a late June planting is very likely to be killed by the fall frost before the beans are mature. Several farmers did replant and got excellent stands. Other fields grew very slowly. Nights remained cold until mid-July and daytime temperatures were also low. With this climatic condition prevailing in the bean areas, root rot began much earlier and more severely than usual. Many fields suffered 50-70 percent infection. Some plants died while others sent out surface feeder roots and remained alive. All infected plants, however, remained small. Then, summer rains were very heavy this summer and washed many acres of beans severely. This further reduced the stand of beans. On August 20th, the rains stopped and no measurable moisture fell until late November. The temperature turned warm and dry and all small immature beans shed. The other beans matured very fast. In early September blight hit many bean fields and all leaves fell. This left the mature beans at the mercy of high winds and hot temperatures. Farmers cut their beans in September and high winds scattered windrows causing severe shelling. By the middle of October all beans were threshed. Yields were average to poor. Some fields were never cut because of such poor stands" (Extension Service report 1955).

Some farmers purchased livestock to compensate for crop failure and used the bean straw and small grain hay that they had grown for fodder. Other farmers started planning for and planting forage or silage crops for local sale, such as corn and 'sweet sudan.' The Extension Agent wrote that many farmers had realized that their reliance on one cash crop was a recipe for disaster, and the need to diversify was important.

However, within the next two years, much had changed. Drought was still at hand, and had intensified to the extent that many farmers turned to whatever remedies were available. Help finally arrived later with big hands: the federal Soil Bank Act (see Chapter 4). During the years from 1930 to 1955, there were other important factors that significant to Coconino County's agriculture. One of those was labor.

1a. The implications of mechanization and WWII on bean-farm labor

In 1936, there were 50 farmers in Coconino County who farmed pinto beans. As the 1930s progressed, increased farm mechanization and equipment were increasingly tied to farm success and reduced costs. The Extension Service had always focused on helping farmers increase their yields, and certainly during World War I large agricultural output was seen as something that was for the public good and was also driven by necessity. Agricultural resource policy at the local and national level especially during and after the Depression was focused on increasing productivity (Mercier and Smith 2006). Even though acreage allotments reduced the total number of acres a farmer could grow certain crops, there were no restrictions on the yields from those acres. Farmers were always looking for ways to reduce their costs and total labor while increasing production. By the mid-1930s, tractors had largely replaced horses on farms, and in the 1936 Extension report the Agent wrote that tractors had "proved more economical." In that year a production cost study was started to compare the financial difference between using horses or a tractor. The study was mentioned the following year, in 1937, but no results, unfortunately, were reported in any future reports. Up until about 1933, plowing and preparation for planting were originally done with a "four horse outfit," and planting, cultivating and

harvesting were done with a "two-horse outfit." In 1938, "two- and four-row machines" (Extension Service report 1938) were used for planting and cultivating, and by the late-1930s and thereafter, the equipment was pulled by tractors, rather than horses. The tractors could plow at a rate of seven to twelve acres a day (but the report does not say how much acreage could be plowed by horses in a day).

Several other types of recently-developed machines started to be used more widely by Coconino County's bean farmers in the 1930s. "Pick up combines" were used by a few farmers to harvest beans (which reduced short term labor to hand-harvest) and some also used a "side delivery rake" to "dispense with some labor in the bunching of beans for drying." In the early '30s, a small bean "thrasher" was used by most bean farmers, a device which could produce about 100 sacks a day. Then, as large thrashing machines were developed, their use became more widespread among the farmers (there is no mention in the reports of how many sacks a large thrasher could produce). In the late 1930s, a most bean farmers purchased combine thrashers, which, it appears, are the same machines as "pick up combines." These harvested and 'threshed' the beans by cutting the bean plants at the base, then transported the plant to beaters or 'thrashers' with metal teeth that cut the plants, and separated the beans from the straw. The straw was often used for livestock forage. The process was slightly different on each farm, depending on the particular machine and methods used: "This year [1938] most of the thrashing was done with combines, some picking up the beans out of the windrow and others with men pitching in small shocks [of beans] into the machine as it moved across the field. Some of our good farmers and good managers prefer the large thrashing machine in order to save the bean straw for stock feed." The difference the machines made was

profound. The Extension report in 1937 noted that "200 men have been replaced by machinery in the bean harvest."

The U.S. entered World War II in late 1941. The war had an immediate effect on the availability of farm labor, which was greatly needed even with farm equipment mechanization advances. "When the United States entered World War II in December 1941, farm labor shortages became acute as the workforce went off to war or to higher-paying defense industry jobs" (Carrasco, Bracero Program 2011). In Coconino County, farm labor shortages did not begin until the fall of 1942, when healthy crops of beans made the labor situation "acute" because the potential harvest was so large. Agent Lueker reported that ultimately, thousands of beans were lost because labor was not immediately available and an early frost cut the harvest window very short. The frost came just after the beans had been 'cut,' and caused them to dry out more rapidly than normal, making a quick harvest and removal from the fields more important. One farmer told the Agent that he had lost the equivalent of 500 sacks of beans, and some "apple drop" occurred in Sedona, due to lack of extra workers. The Extension Service got help from the Navajo and Hopi reservations just in time to prevent the entire bean crop from freezing: "Many Navajos and some Hopis were obtained" (Extension Service report 1942). Male high school students were beseeched for their help as well, and some came after school and on the weekends to lend a hand. Women farmers pitched in more too, according to the '42 report—they drove tractors, piled beans, and helped thresh.[z] The Agent said, "Without this help the crop waste at harvest would have been much greater."

[z] Note: the Extension reports switch back and forth from 'thrash(er)' to 'thresh(er)' but imply the same activity or machine. In later years 'thresh' is used more often. When writing a description, I've used the spelling that is used in that year's report.

From 1943 through 1946, labor shortages because of World War II created some challenges for Coconino County farmers, though in 1946 more farms had purchased mechanized farm harvest equipment, which lessened the extent of the difficulties. During those four years, Navajo and some Hopi men were the primary temporary workers on the farms. Agent Lueker wrote, in 1943, that farm labor recruiting became the most important project for the Extension Service starting "September 6th and 7th" and during the months to follow.

> "Labor was needed for shocking beans behind the cutters, pitching beans on wagons and from wagons, turning bean shocks after rains, and handling and storing beans. Close following this came the potato harvest, where help was needed picking up potatoes, and hauling and storing and sorting them. Mechanical labor and manpower to do this was sufficient. Then some help was needed in November to help thresh wheat, oats and barley. A limited amount of transient labor was available and employed. A few Hopi Indians were available; Navajo Indians were depended upon for the main source of this labor. Some farmers traveled to the reservation where they gathered men with the help of an interpreter. The County Agent recruited 188 laborers on the streets of Flagstaff, on the highway and from office callers, since but few farmers have phones" (Extension Service 1943).

Even though native people provided most of the labor—and presumably if they had not worked the farmers would have suffered huge losses—they were discriminated against. Pay scales were lower for Native American men, who were paid $4 per day without board, while "white help" was paid more—up to $5 or $6 dollars per day. However, compensation did increase—in 1946 wages were up to $5/day, board included. The Agent noted some differences in behavior between Navajo and Hopi workers: "The Navajos without exception stay but a little while. They habitually stay on the move regardless of wages and

labor conditions. While on the move we intercepted them and diverted them to where they were needed on the farm. They could not be depended upon for long, but then could usually be replaced by other Indians on the move. A limited amount of Hopis help with the harvest. They live in Pueblos on the reservation and are not accustomed to moving around. They seem somewhat imbued with the idea of getting the job done" (Extension Service report 1944). However, the truth was more complex than the Agent's interpretation. During the war, there was a lot of competition from other recruiters, who often paid much more than the farmers could to both native and white workers. The Santa Fe Railway Company, the copper mines and smelters in Jerome, the Navajo Ordnance Depot,[aa] and the Yuma air force base all actively recruited and employed native and non-native men. The pay rate, at least by the railroad and Ordnance Depot, was $5.40 a day. The Depot also had an "Indian camp," which apparently, along with the high wages, attracted native workers. Many native men were also "inducted into the Army" towards the end of 1943, and because of this, labor shortages on the farms were felt acutely in 1944 and '45, especially during harvesting from late August through October. In 1945, the Extension Agent mentioned that some young men were "calling for farm work" who were 16 and 17, and not old enough to go to war. They could be not be hired elsewhere since they were under 18, and if they said they were 18, other employers wondered why they were not in the army. Sometimes county farmers would get help from ranch laborers, mostly older men, from Montana, Wyoming, and Idaho that traveled through Arizona in the winter and early spring, when they had been "frozen out" in the other states. And some farm hands would travel up from

[aa] "Camp Navajo was originally established as Navajo Ordnance Depot in 1942. The original mission was the storage of ammunition in support of the Pacific Theater of operations during the Second World War" (Camp Navajo, n.d.).

Phoenix during the summer if they got too "burned out" and "were desiring of work in the cooler section [of the state]." Veterans started to return towards the end of 1945, and the Extension Service received many letters from them inquiring about the possibilities in Coconino County for ranch or farm work. The Agent treated them with much respect: "We felt they are deserving of every consideration, and consequently much time is given in conferring and advising with these returning boys." In 1946, once the war had ended, older teenagers and young men in their early 20s (some who were recent veterans) were traveling around, out of money and looking for work. After Navajo workers, these young men "constituted the next largest source of farm help." All told, between 150 and 200 men were hired each year to help with the harvests in Coconino County. After the war in 1947, the U.S. Employment Service took over farm labor hiring, and although the Agent felt sure that the Extension Service would be "called upon for assistance in directing farm labor in crop harvest seasons," there was little mention about farm labor thereafter. In 1948, the Agent met with the local representative of the State Employment Service and with farmers to "work out a plan through which our farmers could secure Indian labor when needed." From that time forward, the Extension Service was not as actively involved in farm labor employment.

1b. Bean marketing and national prices

In the 1930s, bean farmers started forming committees to discuss common problems and to become advocates for their crop sales to local and regional merchants. They started pooling their money to make purchases of equipment that improved the quality of crops, and thus their reputation. The Extension Service was an active participant in the meetings, and had long been diligent in

helping farmers to standardize crops so that they could get better market prices after harvest. To reap the best prices on the market, bean farmers needed to be able to offer higher grades of beans, which meant that they needed to be 'clean,'—without bean straw or rock particles. Just as potatoes needed 'graders' or 'sorters' (see Chapter 2), machinery was needed to eliminate any unwanted materials from the beans. Without them, farmers could not compete in the bean market. In 1933, the Trinidad Bean and Elevator Company in Denver rented a building and was buying and cleaning beans, and "putting them up in a standard pack, as had never before been done." That year, Coconino County farmers were able to easily sell beans to them, since they took care of all the cleaning and grading. The total bean crop in '33 was 2,000,000 pounds, or 20,000 sacks of 100 pounds each, which garnered the farmers $110,000, since beans were selling at $5.50 per cwt (100 pounds) by the end of the year. If we assume that there were 50 bean farmers, as reported in 1936 by the Extension Service, then each farmer received $2,200 (equally divided). Of course, it is doubtful that the funds were equivalent to each farmer, but it does give a sense of the profit they made from their crop. The 1936 Extension report mentioned that "a few years ago" Coconino County farmers' beans were "discriminated against on the market, for lack of standardization." Once farmers purchased their own cleaners, and a centrally-located cleaner was set up in Flagstaff for farmers who could not purchase one, beans became "cleaned according to standard" within the county (rather than having to send them to another company for that process), and could be put into "standard [100 pound] bean sacks."

In 1940, it seemed challenges still existed in bean marketing because of quality issues to do with cleaning. As farm modernization progressed, the ability to effectively compete against crops grown in other states meant that it became

critical to have the farm equipment that helped to raise the quality of a crop. The bean cleaners that Coconino County farmers used did not fully remove the "smallest cindery rocks," presumably from the volcanic soils north-east of Flagstaff, and in the 1941 Extension report Agent Lueker remarked, "This reacted against our beans in the market." That year, five bean farmers, Raymond Smith, Chet Monroe, Claude Smith, Charley Rice, and Ernest Burrus purchased a newly developed machine called a "C.H. Eckhart Jr. Rock Picker," from Salinas, California. From Dallas, they bought a "new blower-type machine" made by a company called Sutton Steele and Steele's Machinery. Last but not least, they also bought a "large clipper fanning mill." Then they constructed a building dedicated to this equipment just east of Flagstaff (probably in the Doney Park area). The process for effectively cleaning the beans meant the beans went "through the fanning mill," then through the "blower," and finally through the "rock picker." Lueker wrote, "Beans when [they have gone] through these cleaners will no longer be discriminated against [in] the market" (Extension Service report 1941). This publically-available bean cleaning warehouse provided a tremendous community benefit. Lueker remarked, in 1942, "Without this cleaner the beans would scarcely have been marketable. It is claimed that this cleaner is operated without profit to those who own it, where as those who patronized it with their 1941 crop profited by it to an extent more than necessary to liquidate the entire cost of the plant" (Extension Service report 1942). Making sure that Coconino County beans were of high quality was especially important in the years that the bean cleaning warehouse was established, in 1940 and '41. 1939 and 1940 were very dry, and bean harvests had suffered. In 1941, the rains were prolific, but an early frost reduced the yields. Also in '41, there was apparently a surplus of beans on the U.S. market which lowered national prices: "Bean prices have been low during the entire year due to the large supply of 19.5

million bags on hand as of January 1st, 1941." If the weather was excessively dry or excessively wet, crops could suffer. In 1942, the rains were again torrential and excessively wet fields and dampness (not common problems in Coconino County!) caused some diseases that "reduced bean quality." Still, much of the crop was sold to "local markets," and many carloads were shipped out by rail. In early May of '42 ten train cars were filled using the previous fall's bean harvest, and shipped to "Mr. Bickler of Farr Company in Mountainair, New Mexico" (just south of Albuquerque). Mr. Bickler came to Flagstaff in June to investigate that year's crop, and advocated for beans to be sold to him, pointing out that it was more difficult to sell directly to the government—the Extension Service and farmers' original intent—than to him.[bb] Farmer Ernest Burrus was the first to have his beans "U.S. sampled and U.S. graded," and was thus able to sell his harvest in 1942 at "U.S. No. 1 grade," which garnered the "government-supported price" of $5.35/pound f.o.b. Flagstaff. Other farmers had only been able to negotiate for $5.10/pound f.o.b. Flagstaff (which meant that the buyer paid for rail shipping from Flagstaff). Burrus' success inspired the farmers to create a committee that worked directly with the County Agent and local Farm Bureau to "market directly to the federal government." They were successful, and the extra .25 cents per pound made quite a difference. Between 15,000 and 20,000 bags of beans were sold at the higher price, which meant the farmers received $3,750 to $5,000 more ($75 and $100 extra for each farmer, if divided evenly between all 50 farmers).

In 1945, Extension Agent Lueker announced that "marketing does not constitute a problem with present government regulation price supports and

[bb] It is not mentioned in the report why there was more difficulty selling to the government rather than a regional seller, but it is possible that government sales were more lucrative for farmers and thus more desirable.

ceilings." (A price support is the lowest amount that a crop can be sold for; this is sometimes accomplished by subsidies, limiting production, or by storing surpluses. A price ceiling is the maximum price allowed by law.) Prices would often fluctuate during the year, starting low and going higher, or vice versa. In 1945, the Coconino County bean crop that was left in storage from the previous year, which was twice cleaned and in new sacks, sold easily at $6.15 per cwt (100 pounds) early in the year, and it seemed from the tone of the Extension report that the farmers were happy with the price. Later that year, they had to advocate to keep the prices over $6. In December, the War Food Administration attempted to reduce bean support prices from $6.50 to $5.40 per cwt. The farmers petitioned "our delegation in Congress to intervene," and the local Farm Bureau sent a resolution to the Arizona State Farm Bureau asking that it protest the price decrease. The efforts were successful, and the price support was only dropped to $6.25 per cwt.

Bean prices kept going up during the mid- and late 1940s. The price ceiling just a year later in 1946 was $8.71, and because demand was high, this price was considered quite low (even though the year before it was $2 less per cwt or 100 pound sack). This time, Coconino County farmers did not sell at the ceiling price, preferring instead to sell their beans on the black market, where they could apparently get much more. (Who would have thought there would be a black market for pinto beans?) The Extension Agent reported that when the ceiling was removed at some point that same year, beans sold at $13.75 per cwt, and stayed that way until year's end. (Unfortunately, there was no mention in the report of why the price shot up so much during those few years, unfortunately.)

Up through the early 1950s, farmers continued to put effort into organizing themselves so that they would have more group selling power in the marketplace. In 1950 the farmers, through members of the local Farm Bureau, asked the new Extension Agent, Bill Brechan, to "get all the particulars on the forming of a cooperative to handle the storage, cleaning, and selling of beans. The cooperative would consolidate all beans and other crops, and perhaps a more suitable market could be established. It would help the farmers with storage and marketing all the crops together, as well as enable the farmers to purchase many of their materials for the farms at wholesale cost." Agent Brechan's research revealed that the Berkeley Bank for Cooperatives "was found to be the office from which such a co-op could be established," and he called a meeting to present the information. The meeting was held on the east side of Flagstaff, and a group of farmers from Doney and Black Bill Parks attended. The stipulations to become a cooperative were formidable. Each farmer would have to pledge 100 percent support to the co-op, and "stand his share of the initial investment." The Bank would only stand 40 percent of the initial cost, "which would include land, buildings, and equipment, and then only if other factors were favorable." To be able to afford to participate in this arrangement, each farmer would have to mortgage his land and equipment to the Farmers Home Association—just to have enough for the initial investment. Although such a cooperative was needed by the farmers, the risk was too high for them, and they voted to postpone action on the project indefinitely. Agent Brechan noted that he "could not see how it would be possible to establish [this]." However, three farmers (Russell and Ike Fleming and R.F. Crisp), tried another strategy and formed the Flagstaff Bean Company in 1955, with plans to operate it in a manner similar to a cooperative. At the warehouse facility, they built a bean elevator, which was able to store over 10,000 pounds of beans. The facility, housed on

Russell Fleming's Doney Park farm, could clean 200 bags of beans a day. The farmers planned to store beans in 25, 50 and 100 pound sacks (rather than just 100 pound sacks) with the intent of marketing them to "state wholesale stores" (Extension Service report 1955). All bean farmers in Coconino County were able to clean and package their beans through the Bean Company at wholesale prices, and this became the prevalent practice post-1955 (Extension Service report 1956).

