The first of two issues honoring the major achievements of the Utah Agricultural Experiment Station.

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A Seedbed for Innovation

The centennial of the Utah Agricultural Experiment Station is an excellent chance to examine past achievements. Instead of a comprehensive history, which would require volumes, we provide a "snapshot" of our achievements, a cursory glance back that we hope will reveal some of what we have accomplished, and why.

A fuller history can be found in the scientific articles and reports concerning research supported by the Experiment Station—approximately 2,600 such reports have been published during the past 5 years alone. Rather than attempt to summarize these achievements, we asked departments to focus on a few of the most significant achievements that resulted from research supported by the Experiment Station. This summary is a tribute to all those who have worked for and supported the Utah Agricultural Experiment Station.

The centennial is also a time to address some misconceptions concerning the role of research in agriculture. It seems that nostalgia for the past colors our perceptions of agriculture. The farms of previous decades are somehow viewed as the epitome of the "good life," an idyllic lifestyle free from today's stresses and imbued with simple virtues.

We should cherish and preserve our history, but we should take pains not to distort reality in the process. Often forgotten is the fact that, decades ago, agriculture was a demanding occupation, one which often provided little security and even fewer financial rewards. Farmers and their families faced formidable odds and endured incredible hardships. The desire to alleviate those hardships explains why Experiment Stations were founded and researchers worked with such dedication and enthusiasm. They still do.

Misconceptions are also fostered by recent movies and documentaries focusing on the plight of financially strapped farmers. These portrayals are often larded with anti-technology sentiments worthy of Luddites. Many portray farmers as victims of technology, or of a heartless system driven by a shortsighted preoccupation with "progress." Since few Americans live on farms, it is perhaps understandable why many Americans mistakenly think agricultural research has opened a Pandora's box of woes. Agriculture is portrayed as having struck a Faustian bargain: Increasing productivity in exchange for simpler virtues.
That's a harsh assessment, but one that reflects the charges that some critics hurl at American agriculture. Nothing could be further from the truth.

Just a few generations ago, most people knew how a livestock disease, insect infestation, or a plant disease could threaten a year's income or a lifetime's work. Today, however, the details of farming are less important to most of us than finding a parking space at the local supermarket—and many Americans simply don't understand the benefits derived from agricultural research. That's understandable. But our abundant, healthful, and inexpensive supply of food, and a better standard of living, is the direct result of past research. The quality of life of future generations may decline dramatically if we abandon or reduce our modest investment in agricultural research.

Agricultural research is still the linchpin of agricultural productivity. The Experiment Station's mandate also includes such vital topics as economic growth and development, environmental quality, social relationships, and the conservation of soil, water and other natural resources. We are studying diseases and metabolic processes that will have direct benefits in human health. Our research has fostered innovation, nurtured creativity, and created hundreds of remarkable opportunities. Experiment Station research has
immeasurably enhanced the economic and social vitality of the state.

The history of agricultural research in the state is a fascinating chronicle of adversity, toil, optimism, and hope. In hindsight, some of the pictures are amusing, and some of the approaches may strike us as naive. But without research, many chapters in this history would have ended tragically.

Circumstances have changed since the Experiment Station was founded in 1888, and our programs have changed accordingly. We are proud of our century of service. This rich and productive legacy has created a solid and productive foundation for the next 100 years.

Doyle J. Matthews
Director, Utah Agricultural Experiment Station
A miracle occurs every time a seed germinates and a plant grows. Innumerable times during the last century, Experiment Station researchers have worked to preserve this miracle, staving off catastrophic losses from the climate, insects, weeds, and diseases. Few of these endeavors attracted headlines, but all were vitally important to harvests, whether from a family garden or fields covering hundreds of acres. The selected accomplishments described in the following section indicate what this research has meant to the state.

Plant scientists have conducted research since the beginning of the Utah Agricultural Experiment Station. At one time, their research involved areas such as entomology, soil fertility, plant pathology, dry farming, soils, and irrigation. Some of those achievements will be featured in the next issue. The Plant Science Department, which was formed in 1965, now incorporates crop management, breeding, and production. The department is concerned with all field crops, fruits, vegetables, and ornamental horticultural crops, and encompasses a variety of disciplines.

The benefits of this research are reflected in the harvest from the fields, orchards, and gardens in the state worth almost $300 million annually.
Plant Breeders Save the State's Wheat Industry

New varieties are often the best method of countering pests and diseases that periodically threaten crops. USU's cereals breeding program is a remarkable example of the value of improved varieties. The state has earned multi-million dollar dividends from improved cereal varieties, and new varieties have saved the state's wheat industry several times during the past century. Returns from wheat breeding alone may have exceeded $100 million during the past 20 years.

