An issue focusing on the Agricultural Systems Technology and Education Department.

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Our lives are no longer governed by the seasons. Terms that reflect crops and livestock also are being scoured from our vocabulary.

Not too many years ago, nearly every American could distinguish between plowing and cultivating, wheat and barley, dairy cows and beef cows, or gilts and barrows.

No longer. Most Americans probably know more about brands of toothpaste than the basic principles of farming. History will eventually determine whether it was wise to allow such a gulf to develop between farmers and consumers. Right now, however, the difference in vocabulary is creating a passel of problems as engineers who may never have raised a pig design hog feeders and designers who have never turned a furrow put the finishing touches on a plow.

As the ranks of farmers thin, agribusinesses are having trouble finding employees familiar with the nitty gritty of both commerce and agriculture.

The problem manifests itself in other ways as well. Relations between farmers and their city cousins are also a bit testy these days, soured by representatives of agencies bearing regulations and an army of inquisitive researchers, many of whom see problems instead of nutrients in a lagoon brimming with hog
manure or fail to smell the profit packed in a trench of fermenting silage.

No wonder farmers are occasionally cantankerous. Not only do they only get a sliver of the consumer’s food dollar, but fewer Americans comprehend what they’re doing or understand what they’re saying.

This is a dangerous state of affairs, particularly since agricultural progress is lubricated by a common vocabulary between producers, processors and manufacturers. A failure to communicate accurately clearly threatens to gum up the entire works.

Weldon Sleight, associate dean for resident instruction for the College of Agriculture and head of the Agricultural Education Department for 5 1/2 years, has done something to remedy this state of affairs.

Last year, his work culminated in the formation of the Agricultural Systems Technology and Education Department, a transformation that equips the former Agricultural Education Department for the 21st century. The changes, he says, will give students the type of skills desperately needed in agribusiness. Graduates of the department will bridge the gap between the dwindling ranks of farmers and the gargantuian ag-related sectors of the economy, and will do so at handsome salaries.

A new curriculum will give students a much broader perspective on the problems and opportunities that confront agriculture. Moreover, the department’s role has been expanded to include research and Extension responsibilities consistent with those of other departments on campus.

This has meant some new faces have joined Darwin Jolley (see page 23), Evan Parker, and Gil Long, who teaches several courses and studies the adoption of sustainable
agriculture practices in the state. Steven Poe, Extension agricultural engineer, focuses on computer-assisted instruction and the application of computers. His research concerns the components of livestock buildings, including ventilation systems and stray voltage. Kitt Farrel-Poe is an Extension water-quality specialist and will teach courses on the effects of agricultural practices on water quality and agricultural water supplies.

Bruce Miller teaches rural electrification, metal technology, machinery management and technical writing. His research focuses on waste management. Gary Straquadine, assistant department head, teaches technical writing and agricultural education courses and studies farm safety.

Sleight says the popularity of the agribusiness option offered by the department provided much of the impetus for the change. Agribusinesses snapped up graduates who chose this option at an average salary of $21,000, although many employers mistakenly thought graduates were educators rather than managers, largely because their degrees were in agricultural education. The new name clears up that confusion.

"The new curriculum marries ag production with business," Sleight says. "Graduates of our program may not be able to solve all problems for a client, but they will know where to get the information," Miller says.

The new degree is not designed to prepare specialists, and Sleight admits that the curriculum will be "an inch deep and a mile wide" and includes courses in plant science, soil science, food science, animal science, mechanization, and economics.
“The program is designed for people who like to work with their hands, who work well with people, and who like to solve problems. These people typically end up in sales or management. Graduates will not be engineers, but will have the analytical skills to work effectively with engineers and managers of a manufacturing plant,” says Steven Poe.

“The emphasis on management, business and communications will distinguish our graduates from those who complete a traditional engineering curriculum,” Poe adds.

“It’s as important to know where to find the knowledge as it is to have the knowledge. It’s absurd to think that even a specialist knows everything about a particular topic,” Sleight says. “Students in our program will learn that their education is never complete.”

Many agricultural education departments around the country are undergoing a similar metamorphosis, prodded by a decline in the demand for ag teachers. (There are usually fewer than 10 openings for ag teachers annually in Utah.)
Some departments are emphasizing Extension education, others are leaning toward agricultural communications. However, it doesn’t appear as if there will be a lot of demand for agricultural communicators, particularly in the West, but opportunities in agribusiness should continue to be plentiful, as manifested by the 100 percent employment rate of students who chose the department’s agribusiness option, which was selected by about 50 percent of the students in the “old” ag education department.

The change in name should also solve an image problem. Many people mistakenly associated mechanization with farm mechanics. Sleight says mechanization has a far broader scope and involves the application of engineered systems. “We don’t engineer systems. We will apply them. We will know what’s available and will help producers and industries use those systems.”