2. Potatoes, 1930—1955

Potato farming had met with some challenges from drought and soil depletion from the late 1920s to 1931, as described in Chapter 2. Once the rains returned, farmers also partially returned to cultivating potatoes, though on a much smaller scale. Bean crops had taken precedence, and by the early 1930s, potatoes had dropped from the primary cash crop to the second most important cash crop. From 1932 to the early 1940s, potatoes were still grown in Coconino County, though as time progressed, the acreage devoted to them became less and less, and as of the '30s, beans were always considered more important in the farming landscape. Potato acreage varied from year to year, and like all other crops, the amount grown was influenced by World War II in the 1940s. In 1932, 500 acres were planted, and then after two years of spartan yields for many farmers—due to disease and insect damage—in 1935 the acreage dropped to 125 acres. The primary issues that caused acreage to increase or decrease were diseases and an insect pest: bacterial blight and "ring rot" (both are soil bacterium that affect the roots and above-ground portion of plants) and psyllids (sucking insects that can cause severe damage to plants). If one or both of these issues affected the previous year's crop, such as happened in 1933 and '34, the amount of acreage that farmers would apportion to potatoes the following year was cut back, resulting in a decrease from 500 potato acres in 1932 to 125 acres in

1935. Farmers had not yet understood how to effectively combat or prevent those problems during that time, other than chemically treating seed potatoes using highly toxic and expensive methods.

Farmers had some better potato yields during the years from 1936 to 1942, and the acreage planted gradually increased during this period to 200, 300, and then 450 acres—just as the first full year of World War II commenced (for the U.S). During the middle of World War II, crop prices were high because of the increased need for food exports, and potatoes were no exception. A WWI poster, stating the U.S.'s wartime philosophy during both world wars, read, "Eat more corn, oats and rye products—fish and poultry—[sic.] fruits, vegetables and potatoes, baked, boiled and broiled foods. Eat less wheat, meat, sugar and fats to save for the Army and our Allies" (Figure 6). The sentiment was similar during WWII—potatoes were a "home" food; wheat was intended for export (see next section on grains).

Because of war production and better prices, farmers took the opportunity to plant more (as they had with beans), and in 1943 and '44 the potato acreage went up to 855 and 700 acres, respectively. A total of 855 acres in the 1930s was much less than 2,400-4,000 acres[cc] of potatoes that were farmed at their peak during the "potato heyday" years in the 1920s, but 855 acres was still more than the 50 to 400 acre-range throughout the rest of the years of this period. Although potatoes are not a national commodity crop like wheat, apparently they were covered under the Agricultural Adjustment Act of 1933, since acreage

[cc] Note: In the reports of the 1920s, the largest number of potato acres listed is 2,400. However, in the 1943 Extension report, the Agent mentions that "Extension Circular no. 48" from 1924 lists "3,000 to 4,000 acres" of potatoes planted in the early '20s. This report has been lost to time, and the annual report of 1924 does not give a total acreage. However, it's safe to assume that several thousand potato acres were being worked in the 1920s.

allotments—and restrictions—are mentioned a few times in regard to potatoes after 1942, though not prior to that year. Potato prices rose in the late 1930s, perhaps because of AAA allotment restrictions, and certainly during the war in the mid-'40s, prices were considered good according to the Extension reports.

The types of potatoes that were grown and tested for suitability in the Plateau soils and climate during the 1930s and '40s were Blue Victor, Bliss Triumph, Bliss Tuft, British Queen, Brown Beauty, DeSota, Gold Coin, Irish Cobbler, Katahdin, Pawnee, Peachblow, Pearl, Polaris, Pontiac (a cross between Katahdin and Bliss Triumph), Rural New York, Sequoia, and White Ross. Of these, Katahdin and Pontiacs did consistently well over time, and more acreage was devoted to them than the others, although Bliss Triumph and Irish Cobbler were favored for several years in the 1930s, as were British Queen and White Rose in the 1940s.

Yields varied during the pre-war years and during the war from 32 sacks (100 pounds each) per acre to over 47 sacks per acre. After WWII, from 1946 onward, yields were down to about 23 sacks per acre. The trend of increasing potato acreage again reversed, and by the late '40s, only 200 acres were harvested. In 1950 and beyond, 25 and fewer acres of potatoes were grown. To get an idea of the number of sacks and pounds harvested during this time period, I calculated potato yields for 1932, 1935, 1943, and 1949 (Table 6) based on the number of acres planted and the average yields cited in the Extension reports. Even at the lowest acreage planted—25 acres—over 57,000 pounds of potatoes were produced.

Table 6. Estimated potato yields for four years (Extension Service reports 1932, 1935, 1943, 1949).

Potatoes	1932	1935	1943	1949
Average yield per acre (sacks)	32	23	47	23
Number of pounds per sack	100	100	100	100
Number of acres planted	500	125	855	25
Total number of sacks	16,000	2,876	40,185	575
Total number of pounds	1,600,000	287,500	4,018,500	57,500

One of the issues for Coconino County farmers was planting "clean" seed, which was seed certified to be free of disease issues like bacterial blight and "ring rot," and had to be purchased from other states since it was not available in Northern Arizona. (Ring rot was first detected in Coconino County's fields in 1941.) It came from growers in the towns of Ackmen, Stoner and Dolores, Colorado; the Tres Piedras Potato Growers Association of Northern New Mexico; from Hatch, Utah; Sand Point, Idaho, and even Minnesota. For an unknown reason, potatoes grown in Coconino County never became certified, and when most farmers saved their potatoes for seed, they continued to populate the soil and their crops with blight and ring rot. A few farmers, such as Ernest Burrus and M.F. Ferrell, exercised great care in the seed selection of their potatoes or purchased certified seed, and had less disease and much higher yields as a result (Extension Service report 1932). When farmers heeded the Agent's advice to treat their potato seed with remedies such as "home boiling sulphur," or mercuric chloride (incidentally, a poisonous form of mercury salt), disinfecting the cutting knife and equipment, planting separate seed plots, 'roguing' the seed plot (removing visibly diseased plants), spraying, disinfecting the storage house, storing seed separately, and then spraying or dusting the potatoes during growth (Extension Service report 1944), yields could as much as quadruple.

In 1947, the Extension report said that potato farming had dropped to "its lowest point in 28 years." One of the reasons for this decline had to do with increased AAA acreage restrictions. During WWII, the acreage allotment allowance for potatoes had been 800 acres. In 1947, it was reduced to 210 acres. 1953 was the last year a section of the Extension reports was written about potato farming in Coconino County. Extension Agent Bill Brechan mentioned in the 1952 report that there was hope for the future of potatoes, but due to low prices and difficulty with obtaining abundant yields, the 50 farmers who were planting potatoes commercially up until 1947 had dropped to "less than three growers" by the early 1950s (Extension Service 1953).

Table 7.

Growers active in potato farming from 1930 to 1955, and their farm locations, if mentioned in the Extension reports. (Note: not all potato farmers are listed here, since the Extension reports do not give complete lists of names).	
Bearden, J.S.	Gregg, Jesse
Berry, Demma	Haner, John
Brent, C.C. (Red Lake)	Johnson, Clarence
Burdette, Robert	Kester, J.C.
Burrus, Charley (Doney Park)	Loveless, Paul
Burrus, Ernest (Doney and Black Bill Parks?)	Millet, Art
Byrd, D.S. (Red Lake)	Morrow, Jack
Cameron, Jess (Red Lake)	O'Leary, Frank
Cole, Ben	Olin, Tom
Colton, Harold and Mary	Priest, Ed
Crisp, U.S.	Pringle, Andres
Donovan, Gene	Rathjen, Jack
Engblom, Emil	Roundtree, H.G.
Ferrell, M.F.	Roundtree, R.B.
Fuller, D.E.	Schultz, Ernest (Garland Prairie)
Goodman, C.N.	Sechrist, Dr.

Graves, Emmett	Snow, H.S.
Graves, George	Ward, D.K.
Graves, Rod	Wise, M.M.

3. Small grains and corn, 1930—1955

Like potatoes, grains were widely grown throughout the 1930s, '40s, and '50s. However, they were much less important as a cash crop than beans and potatoes. Winter and spring wheat, oats, barley and rye were all grown, though oats and wheat were planted on the most acreage. Corn and a grain called 'sweet sudan' were also planted, mostly for "ensilage" or fodder for sheep and cattle. Some sweet corn was planted for home use and local sales. Wheat and corn were primarily grown for poultry feed during the 1930s (Extension Service report 1930), and wheat sales picked up during World War II due to its designation as a national export crop. Oat hay was sometimes planted with alfalfa, beans, or rye to give increased nutrition to horses, cattle, sheep, and hogs. Many farmers were diversified and had livestock, so their grain fields helped to feed their animals during the winters, as well as provide some extra income from local sales to ranchers and the mill. Many acres of grains were grown at Hart and Garland Prairies and west of Kendrick Mountain. Mary and Harold Colton, on their ranch located near today's Museum of Northern Arizona (that they helped to found), tested many different types of grains on their farm. In 1931, Mary Colton spring-planted oats, barley, wheat, rye, and millet in large test plots, which yielded "abundantly," and were threshed for grain and cut for use as hay. Overall, Mrs. Colton grew nine oat varieties, eight of wheat, and five of barley (Extension Service report 1933). In good years, oat harvests averaged as high as two and a half tons per acre (all farmers combined); winter wheat yields were 800 to 1000 pounds per acre; and spring wheat averaged 1,200 to 1,500 pound per acre

(Extension Service report 1954). In 1933, a fire-proof growers' warehouse and grain-storage elevator were built so that farmers could better store their harvests.

A comparison of the crop acreage during the 1940s shows the importance of grains to Coconino County farmers and ranchers; however its importance was not because it was a significant cash crop, but because grains provided a crucial source of animal feed. During 1940, just prior to the war, pinto beans were grown on 8,211 acres. Potatoes were planted on 712 acres, and orchards on 158 acres. Oats covered 5,548 acres; wheat was on 2,222; rye on 1,841, and barley on 549 acres. (Spelt, a type of wheat, was added to this list in 1947.) Some of the rye was undoubtedly grown as a green manure to increase soil fertility and for crop rotation. Combined, small grains occupied 10,160 acres, two thousand more acres than beans.

Sweet and flour corn were grown for home use, local sales, and livestock fodder. A local variety of feed corn was developed by a farmer named Joe Lawson. Lawson's father received the original seed from Mountainair, New Mexico. The first mention of the variety was in 1935, when it had already been developed enough to be given its own name (the strain had probably been started many years previously). Over the years, the father and son selected seed for "uniformity and other desirable qualities" (Extension Service report 1949). It became called "Lawson's White Dent," and was well adapted to Plateau farms' short growing season (Extension Service report 1956). Alongside Lawson's White Dent, the sweet corn varieties most popularly grown by "many farmers and town people" during the 1940s were Golden Cross Bantam and Ioana. Farmers Andy Matson, C.D. Smelser, and Geo. McNelly grew a great deal of corn "silage"

for dairy cattle, and would fill the local "trench silos" with the corn harvest (Extension Service report 1943).

Once the intense drought years of the 1950s started, grain cultivation was scaled back, but because it was needed for livestock forage, it ultimately persisted on more acreage than other crops. Bean straw that was widely used for livestock forage was "hard to come by" since the drought reduced bean cultivation, and so Agent Brechan suggested farmers grow more oat hay instead. Farmers continued to plant feed corn and sweet sudan and started adding some sorghum, all for winter "enslisage" crops for cattle (Extension Service report 1959). The last Extension report, written in 1960, saw the continuation of grain, corn, and sorghum planting, because of the persistence of ranching in Coconino County.

4. Sedona's fruit, 1930—1955

Sedona's Oak Creek Canyon orchards and small farms continued to produce large amounts of fruit throughout the 1930s, '40s, and '50s. A note in the Extension report from 1930 states that an increase in apple production in the "Oak Creek Canyon district" to 50,000 boxes per year was possible, and "the domestic market should insure a comparatively good price." The Jordan family's peach trees could yield 300 boxes a day during harvest once the full orchard of 1,500 trees was mature (Schnebly Heidinger and others 2007, 35). Fruits raised in the canyon were the same as in the 'teens and 1920s (see Chapter 2): apples, peaches, pears, apricots, plums, cherries and many kinds of berries—blackberries, raspberries, boysenberries, youngberries, and strawberries (Extension Service report 1950). Some orchardists also raised pecans and English walnuts. Apples were the largest fruit crop in the canyon (Extension Service

report 1954). Walter and George Jordan, some of the most prolific growers in the canyon, continued their truck crop business and grew hundreds of pounds of carrots, among other vegetables, to be sold in Sedona and Flagstaff (Schnebly Heidinger and others 2007, 46). Many other smaller orchardists and truck farmers in Sedona continued to provide warm season produce, like sweet corn and tomatoes, and "cucumbers, squash, beans, cantaloupe, beets, and peppers" to regional markets (Extension Service reports 1934, 1952).

During the 1930s and early-'40s, Frank Pendley, another prominent orchardist, built a community apple storage house. The location is not mentioned in the 1932 report, but it is probable it was on Pendley's land and still exists now as part of Slide Rock State Park, the site of the annual Apple Festival. Pendley had built the irrigation system to his orchards which carried water from Oak Creek, and in the 1940s, he was able to add advanced improvements. Before, the water "dropped from an upper ditch across the orchard," causing soil erosion. The new system of piping allowed the water to travel more slowly down a slight grade (Extension Service report 1944).

The four main apple varieties grown in the canyon during those years were 'Staking Double Red Delicious' (called Delicious or Red Delicious in most of the reports), Jonathan, Winesap, Grime's Golden, and Arkansas Black. Other apple varieties included Ben Davis, Ding David, Red Rome Beauty, Red Staymen Winesap, White Winter Permain, Wolf River, and York Imperial. The favorite peach varieties were Alberta, Hale, Halberta, and Rio Osa Gem. The pears most orchardists grew were Bartlett, Kiefer, Anjou, Winter Nellis, and Lincoln. The trees blossomed from late March to early April, and were harvested from late August through mid-September (although the timing for each type of tree—

apple, peach, pear—was slightly different. However, the reports give a range for all the trees together).

The Extension Service continued to give a great deal of support to orchardists to help resolve growth and pest issues with their trees. Agent Bill Brechan frequently organized pruning and spraying demonstrations, and frequently between 29 and 45 orchardists would attend each demonstration. Issues covered during the workshops included how to deal with "late frost, insects (thrips, codling moth, and red spider), diseases (powdery mildew, crown gall, fire blight and root rot), pollination, apple drop, proper tree spacing to improve yields and better coloring of fruit, and maintaining soil fertility" (Extension Service report 1947). Thrips were considered the primary problem and were actually called "enemy no. 1 of Oak Creek apple growers" in the 1947 report. Though DDT had been introduced and was used occasionally with no warnings about its toxicity, eventually there was some recognition that it was harming pollinators: "It is also feared that DDT is killing bees to the extent that it interferes with pollination" (Extension Service report 1947). (There was no mention of DDT being used on the Plateau potato, bean and grain farms.) The Extension Service helped orchardists run fertilizer trials and compared notes of the results between orchardists. Frank Pendley and the other largest apple growers—Walter Jordan, George Jordan, Tom Anderson, Ted Spencer, and Frank Todd—participated in many of fertilizer trials, and often improved yields as a result (Extension Service 1934, 1944, 1950). Pendley and others also experimented with legume cover crops between their trees to improve the soil and provide more nutrients to the trees. Sweet clover and alfalfa were found to grow too tall and thus interfere with the apple picking in the fall, so the Extension Service

supplied black medic seeds instead, a low-growing legume (Extension Service report 1944).

In 1950, Pendley "opened up" or created a new market for Sedona's apples. He had previously "trucked" his apples to Phoenix; however in 1950 his regular buyer announced that the market was flooded, and the price that Pendley expected to receive was reduced from .13 cents down to .10 cents per pound. Pendley instead hired a semi-truck and hauled his apples to Los Angeles, where he was able to receive the original price, and ended up "outselling all apples that came from the Southwest" in L.A. The bigger and more profitable market also meant that he sold his entire crop in four weeks, rather than "the usual" two to three months (Extension Service 1950). Commercial crops had long been sold regionally, but improved roads and vehicles (such as the semi-truck that Pendley used), were starting to shift food transport by decreasing the time the transport took, while increasing distance food could travel. Even though these factors opened up possibilities, in other cases they increased competition and reduced reliance on local agriculture—as eventually happened with Coconino County's farms (see Chapter 4).

Sedona's population had started to grow after the mid-1940s (Schnebly Heidinger and others 2007, 78). After WWII, tourism started to drive an increase in Sedona's traffic and growth, when leisure time and improved vehicle transportation started the national "tourist trade." In the 1950s, an underground aquifer was discovered in the area once called Grasshopper Flat, now West Sedona (Schnebly Heidinger and others 2007, 8), making increased development possible. New amenities such as hotels and markets attracted tourists and home buyers (Schnebly Heidinger and others 2007, 78). Companies such as Pink Jeep

Tours started in the late 1950s, and Sedona started to draw "cinema producers," artists, and entrepreneurs (Schnebly Heidinger and others 2007, 82, 114). The population grew from 350 people in 1950 to 2,022 in 1970[dd] (U.S. Census Bureau 1970). The proliferation of new businesses expanded into farm and orchard land, and as real estate land prices increased, agriculture started to be "squeezed out" (Schnebly Heidinger and others 2007, 123). Nevertheless, a number of orchardists remained, and fruit growing continued, on a slightly smaller scale.

IV. Conclusions

The years from 1930 through 1955 were, overall, a time of local crop abundance and a period of national change, though the changes were not as dramatic as over the decades to follow (see Chapter 4). The 1930s saw the first farm bill (AAA) and soil conservation policy (SCS) acts, passed by President Roosevelt under the New Deal. The Depression and Dust Bowl precipitated the need for federal support to farmers. The AAA started a system of paying farmers to restrict the acreage on which they planted in order to reduce national crop surpluses and raise prices. Prices for three major crops in Coconino County—beans, wheat and potatoes—improved (though beans were not an AAA-covered crop), and although the AAA did have a positive financial effect for farmers locally, its ultimate outcome was mixed. Fruit production was not included under the AAA, and it is unclear how much Sedona agriculturalists were affected by the Depression (judging from the Extension reports and other historic materials used in this thesis study). Farmers on the Plateau derived benefits from the SCS soil conservation program, since it provided federal funding and machinery to assist with a variety of soil improvement methods that reduced

[dd] No census records were taken in 1960.

erosion and loss of top soil. These methods included terracing, creating contour berms, and strip cropping. Plateau farmers received payments from the SCS for 'resting' some of their lands and adopting SCS-recommended techniques. Between 1936 and 1942, between 33 and 112 farmers received SCS support. It was a beneficial program both for soil conservation and for farmers.

