The Umatilla Experiment Station
Its Development, Program, and
Accomplishments . . . 1909 to 1969

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INTRODUCTION

This report presents a brief story of the part played by the Umatilla Experiment Station in transforming an area of sandy windblown soils into productive land that now supports about 625 farm families. These farms are located on 40,000 acres near Hermiston, Oregon, and produce millions of dollars worth of farm products. This report indicates some of the progress and changes that have occurred in this area from 1909 to 1969.

The Umatilla Irrigation Project was founded by the passage of the "General Reclamation Act." This Act was signed by the President of the United States on June 17, 1902, and provided that receipts from the sale of public lands in certain states and territories could be used in the construction of irrigation works for the reclamation of arid lands.

HISTORICAL BACKGROUND

In 1909 the U. S. Reclamation Service undertook the development of the Umatilla Irrigation Project. The project was located in the northwest portion of Umatilla County, near the confluence of the Umatilla and Columbia rivers. In the beginning the project consisted of about 25,000 acres, of which 15,000 could be irrigated. In 1917 the "Western Unit" of the Umatilla Project was developed. This added 11,000 acres, of which 6,000 could be irrigated.

The elevation of both units is from 450 to 600 feet above sea level, and the soil varies from a sandy loam to a coarse sand. The average growing season is over 180 days. Extreme winter temperatures are below zero and extreme summer temperatures are above 100 degrees. Late spring frosts make fruit growing hazardous.
From an engineering standpoint, the plan for impounding the available water and delivering it was efficient and sound. Unfortunately, an evaluation of the soils to be irrigated was not made prior to the construction of the irrigation facilities. It soon became apparent that the soils under consideration for irrigation should have been investigated thoroughly before a project embracing them was deemed feasible. Such an investigation would have determined that some of the area was too sandy for furrow or flood irrigation.

Wide publicity associated with the development of the new irrigation project brought a stream of new settlers into the area. They were hopeful of developing successful farming enterprises, but many were doomed to frustration and disillusionment. A considerable number of them had no previous farm experience, and did not realize the unavoidable hardships in developing the raw, infertile, sandy land. Others paid excessive prices for property to private owners who had acquired it before irrigation facilities were available. Sometimes this left inadequate funds for developing their farms. Those who were unfortunate enough to settle on the coarser soil soon found it necessary to abandon the land. Most of the settlers were diligent, untiring, determined workers, with a great desire to succeed, but all too often their finances were exhausted before they could reach that goal.

It immediately became necessary to provide the settlers with information that would guide them in their efforts to establish farming enterprises. It was urgent to stabilize the windblown soils and increase their productivity. Of equal or greater importance was the need for practical knowledge in handling the irrigation water. Early solution of these problems was vital to the worried settlers.

The Oregon Agricultural Experiment Station, Oregon State University (then named Oregon Agricultural College), entered into a cooperative agreement with the Division of Western Irrigation Agriculture, Bureau of Plant Industry, USDA, to establish local research programs that would furnish the greatest possible assistance to the settlers in reclaiming and farming these low-fertility sandy soils. The U. S. Bureau agreed to contribute $3,000 annually in support of the research program with the understanding that the state of Oregon would contribute a similar amount.

To carry out its part of the agreement, Oregon State University requested funds from the Oregon Legislature. In 1909, under House Bill 11, Chapter 96, the legislature appropriated the sum of $3,000 annually for "support and maintenance of an Experiment Station on the Government Project known as the Umatilla Irrigation Project in Umatilla County, Oregon."

The Umatilla Experiment Station was located on a 40-acre tract of federal land which had been withdrawn from entry in 1908 by the Department of Interior for use as an experiment station. It was to be maintained by the Oregon Agricultural Experiment Station and operated in cooperation with the Division of Western Irrigation Agriculture, Bureau of Plant Industry, USDA. Operations began in 1909.
In addition to furnishing the 40-acre tract for experimental work, the Reclamation Service constructed a residence cottage, a barn, and an office building. The state constructed a concrete storeroom, a pump house, and a machine shed.

Through the years the original site was found to be too small and much of it was not suitable for the type of experiments being conducted. Both the federal and state officials agreed that a more appropriate site should be selected. On April 16, 1931, the following executive order was issued by the White House:

"By virtue of the authority vested in me by the provisions of the Act of Congress of June 25, 1910 (36 Stat. 847) as amended by the Act of Congress of August 24, 1912 (37 Stat. 497) the following described lands within the Umatilla Federal Irrigation Project, Oregon are herewith withdrawn and set aside for the use of the Department of Agriculture, as an Agricultural Field Station."