Smut is one of the most devastating diseases threatening wheat grown in the state. In 1903, a researcher found "smut in some of its forms prevalent in every county of the State visited," and other reports indicated that "there is not a single county in the state exempt from the disease." In 1935, covered smut in wheat caused losses that exceeded $1,000,000 annually.
During the mid-1920s, concerned wheat growers petitioned the Station for help with a form of smut, later identified as a dwarfing form of covered smut, that was not controlled by the traditional chemicals used for seed treatment. A crash breeding program to develop resistant varieties soon resulted in a resistant variety called—appropriately enough—Relief, the first of many resistant varieties to be developed at the Station.

Plant breeders developed the resistant varieties Cache, and Wasatch during the next few decades. And when the problem seemed under control, a new race of smut appeared, and researchers developed the resistant varieties Delmar and Bridger. Yet another race appeared, and the varieties Cardon, Hansel, and Manning were bred and released. Other varieties must be bred in anticipation of new virulent races.

Improved smut resistance was only one characteristic that the breeders had to incorporate. As commercial breadmaking replaced home breadmaking, new varieties had to include stronger gluten suitable for large commercial mixers.

Plant breeders also developed several varieties of spring wheat and, in cooperation with the USDA, superior barley varieties.

It might require 10-15 years to breed a new variety of cereal or other crop. Invariably, returns far exceed costs. During the past 20 years, wheat yields in Utah have increased by approximately 10 bushels per acre while barley yields have increased by about 15 bushels per acre. This increased production is worth about $10 million annually. If half of this increase is due to improved varieties, the new varieties have returned about $5 million annually, probably more than has been spent during the entire cereals breeding program in Utah.

There are other savings from new cereal varieties, such as avoiding dockage and discount penalties for smutty, poor quality grain. Resistant varieties minimize, and in some cases, eliminate, the use of disease-control chemicals. Genetic resistance is usually the cheapest and safest form of controlling plant diseases.
Goatsrue-infested canal bank in Cache County.

New Tactics Against Age-Old Foes

Weed seeds are usually small—so tiny in fact that it is hard to realize how many there may be in a pound of seed. In one sample testing 1-5 percent weed seed, there were 990 weed seeds for each pound of seed sown, or 9,000 to the acre. Another lot of seed tested 3,000 to the pound, which was 45,000 to the acre, while a particularly bad lot introduced 5,000,000 to the acre. If 4-5 percent of these grew, nearly one hundred weeds would feed from each square foot of soil in the entire field. Manifestly little else could exist on the same area.

Circular 23 (1916)

Weeds, the prolific thieves of valuable nutrients, water and sunlight, cause losses estimated at $18-$20 billion annually in the United States. In Utah, losses due to weeds on cropland, rangelands, pasture and forests total $35-$50 million annually.
Top: The left portion of this alfalfa field was treated with herbicide to control mustards.

Center: A goatsrue-infested pasture.

Bottom: Yellow nutsedge competition in corn. The corn in the background has been treated with herbicide.

PHOTOS: J.O. EVANS
Weeds posed a particularly severe threat in Utah where irrigation water was extremely limited. USU researchers were among the first to develop and implement weed-control technologies, and were instrumental in creating the Western Weed Conference, the first professional weed control organization in the nation.

Experiment Station research has helped combat hundreds of species of weeds, thus maintaining the upper hand over pests that would otherwise choke agriculture in the state.

Along with county weed supervisors, landowners and federal officials, Experiment Station weed scientists have nearly succeeded in eradicating goatsrue, a noxious weed (and one of the most poisonous plants ever studied) that had infested more than 38,000 acres in Cache County by 1980. If goatsrue is eradicated, it would be the first time an introduced weed has been eradicated in the United States.

Altogether, landowners and tenants in the heavily infested communities dreaded morning glory in no uncertain way. Yields were decreasing tremendously; in a few cases what had been high-priced land was sown to less profitable crops or completely abandoned. Several infested tracts of land were offered for sale at prices that represented a mere fraction of the value of neighboring uninfested land. A strong feeling of utter hopelessness was spreading. Buyers for infested farming land were not to be found. Even city building sites that were overrun with morning glory were noticeably less attractive. The great dread in which the pest was held is partly expressed by the local name “devil gut” applied to it in Davis and Weber Counties. “Sucker weed” and “stranglehold” were also heard.

Bulletin 189 (1924)
Informal plantings soften a desert environment.

Variety trials.

Celosia (Forest Fire)
Utah Botanical Gardens

Hundreds of vegetables, flowers, shrubs, roses, and trees are grown at the Utah Botanical Gardens in Farmington to determine which thrive best under Utah conditions. Experiments and demonstrations at the gardens provide valuable information to the thousands who visit the gardens annually to learn how to improve Utah’s landscape and increase harvests.
Researchers with the USDA Agricultural Research Service have the world’s largest collection of wheatgrasses, wildryes and related species. These grasses are used to breed more productive forages, including those that are drought and salt tolerant. Already the collection includes more than 250 hybrids, the source of new cultivars for more than 382 million acres of rangelands in the eight Intermountain states.