Many of the courses transcend departments and colleges. For example, some courses will be taught in cooperation with the Agricultural and Irrigation Engineering Department and “will provide engineering students with a better understanding of the application of systems and will provide our students with a better understanding of the design of systems,” Sleight says.

A proposed conflict resolution course team-taught with faculty in the College of Natural Resources seeks to stave
TEAMWORK COUNTS

Cooperation and communication are two attributes that employers prize but which new employees often lack. These are skills that students in the ASTE Department will be encouraged to develop.

"We're going to give students ample opportunity to practice interpersonal communication skills, cooperative learning, conflict resolution and team-building," says Kitt Farrell Poe.

Another concept that has taken root in the department is synergism, which basically means that the results due to cooperation exceed the sum of individual efforts. "We are trying to demonstrate the integration of the agricultural disciplines. One of the gains is that managers, scientists and producers will finally be talking to each other," says assistant department head Gary Straquadine.

"As indicated by the title of our department, we employ the systems approach to solving problems, integrating teams of experts to solve problems. The same will be true of instruction. We will teach students to be integrators of knowledge," says Stephen Poe.

off the misunderstandings that crop up between students majoring in agriculture, many of whom return to operate ranches and farms, and those majoring in natural resources, many of whom find employment with regulatory agencies. "We want to get these groups together so they can understand each other before they enter the real world," Sleight says. The course should destroy some misconceptions and defuse some tensions, thus scaling down the potential conflicts between so-called "environmental" issues and those involving agriculture.

Computers will be ubiquitous, and widely used in instruction to analyze and solve problems. The massive building housing the department is also wired for the AG*SAT satellite system that links land-grant universities around the United States. Sleight anticipates that USU will eventually offer courses in dairy production, agricultural mechanization and other topics through the satellite system.

The building provides ample room to accommodate training sessions by manufacturers and dealers, which will also give students access to the newest equipment and will keep students abreast of the latest developments in the industry.

Students can still choose courses that will prepare them to become technicians for the farm machinery industry, but there are several other mechanization options, including those that affect soil and water, electrification, and food systems.

"We think we're doing some things right," Sleight says, citing the tripling of student credit hours, the
Doubling in the number of majors during the past 5 years and the enthusiastic response of employers.

There's an irony buried in all of these changes. Learning how to solve problems and getting a broad perspective on a variety of agricultural topics and insights into a variety of disciplines may lead to good jobs in agribusiness.

It's also what's required of farmers.
The U.S. economy is expected to create more than 48,000 jobs annually for college graduates in the food and agricultural sciences.

Nearly one-third of these employment opportunities, about 16,000 jobs, involve marketing, management, merchandising and sales--jobs tailored for graduates of the Agricultural Systems Technology and Education Department. Moreover, these are occupations in which the employment opportunities exceed the number of available graduates, even when graduates of allied fields are considered.

For more information about the Agricultural Systems Technology and Education Department, contact Dr. Weldon Sleight, ASTE Department, College of Agriculture, Utah State University, Logan, UT 84322-2300; telephone (801) 750-2230.

Welcoming New Students and New Ideas

She sat in the front of the classroom. They sat in the back.

She moved to the back. They moved to the front.

Only after she sat in the middle of the classroom did seating preferences resemble the random dispersal that typically occurs in a “normal” classroom.

They were the male students in some of Kitt Farrell-Poe’s classes during her undergraduate years. Farrell-Poe, the first woman to earn a BS degree in agricultural engineering from the University of Nebraska, says seat selection based on gender was about the oddest behavior she encountered during her academic career in traditionally male-dominated disciplines. (She subsequently earned an MS degree already fostering interdisciplinary research on the USU campus.

Any type of system can be studied. USU researchers are studying a process to separate the water from livestock manure to produce a fertilizer for gardeners and facilitating waste storage and disposal for farmers.

And the laboratories can also handle the largest, most modern farm equipment.

Also included is a state-of-the-art computer laboratory, five classrooms suitable for instruction and conferences, and sophisticated telecommunications systems.

The closeness to land and livestock is also a plus. And as the USU campus becomes more congested, visitors will appreciate the ease of parking provided by 150 spaces.

General contractor: Stacey Enterprises, Ogden

The new $3 million ASTE building contains about 40,000 square feet, with rooms large enough to accommodate the prototypes of a variety of systems and processes used in agricultural industries. For example, it can be used to construct prototypes of processing plants for dairy and meat products, and fruits and vegetables.

"It’s large enough to do things that can’t be done in traditional laboratories," says department head Weldon Sleight. The availability of facilities is
in agricultural engineering and a PhD in environmental engineering from Purdue University).

As a faculty member in the newly-minted Agricultural Systems Technology and Education Department at USU, Farrell-Poe has a simple message for prospective students—male or female, black, white, brown, or red, city slicker or farmer:

Welcome.

The opportunities, she says, are as big as the cavernous new building that houses the department. And forget about having to come from a farm background to succeed or feel at home in the department.