(Signed) Herbert Hoover, President

On this tract of 180 acres, located three miles south of the original site, an intensive and enlarged research program was initiated. The following essential buildings were constructed by the federal government: a superintendent's residence, a dairyman's cottage, a dairy building, calf barn, loafing shed and yards, horse barn, garage, machine shed, an office building, and two irrigation pump houses with electrical equipment. Later the state constructed two additional residences, a hay shed, granary, hay barn, sheep barn, cattle feedlots, and a machine shed. Although the land and most of the buildings are owned by the federal government, they have been conditionally assigned to the state for as long as experimental work is conducted there. Essential technical laboratory and field experimental equipment and farm machinery necessary for efficient operation of the research program is owned by the state.

When the research program was shifted to the new site, the original 40-acre tract reverted to the control of the U. S. Reclamation Service.

TECHNICAL POSITIONS AND PERSONNEL

The research program of the station is conducted by the Superintendent and other technically trained specialists assigned to work on specific agricultural problems of the area.

Through the years the following technical personnel, some full-time and some part-time, have been employed at the station by the state or the USDA. These employees have contributed directly to the research program by solving some of the problems and increasing the wealth of the Umatilla area:
R. W. Allen, Agronomist and Superintendent 1909-1919
H. K. Dean, Agronomist 1912-1913, 1914-1919
Superintendent 1919-1945
Carl A. Larson, Soils Specialist and Superintendent 1945-1957
D. H. Sherwood, Dairy and Turkey Research Specialist 1934-1950
Clifford Domingo, USDA 1946-1948
David Graham, Horticulturist 1947-1948
Jim Burr, Soils Specialist, USDA 1951-1955
Lew Wallace, Entomologist 1953-1955
Fred M. Tileston, Irrigation Specialist, USDA 1955-1956
William Stammers, Irrigation Specialist, USDA 1958-1960
Tom Davidson, Horticulturist 1950-1957
Superintendent 1957-Present

In addition to those listed above, the station has had the occasional direct services and cooperation of many of the technical staff of the USDA (including representatives of the Bureau of Plant Industry, Bureau of Reclamation, Division of Engineering, and Division of Entomology) and of several departments of Oregon State University at Corvallis. Chief among these departments are Farm Crops, Soils, Botany and Plant Pathology, Entomology, Horticulture, Agricultural Chemistry, Animal Science, and Statistics.

PROGRESS AND ACHIEVEMENTS

The Umatilla Experiment Station was established in 1909 for the purpose of investigating the agricultural problems on the irrigated sandy soils of the Columbia Basin. During the past 60 years, the station has tested and evaluated hundreds of new and old crops on thousands of plots, under a wide range of irrigation, fertilization, and cultivation practices in an effort to find varieties best adapted for market and for home use under the prevailing climatic conditions. The station has tested nearly every conceivable method of putting humus into these sandy soils to increase production ability, decrease wind erosion, and reduce the amount of irrigation needed. Through this extensive research effort, many items of practical benefit have been accomplished, although many disappointments and frustrations have accrued. The positive results have outweighed the negative ones. A few of the major achievements of the station are listed in the following pages.
SOIL AND WATER MANAGEMENT

In the beginning the main problem was removing the sagebrush from the land and supplying the available irrigation water. Because of excessive seepage from unlined ditches, it was necessary to line the irrigation ditches with concrete or use tile pipelines to get the water to the fields.

Through years of testing every known system and device used in irrigating sandy soils, practical methods of irrigating these lands have been achieved. The amount of irrigation needed to produce practically every crop grown in this area has been established.

Sprinkler irrigation also was thoroughly tested, and in many cases it was found to be less costly and more efficient than furrow and flood irrigation. Sprinkler irrigation greatly reduced or eliminated the cost of land leveling and minimized the loss of water through deep percolation.

Perhaps the most important accomplishment of the station was the finding of practical, efficient, and economic methods of irrigation.

Low fertility was one of the major problems on these sandy soils, so it was necessary to determine practical methods of incorporating humus and fertilizers that would bring economic crop yields. Accordingly, extensive experiments were conducted to measure the effect of selected commercial fertilizers and green manure soil-building crops on production.

Many kinds of fertilizers were tested to determine their effects on yield and quality when applied singly and in combination at varying rates, times, and methods.