For example, a salt-tolerant combination of quackgrass-bluebunch wheatgrass has been developed after more than 20 years of research. The most promising hybrid developed to date, however, resulted from crossing Fairway and Standard crested wheatgrass. Chemical treatment made it possible to cross these two grasses, which have different numbers of chromosomes. After 16 years of research, the drought-resistant cultivar Hycrest was released. Planting these new hybrids can often double forage production, particularly during the early stages of stand establishment.
Top: Bozoisky-Select Russian wildrye (right), a new cultivar selected from plants from the U.S.S.R. developed for improved seedling vigor.

Center: The range grass research program includes more than 250 interspecific hybrids.

Bottom: RS Hybrid (left) and Russian wildrye (right) on a saline site. RS Hybrid has excellent salt tolerance.

Left: RS Hybrid combines the vigor of quackgrass and the bunch-type growth and drought resistance of bluebunch wheatgrass.

PHOTOS: K. H. ASAY and W. H. HORTON
Development of This Onion Spurs Growth of an Entire Industry

Large, mild Sweet Spanish-type onions were once imported from Spain because it was thought they couldn't be grown in the United States. That changed when Utah Agricultural Experiment Station researchers developed the Utah Yellow Sweet Spanish onion, the variety that, for 25 years, was the foundation variety for the Spanish-type onion industry in Utah, Idaho, Oregon, Colorado, New Mexico, and California. The onion was famous for its large and perfect globe shape, bright, glossy, copper-colored scale, pure, white firm flesh with a mild flavor, and excellent yield and storage quality.

PHOTO: D. LYLE and H. BROOME
Helping the Queen of Forages Continue her Reign

Alfalfa, commonly referred to as the Queen of Forages, is the largest cash crop in Utah, worth more than $140 million annually. "With its deep roots it laughs at drought and mellows up the subsoil," wrote a researcher in 1921. Yields have increased by about 70 percent during the last 60 years; most of the increases occurred in recent years. Average alfalfa yield was 2.93 tons during 1960-69 and 3.98 tons in 1980-84, a whopping 36 percent increase.

Alfalfa is a major crop on both dryland and irrigated farms. The excellent protein and energy in high-quality alfalfa is essential in maintaining top production in the state's best dairy herds.

Computerized methods to determine hay quality increase markets for Utah hay, reward growers who produce quality hay, and help livestock producers make more profitable use of this forage.
Left: Hay yields of 7 tons per acre, double the yields a decade ago, are possible with modern alfalfa varieties.

Center: Alfalfa variety trials. Deseret is in the second plot from the right.

Bottom: Alfalfa, the highest yielding and most nutritious forage legume, is shown in research plots with ladino clover (left) and birdsfoot trefoil (right).
Vernal alfalfa, a winter hardy variety also resistant to bacterial wilt, was developed at Wisconsin and tested at the Utah Agricultural Experiment Station.

Within a year after Vernal alfalfa seed was released for commercial use, seed was on sale in seed stores. More than two million pounds of certified Vernal seed was produced commercially in 1954. Never before in history has there been such fast production of seed of a new variety of alfalfa as there has been with Vernal.

*Farm and Home Science* (December 1955)

Deseret is a highly productive variety developed at the Experiment Station that "stands head and shoulders" above other alfalfas adopted to Utah conditions.
With old, large apple trees such as that shown here, only 27 trees could be planted per acre. Modern hedge row plantings of 400 to 500 trees per acre on dwarfing rootstocks can produce over 2,000 bushels per acre.

Research That Revolutionized Fruit Production

The commercial fruit industry occupied 1 percent of Utah's cropland in 1980 but provided 5 percent of the value of all state crops, about $25 million annually. Utah fruit producers can now produce over 5 times more fruit per acre than was produced in 1910 due to advances in fertilizers, pesticides, herbicides, and orchard design.
Orchard spraying techniques have been revolutionized. Recent integrated pest management methods reduce the cost of chemicals required for effective pest control. However, additional research is required to control outbreaks of Western cherry fruit fly, apple maggot and apple scab that pose new challenges to growers.

On the average, freezes reduce total free fruit crop by at least 25 percent. Experiment Station researchers recently developed computer models to predict the dormancy and bloom status of fruit trees, making it much more practical to use evaporative cooling and other methods of bloom delay to avoid spring freeze damage.
In the state of Utah scarcely a year passes without some damage being done to farm crops, either in the spring or the fall, because of the occurrence of killing frosts. For example, in the spring of 1916...90 percent of the fruit of the state was destroyed. During the month when fruit buds are in bloom, a report of the U.S. Weather Bureau shows that on an average covering ten years for the five leading horticultural counties, freezing temperatures of 30 degrees, or below, are experienced six nights a year. The county agricultural agents report that three years out of ten the fruit crop is somewhat below normal due to frost, that the crop is considerably below normal one year out of ten for the counties, and that certain orchards in the counties frequently lose their entire crop.

Bulletin 161 (1917)
Yellow Gold Giant peaches.