She grew up in a suburb of Cleveland, her love of farming fostered by her mother, but with a sparse knowledge of hands-on farming practices or terminology. "For several semesters I didn't know the difference between 'farrow' and 'furrow' and used the terms interchangeably, and I knew what a power

Please turn to page 21.
Researchers Get to the Heart of STRESS

How stressful does Bossy find a long trip by truck?

Apparently not very, say USU researchers who have monitored the heart rate of cows that were transported by truck for several hours. Cows' heart rates increased to about 90 beats per minute during the first 5 miles or so, but tended to return to normal (about 70 beats per minute) throughout the rest of the trip.

The type of road made a difference, however. As might be expected, the bumpier the road, the higher the heart rates. Heart rates were about 74 beats per minute on freeways and about 83 beats per minute on dirt roads.

Cows seemingly get used to travel. Their heart rates were lower when they repeated the trip a week later.

Dairy scientist Clive Arave monitored heart rate via radio telemetry and a laptop computer.

“The technique promises to be a good tool to quantify the effects of a variety of management practices,” Arave says. Previous attempts to measure heart rate required that cows be restrained when cows were “hard-wired,” a practice that may have biased the results.

Results will also be useful in addressing the concerns of animal rights activists who contend that many modern methods of rearing livestock rearing are stressful on animals. Arave is studying the effects of several management practices, such as the type of milking parlor. He also monitors body temperature via radio telemetry, but body temperature changes more slowly than heart rate and is less useful than heart rate in ascertaining short-lived responses of cows.

There are indications that cows may be a lot more resilient to the stress and turmoil of modern life than we think. As part of an Air Force study determining the response of wildlife to aircraft, Arave studied cows' heart rates when various types of aircraft flew over their pen.

Cows' heart rates returned to normal within a minute or two after first hearing a sonic boom. And after they had heard a sonic boom a few times, their hearts stopped fluttering within just a few seconds. Cows got excited when helicopters hovered overhead, but weren't fazed much by helicopter flyovers.
Hyperbole about the speed of computers has become part of the grating background noise of civilization, a mildly irritating phenomenon that ranks somewhere with freeway noise.

Some of the same type of prattling may have accompanied the introduction of automatic transmissions, electric toasters, and plastic shampoo bottles, but the fixation with computer speed doesn’t seem to be subsiding. It threatens to divide the country into those who care about this type of thing and those who are forced to listen to those who care.

Phil Rasmussen has a lot of things going at once in research and Extension and tends to think fast. He thinks a computer program he uses to compile a data base of information about sustainable agriculture is fast. (Actually, he wrote that it is “EXTREMELY FAST”.)

Yawn.

To be polite, we watched a demonstration and were mildly surprised when we too found ourselves thinking that it was, well...fast, maybe even EXTREMELY FAST.

So what? So because within a few seconds after typing in a word (or series of words), he can search through hundreds of thousands of words and find how many references contain the word, and, if he wants to, can locate each time the word is mentioned. Fast. Extremely fast.

Really.

Rasmussen is a member of the Sustainable Agriculture Network, which, according to the letterhead, is “a consortium of universities, government, business and non-profit organizations dedicated to information exchange.” He is establishing an information-searching system for network for use by farmers, Extension agents, and anyone else who is interested.

The information will eventually be available on a disk, and is accessible via modem by calling 750-2195. The program used to retrieve information is Folio Views, which was developed in Utah and is widely used by biblical scholars and lawyers, among others.

KG  Phil Rasmussen  750-2257
A lot of folks talk about the weather, but when employees of the Utah Climate Center deal with the weather, they mean business.

The weather generates all kinds of information, which state climatologist Don Jensen gathers, logs and analyzes, continuing a practice that predates Utah’s statehood.

"We can’t change the climate, but we can help people live more harmoniously with the climate they live in," Jensen says. "We give people information that they need to cope with the climate."

A major function of the office is to record weather data and to make this information available. Personnel also conduct research, and teach classes on the USU campus and via Extension.

Several agencies gather weather information in Utah, including the Bureau of Land Management, the Soil Conservation Service and the National Weather Service. The State Climatologist’s Office collects weather data from these and other sources, creating a broad and complete record of weather conditions in the state dating from the mid-1800s, a tableau of drought, of storms, and of the uneventful.

The information has many uses.

An insurance adjustor might call to verify whether it was snowing when a client was involved in a traffic accident, or if a windstorm could have sent a tree crashing through a homeowner’s window on a certain day. Police and attorneys need similar types of information.

The data are vital to many types of agricultural research. The meteorologists provide information concerning irrigation, planting and harvesting. They also recently verified weather conditions last winter, thus enabling farmers to qualify for federal funding to replace fruit trees killed by cold temperatures.

Climatologists and irrigation engineers are also improving irrigation schedules by developing better methods of measuring evaporation from soils. Researchers from the USDA Poisonous Plant Lab also relied on information from the center when they tried to determine why cattle seem to favor larkspur when thunderstorms move into an area.