Different kinds of green manure crops such as alfalfa, vetch, and cereals were plowed under, and the yields and fertility of the ensuing crops, the water-holding capacity of the soil, and the effect on wind erosion were measured. Likewise, barnyard manure, in quantities ranging from 5 to 30 tons per acre, was applied and compared to other soil-building practices. Soil fertility research at the station has provided a guideline for local growers.

Uncontrolled erosion from the wind has been a limiting factor in growing crops such as sugar beets, beans, and peas. Plowing under cover crops such as rye and vetch, planting rye strips, and working the land when wet to form clods are methods which have been developed to help control wind erosion.

FRUIT AND VEGETABLE PRODUCTION

At the time the Experiment Station was started (1909) there was a great demand for information concerning which fruit varieties to plant and how to handle production problems. To answer these questions, the station tested 186 varieties of tree fruits, 52 varieties of grapes, 54 varieties of small fruits, and a number of varieties of nuts. George Waldo, a USDA horticulturist and plant breeder stationed at OSU, assisted in testing new selections and breeding crosses of strawberries and raspberries.
It was found that most varieties of fruits would withstand normal winters, but would suffer heavy losses in severe winters and from late spring frosts. While extensive commercial production has not developed in the Hermiston area because of the frequency of frost damage, an abundance of fruits are grown for home use.

In the Milton-Freewater area, however, the value of the commercial production of prunes, apples, grapes, pears, and small fruits exceeds $2,000,000 annually. Here the research program was concentrated on production methods, disease, and pest control. Major accomplishments in this area were development of a control program for peach root borer and selection of apple and prune varieties.

Curly top disease of vegetables was found to be the limiting factor in the production of tomatoes, squash, beets, spinach, and beans in 1911 when the first experimental work with vegetable crops was established at this station. In 1926 the late Dr. M. B. McKay, of the Oregon Agricultural Experiment Station, and a research worker at the California Agricultural Experiment Station simultaneously discovered that the curly top disease was spread by the leafhopper (*Eutettix tenellus*).

Concentrated experimental work was started in 1927, under the direction of Dr. McKay, with the active cooperation of the USDA Division of Fruit and Vegetable Crops and the USDA Division of Entomology. In 1930 the Division of Fruit and Vegetable Crops appointed Dr. B. F. Dana, plant pathologist, to lead the curly top project in the Northwest, and the Umatilla Experiment Station was made the center of cooperative state and federal studies in the control of this disease.

**Tomatoes.** Practically every known variety and strain of tomatoes in the United States and many from foreign countries were tested in the search for one resistant to the curly top disease. Although some varieties that had limited resistance to curly top were found, none possessed satisfactory quality.

During these investigations, however, it was discovered that the leafhopper did not thrive in the shade. This led to the growing of tomatoes in shaded slat houses, a practice which met with partial success. Some tomatoes now are grown for home use in this area, but no commercial tomato enterprise has developed.

**Squash.** After testing many varieties of squash, one variety was found to be fairly resistant to the curly top disease. It was selected and improved by the late Dr. B. F. Dana, named "Umatilla Marblehead," and released to seed growers.

**Green beans.** From the selection and testing of certain green bean varieties that showed minor resistance to curly top, and by crossing these and further testing, a new variety of bean named "Columbia" was developed and released.
Asparagus. Commercial production of asparagus has been assisted in this area by the testing and selection of improved varieties and by the development of improved fertilizer practices. Yields of 4 to 5 tons per acre have been produced in fertilizer test plots. Nitrogen, the most important fertilizer element, is used at a minimum of 100 pounds per acre. Planting rates have been studied, and denser plantings have produced higher yields.

Sweet potatoes. Sweet potato varieties have been tested and selected at this station. When grown under good farming practices, they have good yields and show promise as a commercial cash crop.

Watermelons. Many varieties of watermelons have been tested and discarded, but several have been found to be moderately resistant to the wilt disease and are now in commercial production on about 1,000 acres in this locality.

Lima beans. Trials at the station have shown that lima beans are a potential cash crop for this area. Yields of 4,000 pounds of shelled beans per acre have been obtained.

Sweet corn. Many varieties of sweet corn were tested under local growing conditions and compared with those commonly grown in the area. Several of the tested varieties were found to be superior in quality and yields.

FIELD CROP PRODUCTION

Alfalfa. Many field trials showed that alfalfa responded to sulfur, the yields almost doubling with annual applications of 300 pounds of gypsum per acre. This practice is now widespread in the area. On the other hand, application of minor elements such as zinc and iron were not beneficial.

