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More farmers are growing bigger onions and getting a bigger slice of the market.

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If farmers were to classify their crops by personality trait, standing alone in the "bipolar" category would be onions.

They are the definitive model of contrasts.

Their roots are just one stage beyond fuzz yet their leaves are like elk antlers.

They can withstand all kinds of environmental stress yet they must be coddled to grow right.

People love to use onions to add spice to life but can’t help crying about it when they do.

Onions are said to hold the mysteries of an aphrodisiac while offering the medicinal effect of aspirin.

They’ve been around 5,000 years and are just now appearing as a significant Utah agricultural statistic.

About 2,500 acres of Utah farmland is in onions, according to the state Department of Agriculture. Last year Utah produced more than 100 million pounds of onions and sales of more than $9 million. The total size of the 1998 crop was slightly less than in 1997, but total value was up 7 percent, according to USU Extension figures.

Increasing that value has been the focus of recent research at USU. Two studies completed this summer showed that by increasing the circumference of their onions, growers can increase their slice of the onion market.

"Perhaps like no other vegetable, bigger is definitely better for onions," says Dan Drost Extension Vegetable Specialist who coordinated the field studies.
Increasing bulb size increases the onion's value because larger onions are more appealing to processors and consumers. And bigger bulbs are good for farmers because it takes fewer of them to fill a 50-lb. sack, the standard marketing unit.

Since onions are sold by the bag, not by the number of onions per bag, and given the decreasing lack of farmland, the wise approach is to increase the number of bags per acre, Drost says.

Just increasing the circumference of a bulb by a quarter inch could increase production in Utah by 200 to 300 bags per acre, Drost says.

Because the plant is inherently short on roots, it is a poor user of nutrients, Drost says. Its leaves have relatively low area and they grow slow. But by making sure the plants have access to nitrogen and other nutrients exactly when they need them and by naturally enhancing the onions' metabolism, both the size of plants and bulbs can be increased.

On many farms, crops never reach their optimal yield because of environmental and physiological stresses.
Onions are very labor-intensive and the most capital-intensive vegetable, says Charles Black, co-owner of Black Island Farms and Condies Foods, Inc.

“A lot of knowledge and care is required; they have to practically be spoon fed,” Black says, noting that the farm is looking to increase yield 40 percent this year using drip instead of furrow irrigation.

Black, whose onions are sold fresh at grocery stores, in local restaurants for onions rings and shipped out of state to McDonald’s and Burger King, says Utah is becoming famous for its “single-centered” onion, which is ideal for onion rings.

He says onions have become “a bright spot” in Utah agriculture, thanks to the able assistance of USU research and extension experts, adding Drost “is the best thing to ever happen to the vegetable industry in Utah.”

One of Drost’s studies showed that by adding a mix of an amino acid and a natural metabolite, onions’ nutrient uptake could be increased. That in turn promotes leaf growth, which in turn allows the plant to respond to the long days, high temperatures and other environmental triggers that enlarge the onion bulb.

Large bulbs benefit onion growers in the western United States because they are interested in the jumbo (3-4 inches in diameter) and the colossal (4 or more inches in diameter) bulbs while at the same time reducing the number of smaller bulbs, Drost says.

**ONION SIZES:**

<table>
<thead>
<tr>
<th>SIZE</th>
<th>DIAMETER</th>
<th>AVAILABLE TYPES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super Colossal</td>
<td>4-1/2&quot; &amp; up</td>
<td>Red, white &amp; yellow</td>
</tr>
<tr>
<td>Colossal</td>
<td>3-3/4&quot; &amp; up</td>
<td>Red, white &amp; yellow</td>
</tr>
<tr>
<td>Jumbo</td>
<td>3&quot; &amp; up</td>
<td>Red, white &amp; yellow</td>
</tr>
<tr>
<td>Medium</td>
<td>2&quot; to 3-1/4&quot;</td>
<td>Red, white &amp; yellow</td>
</tr>
<tr>
<td>Pre-Pack</td>
<td>1-3/4&quot; to 3&quot;</td>
<td>White &amp; yellow</td>
</tr>
<tr>
<td>Small</td>
<td>1&quot; to 2-1/4&quot;</td>
<td>Red, white &amp; yellow</td>
</tr>
<tr>
<td>Creamer/Boiler</td>
<td>Under 1&quot; &amp; from 1&quot; to 1-7/8&quot;</td>
<td>White &amp; yellow</td>
</tr>
</tbody>
</table>
Jumbo onions are currently worth $7.50 per bag. Colossal onions are worth $8.50 per bag.