At least 25 percent of the peach growers in Utah have changed to less severe methods of pruning since 1948 when results of the pruning research were first publicized. Adoption of recommended methods should increase yields by at least 220,000 bushels annually. Valued at $1.50 a bushel, this would mean an additional gross income of $330,000 to the state.

_Bulletin 375 (1952)_

In the third year of bearing, four of our combinations were producing over 1,000 bushels per acre, with Golden Delicious on a Malling 7 rootstock at 6" × 12" spacing producing over 1,600 bushels per acre. In the fifth year of bearing, 80 percent of the combinations used, produced over 975 bushels per acre, which is nearly four times the state average. That same year, 40 percent of the treatments produced over 1,200 bushels, with some reaching 1,600 and 1,700 bushels. This fruit was all of excellent quality and good marketable size.

_Utah Science (Spring 1983)_
Aggie Ice Cream
Aggie Ice Cream: Our Smoothest Tradition in 100 Years

V. T. MENDENHALL
Aggie ice cream. Few words trigger as many mouth-watering memories for those lucky enough to have sampled one of USU’s best known products. Over the decades, Aggie ice cream has acquired an international reputation among true aficionados of this dairy delight. And for good reason.

But Aggie ice cream is much more than just a treat for tastebuds. It has been a partner in the lives of thousands of USU students, faculty, employees and visitors. Thousands of students have celebrated (or lamented) large and small milestones in their academic careers over Aggie ice cream. Administrators and researchers have turned to Aggie ice cream for culinary respite. Visitors luxuriating in the natural beauty of the campus find it enhances their visit. There’s no way to prove that Aggie ice cream has fostered innovation, bolstered scores on exams, or heightened awareness, but it certainly hasn’t hurt.

There’s a larger, more-serious story behind Aggie ice cream, one involving innovation and education. In many respects, it is a tangible symbol of the mission of a land-grant institution such as USU. Teaching, research, and service were as much a part of Aggie ice cream as the milk and other ingredients. Thousands of students enjoyed eating Aggie ice cream, but hundreds learned about dairy processing and technology while helping manufacture it. These students applied their knowledge throughout the world. USU faculty have helped the dairy industry utilize the latest technology and techniques. As a result, many of the world’s best ice creams are in some way progeny of Aggie ice cream.

Thousands of dairy farmers benefitted from the millions of pounds of milk used in Aggie ice cream, and other products that directly or indirectly resulted from its manufacture. The entire state gained when technological advances fostered the development and promoted the growth of Utah’s dairy industry. And the innovation underlying the manufacture of Aggie ice cream was indicative of an environment favorable to other new ideas. This creative environment attracted other talented faculty members to the campus, thus continuing an educational tradition that has served the state well for a century.

Top: First dairy in the Animal Industry building (1919).
Center: Animal Industry building constructed in 1919.
Bottom: Animal Industry dairy in the 1950s.
For those reasons, we believe Aggie ice cream is a fitting culinary tribute for the celebration of USU's Centennial. The following historical vignettes concerning the development of Aggie ice cream trace the process underlying its creation. This brief, unofficial history, which has been culled from the student newspaper and other sources, shows that progress was sporadic, and sometimes not even perceptible. The development and evolution of Aggie ice cream occurred because there was a willingness to explore new ideas and apply new concepts. Had this spirit of innovation not existed, our Centennial celebration would be far less flavorful. The original creamery might be a historical anomaly, and the dairy industry in the state might be a fraction of its present size. Other aspects of our lives would be far poorer as well.

PHOTO: CRAIG LAW and STUDENTS.
Have some Aggie ice cream to celebrate USU's proud past and even brighter future. See for yourself whether it really provides succor for the soul and nourishment for the mind. We believe it tickles the taste buds better than any other ice cream. Enjoy it.

1888-1907

The original creamery was in the basement of the Administration Building in the space which is now occupied by the Art department. Butter and cheese were made and sold along with some milk and cream. The creamery at this time was run more on the order of a private enterprise, having very little connection with the college and consequently a very small amount of work was done there by students in cooperation with their regular class work. (A. J. Morris, 1960).
Checking the quality of ice cream (1950).

Pictures of the original creamery indicate that the basement was actually the roofed basement at the northeast corner of Old Main. It was used as a pottery shop by the Art Department until it was razed for a parking lot.