In the early 1930s, national bean prices started to rise, and farmers turned from potato to legume-growing for their primary cash crop. More and more acreage was devoted to beans instead of potatoes, and the bean era was well on its way by the mid-'30s. During the period of this chapter (1930s through mid-50s), farming machines had gone through a period of innovation, and finally supplanted horses completely by the end of the 1930s. Tractors, diggers, thrashers and combines all became commonplace, and replaced human labor in the preparation, planting and cultivation of crops. However, extra hands were still needed at harvest: up to 200 extra people during the critical time when crops were maturing and had to be reaped before the frost. World War II had some effect on this and other aspects of agriculture, nationally and locally. The draft drastically reduced the number of young men available to help with the harvest, and their loss was acutely felt. Local farmers and Sedona's orchardists had to rely heavily on men from the Navajo and Hopi Reservations. There was competition for their and other un-enlisted men's labor during the war. While Native American men were always hired during harvest-time, in WWII there was more reliance on their labor. During the war, crop prices increased due to U.S. export of foods to Europe. As part of the patriotic push for the war effort, acreages of all crops were increased, and beans, potatoes and grains were no exception. The WWII years were good for Coconino County farmers.

During the 1930s, ‘40s and early ‘50s, bean farmers became more organized by forming a bean cooperative, collectively buying cleaning equipment, and building a storage warehouse. These efforts ensured that Coconino County beans were as high quality as possible, and thus farmers could receive the best price on the market. Potatoes continued to be grown as a secondary and then tertiary cash crop, while small grains (oats, wheat, barley and rye) and corn were widely grown for livestock feed and some, mostly local, grain sales. During this time, fruit and vegetable growing in Sedona was prolific and successful. Most crops—all except the orchards of perennial Oak Creek—were hindered by the intense dust-bowl-like drought of the ‘50s. And the mid-1950s were to bring other, substantial national and local changes, and these had significant long-term effects on farming (Chapter 4).

CHAPTER IV: 1956 to 1965—The four factors that caused Coconino County's agricultural demise

I. Introduction

From 1954 through 1965, drought returned to Northern Arizona, blowing away the dreams and aspirations of the most dedicated Plateau farmers. The drought endured through the 1960s, with reprieves of much-needed rainfall in 1957 and '58. This time period saw the demise of commercial agriculture in Flagstaff. In 1956, to ease the financial burden of failed farms due to a devastating, 'Dust Bowl-like' drought, the federal government established the Soil Bank Program (passed as part of the Agricultural Act of 1956), intended to prevent farmers from falling into agricultural bankruptcy. While the desired intent—and result—was to provide financial relief to farmers, an unintended effect was the dissolution of commercial farming in the area, even after the return of the rains. However, the drought and the Soil Bank Program were not the only factors in the abandonment of agriculture in Coconino County. There were other national changes afoot, namely, a new transportation policy (The Federal Aid Highway Act) and energy policy development (the construction of Glen Canyon Dam) that fundamentally changed the way northern Arizonans procured their food, traveled, and made a living. Most farmers, of course, did not have this 'future knowledge,' and made decisions based on the difficulties of the terrible drought years, ceasing to farm in exchange for payments under the Soil Bank. However, the Soil Bank's effects were not lasting; instead it was the national developments that took place during the 1950s that ushered in rapid socio-cultural change, ultimately reversing the agricultural land use of the last 100 years.

The farmers who hung on to their land and continued to farm were exceptions to the rule, during the drought and Soil Bank years. In previous years, farmers would simply go back to farming when the rains returned, all the while changing and improving their soil practices, crop choices, and seed as needed. This time, it was different. Once the drought ended and Soil Bank contracts expired in 1965, the agricultural lifestyles that had been required for subsistence and as an income-yielding occupation up until the 1950s in Coconino County and throughout the U.S. now became monumentally more difficult to maintain.

II. Factors that caused agricultural decline in Coconino County: drought, two national policies (Soil Bank Program and the Federal Aid Highway Act), and energy development (construction of Glen Canyon Dam)

1. Precipitation and the status of farming in the 1950s:

a. Drought, beans, small grains, and corn

The drought of 1950 and '51 returned again in 1954, with even greater intensity. Within several years, the Extension report recorded that farmers were experiencing the most serious drought in 60 years, and Agent Brechan remarked, "some say even the worst [drought] since 1860" (Extension Service report 1956). The National Resources Conservation Service (NRCS)—formerly the Soil Conservation Service (SCS, see Chapter 3)—considered this drought to be as bad as the Dust Bowl of the 1930s, but without the "financial straits [of the Depression] and hysteria" which existed then (Helms, National Resources Conservation Service 1981). The difference this time was that, at least across the nation (though not in Coconino County), there was less "farm abandonment" or "outmigration" away from farms. The 1950s drought was reported—largely by eastern newspapers—to be similarly located as the 1930s Midwest Dust Bowl. In fact, the NCRS reports that while the drought included all the area that was

affected in the 30s, it was actually larger and more widespread than the Dust Bowl (Helms, National Resources Conservation Service 1981). The farmers and ranchers in Coconino County were "all but ruined," according to the Extension Service in 1956. Despite predictions from long-range weather experts who predicted that 1957 was going to be equally dry as the three years before it, many farmers put in a spring-planted crop—mostly pinto beans and grains. Most crops failed, although there were a few farmers in certain areas that got a minimal amount of rain—just enough to have a harvest and to meet their financial demands (Extension Service report 1956). Of the 25,000 acres originally planted with crops in Coconino County, 8,300 acres were left "idle." Pinto bean acreage had dropped to 3,500 acres in 1956, and it kept going steadily down year after year thereafter.

By mid-1957, most farmers were in critical financial straits having experienced largely failed harvests for three successive years (as well as in 1950 and '51). The 1950s drought was at its most severe from 1950-'51, and 1954-'57. The 1957 Extension report says, "The general farmer became so desperate that he placed the majority of the best farm land in a five year Soil Bank Program." If farmers had been able to wait until the end of the year—and surely a few did—they may have made different decisions about the future of their fields, at least as far as the Soil Bank was concerned. And then, according to the Extension report, at the end of the year in 1957 and through 1958, rains were abundant. Farmers were ready to return to their planting, but could not because they had signed contracts with the Soil Bank. Many regretted the decision: Agent Brechan wrote, "By late fall [1957] many [farmers] wished they had their land to farm in 1958" (Extension Service report 1957).

Farmers who had kept some land free from a Soil Bank contract, or those who had waited out the terrible years of drought, planted far more grains than pinto beans in 1958. Small grain acreage increased to 15,000 and 18,000 acres the two years that rain was plentiful. Pinto beans dropped down to 1,000 and then 800 acres in 1958. The section in the Extension reports that had been devoted to beans since 1929 did not appear in the final two reports of 1959 and '60. The dominance of pinto bean yields had ended. Potatoes were not mentioned in the reports (and had not been mentioned except briefly since 1953). Corn and sorghum started to gain some importance. The reasons for the shift in crops had to do with low prices on the market for pinto beans and a greater need in the County to feed livestock such as sheep, hogs, and cattle, which had started to supplant crops on the farms that remained. Small grains, primarily spring wheat, oats and barley, corn, and sorghum all were grown extensively for livestock feed, and wheat and oats were also 'cut' for grain sales. Interestingly, grains (especially oats and wheat) were among the first commercial crops to be grown in Coconino County (along with potatoes), and they persisted until the end of commercial farming in the area. This longevity had to do with their dual role for livestock forage and grain seed sales. Many of the scattered farms that still remained after the Soil Bank Program had livestock, and planted a smattering of grains, beans, and other vegetables for home-use and local sales. Walter Brandis, the last bean farmer who passed away recently, stuck with beans and pumpkins, and sold them locally (Brandis, Coconino County Board of Supervisors Area Plan 2001, 8).

Because of the extent of the drought, a local group connected with the Coconino County Farm Bureau formed to build a community well. They called themselves the "San Francisco Peaks local." Prior to the construction of the well,

farmers and ranchers had been hauling water from Flagstaff out to their land for livestock and for their own domestic use. The water cost $3.50 for 1000 gallons. The group was able to get financial assistance from the Agricultural Stabilization and Conservation office (ASC) to cover some of the cost of drilling of the well, and hired a geologist to identify an area in Doney Park that was relatively "centrally located" to all farmers and ranchers in the larger area (Extension Service report 1956). In 1957, three Doney Park farmers and ranchers put together more funds, and the well struck water at 1,265 feet. Though the original plan was to go down to 2,000 feet if necessary, they drilled to 1,347 feet and stopped there. 58 feet of water filled the well, which could be accessed at a rate of ten to fifteen gallons a minute by bailing. A reservoir and loading dock were planned as part of the water development construction, and farmers and ranchers could purchase water from this location, rather than having to haul it from town (Extension Service report 1957). This additional water source was useful to ranchers as well as farmers. The reports say that ranchers had suffered as greatly as farmers during the drought—many had to "close their doors"—since stock tanks stayed dry and range grasses were sparse. The ranchers whose animals survived had to haul water all summer and were forced by necessity to participate in the "Emergency Hay Program" in the winters, when 1,722 tons of hay were needed to sustain their livestock. It was a hard time for all who lived off of the land on the Plateau.

b. Sedona's fruit

The years that were hardest on Plateau farmers were not as harsh on the orchardists of Sedona's Oak Creek Canyon. Oak Creek likely did not receive more rain than up on the higher elevation Plateau, but the orchards were easily

and well irrigated from perennial Oak Creek. While farmers on the Plateau were facing demise, 1956 was an exceptionally good year for apples and peaches in Sedona. Apples were the primary 'cash fruit.' The extreme hot and dry conditions made for a milder spring, and the apples matured ten days earlier than their normal date. Orchardists were then able to put their fruit on the market before Pacific Northwest growers' apples were ripe—usually around October 1st. Sedona's orchardists were able to get "top price" for apples all season, between .14 to .18 cents per pound. Prices for apples would usually drop down to .07 or .08 cent per pound once Pacific Northwest fruit was available, but in 1956 this did not occur. That year, Walter Jordan was the largest apple grower in Oak Creek (prior to that, Tom Pendley had held that title) and he mostly produced Double Red Delicious. The main varieties of peaches grown in Oak Creek that year were: Rio Oso Gem, Early and Late Alberta, Hale, and Halberta. The peach market was also quite lucrative in 1956. Yields were high, the quality of the peaches was excellent, and prices ranged from .10-.15 cents per pound. All other tree fruit—including pears, apricots, plums, cherries and nectarines—had good yields as well. Jordan was recorded in the Extension report as saying the crop was "the heaviest set of fruit he had ever experienced in his 30 years of orcharding" (Extension Service report 1956). Because of the extreme drought, birds and small animals took particular advantage of the cherry crop, and none could be harvested. However, the berry market flourished. Blackberries, boysenberries, raspberries and strawberries found happy eaters at roadside stands, where they regularly sold out. The tourist traffic through Sedona had increased "greatly" because of the new highway from Phoenix (see section on Federal Aid Highway Act), and the demand for Sedona's berries "far exceeded the supply" (Extension Service report 1956).

During 1957 and 1958, fruit trees again yielded well, though perhaps not quite as successfully as the '56 banner year. Apple trees produced 22 to 23 boxes per tree, and again were ripe before the Pacific Northwest crop, which meant the orchardists received good prices for their first set of sales: from .11 to .18 cents per pound in 1957, and .18 to .19 cents per pound in 1958—though in '58 "late harvested fruit" received only .07 to .08 cents. The main variety grown was Double Red Delicious, and others included Golden Delicious, Yellow Delicious, Winesap, Arkansas Black, Jonathan, Grimes Golden, Rome Beauty, Wolf River, Early June, and Red Astrikan. Peach growers in 1958 did very well since prices were up to .15 cents per pound, paid by a "business in the Midwest" (Extension Service reports 1957 and 1958). Improved transportation infrastructure had started to enable long-distance produce sales.

In 1959, the Extension reports reflected growing real estate speculation in Sedona, as a result of the now accessible and paved roads, increased tourism and population growth. The report notes, "There are many small fruit orchards located down the entire length (15 miles) of the Canyon. In the past few years, the few land owners in this area [Oak Creek] have been subdividing their land, and many new land owners have now become small backyard fruit growers" (Extension Service report 1959). In 1960, fruit production continued, though it is unclear from the reports how many orchards had been sold. That year a hard freeze had damaged many of the fruit blossoms before the thrips arrived, so there was a large-scale failure of the crop.[ee] Unfortunately, since 1960 was the last

[ee] A side note: sprays of 50 percent "wettable" DDT started to be used in the orchards during the late 1940s and '50s against thrips, which would often devastate the trees. (Thrips are tiny sucking insects that can cause severe damage to plants.) Sometimes the DDT was effective, and other times (as in 1960), it had no results. This was pre-Rachel Carson's book *Silent Spring*, about the detrimental effects of pesticides.

report, the Extension provides no additional information on how fruit businesses faired into the 1960s and beyond.

2. Soil Bank Program

In 1956, the Agricultural Act of 1956 was enacted by Congress. The Act was passed to reduce crop surpluses in order to raise crop prices and farm income, and to mitigate widespread national soil erosion issues caused by planting crops on land that was prone to erosion (USDA 2009). By voluntarily taking farmland out of production under the Act, farmers could help to adjust the scales of supply and demand (South Carolina Department of Education, n.d.).

> "To effectuate the policy of Congress and the purposes of this title, programs are herein authorized to assist farmers to divert a portion of their cropland from the production of excessive supplies of agricultural commodities, and to carry out a program of soil, water, forest and wildlife conservation" (National Agricultural Law Center, Agricultural Act of 1956, 2003).

After World War II ended, demand for commodity crops waned nationally, since the U.S. was no longer providing food to the troops or exporting crops to Europe. Crop surpluses grew, crop prices and farm income decreased, and the two farm commodity subsidy bills passed in 1949 and 1954 had little effect on these issues or on soil conservation (Cain and Lovejoy 2004). The Senate report that accompanied the Agricultural Act in 1956 noted that even though total farm production in 1955 was 12 percent more than in 1947, gross farm income was 9.4 percent below 1947, and net farm income was down 38 percent. During the same period, national income from non-agricultural sources had increased 68 percent, and farm production expenses had risen 11.4 percent

(National Agricultural Law Center, Senate Report to Accompany Agricultural Act of 1956, 2003). Farmers clearly needed some help. It was becoming more profitable to produce an income off the farm, and small farmers were most affected.

The Soil Bank Program was Part I (or Title I) of the Agricultural Act. Within the Soil Bank, there were two programs: one short-term, one long-term. The short-term plan was the Acreage Reserve Program (ARP), which allowed farmers to retire commodity-producing land under an annual agreement for four years, to be renewed yearly. National commodities such as wheat, corn (in the major corn-producing states), rice, cotton, peanuts, and tobacco were covered under the ARP. The ARP was discontinued one year early, in 1958, because of criticism that it was too expensive and that it did not fulfill its goal to reduce commodity production (Cain and Lovejoy 2004). The long-term Agricultural Act plan was the Conservation Reserve Program, which paid farmers to divert or "retire" crop land and "marginal land" (Vogeler 1981, 168) under contracts that lasted three, five, or ten years, though the Extension reports state that five years was the period of Soil Bank contracts in Coconino County. Soil conservation methods on land that were under a Soil Bank contract could include planting non-commercial, soil-enriching crops, such as rye (U.S. Legal 2011).

Coconino County's farmers participated in the Conservation Reserve Program (CRP), under the Soil Bank. Large farms on the Plateau took advantage of the program, but the orchardists of Sedona's Oak Creek did not. The issues of drought and soil erosion in Sedona were not as prominent, and apple prices (the primary fruit crop) were still relatively high throughout the 1950s, so this federal policy was not a cause of the loss of farm or orchard land in Sedona. The Soil

Bank Program was administered locally by the Agricultural Stabilization and Conservation offices in the county, and Flagstaff's Extension Agent helped educate farmers about the program (Extension Service report 1956). The Soil Bank essentially became one of the County Extension's farm projects (Penn and others, University of Minnesota 2011). The fields that farmers were encouraged to "retire" were the ones that had highest risks of erosion. The goal was to establish permanent vegetative cover to prevent or stop erosion (Extension Service report 1956). By 1960, 28.7 million acres of farmland nationwide were enrolled under the ARP and CRP programs of the Soil Bank Program (Dangerfield, Warnell School of Forestry and Natural Resources 1995).

From the outset, the Coconino County Extension Agent and local Farm Bureau committee, on behalf of Plateau farmers, needed to advocate for a reasonable subsidy payment amount for their land. The 1956 Extension report had this to say about acreage subsidy negotiations:

> "The County Committee had convinced the State ASC (Agricultural Stabilization and Conservation) office that the proposed $9 per acre payment was not feasible in this county. They requested the figure to be raised for some areas within Coconino County. After two very lengthy meetings, a map was prepared by the ASC office manager showing where the different priced land was located. The area east and north of Flagstaff was considered more profitable land according to the survey made by the office manager, and this area would be recommended for the highest payment. The Garland Prairie area west of Flagstaff was considered the next most profitable land and the remaining land throughout the county was to be the lowest paid land. The State ASC office arrived at this payment plan for Coconino County: for top land—$15/acre; for medium land—$12.50/acre; for the poorest land—$7.50/acre. The local county ASC committee will have the sole responsibility in classifying the land as to what payment it shall receive" (Extension Service report 1956).

Many farmers in Coconino County switched part of their fields to rye to grow as a green manure for increased soil fertility, and received subsidies under a contract in the Soil Bank Program, for five years. (Five years was the only contract length mentioned in the Coconino County Extension reports. It is possible that some farmers had the option to sign a three year contracts.) Longer contracts of ten years (not mentioned in the reports), were often for lands put into permanent pastures or for tree reforestation (National Agricultural Law Center, Senate Report to Accompany Agricultural Act of 1956, 2003). Extension Agent William Brechan wrote, in 1956,

> "The ASC County committeemen have approved this as a satisfactory cover crop in the County Soil Bank Program. It appears that rye is to become a very popular crop. Of course this grain will not be harvested but perhaps it will show many farmers that rye is a good cover crop and pasture. Very few farmers, however, practice it because they believe they must grow only one cash crop in order to secure the highest net return per acre. The farmers that do practice crop rotation have much higher yields of cash crops and during stress years such as the last few in this county, they are about the only ones that have a normal crop" (Extension Service report 1956).