Jensen says he is especially interested in getting weather information to areas of the state other than the Wasatch Front, which is another reason why he teaches climatology courses in Roosevelt and Moab.

Doing Something About the Weather

New Faculty

Daniel T. Drost joins the Plant, Soils & Biometeorology Department as vegetable Extension specialist. He earned a PhD degree from Cornell University, and BS and MS degrees from Michigan State University.

Janis L. Boettinger is soil scientist with the Plant, Soils & Biometeorology Department. She earned MS and PhD degrees from the University of California-Davis and a BS degree from Cornell University.
The transfer of all of the office’s historic climate data to computer files should be complete by mid-1992, thus improving access to data now stored in thousands of file folders. Also on tap are plans to recognize the efforts of volunteers across the state who have operated 11 of Utah’s weather stations for more than 100 years.

The weather will always provide fodder for conversation. Greenhouse gases, depletion of the ozone layer and global climate change are likely to make the topic even more popular, and will increase our appetite for information about the climate.

LH

Don Jensen 750-2191

Most Utah Farm Families Have
Health Insurance
but Many Could Choose Better Policies

Most farm families in Utah have health insurance, although many apparently haven’t boned up on the provisions of their policies.

About 90 percent of the Utah farm families surveyed in 1986 and 1988 had "broad-spectrum" health insurance coverage for the entire family, a "surprisingly high" percentage considering that it’s estimated that 24 percent of American farm families lack health insurance of any type.

However, many of the Utah farm families surveyed by USU researchers were uncertain whether they were adequately insured or had selected additional insurance that provided limited coverage.

Broad-spectrum policies cover ordinary hospital care, surgery, and other medical expenses. Limited health-care policies usually pay a certain amount per day, regardless of actual costs, and cover specific situations, such as hospitalization or a single disease such as cancer. There’s widespread agreement that broad-spectrum health insurance is preferable to limited-coverage policies.

Many Utah farm families (56.8 percent) obtained broad-spectrum health insurance through an employer. Others purchased or paid for this type of health insurance through a farm organization (22.8 percent) or directly from an agent or insurance company (14.8 percent).
In addition to their broad-spectrum health insurance, almost 20 percent of those surveyed in 1988 had purchased cancer insurance and 10 percent had purchased hospital-indemnity plans. Experts recommend expanding broad-spectrum coverage rather than adding limited-coverage policies.

Some families purchased insurance policies that didn’t protect all family members, a tactic that can cut insurance costs but may not provide adequate protection. “Health insurance should protect against the financial impact of large health-care bills that would be difficult to pay from current income. It does not matter which family member incurs the costs, the family must pay the bills. Therefore, the entire family should be insured,” report the USU researchers.

Workers who obtain health insurance through their employers have few choices in insurance plans and may not know how to compare plans. “With little experience in comparison shopping for health insurance, many appear to have accepted employer-provided plans without understanding their coverage,” the researchers say.

Many of the respondents did not know whether their insurance coverage was adequate.

Escalating health-care costs (a routine childbirth can cost nearly $8,000 and a heart attack can cost nearly $50,000) have increased the need for adequate health insurance.

The surveys were conducted by Norleen Ackerman, family-consumer economist, Glen Jenson, family and human development specialist, and Dee Von Bailey, economist. In 1986, wives in 116 dairy farm families in five Utah counties were interviewed. In 1988, 109 wives on dairy and grain farms in two counties were interviewed.

The survey included only married couples who farmed. The unemployed and the unmarried are less likely to have health insurance.

Researchers Assess the Long-Term Health Effects of Mycotoxins

Do the mycotoxins (toxins produced by fungi) that we ingest over a lifetime take a toll on our health?

USU toxicologists are trying to find out. Understanding how low-level exposure to mycotoxins affects the immune system of mice may indicate how these toxins affect our well-being.

Raghbir Sharma and Roger Coulombe are investigating the effects of aflatoxin B, and fusarium T-2

Norleen Ackerman 750-1571
Dee Von Bailey 750-2316
Glen Jenson 750-1543
toxin, which are produced by two different types of fungi that contaminate peanuts, corn, cottonseed and a variety of grains.

The fungi that produce aflatoxin B₁, the most toxic of several aflatoxins, thrive in warm, humid conditions. The fungi that produce T-2 toxin prefer cold, dry climates.

It has long been known that these mycotoxins suppress the immune system, but most research has involved high levels of exposure to the naturally-occurring toxins, Sharma says. The USU researchers are concerned with the effects of low-level exposure.

"We are exposed to these toxins over a lifetime, but it's difficult to assess the effects of lifetime exposure," Sharma says. However, if they find exposure to a certain amount for 4 weeks affects the immune system, it's likely that exposure to this amount over a lifetime also has some deleterious effects, although it will be difficult to accurately quantify the effect.