1907-1917

In the fall of 1907, the Department of Dairying was established covering the field of dairy production and to a small extent dairy manufacturing. The original creamery was still in operation and used, to a small extent, as a laboratory for the few dairy manufacturing classes that were being taught. Dairy manufacturing here at the college was in its infancy and a very limited amount was done in the field. (A. J. Morris, 1960)

1917-1920

Immediately east of the horse barn and north of the drill field is the Livestock Building... No, that isn’t where the livestock are kept. This is a modern brick and concrete structure, well-lighted and ventilated and has lecture rooms, laboratories, and a dairy. As yet, the laboratory and experimental work in these buildings is not fully underway. The livestock building at present is serving as a convalescent hospital... . (Student Life, February 7, 1919)

The Livestock building, which is now undergoing restoration after its use as a barracks building, will be completely equipped to house the departments related to the animal industry. Of special interest will be the equipment which is now proceeding of the department of Dairy Manufacturing. Undoubtedly the accommodations in this department in the east wing of the building and the general arrangements of the building are now as satisfactory as any in the country. (Student Life, April 11, 1919)

All the new machinery has been received for the college dairy. No one seems to know just when things shall be ready for commercial purposes... but we are assured that cheese, butter and ice cream will soon be manufactured in such large quantities that servings of each will be granted free at the cafeteria to those who have so far stood the menu without refusing to pay or raising a riot. At present, the head of the department of dairying seems unable to sign anyone up for the job as dairymen. However, a capable hand with a Danish dairy name (Chris Christiansen) has been persuaded to help out temporarily, but refused to stay more than winter quarter saying he couldn’t stand it long. (Student Life, January 9, 1920)
Professor Gustav Wilster, formerly in charge of dairy husbandry at the Queensland Agricultural College, Australia, M. S. Ames, is an addition to the school of Agriculture. (Student Life, September 16, 1921)

A Short Course in Ice Cream Making and Testing will begin January 9, 1922. (Student Life, December 16, 1921)

The UAC Dairy Department under the direction of Professor Gustav Wilster is now making lacto ice cream which has never before been produced in Utah, the formula for which he brought from Iowa. It is a frozen ice cream made from pasteurized milk which has been ripened with pure culture and then had sugar and flavoring added. This new product is meeting with great favor locally, and when Governor Maybe was visiting the campus on February 21 and 22, the sample of cherry lacto given him was a very fine article. The college creamery is operated on a commercial basis. Two thousand pounds of milk are purchased daily from the dairymen of North Logan and this, with what the college herd produces, is made into butter, cheese and ice cream, all of which are consumed locally. All the work connected with the creamery is being done by students taking the dairying courses. The butter is made from sweet, pasteurized cream which is ripened to a slight acidity before churning. This product is unsurpassed by any other product in the state. All these products are for sale at the Dairy Products Laboratory in the Livestock Building daily from 2:00 to 5:00 and all day Saturday. (Student Life, March 1922)

Gustav had two ideas to make his Aggie ice cream famous, i.e. 1) sell everyone in the state a sample, and 2) teach his skills to his students and send them out in the world. In the summer of 1922, he had an opportunity to fulfill his first objective.
Contemporary ice-cream making.

PHOTO: CRAIG LAW and STUDENTS.
Every successful teacher thrives on the accomplishments of his students, and Gustav was no exception. It was his students who applied his knowledge of ice cream making to successful enterprises in Utah, the West and even the nation.

Gustav Wilster must be credited with the creation of Aggie Ice Cream, but the achievements of his students and their contributions to ice cream manufacturing far exceeded his visions of success. Gustav returned to Oregon State University at Corvallis where he had a long and successful career. One of his 1925 graduates, Casper Merrill, recently noted that “He was the finest teacher I ever had. He loved his students and he loved to teach.”

So whenever you’re in Snelgroves, the Bluebird, Fernwoods, Farris, the Campus Dairy Bar, or just enjoying a dish at home, lift a scoop for Gustav, the man who made it happen 66 years ago.

A. J. Morris recognized the importance of Gustav’s original idea of training those in the state’s ice cream industry by holding a short course on campus. He began to hold these training courses on an annual basis in 1932.

Ice cream and dairy products were not very popular in the college cafeteria which may account for the appearance of an advertisement (the first in Student Life) for dairy products on campus.
An army estimated at 2500 people will pitch their tents and make themselves at home July 26-29 on the campus of the Utah Agricultural College. Men, women and children will be guests of the college.

The Extension division under the direction of Dr. J. H. Evans has charge of this annual Farmer’s Encampment and no pains have been spared to make this an epochal event. Conveniences for the visitors will include a tent city on the campus with electric light and water; a milk bar where milk, butter, cheese, bread, and ice cream may be had. (Student Life, July 1922)

On the counter at the entrance to the Dairy department rests a large canteen with a tap in the bottom of it, plenty of cups at hand and a sign just below ‘Free Buttermilk.’ There are no charges for the use of the cups. Ice cream cones of all colors and flavors such as Yum, Pineapple, Raspberry, Chocolate and Vanilla are sold. (Student Life, October 1922)
Milk and ice cream, it is surprising to note, are not popular. There is a total consumption of only two gallons of milk daily and often less than 1 gallon of ice cream is consumed in the cafeteria (200-350 students per day). The cafeteria foods most popular are: potatoes, 120 lb/day; chili, 15 gallons/day; and gravy, 7 gallons/day. Two hundred students eat salad and pie. (Student Life, 1932)