In 1957, 30 percent of the farm land in Coconino County had been put into the Soil Bank, and more farmers at that time planned on entering into Soil Bank contracts. The Extension Agent encouraged farmers to plant permanent pastures of grasses that would later support grazing, rather than returning to farming. The Soil Bank program paid farmers for "land preparation" (plowing) as well as seed purchases if farmers grew grasses or rye, in addition to annual payments. Farmers were encouraged to prepare their land for "livestock operations," which was more financially reliable in the 1950s than farming had become.

There was, however, at least one problem that arose with Soil Bank plantings, since harvesting was not allowed under the contracts. Spring-planted rye was seeded at about 1,000 pounds of seed per acre. It yielded well, germinated, and fell to the ground unharvested. Then, over the hot dry summers, it dried like "straw" in the fields and self-seeded the ground again each fall. This situation created concern for the growers, since a large amount of "straw residue" was left in the fields. When all of it germinated the following year, lack of sufficient rainfall moisture would kill the too-thick stand of rye, which was counterproductive to the return of nutrients to the soil, and to the Soil Bank program intent. The farmers' option was to either leave it, or to "disc up" the fields at their own expense, since the Soil Bank would not cover that cost. The Extension Agent encouraged farmers to disc the fields, even if it was out of pocket, but many could not afford to have this done (Extension Service report 1958).

During this time period, daily costs for household, farm and ranch necessities had risen, as had the standard of living. This is evident from mention of a meeting that the Farm Home Administration (FHA) Supervisor, Leonard Johnson, had with the SCS, ASC,[ff] and the Extension Service in 1958. Johnson had to revise his farm and ranch loan limits upward after a review of the minimum number of acres, total land, machinery, and buildings that a farm required to be self-sustaining. The 1958 Extension report noted that, "Mr. Johnson's previous figures were increased substantially to meet today's rising costs and standard of living." The trajectory of modern American life made small-scale farming more expensive and less profitable. In 1959, the Extension report mentioned that

[ff] One of the ACS committee members was Mr. Arthur Brandis. The late Walter Brandis was the last bean farmer of Coconino County. It's not clear how they were related.

farmers were paid $15 per acre under the Soil Bank, so it appears that the productive land continued to be given the "top" price that was originally negotiated. Both in '59 and 1960, the reports stressed that most of the farmland was under the Soil Bank, "at least through 1961." Just a few farmers continued to farm. The last Extension report, in 1960, mentioned the character of the farmers that persisted:

> "Today, only a handful of farmers remain, but they are likely to remain as farmers, as they are the type who value land above money. Small grains and forage crops are their main yields. The main objective of the Extension office is to help these farmers continue a practical and efficient farm operation. The County Agent has also tried to make these small farmers aware that their land is far better as an investment than they would have by selling their land and trying to find something else to invest their money into which will make them a living" (Extension Service Report 1960).

The Extension Agent encouraged farmers who had endured the drought to hold onto their land, while "diversifying" into livestock (mostly cattle, and some sheep and hogs). By 1965, there were just a few farmers left in Coconino County, one of them the well-known "last bean farmer," the late Walter Brandis of Black Bill Park (Brunner, AZ Daily Sun 1999). That year, the Soil Bank Program was repealed by a section within the Food and Agriculture Act of 1965. A new version of the Conservation Reserve Program (CRP) was eventually re-enacted in 1985.

3. Glen Canyon Dam

Besides the crippling drought of the 1950s and the cessation of farming under the Soil Bank (which likely did save many farmers from financial ruin), there were two national programs that had dramatic ramifications for Coconino

County agriculture. The first was the building of Glen Canyon Dam for hydropower development and water storage on the Colorado River, 135 miles north of Flagstaff.

Glen Canyon Dam's construction started in October, 1956. Land speculation in Flagstaff commenced in earnest, since it became the staging location for construction supplies delivered by train to build the town of Page, Glen Canyon Bridge, and the dam.[gg] A road to the dam needed to be built, as well, and Highway 89 was extended to the eastern rim of the site (Rogers, Bureau of Reclamation 2006, 17-19). Large areas for machinery and materials were needed, and the open farm lands east of Flagstaff were perfect for this purpose. Thousands of workers were required to fulfill all the construction needs and they poured into Flagstaff and traveled up to Page. Land prices in Flagstaff increased ten times within two years as a result, and farmers that had not put their farms under a Soil Bank contract "took advantage" of the increased land value and sold out (Extension Service report 1958). In 1957, Extension Agent Brechan reported on the gravity of the developments:

> "Coconino County has many problems but the most serious one now that is affecting agriculture is the beginning of the construction of the Glen Canyon Dam on the Colorado River about 156 miles north of Flagstaff [google maps sets it at 135 miles north]. Flagstaff is the main railhead for all supplies to this dam and a great amount of people are moving into the area. The entire activity of this work is in the farm areas east of Flagstaff. The entire farm area east of Flagstaff may be required to be used some way or other for this six-year construction project. It will be at least another year before it is known how much farm land will be taken out of crops and used for this dam project" (Extension Report 1957).

[gg] Construction for the town of Page, sited near the Glen Canyon Dam site, did not begin until 1957. It was originally built as a "federal municipality" to house workers building the dam. (City of Page 2006).The town was named in honor of John C. Page, former Reclamation Commissioner of Page, Arizona (Rogers, Bureau of Reclamation 2006).

Land and real estate speculation in Flagstaff was active and continued well after the dam was completed in 1963. It finally slowed during the mid-1970s, when rising energy costs and stricter zoning development laws were enacted in the county. The demand for "remote" or more secluded homes and land on the outskirts of Flagstaff picked up again in the 1980s, and "many more meadow lands were lost to summer home development" (Britt, Western Association of Fish and Wildlife Agencies 1982).

4. The Federal Aid Highway Act of 1956 (The National Interstate and Defense Highways Act) and national socio-cultural changes

The other national program that had dramatic ramifications for Coconino County agriculture was the passing of the Federal Aid Highway Act of 1956 (Figure 7), which changed the nature of transportation, communities and commerce in the U.S. Interestingly, the Federal Highway Act was passed in the same year as were the appropriations for Glen Canyon Dam, and construction on both was concurrent.

President Eisenhower, elected in 1953, considered highway transportation across the U.S. important to "protect the vital interest of every citizen in a safe and adequate highway system," calling for a "modern, interstate highway system" in his State of the Union address in 1956 (National Atlas of the U.S. 2011). The Highway Act provided for a national system of interstate highways to be built over 13 years, and it changed the face of America.

Before the implementation of the Highway Act, roads in the U.S. were not necessarily interconnected. During Eisenhower's personal experience in Germany during World War II, he noted the advantages that Germans had in

wartime from the autobahn road system, and he translated that experience into transportation policy during his presidency. Eisenhower considered a "grand plan for a properly articulated system of highways" to be a national defense priority (National Atlas of the U.S. 2011). The Cold War during the 1950s led to concerns about a nuclear attack by the Soviet Union, and interstate highways were considered important to provide rapid evacuation routes from cities, in addition to allowing the transport of military equipment more quickly across the country. Plans for a 41,000 mile system of highways that reached every city with a population over 100,000 were put into place (National Museum of American History 2011). National commerce and industry fueled by fast and easy transportation was greatly facilitated by the highway system (Rosenberg 2011). The system "profoundly changed American landscapes and lives and the way business was conducted" (National Museum of American History 2011). It was the largest Public Works program in the history of the U.S. It became "a major impetus for in the development of suburbanization and sprawl of U.S. cities. Along with the Interstates came the problems of congestion, smog, automobile dependency, and a drop in densities of urban areas" (Rosenberg 2011). Food transport became easier, cheaper, and quicker, and refrigeration meant that perishable foods could travel long distances and stay fresh (Modotti 2011). This revolution in transportation "created the foundation for large national markets," and national and global transport of agriculture developed (Agropolis Museum 2007). Highways made rural land more accessible and contributed to suburban growth and land development (American Farmland Trust 2009), nationally and most definitely in Coconino County.

In 1927, the best—yet unpaved—route to Flagstaff from the southern part of the state was a drive north on Hwy 280 to Prescott and Williams, and then east

to Flagstaff on Rt. 66. There was a more direct route, but it was a rough dirt road north called Rt. 79, which wound through Sedona's Oak Creek Canyon north to Flagstaff. Efforts to pave Rt. 79 took several years during the 1930s. By 1938, the work was complete and the Oak Creek Canyon road was paved (Arizona Roads, Rand McNally Sinclair roadmap 1938). In 1941, the Oak Creek road was renamed US 89A.

In the mid-1950s, direct a route from Flagstaff from Phoenix, called Black Canyon Highway was established. (It later became I-17.) Another road, Rt. 179, connected Black Canyon Highway/I-17 directly to Sedona at US 89A (Johnson 2008, 72). In 1961 those routes were fully completed, and Flagstaff, Sedona and Phoenix for the first time had direct, paved interstates that connected the three.

During the height of road construction, the Soil Bank Program was in effect, land speculation was active, and the effects of drought were being felt profoundly in Flagstaff. Sedona's economic base was shifting to real estate development and tourism (Sedona Chamber of Commerce 2011) and while Flagstaff continued its reliance on ranching, logging and the railroad industry (though not farming), it gradually shifted its economic base to real estate, tourism, education, government, and science and technical development over several decades (City of Flagstaff 2011). Small-farm agriculture across the U.S. and in Coconino County was disappearing in favor of industrialized agribusiness; produce now traveled hundreds of miles from grower to eater.

There are some notes within an Extension Service report that describe how food purchases were changing in the 1950s as a result of the modernization of the food system and increased interconnectivity in transportation and communications, and the notes briefly describe the socio-cultural impact of that

change. The notes were written in the 1957 report on "Home Demonstration Work," a section written by the Extension Home Agent Lucinda Hughes[hh], called the "Revolution in Foods and Nutrition."

> "The homemaker of today is confronted with many food purchasing problems not encountered by her grandmother. She has a much larger variety of foods to choose from. Today's food market is quite different from yesterday's. Gone is the cracker barrel and bulk sugar. Today practically all foods are factory packaged in convenient sizes. The Modern Market Basket provides improved quality, and a greater number of time saving foods to grace the family table. Most grocery stores have from 4,000 to 7,000 items to put in today's market basket. One-third of these were non-existent ten years ago. Another third is now a new style or in a new package. More Americans have more money to spend and are spending more money on food than in past years. We are eating more expensive foods at home, with more built-in services. We are also treating ourselves to more meals away from home. Fresh fruits and vegetables are available year around giving greater meal time variety"(Extension Service report 1957).

Another paragraph in an Extension report from the late 1950s also discusses food industrialization and transportation, and its effect on local dairies:

> "Commercial dairying is a thing of the past in this county. Even the backyard, family cow is on her way out. Super highways are making large dairy areas only a couple of hours away. Consequently, milk can be produced there and shipped into the county cheaper than it can be produced here" (Extension Service report 1958).

The Federal Aid Highway Act transformed the economics of food production by allowing the rapid dissemination of processed and fresh foods from centralized producers in one region, to consumers in another region. Centralized industrial production tends to result in efficiency and financial gains

[hh] The Home Agent's work is not discussed elsewhere in this thesis, because the focus of that Agent's work was largely non-agricultural.

that are not possible for smaller farmers to achieve. Over time, this made it difficult for small producers to price their products in a competitive manner with larger companies. It became cheaper and more convenient at that time for people to purchase more, and produce less, of their own food. The Federal Aid Highway Act was thus another piece of the picture in the decline of Coconino County's agriculture.

As local farms declined and the number of supermarkets increased, the rate of population growth and new home construction in Coconino County was surging. These developments changed the nature of the Extension Agent's work. Home landscaping projects and backyard gardening, both ornamental and edible, became more of a focus. Home gardens had persisted since the Victory gardens of World War II, but population growth increased the numbers of backyard gardeners, and the 1957 and '58 Extension reports noted that small gardens were in "almost every backyard" in Coconino County. Each report, from 1956 onward, mentions that many new families were moving into Flagstaff and its outskirts and into the Oak Creek area. Before the mid-1950s, ornamental landscaping was not mentioned in the reports. As Extension farm work declined and community agricultural and horticultural needs changed, new chapters—such as one on home landscaping—appeared in the reports. Home gardeners apparently kept Extension Agent Bill Brechan busy, since he said they were "constantly" calling on him for assistance with vegetable varieties and disease and insect control information. Brechan was enthusiastic about the gardens, saying, "vegetables of most every variety will grow and produce excellent results, especially in quality [in Flagstaff and Sedona]" (Extension Service report 1959). This paragraph written in 1959 captures well the changes that were rapidly taking place in gardening and population growth:

> "With so many new families moving to Flagstaff, Williams [and Sedona], the work in home vegetable gardens will definitely increase in 1960. Home gardeners of this year are confident that high-quality produce can be grown, and will encourage their friends and neighbors to become gardeners. Home landscaping and flower gardening has mushroomed in the Flagstaff area the past two years, so that this work now ranks second to 4-H club work in this county. This phase of agriculture has always been popular, but on a small scale. In the past four or five years, however, Flagstaff has grown faster than any city in Arizona. In 1950 the population was 7,000 and today it is 24,000. This increase is predicted to continue and Flagstaff, in the very near future, will be a city of over 50,000 pop. This terrific increase in population has naturally stimulated new home growth. New home subdivisions have opened up on every available piece of patented land near Flag. In the past four years about 600-700 new homes have been built, and there is no sign of any decline" (Extension Service report 1959).

V. Conclusions

The key to agricultural demise in Coconino County was a confluence of four events (drought, energy development and two transformative federal policies). Farmers were caught between a terrible drought and rapid national changes of the times. Once regular rains returned in the mid-1960s, enough of the aspects of living, traveling, and food growing and procurement had been so fundamentally altered that farming never recovered. National socio-cultural change that included increased economic activity through tourism, population growth, the new interconnectivity of communications and transportation, mass production (including industrial farming), packaging and quick transit of food, and the increased opportunities in non-agricultural work changed how people related to and worked on the land. Real estate prices had increased rapidly during the mid-1950s and '60s in Coconino County, and suburban development

was more profitable than farming. The fundamental characteristics of American life were changing, and quickly.

Producing an income from the land is challenging work, requiring patience, practice, a deep understanding of place, a long-term vision, and the ability to adapt when rain is too plentiful or sparse. The developments that occurred in the country during the time of agricultural decline in Coconino County changed people's mental landscapes to change with regard to the ease of food procurement and production, and price of food. The national modernization of farm culture was widely supported by the idea that 'modern progress' was inherently good, and that it led to more leisure time—and perhaps more income. This paradigm shift, made possible by technological advances concurrent with climate difficulties in the Southwest, and ultimately restrictive agricultural land use policies (though initially they saved many farmers from financial ruin), were fully evident in Coconino County by the mid-1960s.

If the only determinants of longevity of Coconino County agriculture were lack of precipitation or a short growing season, then perhaps we would still see farms dotting the landscape where there are now subdivisions. But increased land prices, industrialization of farming, ease of food transportation, subsidies that favor larger farms over small farmers, and the relative price of food versus the cost to grow it for a small farmer all ultimately restricted farming opportunity in Coconino County, contrary to the assumptions widely held about the demise of agriculture in this landscape. It was the convergence of factors that finally caused farming to be abandoned; no single factor predominated.

This is a contradiction to the belief that Flagstaff's climate, soils, and growing season did not permit much farming, and the farming that did exist was

brief and had rather miserable success. In most publications on the history of Coconino County, the reason given for farming's demise is "climate," or a description of the county's agriculture is completely omitted. It is a huge oversight. While it is true that physical and climatic factors make farming a significant challenge here, if the climate that farmers faced in the mid-'50s through 1960s had occurred with the advances, knowledge, and access to sustainable farming information that we have now, perhaps agricultural land-use would not have declined so completely. It is food for thought.

Final thoughts

One of the questions I am frequently asked is how this study informs or helps local food sustainability growing efforts today. It is a hard question for me to answer. This study, as mentioned in the thesis introduction, does not uncover patterns of sustainable farming that I am arguing we should mimic. In fact, the farming practices—monoculture planting resulting in soil depletion—were early versions of the same industrial farming practiced today—just without the scale of land, machinery, water and intensity of pesticide use that go along with the industry now. The difference is that in this history, these practices were community based and supported, and they contributed greatly to the local economies and sustenance of Coconino County.

Instead, I would like to counter with a question of my own: does the knowledge of history, the preservation in writing and photographs of the activities, lives, challenges, and beliefs of that time better help us understand the place that we live? We cannot—and for ecological reasons, should not—translate all the specific practices of this history into today's agriculture, but we can translate the knowledge that people farmed this soil for about 100 years. This

county provided food and income to those who dug in and tilled its soil for generations. Our food-growing ambitions locally and regionally can be strengthened by the knowledge that commercial agriculture and local produce grown in Coconino County fed many people for many years. The lives of those farmers and the extent of agricultural production in the county's recent history should give us pause for reflection about the depth of farm experience embedded in this landscape.

FIGURES AND TABLES

Figure 1. County map of Arizona (Digital Map Store, National Geographic, n.d.).

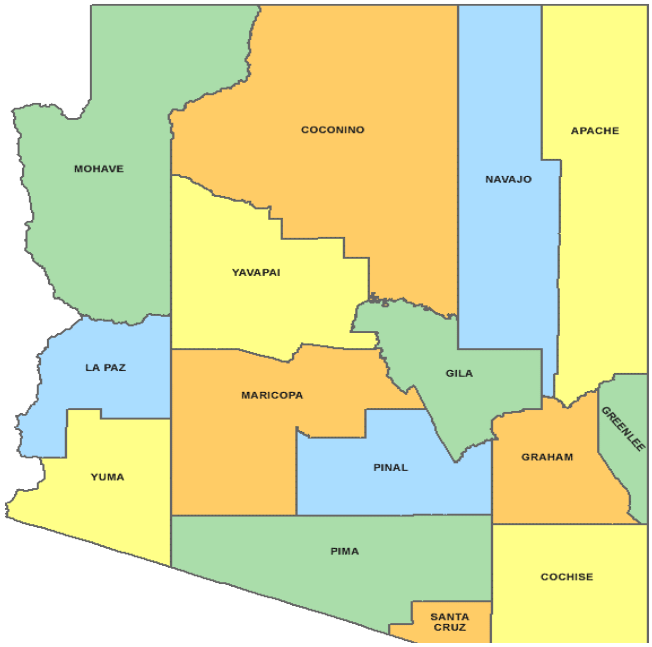

Figure 2. Map of the Mogollon Rim (Grahame and Sisk 2002).