The yellow Sweet Spanish is the main variety grown in Utah. Small plots of red and white onions are also grown. The onions are sold locally and many are shipped out of state for fresh market use and onion ring production.

Growers, located mostly in Box Elder, Davis and Weber counties, in 1998 planted 2,500 acres in onions, about 100 acres more than in 1997. They received an average of $10.10 per hundredweight of onions, up $1.26 from 1997, according to USU Extension figures.

Drost’s second study showed that the plant’s use of nitrogen can be improved if the fertilizer is available at the precise times the plant needs it. That can be achieved by applying fertilizer in plastic-coated, temperature-sensitive granules. (See graph at right.)

As temperatures warm, the plastic expands and allows the nitrogen to be released at the slowest, most usable rate for the plant. Because the fertilizer is taken up by the plant, nitrogen leaching into the soil is dramatically less than when standard urea mixtures are used.

Drost says nitrogen availability in the root zone is traditionally guesswork, and when high nitrogen applications are combined with excessive irrigation, nitrate leaching can occur. Continual leaching leads to the movement of nitrogen into ground water sources, posing a potential threat to water quality.

**WORKING WITH ONION**

- To reduce tearing when slicing onions, chill them first for 30 minutes.
- High heat makes onions bitter. When sautéeing, always use low or medium heat.
- To make onions milder, soak in milk or pour boiling water over slices. Let stand for 30-40 minutes, then refresh in an ice water bath.
- To reduce tearing when slicing onions; cut off the top, peel off the outer layers and leave the root end intact. The root end has the largest concentration of sulfuric compounds which make your eyes tear.
- To remove the smell of onions from your hands or cooking equipment, rub them with lemon juice (or salt, if the pots or pans are made of aluminum, cast iron, or carbon-steel).
- To get rid of onion breath, eat parsley.
He says earlier studies have shown that growers tend to over apply nitrogen to compensate for excessive irrigation applications or from fear that if they don’t add it, yields will be too low to be profitable.

Nitrogen in plastic-coated granules, which is available under the name Polyon, produced significantly more jumbo and colossal size onions and the number of medium onions decreased. In test areas where traditional amounts of urea were used in the fertilizer mix, there were more medium but fewer jumbo and colossal sized bulbs.

Drost says the coated fertilizer is not inexpensive. But because it can be applied in the fall or early spring, growers could not only reduce other additional fertilizer applications but the distribution of nitrogen is more uniform. JT

ONION SEASONS

All onions can be divided into two categories: spring/summer and storage. The spring/summer onion has thin, light colored skin, while the storage onion is protected by multiple layers of thicker, darker skin.

Spring/summer onions are routinely sweeter and milder than storage onions, because they have a high water and sugar content. This also makes them more susceptible to bruising. These onions are available in red, white, and yellow throughout their season that begins in March and ends in August. Take extra care in handling these onions. Varieties include Vidalia Sweets, Walla Walla Sweets, and Texas Spring Sweets.

Storage onions, which are known for their intense flavor and higher percentages of solids, can be red, white or yellow and are available from August through March. Storage varieties include the Spanish Sweet grown in Utah.

SELECTION

When selecting onions, choose those with short, tight necks and dry papery skins. The onion should be heavy for its size, with no scent. Avoid onions with strong odors; a sign of internal bruising. Finally, make sure the onion is firm and hard with a minimum of spots or blemishes.

STORAGE

Onions can be stored for an extended period of time by following these simple rules:

* Spring/summer onions should be refrigerated at a holding temperature of 55°F with a relative humidity of 65 to 70%. They will keep for 1 to 3 weeks. If an onion begins to sprout, it has been stored too long or at too high a temperature.
* Storage onions keep best in a cool, dark, dry, and well-ventilated place. They will hold for approximately 4 to 5 weeks under these conditions.
* Onions freeze at 30.6°F.
G rowing onions as crops began in Utah just after the turn of the century when a Mormon missionary returned from Spain with seeds for a variety of sweet onion that he planted in west Bountiful. The Sweet Spanish is the main variety grown in Utah today, and seed from those original starts are still being planted today.

An onion plant is considered to be mature when it stops growing. The grower stops irrigating, and the bulb continues to grow even after the water is withheld. When 25 to 50 percent of the onion leaf tops have fallen over, the plant is ready to be lifted from the ground. The lifters move carefully through the fields to prevent clods. Plants are left to wilt or cure before they are topped. About 10 or more days later, a mechanical toppler cuts off the tops of the onion bulbs. They must be handled carefully because any breaks in the skin can leave the bulb susceptible to rot and other disease. They cure in the fields for several days and are lifted again then stored.