T-2 toxin damages the gastrointestinal system, and suppresses the immune system by increasing the absorption of toxins that are produced by bacteria. T-2 toxin stimulates the hypothalamus and endocrine system to produce more steroids, which also suppress the immune system. Aflatoxin damages the liver and is a potent carcinogen.

Sharma notes that more than 100 species of fungi produce mycotoxins associated with diseases in humans and animals. These fungi are more of a problem in areas with high rainfall, relative humidity, and temperatures. Currently, exposure level guidelines have only been established for highly toxic aflatoxin B₁.
A Closer Look at Grasshopper Appetites

Twenty-five species of grasshoppers may be gnawing and chomping on an acre of rangeland but probably only four or five species do most of the damage.

Because species often prefer different plants, the taste preferences of grasshoppers hold the clues to many of their actions, including some behavior that may be beneficial, says ecologist Mark Ritchie with the Fisheries and Wildlife Department. By determining which plants a species of grasshopper prefers, he can model grasshopper populations, thus predicting which species are likely to prevail on a site and cause serious damage.

Ritchie determines the taste preferences by weighing how much of a particular plant each species ingests and digests. One grasshopper eats about 100 mg of dry matter daily, or 9 grams in 90 days. That doesn’t sound like much (there are 454 grams in a pound), but a typical infestation of up to 10 grasshoppers per square yard can quickly strip vegetation from a western rangeland, which only produces about 40 grams of new vegetation per square yard each year.

Ritchie is also studying the role of natural predation on grasshopper populations. Surprisingly, he’s found that predation by birds can increase the number of grasshoppers because they prefer large grasshoppers, thus removing a restraint on the proliferation of smaller grasshoppers. Birds also snare spiders that prey on grasshopper nymphs. Predation on spiders may not be too important on drier western rangelands where there are relatively few spiders. However, the effects of insecticides on grasshopper predators might affect the number of grasshoppers.

Some findings are at odds with the view that the only good grasshopper is a dead grasshopper.

Some species of grasshoppers prefer undesirable plants such as rubber rabbitbrush and sagebrush, noxious weeds, and poisonous plants. Grasshopper species also vary in their preference for bran laced with insecticide, which is a common method of controlling serious infestations. With these differences, Ritchie says it might be possible to selectively encourage species of grasshoppers that prefer to munch on weeds and other undesirable plants, thus using these insects to improve rather than decimate rangelands.

KG
Mark Ritchie 750-2465

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Recent Grants & Contracts

Micheal O'Neill, Geography & Earth Resources Department, Jeffrey McDonnell, Forest Resources Department, and Christopher Neale, Agricultural & Irrigation Engineering Department will study the effects of streambank erosion on water quality with a grant from the Cooperative State Research Service (USDA).

Anne Anderson, Biology Department, is studying the survival mechanisms of root-associated pseudomonads with biocontrol activity. Her research is funded by the Cooperative State Research Service (USDA).

Larry Rupp, Plant, Soils & Biometeorology Department, has received funding from the Cooperative State Research Service (USDA) to study instructional technology and teleconferencing in a landscape management course. The Bureau of Reclamation funds his research concerning the irrigation requirements of woody landscape plants for the Wasatch Front area.

Frank Salisbury, Plant, Soils & Biometeorology Department, will review the Russian Bios-3 Project for Lockheed Engineering & Sciences Company.

The Western Dairy Foods Research Center is funding research by Conly Hansen, Nutrition & Food Sciences Department, on the use of whey to improve exposed subsoils and sodic and saline-sodic soils.

John Carman and David Hole, Plant, Soils & Biometeorology Department, and Elizabeth Hood, Biology Department, have received a grant from the Cooperative State Research Service (USDA) for the production, transformation and regeneration of embryogenic tissue cultures of wheat.

Bart Weimer, Nutrition & Food Sciences Department, is determining whether direct steam injection can extend the shelf life of milk. His research is funded by the Dairy Research & Development Corporation.

John Carman, Plant, Soils & Biometeorology Department, and Kevin Jensen, Forage and Range Research Laboratory, USDA, are co-investigators with the Center for Value-Added Seed Technology created under the auspices of Utah Center of Excellence program of the Utah Department of Community and Economic Development.

Archer Daniels Midland supports the research of Daren Cornforth, Nutrition & Food Sciences Department, concerning the possible relationship between soy protein concentrates and pink color in turkey rolls.

The Utah Department of Agriculture funds the research of Mark Healey, Animal, Dairy & Veterinary Sciences Department, to develop a subunit vaccine against Cryptosporidium parvum.

Keith Mott, Biology Department, studies the limitation of nonsteady-state photosynthesis by the enzyme ribulose 1,5-bisphosphate carboxylase (rubisco). His research is funded by the Cooperative State Research Service (USDA).

The Animal and Plant Health Inspection Service (USDA) supports research concerning the comparative roles of food abundance, competition, and predation in limiting grasshopper populations by Gary E. Belovsky, Fisheries & Wildlife Department.