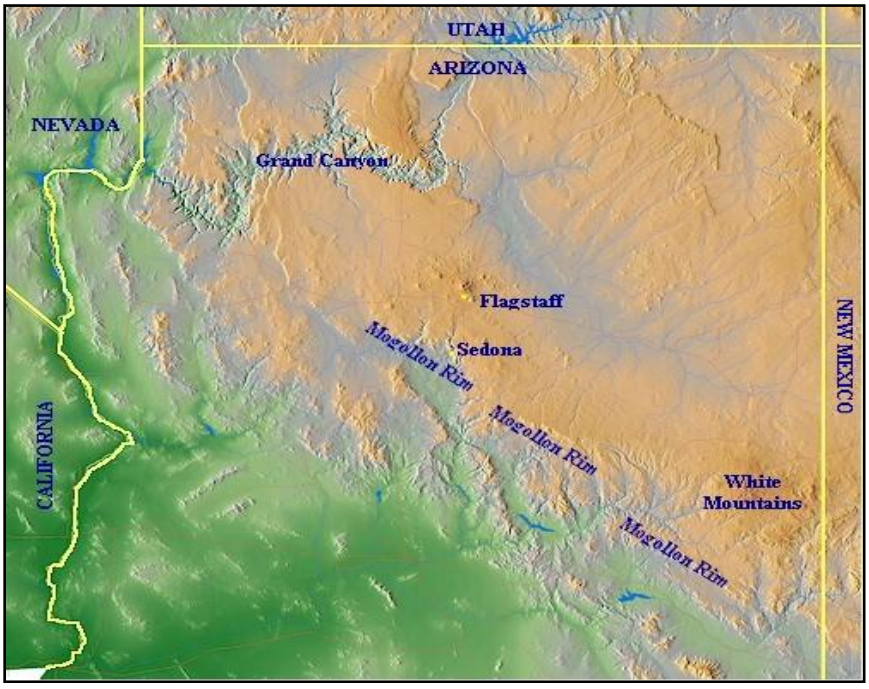

Figure 3. Flagstaff at the base of the San Francisco Peaks (Allen and Rocchio, NASA, Landsat Project Science Office 2008).

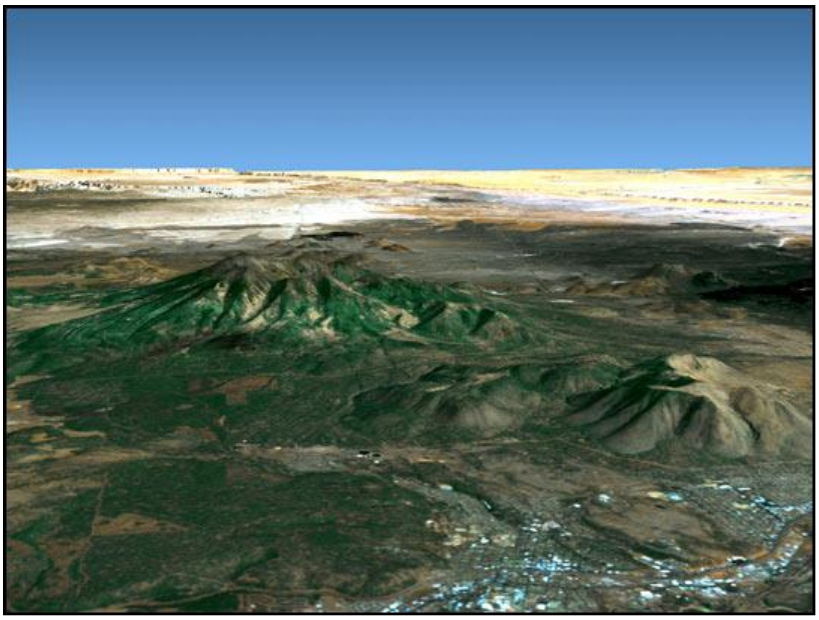

Figure 4. A family poses with the wagon in which they live and travel daily during their pursuit of a homestead, 1886 (U.S. National Archives and Records Administration, n.d.).

Figure 5. Map of Coconino County farming areas (Extension Service report 1954).

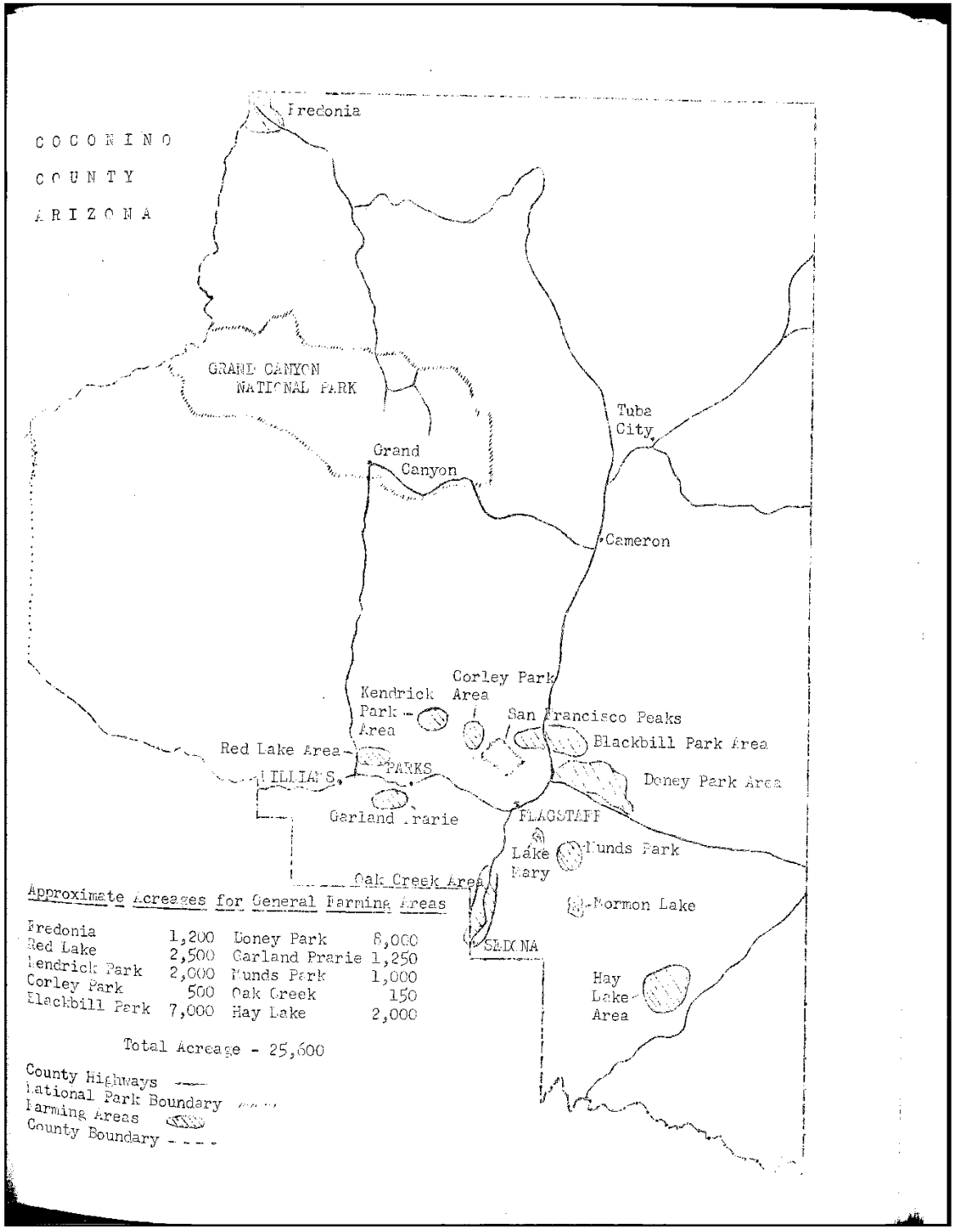

Figure 6. Posters from the U.S. Food Administration, World War I. Note references to potatoes and wheat (U.S. National Archives and Records Administration, n.d.)

Figure 7. Federal Aid Highway Act sign along Highway 40, now Interstate 70, St. Charles County, Missouri, 1956 (National Museum of American History 2011).

Table 8. Northern Arizona Drought Severity Index: 1918 - 1965 (NOAA National Climatic Data Center 2008).

This table was calculated using the Palmer Drought Severity Index (PDSI), which "attempts to measure the duration and intensity of the long-term drought-inducing circulation patterns. Long-term drought is cumulative, so the intensity of drought during the current month is dependent on the current weather patterns plus the cumulative patterns of previous months. Since weather patterns can change almost literally overnight from a long-term drought pattern to a long-term wet pattern, the PDSI can respond fairly rapidly" (NOAA National Climatic Data Center, Historical Palmer Drought Indices 2008).

Key:

0	extremely moist = 4" and above
1	very moist = +3 to +3.99
2	moderately moist = +2 to +2.99"
3	mid-range = -1 to +.99"
4	moderate drought = -2 to -2.99"
5	severe drought = -3 to -3.99"
6	extreme drought = -4" and below

	April	May	June	July	Aug	Sept	Oct	Nov
1918	2	3	2	1	1	2	3	2
1919	3	3	3	0	0	0	0	0
1920	0	0	0	0	0	0	0	0
1921	3	3	3	2	1	1	2	2
1922	2	2	1	1	1	2	3	2
1923	3	3	3	2	2	1	2	1
1924	2	2	2	2	3	3	3	3
1925	3	4	3	3	3	3	3	3
1926	2	2	1	1	2	2	2	3
1927	3	3	2	2	2	1	3	3

1928	3	3	4	4	4	4	4	3
1929	3	3	4	3	3	3	3	3
1930	3	3	3	2	1	2	3	3
1931	3	3	3	2	1	2	2	1
1932	0	0	0	0	0	3	3	3
1933	3	3	3	3	3	3	3	3
1934	4	4	5	5	4	5	5	5
1935	3	3	2	2	2	2	3	3
1936	3	3	3	3	3	3	3	3
1937	3	2	2	2	3	3	3	3
1938	3	3	1	3	3	3	3	3
1939	3	3	3	3	4	3	3	3
1940	3	4	4	5	3	3	3	3
1941	0	0	0	0	0	0	0	0
1942	0	1	2	3	3	3	3	3
1943	3	3	3	4	3	3	3	4
1944	3	3	3	3	3	3	3	3
1945	3	3	3	3	3	3	3	3
1946	3	4	4	4	3	3	3	3
1947	5	5	5	6	3	3	3	3
1948	3	3	3	3	3	3	3	3
1949	3	3	2	1	2	2	2	3
1950	3	4	4	3	4	4	5	5
1951	5	5	5	6	3	3	3	3
1952	1	1	1	1	1	1	3	3
1953	3	3	3	3	3	3	3	3
1954	4	4	4	3	3	3	3	4
1955	4	5	4	3	3	3	4	4
1956	4	5	5	5	5	6	6	6
1957	3	3	3	3	3	3	3	3
1958	3	3	3	3	3	3	3	3
1959	4	5	5	6	5	6	4	4
1960	3	3	3	4	4	5	3	3
1961	3	4	4	4	3	3	3	3
1962	3	3	3	4	4	4	3	3
1963	4	5	6	6	5	4	5	4
1964	4	4	5	4	5	3	4	3
1965	3	2	2	1	2	2	3	2

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APPENDIX A: HISTORIC CROP DATA FOR ARIZONA AND COCONINO COUNTY: 1909-1910

Coconino County produced approximately 36 percent of the overall potato yield (in bushels), and farmed approximately 29 percent of the total potato acreage in Arizona. Numbers were gathered from two census archives and recreated so that the state and county data matched side by side (Department of Commerce, Bureau of the Census 1913 and 1922).

USDA HISTORIC DATA: CROP YIELDS, AND COMPARISON OF POTATO YIELDS BETWEEN COCONINO COUNTY AND ARIZONA					
USDA Census data for Coconino county, 1909-1910: Individual crops			**USDA Census data for entire state: potatoes only**		
CROP	**ACRES**	**BUSHELS**	**YEAR**	**ACRES**	**PRODUCTION (BUSHELS)**
Dry edible beans		2	1879		26,249
All other vegetables	20		1889	407	38,918
Barley			1899	626	33,927
Potatoes	331	34,741	1909	1,151	97,141
Cereals, total	247	3,326	1919	2,505	174,301
Corn	89	784			
Oats	75	2,125			
Wheat	75	200			
Kafir corn and milo maize	4	200			
CROP	**TREES**	**POUNDS**			
Orchard fruits, total	2,796	3,058			
Apples	1,201	1,942			
Peaches and nectarines	965	751			
Pears	283	187			
Plums and prunes	243	116			
Cherries	38	13			
Apricots	58	35			

Quinces	8	12
Nuts, total	37	200
Almonds	35	200
CROP	**VINES**	**POUNDS**
Grapes	399	4,025
CROP	**ACRES**	**QUARTS**
Small fruits, total	2	2,201
Strawberries	2	2,055

APPENDIX B: FARMING AREAS AND ACTIVITIES IN COCONINO COUNTY (Extension Service reports 1925-1931).

Coconino County crops and communities where the Agricultural Extension Service helped farmers: 1925—1931. (Note that this is not where all crops were grown, in all areas of Coconino County.)	
PROJECTS	**COMMUNITIES: 1925--1926, 1929--1931**
Soil improvement (improved tillage, etc.)	Black Bill Park, Doney Park, Flagstaff, Garland Prairie, Anderson Pass, Brannigan Park, Spring Valley, Red Lake Valley
Potatoes	Doney Park, Hart Prairie, Mund's Park, Kendrick Park, Brannigan Park, Flagstaff
Beans (started in 1929)	Doney Park, Black Bill Park, Anderson Pass, Red Lake
Wheat	Black Bill Park, Doney Park, Brannigan Park
Corn	Doney Park, Black Bill Park, Garland Prairie, Anderson Point, Anderson Pass, Dead Man Flat, Red Lake
Lettuce	Hart Prairie, Fort Valley, Mund's Park, Kendrick Park, Hay Lake, Spring Valley
Walnut trees (and grafting)	Oak Creek
Truck (Market vegetable) growing and gardening	Hart Prairie, Pitman Valley, Spring Valley, Government Prairie, Red Lake Valley
Horticulture, fruit growing, truck vegetables	Lower and Upper Oak Creek, Tuba City, Fredonia

APPENDIX C: HISTORIC PHOTOGRAPHS

Photo 1. Alfalfa, clover in Munds Park (Coconino County Cooperative Extension Service archives, 1945-1948).

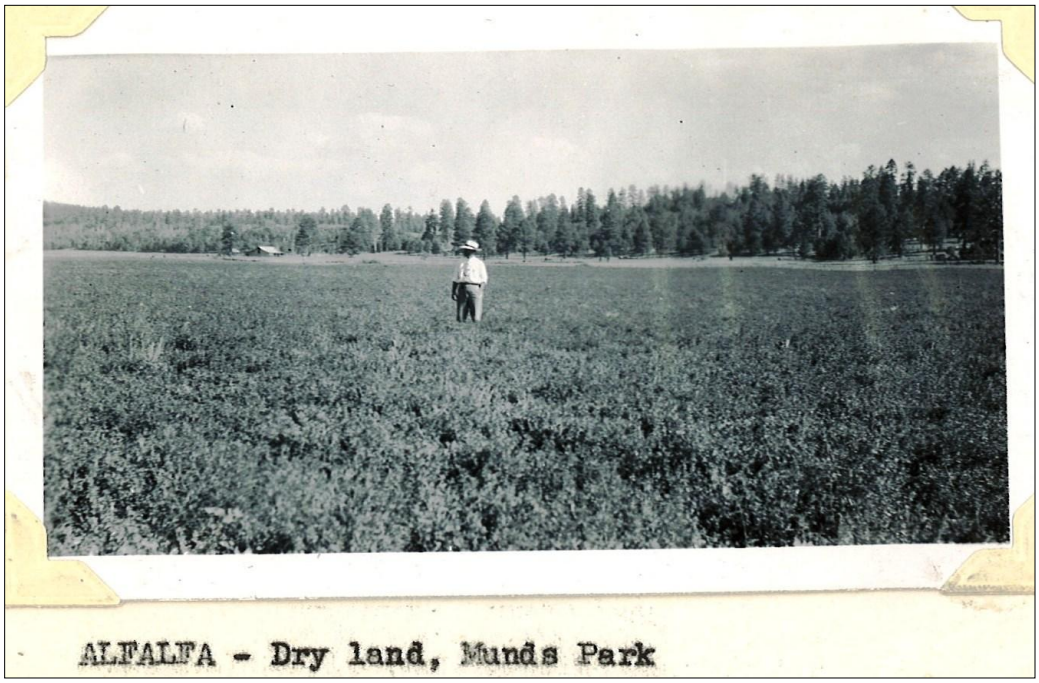

Photo 2. Seeding sweet clover (Coconino County Cooperative Extension Service archives, 1945-1948).

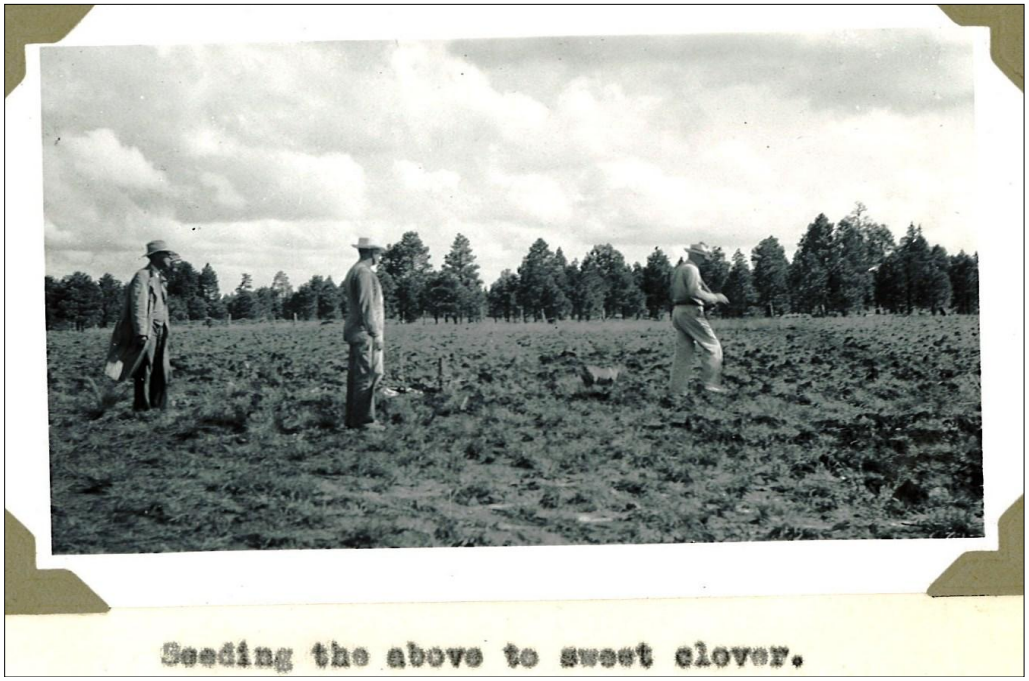

Photo 3. Pinto beans. Row 1-Early Idaho, Row 2-Early Wyoming, Native pinto bean strain both sides (Coconino County Cooperative Extension Service archives, 1945-1948).