According to Paul Larsen, Marie Caine, wife of Professor George B. Caine, was responsible for one of Professor Morris' original creations. Marie asked A. J. to make some of her sherbet commercially in the college and provide some for her dinner party. Morris may have put off making the sherbet until the day of Marie's party and when her recipe turned out to be a flop in the USAC creamery, he decided to make up his own sherbet recipe for the occasion. It contained oranges, lemons and bananas in addition to the normal sherbet ingredients. Fortunately, everyone at the dinner party thought it wonderful, including Marie. In her honor, A. J. named it Marie Sherbet.
Professor Morris taught many students how to manufacture ice cream and was so cognizant of the nuances of ice cream that he could identify students by the quality of their ice cream. While traveling through the Midwest one summer, he stopped at an ice cream parlor. After tasting the ice cream he commented, "This is one of my student's ice cream." Sure enough, his former student managed the ice cream operation and Morris was delighted to see the fruits of his labor many miles from the campus.

In 1939, ice cream in Utah was available in the following flavors: vanilla, chocolate, strawberry, maple nut, peach, red raspberry, black raspberry, apricot, cherry, boysenberry, orange, pineapple, and cantaloupe. Some research by A. J. Morris concerning the use of frozen fruit in ice cream was only partially successful. Prune-flavored ice cream never really got off the drawing boards.

The consensus (sic) of opinion of the jury was that plums and prunes were not as suitable for ice cream as some of the other kinds of fruit. Some of them produced ice cream that resembled sour milk, others lacked flavor, and still others gave a sickly sweet taste to the product.

*(Farm and Home Science, June 1940)*

PHOTO: CRAIG LAW and STUDENTS.
A. J. Morris' students continued the tradition of Aggie ice cream on the campus and throughout the nation. Paul B. Larsen, a former student, joined the staff in 1946 and worked with Morris until A. J.'s retirement in 1965. C. A. Ernstrom, a former student, replaced Morris as Head of Dairy Manufacturing and became the Chairman of the Department of Nutrition and Food Sciences in 1968. Dairy manufacturing then became a part of the Food Science curriculum.

A new dairy bar and ice cream parlor were included in the new Nutrition and Food Sciences building dedicated in 1975. The existing dairy bar in the Animal Industries building was retained and used as a branch sales area, much the same as it was in 1922. The annual ice cream short course is still held.

New dairy bar.
Twenty-six flavors of Aggie ice cream are available; chocolate and vanilla are still the most popular. And you can choose among three types of cones. Former students still have Aggie ice cream shipped all over the nation for alumni gatherings. And impatient adults still wait while thousands of children make that all-important decision: What flavor should I have?

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Early livestock producers in Utah couldn't always rely on their past experience in deciding what to feed livestock in a region where the climate, soil, and many of the plants were unfamiliar. It wasn't even clear how ruminants differed from nonruminants. Vitamins? Minerals? To the pioneers, the smallest analytical unit in a livestock diet was a feedstuff, not a nutrient.

Life could be precarious, for livestock as well as humans. Mysterious ailments, some common to livestock and humans, abounded. Agricultural wisdom consisted of equal doses of experience, myth and hearsay, a fertile environment for hucksters and those peddling products and theories of dubious merit.

Many contemporary portrayals of pioneer life show a self-reliant family raising a cow, a few pigs, and a flock of chickens. There was, however, another, less idyllic side of livestock production, one fraught with economic uncertainty, hardship, and ignorance.

One-hundred years of research sponsored by the Utah Agricultural Experiment Station has transformed many aspects of livestock production in Utah. New industries have been created. Others have vanished. Those that remain require new infusions of knowledge to remain competitive.

The following section covers only a few of the major research projects supported by the Experiment Station. This research has been essential in the continued production of livestock and livestock products, which now account for more than $400 million annually in Utah.
An Appetite for Higher Milk Production

Genetic improvement in dairy cows raised a question with profound implications for the dairy industry: Does breeding for increased milk production also increase (or decrease) the efficiency with which cows use feed? Or, in other words, does milk production increase simply because cows are eating more, or do cows actually produce milk more efficiently?

During the 1960s and 1970s, dairy scientists with USU and the U.S.D.A. Agricultural Research Service conducted an extensive study of the relationship between selection for higher production and feed efficiency. They found that breeding for higher milk production also increased the ability to produce milk more efficiently. Since this was true regardless of the type of ration, breeding strategies need not change when feeding programs are altered.

Results of this study assured dairy farmers that breeding for higher production will also result in higher profits, thus encouraging continued genetic improvement in the dairy industry.

USU Caine Dairy Teaching and Research Center
The Benefits and Hazards of Fluoride

In the late 1940s, farmers and ranchers asked for help in determining why leaves of some crops seemed to have been "burned" and why unthrifty livestock had abnormally colored and excessively worn teeth, and enlarged bones. Thus began USU's internationally known fluoride studies, one of the most extensive research projects ever undertaken by the Utah Agricultural Experiment Station.