In the search for higher yielding varieties of alfalfa, many varieties have been under test for disease and insect resistance, longevity, and quality. Thus far the variety Vernal has excelled in these qualifications and is the principal variety grown here.

Soybeans. Many varieties of soybeans have been tested, resulting in the selection of the variety "Merit" as having qualities suitable for commercial production under prevailing conditions on the Hermiston Project. Yields of 40 to 45 bushels per acre were common in the experiments conducted. Although these yields compare favorably with yields in areas now growing soybeans, the acreage of this crop has not yet expanded materially. The research has proven, however, that soybeans offer potential for the future.

Wheat. Through the years a great many wheat varieties were tested in the search for one that would give economic yields. Spring grains did not meet this requirement, and winter grain proved to be unsatisfactory when there was a shortage of fall irrigation water. Recent tests have shown that the comparatively new varieties "Gaines" and "NuGaines" are making good yields, many fields running from 60 to 100 bushels an acre. These are now the principal wheat varieties grown on the Hermiston irrigation project.
Potatoes. Adapted varieties of potatoes were evaluated at the station to determine the best fertilization and cultural practices. Efficient irrigation has expanded potato production until now (1969) it ranks second only to wheat as a cash crop. In 1969, 3,600 acres of potatoes were grown, with an average yield of 20 tons per acre.

Silage corn. Corn silage has proven to be superior to that made from alfalfa, sorghum, or sudan grasses. Yields of corn silage, under proper fertilization, irrigation, and cultural practices, range from 20 to 30 tons per acre in this area. When the farmer can feed the silage to his own animals, he is able to realize the greatest income from this crop. Feeding trials at the station have shown that cattle gain economically when fed corn silage.

Peas. Peas have been tested for processing use. Some varieties have given yields of 4 to 6 tons per acre. Since the local growing season is long and peas have a short season, it is possible to grow some other crop after the peas are harvested.

Safflower. Safflower has proven to be productive, and limited quantities have been commercially produced. It has potential as an oil crop and as a crop that can be grown in rotation with sugar beets.

Pyrethrum flowers. Pyrethrins are extracted from pyrethrum flowers and used in making insecticides. The flowers have been tested at this station and found to produce well. The insecticide produced from this plant is short lived and is not harmful to animals.

Sunflowers. Sunflowers have been grown to provide feed for turkeys; they are also used to make shade for the turkeys in hot weather.

LIVESTOCK PRODUCTION

At different periods of time since the beginning of the Umatilla Experiment Station, extensive research and testing has been done on beef cattle, dairy cattle, swine, and sheep. This research has involved evaluation of the response of livestock to different kinds and amounts of feed and to methods and practices of livestock management.

In 1960, feedlots and buildings were constructed for conducting necessary research in feeding cattle and sheep. Construction materials were purchased with funds donated by livestock growers and the Oregon Wheat Commission. The Experiment Station provided the labor for constructing the facilities.

Cattle feeders now are provided with reliable information that is applicable to their individual enterprises. This information was derived from experimental trials with evaluated different rations containing wheat, barley, corn, milo, alfalfa, and other locally grown feeds. Other trials have shown that the pre-feedlot environment of cattle on feed is more important in their fattening process than their genetic makeup. When
diethylstilbestrol implants were tested, it was found that cattle receiving a 12 mg. implant under the skin of the ear gained better than those not receiving the treatment. Subsequent trials have shown that the 12 mg. strength implant was as good as 24 mg. or 36 mg. and was superior to feeding diethylstilbestrol in the ration.

The forage-producing capacity in animal units per acre was determined from six varieties of grasses and five legumes grown singly and in several combinations. The 24 half-acre plots were fertilized, irrigated, and pastured for maximum production. The Alta fescue-orchardgrass mixture produced the most pounds of beef per acre. This mixture is still a standard recommendation.

Various rations for carrying beef cattle through the winter and then finishing them for market have been tested separately and in different combinations. The wintering rations have consisted of combinations of silage, concentrates, chaff, long alfalfa hay, chopped alfalfa hay, alfalfa cubes, and alfalfa pellets. In these tests long alfalfa hay has given the cheapest gains, but it costs more to handle large quantities of this feed. Corn silage, with 5 to 6 pounds of grain concentrate per head per day, has been the best wintering ration.