Photo 4. Looking across bean rows. Right-growth in deep sub-soil. Left-Bean growth on shallow soil tillage (Coconino County Cooperative Extension Service archives, 1945-1948).

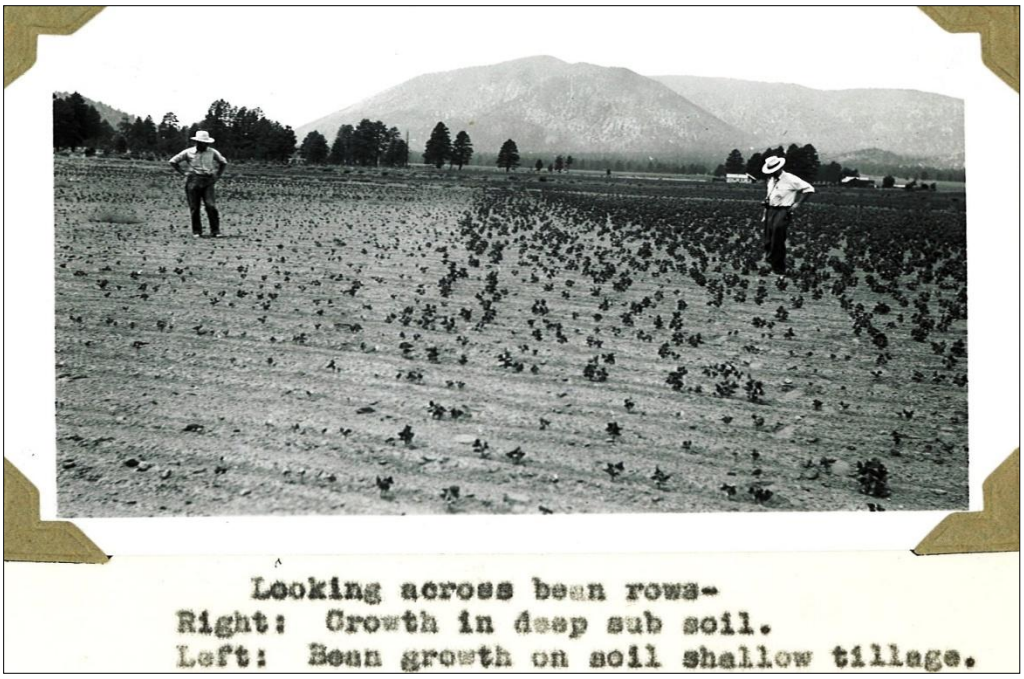

Photo 5. Pinto beans, Fleming farm, terracing and grain to right, August 23rd. (Coconino County Cooperative Extension Service archives, 1954).

Photo 6. Pinto beans, Doney Park (Coconino County Cooperative Extension Service archives, 1954).

Photo 7. Pinto beans, Doney Park, big pines in foreground (Coconino County Cooperative Extension Service archives, 1954).

Photo 8. Corn and beans, Joe Lawson's farm, (drought) (Coconino County Cooperative Extension Service archives, 1949).

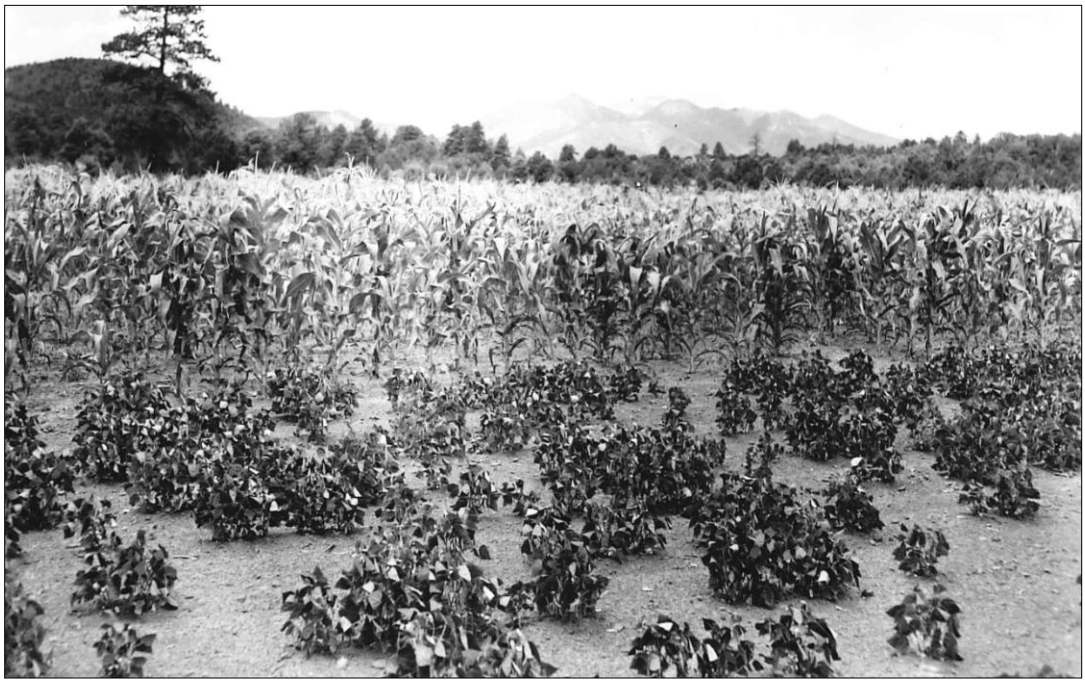

Photo 9. Pinto bean fertilizer test (Coconino County Cooperative Extension Service archives, 1954).

Photo 10. Pinto bean fertilizer test (Coconino County Cooperative Extension Service archives, 1954).

Photo 11. Pinto bean stand, beans are in rows, very sparse due to drought (Coconino County Cooperative Extension Service archives, 1955).

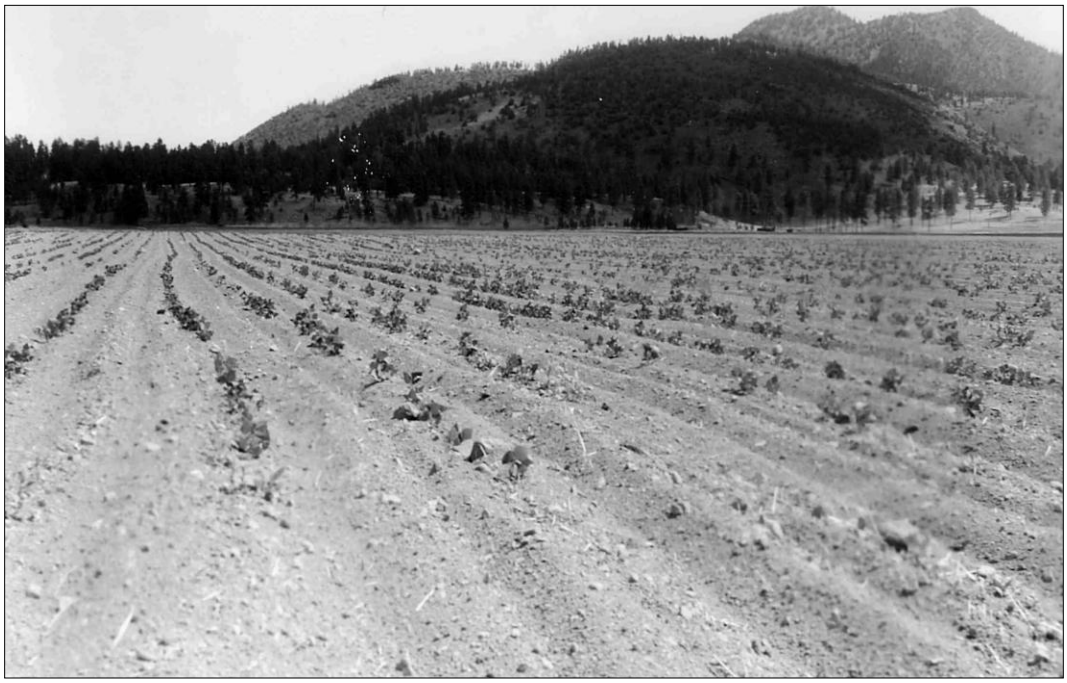

Photo 12. Ike Fleming, Pete Crisp, and Russell Fleming cleaning and sacking beans (Coconino County Cooperative Extension Service archives, 1956).

Photo 13. Flagstaff Bean Company (Coconino County Cooperative Extension Service archives, 1956).

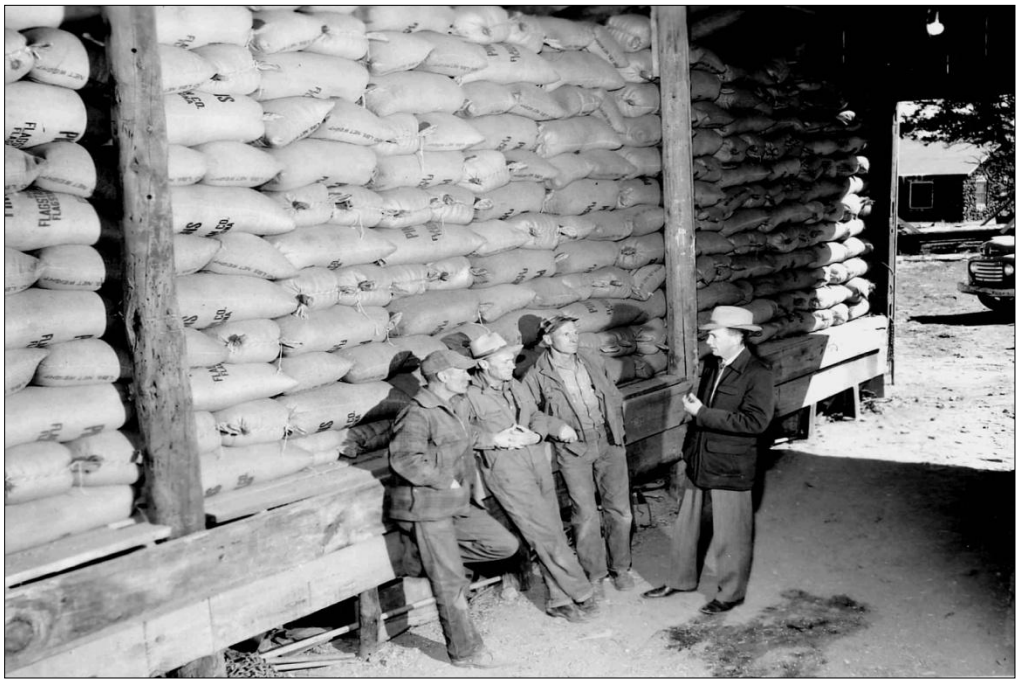

Photo 14. Flagstaff Bean Company, sacks piled up (Coconino County Cooperative Extension Service archives, 1956).

Photo 15. Dusting potatoes, Shepherd and Warfield (Coconino County Cooperative Extension Service archives, 1945-1948).

Photo 16. Spraying potatoes, Walter Anderson (Coconino County Cooperative Extension Service archives, 1956).

Photo 17. County Agent spraying potatoes for psyllids (Coconino County Cooperative Extension Service archives, 1952).

Photo 18. Certified Katahdin potatoes, William Warfield, 4 acres (Coconino County Cooperative Extension Service archives, 1945-1948).

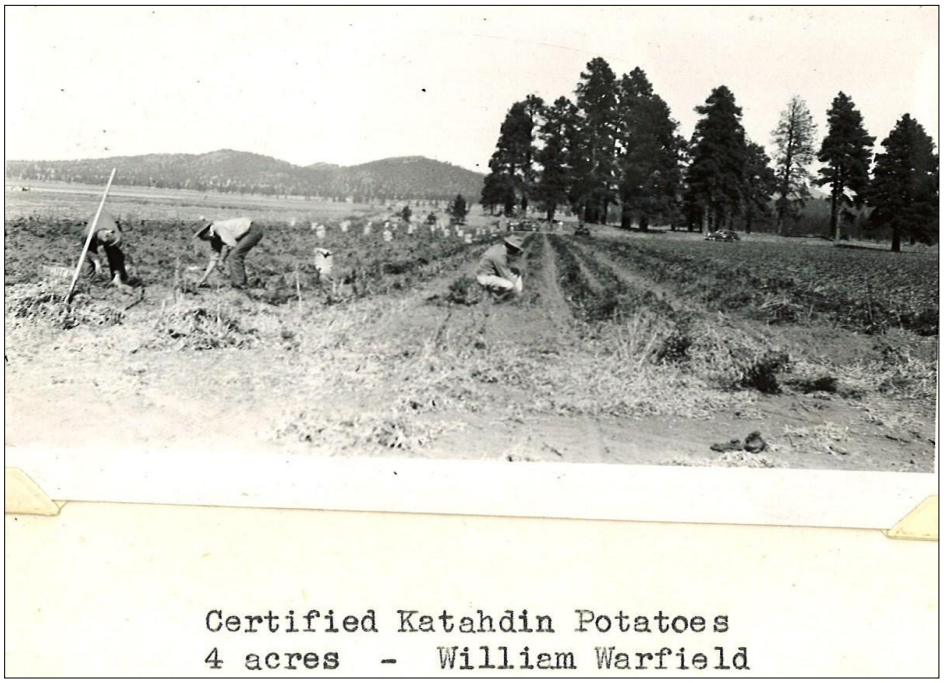

Photo 19. Ryberg potatoes, August 23 (Coconino County Cooperative Extension Service archives, 1954).

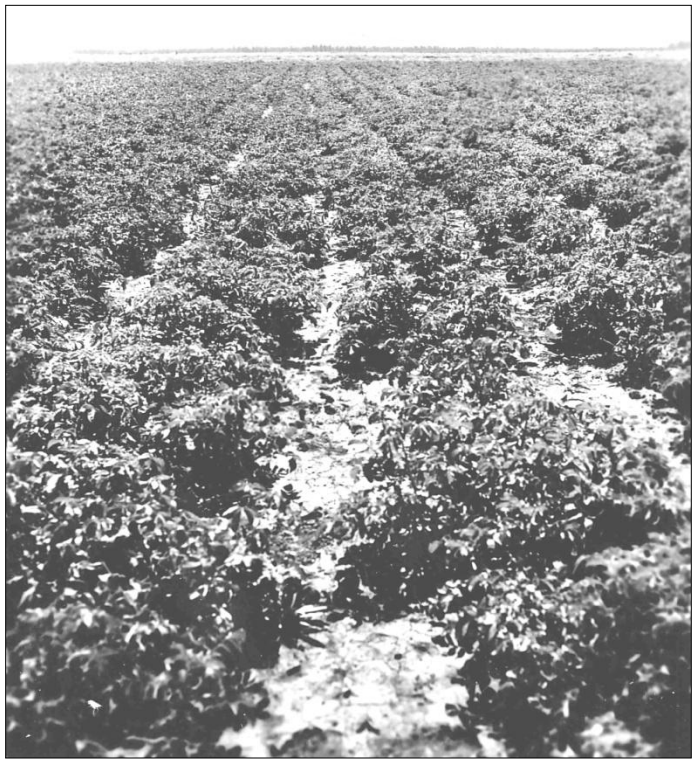

Photo 20. Oats and Canadian field peas, damaged by deer, R.B. Rountree (Coconino County Cooperative Extension Service archives, 1945-1948).

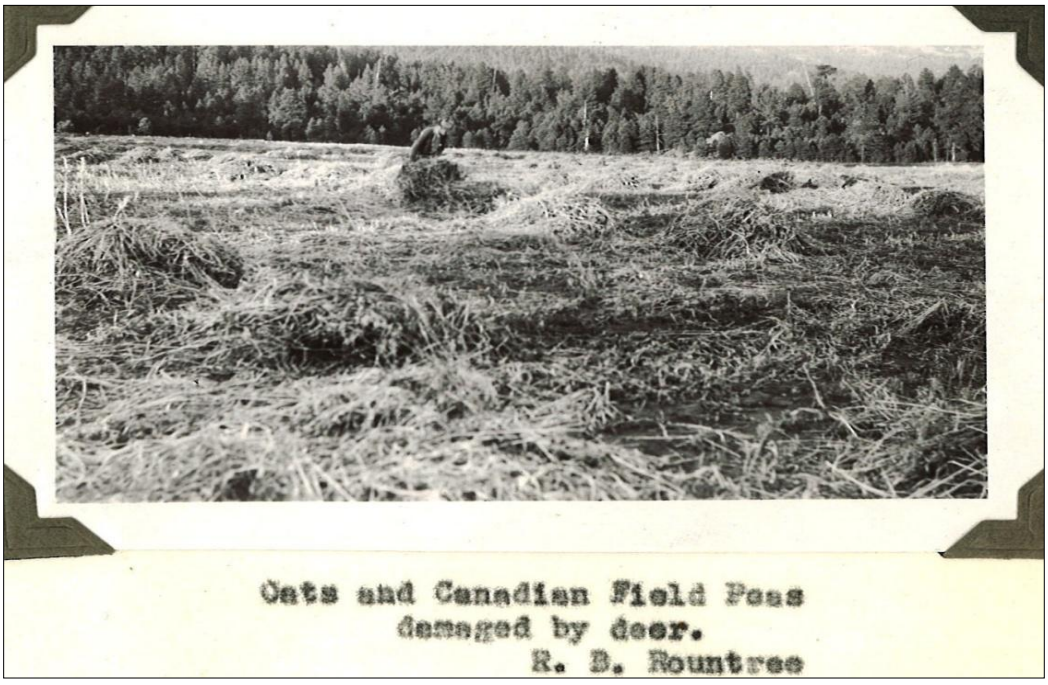

Photo 21. Oat and Canadian field peas hay mixture, fallow weed control in foreground, R.B. Rountree (Coconino County Cooperative Extension Service archives, 1945-1948).