Experts from several disciplines collaborated in studies to determine how fluoride affected animal growth, production, reproduction, metabolism, pathology, and physiology. The fluoride research eventually involved nearly 100,000 domestic and wild animals. Researchers learned the causes and consequences of excess fluoride, findings which were applied around the world. Fluoride research helped understand bone and musculoskeletal diseases in animals, and the role of fluoride in human health.
Experiment Station researchers also studied how DDT was concentrated in the food chain, findings which helped government agencies formulate standards and regulations concerning use of the insecticide. Later studies led to a method of decontaminating dairy cattle that had inadvertently been exposed to insecticides such as dieldrin and chlordane.
## Individual Cow Record

**Owner of cow:** Earl Robinson  
**Name and number of cow's dam:**  
**Breed of cow:** Holstein, Woodside Pocket  
**When born:** 6/12/11  
**Sex of cow:** Male  
**Registered number:** 432.1411

### Feed Consumed During Testing Period

<table>
<thead>
<tr>
<th>Date</th>
<th>Amount</th>
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<tr>
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<tr>
<td>1-2-20</td>
<td>2.00</td>
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<td>1-3-20</td>
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<td>1-4-20</td>
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<tr>
<td>1-5-20</td>
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### Description of cow:
- **Distinguishing features in color:**
- **Other distinguishing features:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Notes</th>
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Linking Cows and Computers

Experiment Station research helped develop the system that is now used to analyze records of millions of dairy cows around the country.

More than 5 million cows in the United States are now enrolled in performance-testing programs available through Dairy Herd Improvement Associations (D.H.I.A.). Every month, D.H.I. records provide detailed information on milk production, milk quality, feed efficiency, breeding, and several other factors. This detailed information has been vital in improving herd management and increasing the efficiency of milk production. Computerized records also made genetic evaluation of sires and cows possible.

Procedures, forms, and algorithms for a pilot mechanized system had been developed at USU by 1952. USU's system was subsequently copied by other states and, within a few years, all dairy records in the country were machine-processed. Records are now processed at nine centers in the United States.

The system has helped increase average milk per cow in the United States from 5,725 pounds in 1950 to about 13,000 pounds today. In Utah, average production of cows enrolled in D.H.I. programs is about 4,000 pounds more than cows not enrolled.
Improving the Value of Rangelands

In Utah, sheep and cattle graze on high mountain ranges in the summer and on foothills in the fall; many sheep and some cattle graze the semi-arid desert ranges in the winter. These ranges have a diverse soil, climate, topography and vegetation. Little was known of the nutritive value of range forage except that it was often borderline or deficient in essential nutrients, especially winter forage.

Landmark research at USU was the first to determine the nutritional quality of range plants. Range surveys started in 1918, and studies of reseeding methods and plant species began in 1921. Subsequent projects established the nutritive value of range plants and composition of grazing animals’ diets. By 1966, more than 250,000 chemical determinations had been made of the composition and nutritive value of range forage.

These findings were used nationally and internationally, and were the basis for proper supplementation of cattle and sheep grazing Utah ranges. Proper supplements increased wool production by 1 pound per ewe, the lamb crop by 15-20 percent, and the pounds of calf weaned per cow by at least 50 pounds.
Reducing Losses from Deadly Plants

In the western states, livestock losses caused by hundreds of species of poisonous plants total more than $190 million annually. In addition to killing livestock, poisonous plants can cause chronic illness and debilitation, decreased weight gains and reproductive efficiency, photosensitization, abortion, and birth defects. Other less obvious costs associated with poisonous plants include fencing, loss of forage, increased labor and, in some cases, supplemental feeding and veterinary fees.

The U.S. Department of Agriculture-Agricultural Research Service established the Poisonous Plant Research Laboratory on campus in 1955, the only research facility of its kind in the world. Researchers at the laboratory have helped livestock producers reduce losses by identifying specific toxins in poisonous plants, describing symptoms of poisoning, and developing management techniques to avoid livestock poisoning. Many of the studies also involved Experiment Station scientists.
Researchers linked ingestion of certain plants by cows and ewes during certain phases of gestation with deformities in their offspring, findings that have helped understand human birth defects. Although their main work concerns livestock poisoning, scientists at the Poisonous Plant Research Laboratory often advise doctors regarding plants that are toxic to humans.

Top: Tall larkspur, a perennial found in thick clusters on hillsides and meadows. There is no known treatment for larkspur poisoning.

Center: The toxic substance in halogeton (sodium oxalate) is found in leaves and other above-ground parts of the plant.

Bottom: Some of the approximately 1,000 head of sheep killed by halogeton in one poisoning incident.
Tapping the Productive Potential of Pastures

Although pastures were once the major or sole source of forage for cattle, sheep and goats, pasture productivity had diminished as better land was devoted to other crops. Pastures were often relegated to the worst land, and viewed as second-rate alternatives to other crops and forages.

Pioneering research during the 1950s and 1960s demonstrated that pastures were extremely productive when planted with the right mixtures of grasses and legumes, and when fertilized, irrigated and grazed properly. Rotational grazing, which provided time for plants to recover, was clearly superior to continuous grazing. The researchers also found that yields from properly managed pastures were similar to those when forage was mechanically harvested.