Robert Lilieholm, Forest Resources Department, is assessing biological diversity, economic risk aversion and the management of commercial mixed-species forest stands with support from the National Science Foundation.

The National Livestock & Meat Board supports the research of Arthur Mahoney, Nutrition & Food Sciences Department, concerning methods to determine the heme and nonheme iron content of meat.

The American Farm Bureau Federation funds a study by Micheal Conover, College of Natural Resources, on wildlife damage to American agriculture.

The Utah Department of Agriculture supports the development of a portable sheep-milking demonstration unit by Lyle McNeal, Animal, Dairy & Veterinary Sciences Department.

DeeVon Bailey, Economics Department, is studying the economic feasibility of a chicken-processing facility for “spent” hens in northern Utah with support from Ritewood Egg, Inc. and the Utah Department of Agriculture. He is also conducting a market analysis for domestic sheep cheese with support from the Utah Department of Agriculture and is examining the economic feasibility of an integrated broiler processing industry in Millard, Beaver and Juab counties. The latter study is funded by the counties.

Neil West, Range Science Department, is developing an ecological classification of Great Basin pinyon-juniper woodlands with support from the Forest Service (USDA).

The National Dairy Promotion and Research Board supports studies by Don McMahon, Nutrition & Food Sciences Department, concerning alterations to casein to improve the properties of highly concentrated milk, the manufacture of fermented foods using pre-mixed dry ingredients, and the development of new cheese using cheesemaking techniques common in Russia.

Von Mendenhall, Nutrition & Food Sciences Department, is principal investigator for the Center for Meat Processing Technology that was recently established as a Utah Center of Excellence by the Utah Department of Community and Economic Development.

The Bureau of Land Management funds the research of Philip Rasmussen, Plant, Soils & Biometeorology Department, concerning the no-till reclamation of burned rangeland sites.

The Utah Department of Agriculture supports research by Jennifer MacAdam, Plant, Soils & Biometeorology Department, concerning the broat-producing characteristics of high-altitude alfalfa.

Fred Provenza, Range Science Department, continues to study the role of diet training in livestock grazing with funding from the Cooperative State Research Service (USDA).

Carol Windham, Nutrition & Food Sciences Department, received a contract from the National Livestock & Meat Board to distribute revised pork nutrient data to purveyors of diet analysis software.
Continued from page 12.

take-off shaft was, but I didn’t know where it was located. Instructors just assumed that I knew some of these things,” Farrell-Poe says.

Those deficiencies proved to be only a minor handicap. She says students entering the Agricultural Systems Technology and Education Department who might not be up to date on ag terminology won’t be similarly handicapped. The program is designed for problem solvers, generalists interested in agriculture who like working with people, and people who want to couple technical knowledge with a broad perspective on some of the most critical issues confronting agriculture.

Farrell-Poe divides her time between an Extension appointment as a water quality specialist and research, but will teach classes in agricultural systems, the effects of agricultural practices on water quality, and agricultural water supply systems.

And, by the way, there won’t be anything unusual about the seating arrangements in her classes.

Kitt Farrell-Poe 750-3389

**TRACKING RURAL POLLUTION SOURCES**

Agriculture usually gets the blame for all nonpoint source pollution that occurs in rural areas.

It may not be the only culprit.

Kitt Farrell-Poe is determining whether rural municipalities also contribute. Possible culprits include runoff from lawns as overzealous homeowners who apply too much fertilizer, herbicides and water, livestock raised by hobby farmers, and municipal sewage plants.

Other potential offenders—people who dump waste oil and antifreeze down storm sewers.

**AVOIDING HEAPS OF REGULATIONS**

Anyone with a backyard compost heap knows how organic matter soaks up water.

That’s one reason Kitt Farrell-Poe is studying the composition and quantity of water that runs off or leaches from municipal compost heaps. She suspects that little water escapes from compost heaps, perhaps not enough to warrant proposed regulations requiring that the location of municipal compost heaps on a concrete pad or a clay or plastic liner.

She is also determining whether any runoff from compost heaps, most of which consist largely of lawn and garden waste, contain any harmful substances.

If her suspicions are correct, regulations could make it a little easier to make productive use of some waste that now chokes landfills.
SU largely consists of people with even cuticles and smooth palms. Darwin Jolley’s hands are different.

They have been scarred by tractor innards and the detritus of all types of agricultural equipment, nicked by sandpaper surfaces, scraped by sharp edges, and seasoned in all types of petrochemicals. They are hands that won’t come clean until they have been scrubbed raw.

Jolley apologizes for the appearance of his hands. He shouldn’t. They are the battle-worn appendages of someone who “fixes things,” a multi-faceted and undefinable activity that is as much a part of farming as weather-watching and worrying.