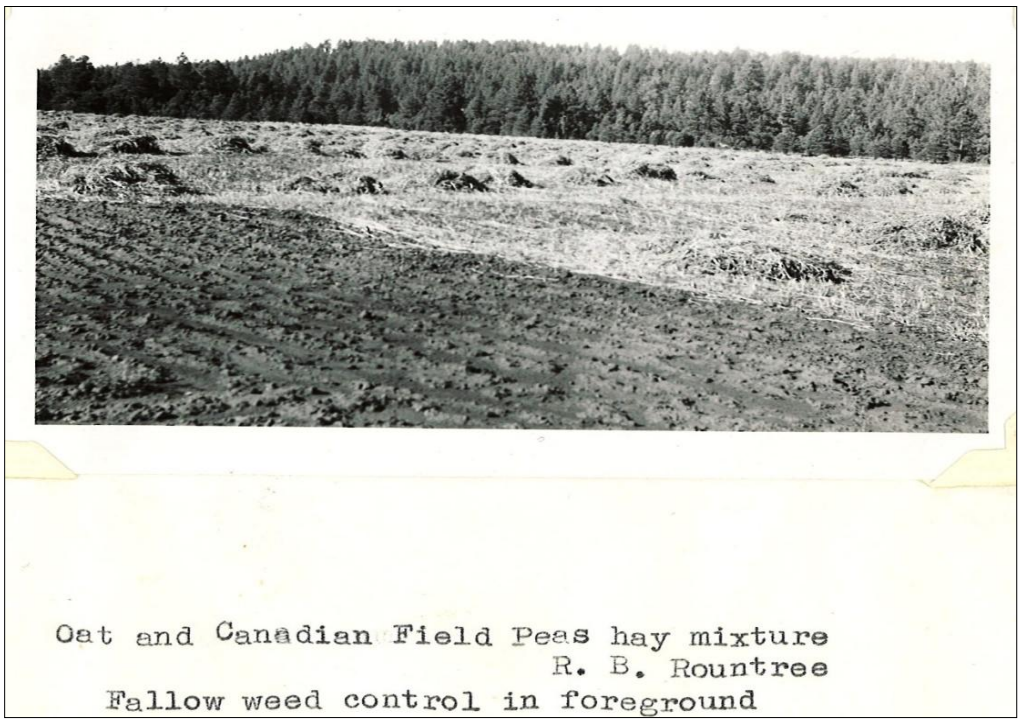

Photo 22. Typical oat harvest (Coconino County Cooperative Extension Service archives, 1945-1948).

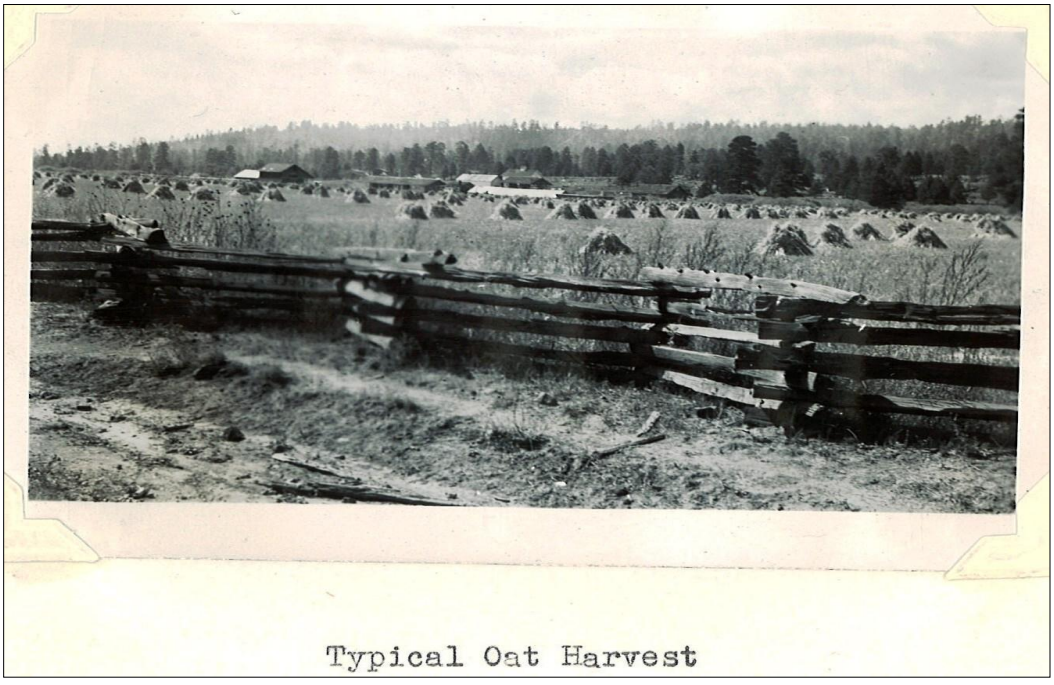

Photo 23. Oats, 80 bushel yield, Andy Matson (Coconino County Cooperative Extension Service archives, 1945-1948).

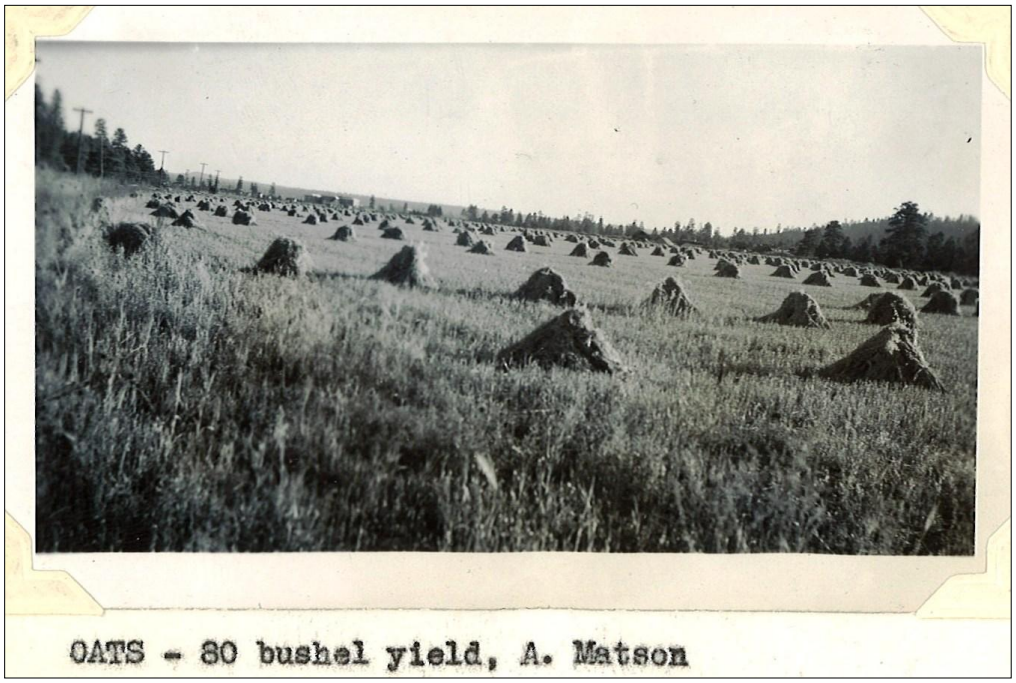

Photo 24. Harvesting Idamine oats, R.B. Rountree (Coconino County Cooperative Extension Service archives, 1945-1948).

Photo 25. Harvesting Hannchen barley with a combine, W.E. Anderson. 50 bushels in spite of dry season (Coconino County Cooperative Extension Service archives, 1945-1948).

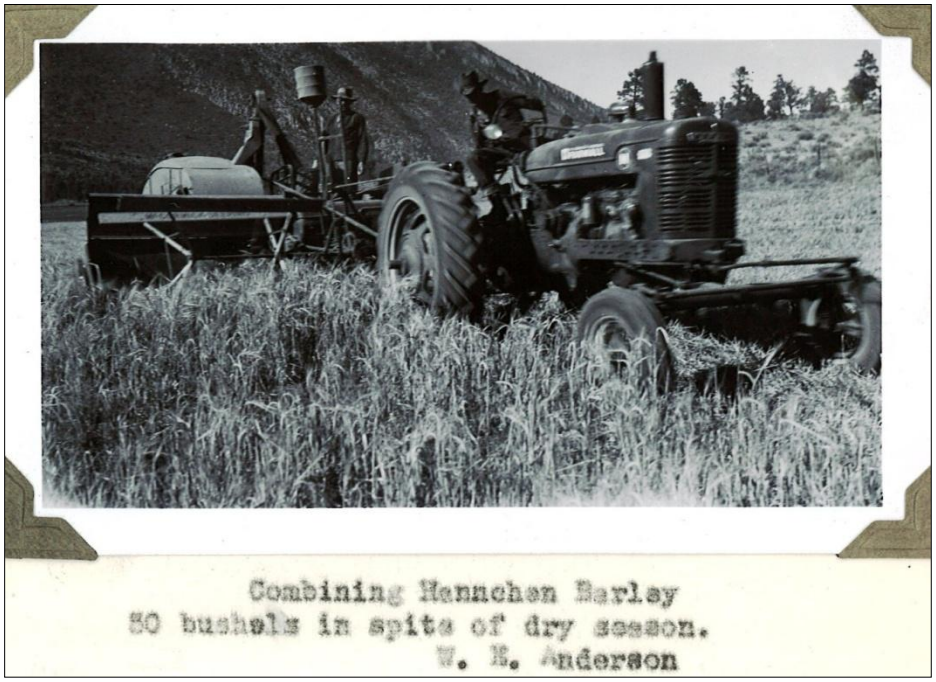

Photo 26. Hannchen barley, roguing. Corner potato experimental plot in foreground (Coconino County Cooperative Extension Service archives, 1945-1948).

Photo 27. Certified Hannchen barley, W.E. Anderson. Potato experimental plot in upper corner (Coconino County Cooperative Extension Service archives, 1945-1948).

Photo 28. Unfertilized oats on Matson farm, oats are knee-high (Coconino County Cooperative Extension Service archives, 1950).

Photo 29. Fertilized oats on Matson farm (60#N 60#P), oats are almost waist-high (Coconino County Cooperative Extension Service archives, 1950).

Photo 30. Markton oats, unfertilized, Garland Prairie (Coconino County Cooperative Extension Service archives, 1951).

Photo 31. Ryberg oats on fallow land (Coconino County Cooperative Extension Service archives, 1954).

Photo 32. Ryberg and Markton oats on fallow land (Coconino County Cooperative Extension Service archives, 1954).

Photo 33. Ryberg wheat, summer fallow (Coconino County Cooperative Extension Service archives, 1953).

Photo 34. Small grain nursery, Bonita Park (Coconino County Cooperative Extension Service archives, 1949).

Photo 35. Ryberg wheat (Coconino County Cooperative Extension Service archives, 1953).

Photo 36. Markton oats, Willie Scholz (Coconino County Cooperative Extension Service archives, 1955).

Photo 37. Defiance and Reliance wheat, mixed, Doney Park (Coconino County Cooperative Extension Service archives, 1954).

Photo 38. Small grain test plots, oats and barley (Coconino County Cooperative Extension Service archives, 1953).

Photo 39. Small grain test plots, wheat and oats (Coconino County Cooperative Extension Service archives, 1953).

Photo 40. Grain on terraces, Joe Lawson's farm (Coconino County Cooperative Extension Service archives, 1949).

Photo 41. Grain and beans, Joe Lawson's farm (Coconino County Cooperative Extension Service archives, 1949).

Photo 42. Harvesting hay with tractor (NAU Cline Library Special Collections, via Susan Olberding, date unknown).

Photo 43. Small grain oat nursery, satisfactory stand coming up (Coconino County Cooperative Extension Service archives, 1945-1948).

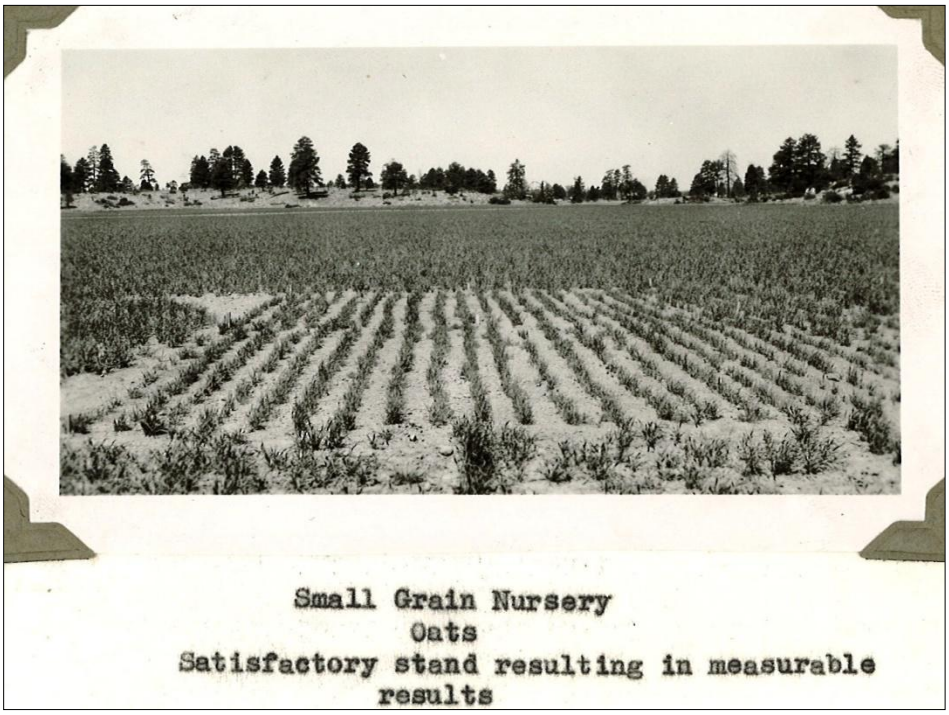

Photo 44. Small grain wheat nursery, "seed no good, poor stand, wasted effort" (Coconino County Cooperative Extension Service archives, 1945-1948).

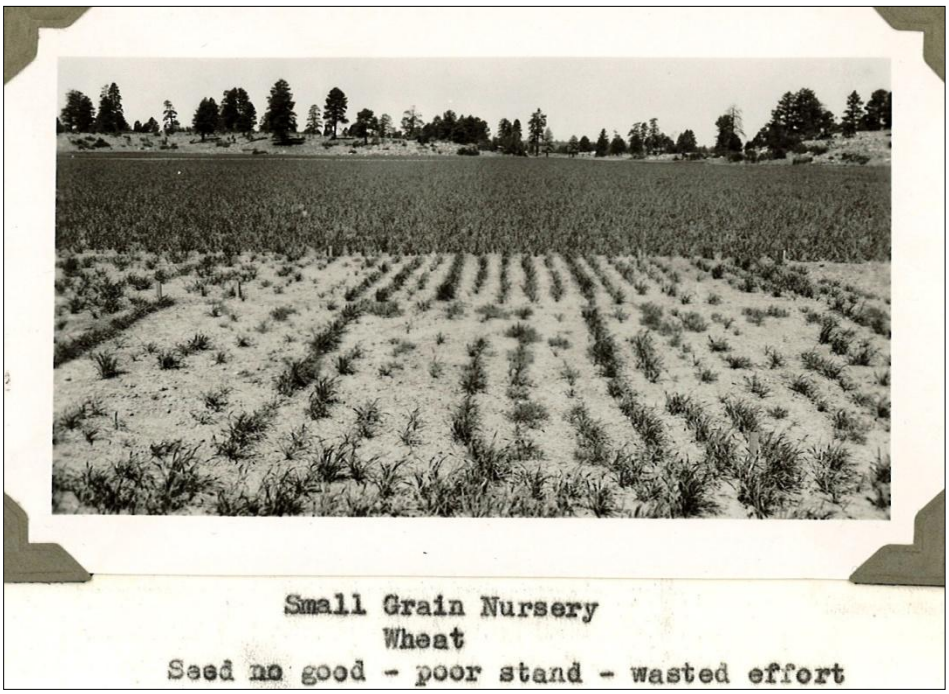

Photo 45. Bind weed patch. Photo shows it "ruins land for crop production" (Coconino County Cooperative Extension Service archives, 1945-1948).

Photo 46. Bind weed spraying demonstration, Henry Reich (Coconino County Cooperative Extension Service archives, 1945-1948).

Photo 47. Smut on white dent corn, Joe Lawson's farm ('Lawson's White Dent') (Coconino County Cooperative Extension Service archives, 1949).

Photo 48. Hybrid corn on Matson farm (Coconino County Cooperative Extension Service archives, 1952).

Photo 49. Orchard, Frank Pendley, dusting with sulphur for powdery mildew (Coconino County Cooperative Extension Service archives, 1945-1948).

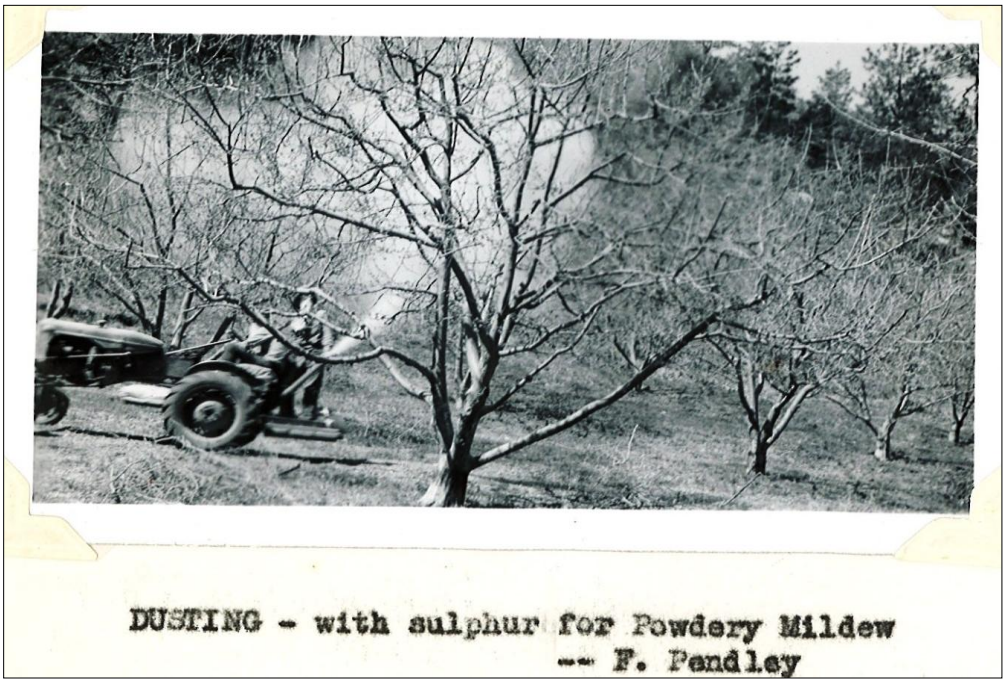

Photo 50. "Effective orchard spraying" with equipment, George Jordan (Coconino County Cooperative Extension Service archives, 1945-1948).