In short, pastures on good land can produce at least as many nutrients per acre as cultivated crops. Moreover, nutrients from pastures can cost less than those from cultivated crops.

The full impact of this landmark research may not be realized for decades; energy shortages and higher grain prices may make forages more economical in livestock production. If so, pastures may be the key to even more dramatic increases in productivity.
An Inventory of the World's Feed Resources

USU has helped countries around the world obtain accurate information about the nutrient value of feedstuffs. The information has helped improve livestock production and is essential in research.

The effort had its origins in a computerized system of feed information developed at USU. In 1972, the system was selected by the United Nations Food and Agricultural Organization for use in international programs. Subsequently, the International Feedstuffs Institute was created at USU, an organization which helped developing countries disseminate information about feedstuffs.
Helping Cheese Get Off to a Better Start

Cheddar and cottage cheese makers save millions of dollars annually with the USU Lactic Culture System to produce cheese cultures. The culture system utilizes whey, a near valueless by-product of cheese manufacturing, instead of expensive, commercial culture media. In addition, the lactic cultures used resist a virus disease that affects starter bacteria, thus improving the yields and quality of cheese. The starter bacteria are more numerous and more active than those commonly used and, unlike other cultures produced by traditional methods, can be stored for days and need not be cultured daily. In the United States, the system is used in about 200 cheese plants. It is also widely used in other countries.

Filtering Out Higher Profits

Experiment Station researchers have pioneered research with a processing technology that dramatically increases cheese yields. The process is ultrafiltration, in which milk components are concentrated when they pass through a membrane. Ultrafiltration captures more of the proteins, minerals, and vitamins in milk. It has increased yields of cheese for process curd by 18 percent, of cottage cheese by 2 percent, and is being used to develop new products with excellent keeping and processing qualities.

Use of the ultrafiltration procedure to make curd for process cheese could increase the value of milk used for cheese by more than $1 billion annually.
Determining Milk’s Real Value

Basing the price of milk on its value in manufactured dairy products benefits dairy farmers and manufacturers. A system which does so—end-product pricing—was developed at the Utah Agricultural Experiment Station and has rapidly been adopted by plants around the nation.

Milk has traditionally been bought according to its fat content rather than its cheese-yielding potential. End-product pricing more equitably distributes income among dairy producers based on the real value of their milk. The pricing system rewards dairy farmers and puts manufacturers on a more solid financial footing.
Marketing Meat That Looks as Good as It Tastes

Research that unlocked the secrets of meat color will help solve several multi-million dollar problems that plague meat processors.

Immediately after slaughter, meat is very dark colored; it later acquires the desirable bright red color associated with fresh meat. Until recently, it wasn't fully understood why this change occurred. A researcher found that the meat becomes more acidic after slaughter, thus inactivating mitochondria, organelles in muscle cells that produce energy. Until the mitochondria are inactivated, they absorb oxygen and prevent meat from turning red.

This discovery may lead to ways to prevent dark-cutting muscle, a problem that affects about 3 percent of all beef carcasses. Findings may also help processors prevent a similar problem called heat ring which forces processors to store carcasses before grading, thus slowing processing, or lowers carcass grade.

Making It Easier to Eat Wisely and Well

The Index of Nutritional Quality makes it much easier to evaluate the nutritional quality of food. The computerized system developed at USU relates the U.S. Recommended Daily Allowances (RDA) to a food's nutrient and caloric value. Bar graphs express each nutrient as a percentage of the RDA in relation to calories provided, thus making it much easier to identify which foods are low in calories and fat and high in nutrients.

The system has found widespread use in education, the food industry, and government agencies.
A Backward Glance...

The demand for Agricultural Experiment Stations is the direct outgrowth of the development of the natural sciences, which have shown the great truth that agriculture is broadly founded in the laws of nature. No other industry or profession is so deeply anchored in law and none is so complex in its manifestation.

*Bulletin 1 (1890)*

First Veterinary Science building.

PHOTO COURTESY OF A. E. OLSON
A new West looms on the horizon, a West of keen competition and of high-priced land. Tracts that were sold for a few dollars a generation ago, now change hands anywhere from fifty to five hundred dollars an acre. With such valuable lands under cultivation, acre-yields must grow apace or the harvest cannot pay interest and taxes on the farm, much less compensate for labor and equipment. Better farming must be practiced.

Circular 23 (1916)
A Word to Prospective Settlers

These glowing accounts of the freedom of farm life and of the ease with which a farm may be secured have especially appealed to the city worker who has saved a little money. The result has frequently been that he has burned all bridges behind him and plunged boldly into the farming game without knowing the first thing about it. As a consequence, he has been forced into a desperate fight for a year or two, depending on how much money he has saved, but only too often he has had to abandon his homestead and return to his former occupation poorer but wiser.

Circular 44 (1921)
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