In 1969 a beef sire evaluation facility was developed. This consists of more than 20 pens for feeding out progeny groups. Carcass information and feed efficiency of different groups can be compared when the animals are fed under controlled conditions. The information obtained is used by the owners for herd improvement or by interested buyers to determine which cattle have the characteristics they desire.

From 1959 to 1961 a boar test center was operated by the station. The building, which had 30 pens, was donated by the Oregon Wheat Commission. The tests were conducted to obtain carcass information and feed efficiency on sibling groups rather than on progeny groups. The results obtained were used much the same way as the beef information is used today. After the tests were discontinued, the building has been used for swine feeding trials.

A large number of swine rations have been tested since the first trial was undertaken. Factors considered in rating the rations were their effect on average daily gain, carcass length, thickness of back fat, loin eye size, and feed efficiency. The results of these tests provide swine growers with valuable feeding information.

"Least cost rations" for lamb feeding were formulated with the aid of a computer. These rations used feedstuffs locally available. Equally good results were obtained from a number of the rations.

POULTRY MANAGEMENT

Different methods of raising turkeys were assessed in the early years of the operation of the Experiment Station, beginning in 1929. Factors affecting egg fertility were investigated. The environment of shaded quarters versus direct sunshine was measured, and the efficiency of sunflowers
and slatted shadehouses in providing shade was compared. Different rations for finishing the birds for market were evaluated.

The incidence of intestinal parasites and blackhead in turkeys was reduced by keeping the birds on clean ground which had not been used by turkeys for at least three years and by moving the turkeys to new lots before the ground became badly infested.

ECONOMIC EVALUATION OF ACCOMPLISHMENTS

It would be very difficult to measure accurately the financial benefits of this station's research program from 1909 to 1969. Nevertheless, it is clearly evident that the station has played an important role in developing, stabilizing, and maintaining a successful diversified agriculture in this area. The station has contributed to the area in the following ways:

Helped in converting low-fertility raw sandy soils into productive farm lands and pointed the way to efficient irrigation, proper fertilization, and other economic production practices.

Tested, screened, and selected the best varieties of fruits and vegetables to be grown in the area, thereby saving farmers the cost of experimenting with crops that might later prove to be unsuited or have limited potential.

Evaluated the most desirable and economic rations for fattening beef cattle, swine, and lambs, and assessed the effect of hormonal implants on finishing cattle for market. The station checked the economy of irrigated pasture combinations for both dairy cows and beef animals, as measured in milk production or pounds gained per day.

Determined, selected, and recommended superior varieties of fruits and vegetables: These selections have provided the public with a great abundance of specialty food crops for local consumption although most of them have not yet been grown for extensive commercial use. Scarcely is there a crop now grown for commercial sale or for home consumption that has not been improved by the research of the Umatilla Experiment Station.

With all factors considered, these results create new wealth. Such wealth is cumulative. Creation of new wealth for one year, in most cases, continues annually.
PUBLICATIONS

SB  115  First Biennial Report of Umatilla Experiment Station
Cir. 129 Work of Umatilla Experiment Station in 1912 (Federal)
Cir.  1 Varieties of Fruit for the Home Supply (Federal)
Cir.  3 Border Irrigation for Porous Soils (Federal)
Cir. 17 Work of the Umatilla Experiment Station in 1913 (Federal)
The Work of the Umatilla Reclamation Project Experiment Farm, 1914 (USDA)
The Work of the Umatilla Reclamation Project Experiment Farm, 1915 & 1916 (USDA)
The Work of the Umatilla Reclamation Project Experiment Farm, 1917 (USDA)
The Work of the Umatilla Reclamation Project Experiment Farm, 1918 & 1919 (USDA)
Work of the Umatilla Field Station 1923, 1924, and 1925
SB  120 Improving Sandy Soils by the Use of Green Manure Crops
SB  125 Windbreaks, Hedges, and Ornamentals for Irrigated Sandy Soils of Eastern Oregon
SB  126 Grape Culture, with Special Reference to Commercial Production Under Irrigation in Eastern Oregon
SB  136 Vegetable Tests on Sandy Soil at the Umatilla Experiment Station
SB  142 The Culture of Small Fruits on Irrigated Sandy Land
SB  177 The Management of Sandy Soils Under Irrigation
SB  198 Fattening Lambs on Alfalfa
SB  218 Fattening Lambs for the Late Winter Market
SB  380 Feeding Alfalfa Hay Alone and with Concentrates to Dairy Cows