Photo 51. Smudging peach orchard, Walter Jordan (Coconino County Cooperative Extension Service archives, 1945-1948).

Photo 52. Walter Jordan's sprinkler in orchard (Coconino County Cooperative Extension Service archives, 1956).

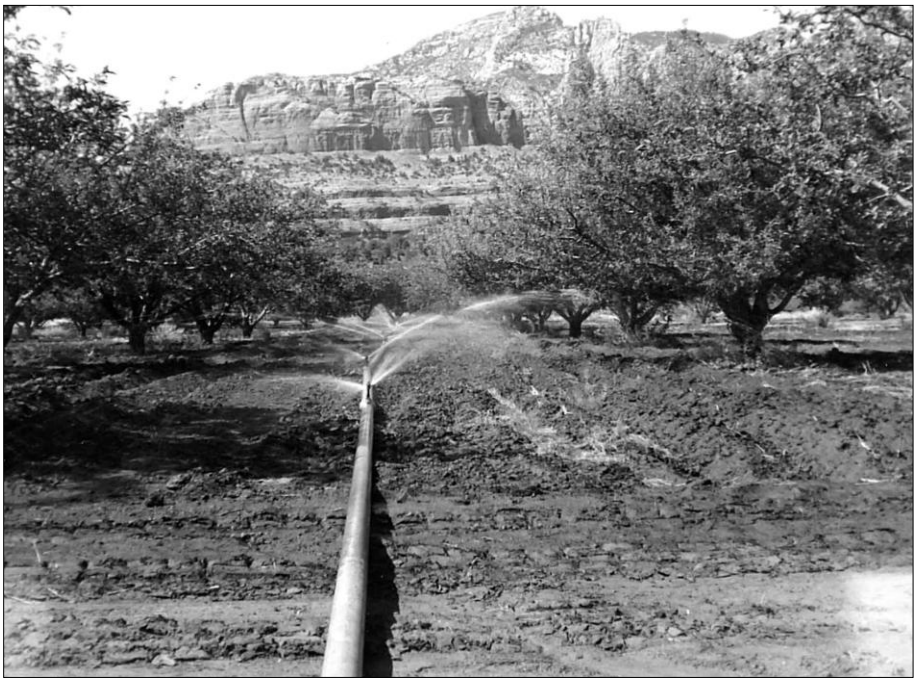

Photo 53. Pendley's apples (Coconino County Cooperative Extension Service archives, 1949).

Photo 54. Jordan's peach orchard. (Coconino County Cooperative Extension Service archives, 1949).

Photo 55. Peach trees. Tree on right side of photo has mosaic virus (Coconino County Cooperative Extension Service archives, 1956).

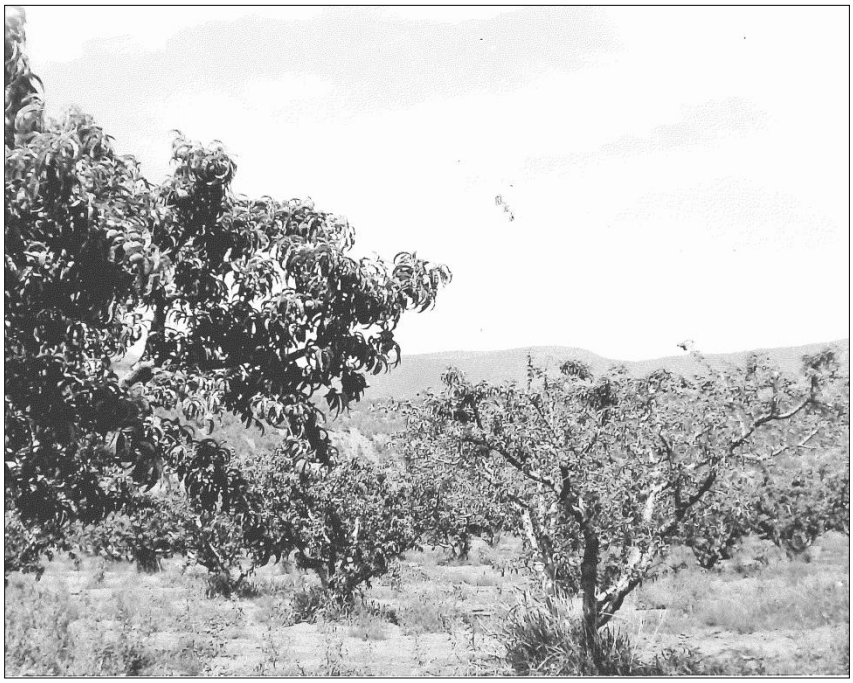

Photo 56. Pruning 'school' for fruit trees and roses. Rose pruning pictured ("Dr. Bellemeades' roses") (Coconino County Cooperative Extension Service archives, 1957).

Photo 57. Sub-soiling 14 inches deep, through hard soil layer, P.E. Butler (Coconino County Cooperative Extension Service archives, 1945-1948).

Photo 58. Deep sub-soiling, Ike and Russell Fleming (Coconino County Cooperative Extension Service archives, 1945-1948).

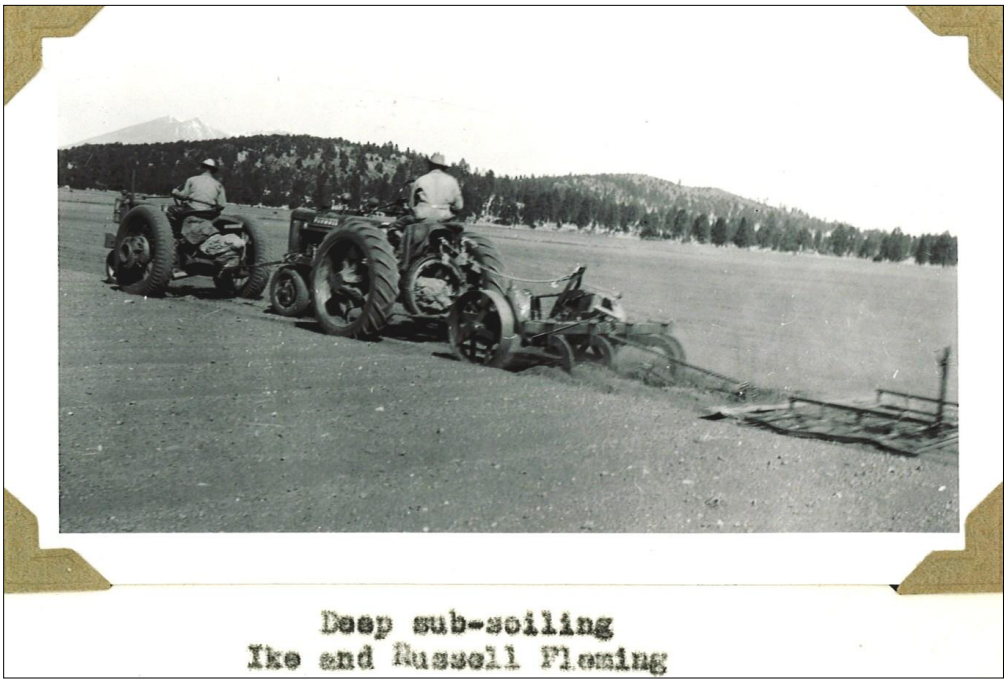

Photo 59. Renovating and applying fertilizer to crested wheat grass, Dr. R.O. Raymond (Coconino County Cooperative Extension Service archives, 1945-1948).

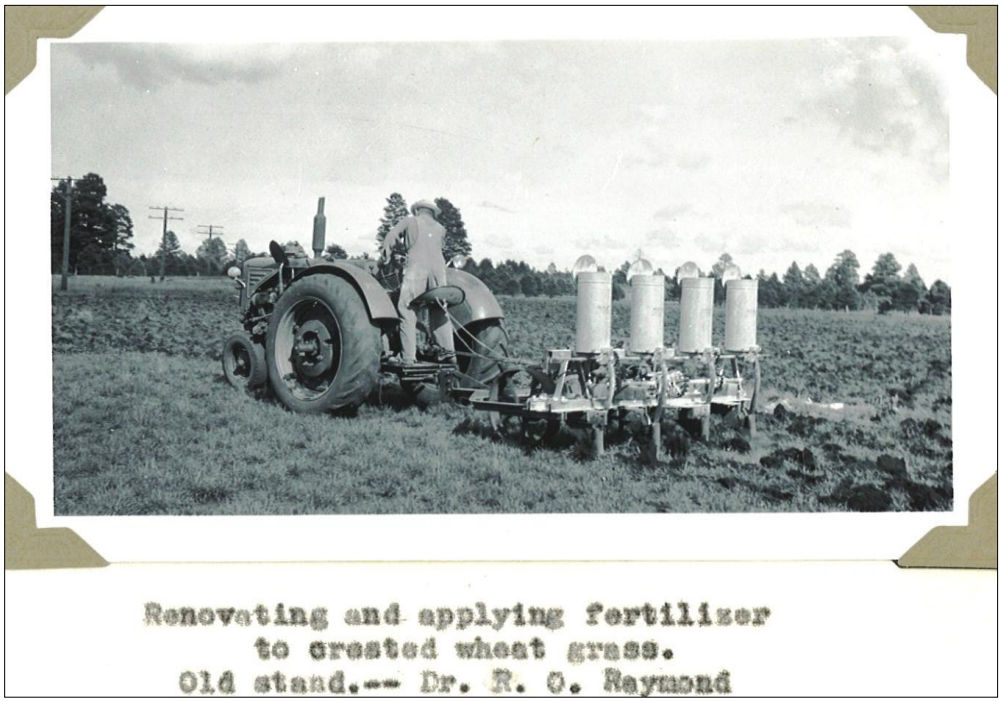

Photo 60. Spray equipment used by Mr. Butler. Large tank for large area. Small tank for separate plants (Coconino County Cooperative Extension Service archives, 1945-1948).

Photo 61. Trailer for moving farm equipment (Coconino County Cooperative Extension Service archives, 1945-1948).

Photo 62. Farmstead requiring post-war repairs (Coconino County Cooperative Extension Service archives, 1945-1948).

Photo 63. Domestic and stock water shipped from Winslow by train during drought year (Coconino County Cooperative Extension Service archives, 1934).

Photo 64. New well at U.S. Crisp's farm (Coconino County Cooperative Extension Service archives, 1957).

Photo 65. Ray Smith's silo (Coconino County Cooperative Extension Service archives, 1956).

Photo 66. Farmers meeting with County Agent W.M. Brechan, Doney Park (Coconino County Cooperative Extension Service archives, 1954).

Photo 67. Marketing carrots, Walter Jordan (Coconino County Cooperative Extension Service archives, 1945-1948).

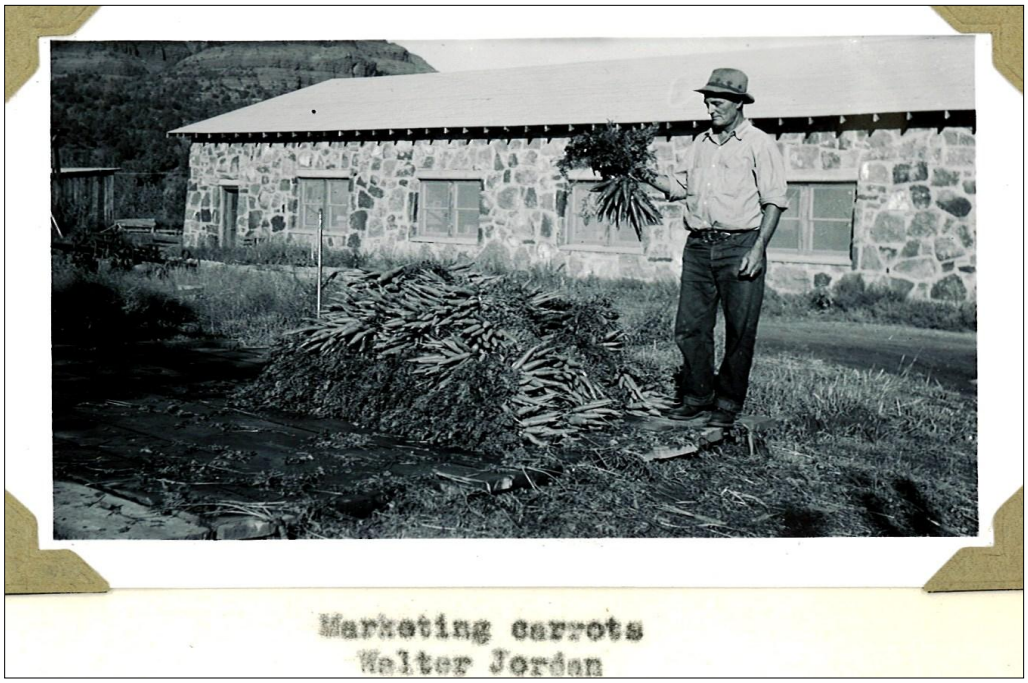

Photo 68. 4-H Club garden project, Mrs. Walter Jordan and children (Coconino County Cooperative Extension Service archives, 1945-1948).

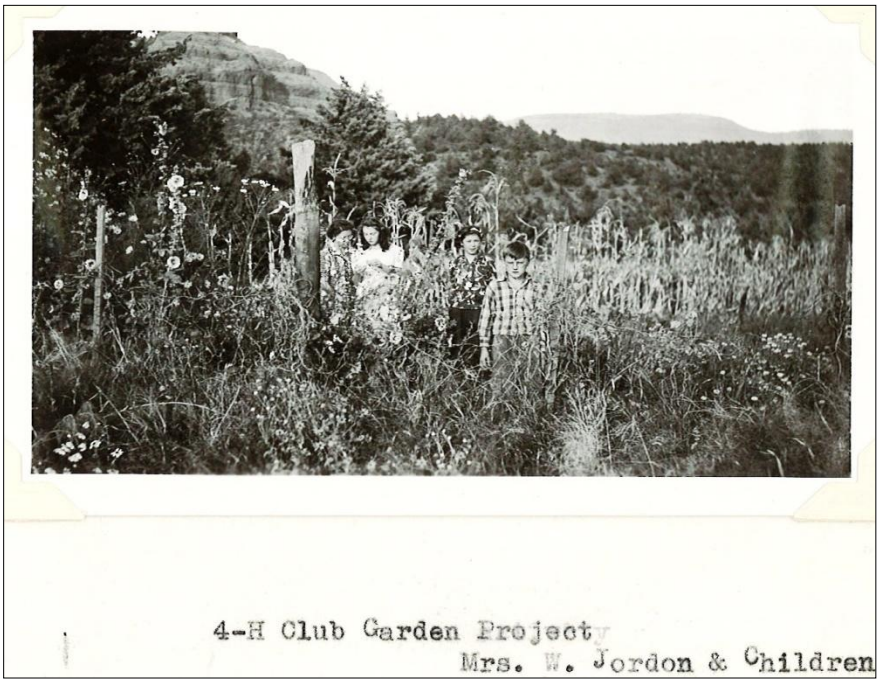

Photo 69. Garden plot (Coconino County Cooperative Extension Service archives, 1956).

Photo 70. 4-H photo (Coconino County Cooperative Extension Service archives, 1956).

Photo 71. 4-H photo (Coconino County Cooperative Extension Service archives, 1956).

Photo 72. 4-H photo (Coconino County Cooperative Extension Service archives, 1956).

Photo 73. Parks 4-H vegetable judging (Coconino County Cooperative Extension Service archives, 1956).

Photo 74. Junior 4-H vegetable judging team (Coconino County Cooperative Extension Service archives, 1956).

Photo 75. Tall Pine Aggies judging vegetables (Coconino County Cooperative Extension Service archives, 1956).

Photo 76. Crops exhibit at County Fair (Coconino County Cooperative Extension Service archives, 1955).

Photo 77. Fruit exhibit at County Fair (Coconino County Cooperative Extension Service archives, 1955).

Photo 78. Squash exhibit at County Fair (Coconino County Cooperative Extension Service archives, 1955).

Photo 79. Bulletin board in the Bank of Arizona (Coconino County Cooperative Extension Service archives, 1957).

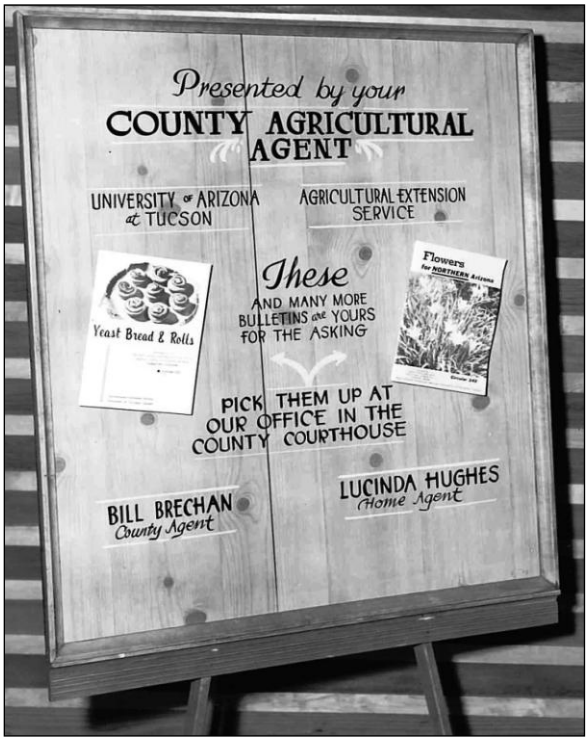

Photo 80. Office magazine rack. "Apples, Beans, Oats, Lumbering" signs (Coconino County Cooperative Extension Service archives, 1956).

Photo 81. Kaibab fertilizing experiment, Kaibab National Forest (Coconino County Cooperative Extension Service archives, 1956).

Photo 82. Aerial view of Fort Valley, taken by Joseph F. Arnold, April 20, 1955. Terraces visible. Photo courtesy of Susan D. Olberding.