For almost 25 years, Jolley has helped students master the skills of agricultural mechanization, an amalgam of science, common sense, and creativity that can’t really be described until it’s been done. He says he teaches a two-year agricultural mechanics
What he does is somewhat like taking a hands-on tour of the industrial revolution from the ground up. As technicians (and would-be technicians) know, dismantling and resuscitating tractors and other farm equipment often means abandoning theoretical niceties in favor of brute force and baling wire. There are times when the neatly drawn shapes in manuals don't even faintly resemble the battered part sitting in a pool of congealed oil. Engineers value precision. Mechanics often find that improvisation is more useful.

For several years Jolley has taught in a building that resembled most farm shops where the activity threatens to exceed building capacity.

That's one reason why Jolley looks forward to moving into the new building constructed for the Agricultural Systems Technology and Education Department—room, oodles of it. No longer will students have to dismantle 11 tractors in a space designed for
eight, and share space with choppers, balers, and sundry other agricultural equipment. Goodbye to the dank, dark gloom of the cellar-like shop. Hello to bright lights, clean, slip-free floors, and places for everything with everything in its place.

Of course, Jolley likes the additional space, but he also heartily endorses the metamorphosis that has accompanied the department's attempt to address more of agriculture's needs.

And, he says, things have certainly changed. A 100-horsepower tractor (now considered a medium-sized tractor) costs $60,000 or $80,000. A farmer can shell out $120,000 for a combine. Some tractors won't even budge until their on-board computers are programmed. No wonder farmers may need help to get the equipment they need, and manufacturers need help to make sure they give farmers what they want.

Farm equipment has been gussied up. Many tractors are so large that they can't even turn around in the space once allocated for fields a few decades ago. Equipment has been larded with technological innovations, most of them helpful—and pricey.

But no one has yet found a way to circumvent entropy. Bolts come loose, metal cracks, pistons clatter and wires fray. And eventually somebody is going to get their fingernails dirty fixing it. Jolley will make sure they do it right.

COMPUTERS

Students need not be computer-literate when they enter the ASTE Department, but they will be proficient on the machines when they graduate.

The computer lab in the department has 20 IBM-compatible computers and 10 Macintosh computers.

The department doesn't teach the basics of computer use (such instruction is widely available elsewhere on campus), but it will teach students how to apply agricultural software.

And there's plenty of software that has been developed for agriculture, which usually means that it's less expensive and more efficient to use existing software than to develop programs from scratch. Many firms have donated software to the department.
Concurrent Credit Enrollment in Agriculture:
The Evidence Is Mixed

Just because students take college-level courses in agriculture while attending high-school doesn’t mean they’ll be more likely to major in agriculture when they enroll at USU.

That’s one tentative conclusion of a researcher studying a concurrent credit enrollment program (CEP) that allows high-school students to take university-level courses in agriculture for credit.

Concurrent credit enrollment is viewed as a method of helping students prepare for college and reducing costs associated with burgeoning university enrollment.

When the USU College of Agriculture began offering the courses in 1987, concurrent enrollment was also viewed as an opportunity to increase the number and quality of agricultural courses offered at the high school level, and—it was hoped—a chance to reverse declining enrollments in the college and in high school agriculture programs.

So far, however, the evidence is mixed. “We keep wanting to convince ourselves that the program is good, but we usually
end up finding that it’s not as
good as we had hoped,” says
Gary Straquadine with the
Agricultural Systems Technol­
gy and Education Department
who is assessing the results of
the program.

Researchers have learned that
students in their junior or senior
years and with at least a B grade
point average were more likely
to succeed in these courses than
were younger students or
students with lower grade point
averages. And it also appears
that high school students did as
well in the courses as did college
students.

The courses also encourage
students to attend USU, but not necessarily to major in agriculture.

Answers to other questions aren’t as easy to come by, however.

For example, the good grades of high school students might not reflect the
courses as much as they do the fact that high school instructors tend to spend
more time with students than do faculty members who teach these courses in
college.

Other questions concern the costs of instruction. Faculty
members in the College help high-school teachers
prepare and grade courses, which tends to be a more
costly arrangement than relying solely on adjunct faculty
members or high school teachers. “We are now assess­
ing whether different instructional arrangements affect
testing scores and grades,” Straquadine says. One
SATELLITE SYSTEM AIDS EDUCATION

Fiber optic cables link every room in the new ASTE building with AG*SAT, the satellite communications system that joins USU with 34 other land-grant universities in the United States. The system makes it possible to offer top-notch instruction in some smaller programs at USU such as poultry science without diluting resources devoted to larger program areas such as dairy science.

Programs over AG*SAT can also be received at eight sites around the state, which also makes the system valuable for seminars and Extension programs. Several courses are already broadcast over the system.

AG*SAT will also encourage faculty involvement in international development programs. Sleight says newer faculty members often shy away from international assignments concern is that eliminating the involvement of USU faculty members might be associated with grade inflation as high school instructors “teach to the test.”

Straquadin is now determining whether taking courses in high school subsequently improved students’ performance in college.

The College of Agriculture offers three courses through the concurrent enrollment program: Introduction to Animal Science, Introduction to Plant Science, and Introduction to Agricultural Mechanized Systems.

Whether or not the CEP meets all expectations, it’s clear that students and their parents can reap substantial benefits. Some students have taken enough courses in high school to enter college as sophomores, thereby gaining a year of university credit without many of the expenses usually associated with university attendance.

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Gary Straquadin 750-3521

because they may delay promotion and tenure, while established faculty members are often reluctant to experience the dislocations that accompany international projects.

AG*SAT lets those on a foreign assignment tap the expertise of those remaining at USU, benefiting the host country and exposing more faculty to international work. One proposed project involving the privatization of government farms in the Commonwealth of Independent States could, for example, let a USU faculty member at the farm could videotape herd health problems, and transmit the images over AG*SAT for a diagnosis by USU veterinarians.
Increasing the Department's Role in Research

Farmers like a direct approach, and often try to solve problems through experience. That tactic has served them well for centuries. Today, however, the direct approach often isn't suitable.

Farmers will get more help from the Agricultural Systems Technology and Education Department, which has increased its ability to conduct research.

One research project deals with fact that farmers and their families are injured and killed at an alarming rate. “Farming is definitely a dangerous occupation,” says Gary Straquadine. The annual death rate in agriculture of 42 deaths per 100,000 workers dwarfs the 9 deaths per 100,000 workers, the overall average for other occupations.

With funding from the National Institute of Occupational Safety and Health, Straquadine studied the logs of emergency room visits in Utah. He found that every
year at least one member from nearly 1,000 of the approximately 13,000 farm families in Utah suffer an injury that requires a trip to the emergency room.

There are several reasons for the high injury rates. Most farmers live where they work and tend to work longer, which increases the odds that they'll be injured. So does a labor force ranging in age from toddlers to those in their nineties. Farmers and their families also tend to quietly accept injuries and seldom initiate lawsuits; the resulting lack of litigation (and the related lack of publicity) tends to mask the extent of the problem. The agricultural labor force is largely nonunion and also tends to lodge few official complaints following injuries.

Surprisingly, Straquadine found that livestock are the most common cause of injury, even though safety programs have emphasized the dangers posed by machinery and equipment. "In part this is because we know the risks associated with removing the shield from a power take-off shaft, but livestock pose unpredictable risks," Straquadine says. The importance of livestock in the state's agricultural economy and the use of horses on ranches also add to the toll.

Until recently, the farm accidents attracted relatively little attention due to the lack of accurate statistics and publicity. Except for 4-H and FFA projects, few programs addressed the problem. Straquadine says safety agencies have developed more programs to correct the problem.

The disposal of livestock manure often raises hackles as regulatory officials worry about potential pollution and neighbors complain about the stench. Bruce Miller employs "soft-systems technology" in his study of the two-stage manure lagoons at the Caine Dairy Center, an approach that incorporates all components of the system—waste characteristics, environmental factors, engineering as-
pects, management factors and economic considerations. "In this approach, the people who use the system are as important as the microbial activity in the lagoons," he says.

Gil Long is taking a closer look at what farmers in the state are adopting practices associated with sustainable agriculture and why they do. It appears that many farmers are motivated by economic considerations. A farmer concerned about reducing chemical inputs might switch to an alfalfa-based rotation, but only if it also reduced costs or increased income. Results of surveys from other states also indicate that there are some who adopt practices simply for ideological reasons, although Long has not yet ascertained whether this motivates a substantial number of Utah farmers.

"So far it doesn't appear that farmers will make any dramatic changes for the good of society unless it has been demonstrated that these practices are profitable," Long says.

Findings will also be used to update programs concerning the economic feasibility of these practices.

"In some cases, farmers may not adopt practices not because they are any less innovative but simply because we haven't facilitated their
ability to adopt these practices," Long says. Recognizing farmers’ differing needs for credit, technology, or other factors might facilitate change. One promising tactic is to have small groups of farmers meet regularly to discuss farming practices, an approach that has been very successful in foreign countries.

“Getting farmers involved makes research dollars go much further,” Long says.

Stephen Poe is determining whether inadequate ventilation predisposes turkeys to round-heart disease. Turkeys with this fatal ailment reach market weight but then topple over of a heart attack when they are exposed to a stress such as loading.

Students studying agriculture may also learn more, thanks to Poe’s studies of computer-aided instruction. Poe says a computer’s infinite patience is a definite advantage but by no means the only one. Good instructional programs for the computer can also respond to a student’s needs by skipping or repeating topics.

Poe developed and tested a module about reproduction in plants, which he distributed and tested in schools throughout the state. It was effective, but good graphics were essential.

“Without good quality graphics, an educational computer program is little more than an electronic textbook. Students expect the quality of educational programs to be at least as good as what they see on television,” Poe says.