Photoperiod is an important factor in bulb development. The term describes the effect of day length on bulb formation. Some onion varieties have a short day length response, forming bulbs when the days are 12 hours or less. Other varieties have a long day length response, forming bulbs when there are 15 or more hours of daylight. Short day length varieties are generally unsuitable for growing in all but the most southern parts of the U.S. Long day length and a few intermediate day length varieties are grown in the large production areas of Oregon and Idaho.

Some varieties of onions, the storage onions people are most familiar with, contain a high proportion of sulfur compounds. The sulfur is absorbed out of the soil and into the onion through its roots. When an onion is cut, the sulfur compounds are released into the air. When it reaches the saline solution that human tears are made of, it combines and becomes a mild form of sulfuric acid, which induces tears.

Specialty sweet onions like Walla-Walla and the Sweet Spanish grown in Utah contain very small amounts of sulfur compounds. Sulfur increases an onion’s storage capacity. Therefore sweet onions will not store as long.

The accidental discovery of a male-sterile onion by the botanist Henry Jones in 1925 marked the beginning of modern onion breeding. Crossing the sterile line of onions with other onions having desirable characteristics could produce new and better hybrids. Cooperative breeding programs began at universities all across the country. Onion varieties have been developed for specific and varied growing conditions.
The new century will be a turning point in agriculture. But whether farmers and people in agribusinesses are part of the "golden age of agriculture" or declare bankruptcy depends on their willingness to tell people about agriculture’s success stories and on world trade regulations, global food analyst Dennis Avery told an audience at Utah State University this fall.

Avery directs The Hudson Institute’s Center for Global Food Issues, the agriculture and environmental policy research group of the institute’s overall public policy analysis focus. He also served as an agriculture analyst for the U.S. Department of State from 1980–1988. His lecture was part of College of Agriculture Week activities at USU.

"Prosperity for American agriculture cannot be delivered by producing more food for overfed Americans, and it cannot be delivered by congress" Avery said. "Prosperity depends on whether world trade rules allow farmers to sell to China, India and Indonesia"

Avery said thanks to increased yields, made possible by biotechnology, chemical fertilizers, pesticides and improved management practices, American farmers continue to feed more and more people on less and less land. Consequently, Avery said, America is caught in a syndrome of having plenty of relatively low-cost, high-quality food. Consequently, most people don’t appreciate the good that agriculture does and are often against the things that make high-yield farming possible.
"LAND IS THE SCARCIEST RESOURCE. YOU CAN BUY MORE LABOR, BUT WORLD CAN'T CREATE MORE GOOD FARMLAND. I DON'T EVEN SEE THAT THERE IS ROOM FOR ORGANIC FARMING BEYOND A NICHE MARKET BECAUSE THE YIELDS ARE TOO LOW." — DENNIS AVERY

“If farm yields were the same today as when I was in high school, we would have had to plow under 15 million square miles of wildlife habitat to provide enough land to grow today’s food supply,” Avery said. “That’s equal to the total land area of the United States, Europe and Brazil. We have saved wildlife and fed people and yet farmers are being beaten up for being bad to the environment. That’s pretty stupid on everyone’s part. Farmers ought to be bragging and other people should be grateful, and I don’t see either one happening.”

Avery said greater use of biotechnology, not curtailing population growth, is key to feeding the world without destroying wildlife habitat, but campaigns against biotechnology threaten higher yields and better diets. He added that, contrary to what many believe, birth rates go down when people get better food.

Avery predicts that the world will need more than 250 percent more farm products by the year 2050 to feed the population and that will either have to come from better yields or from expanding farming into rain forests, on steep slopes and other poor land that poses huge soil erosion and fertility problems. But campaigns banning food produced using biotechnology, especially campaigns in Europe, threaten the future of the world food supply and safety, he said.

He touted biotechnology breakthroughs in breeding plants that survive in highly acidic soil and a new rice variety, golden rice, that
produces high yields and has had genes inserted to make it a great source of vitamin A and iron, two vital nutrients that are often lacking in poor diets.

"In any previous era these scientists would be on the short list for a Nobel Prize, and instead they are being vilified," Avery said.

He disputed claims about pesticides causing cancer, adding that everything—including salt, water and sunlight—is toxic in extremely high doses. "People who work with rats doing lab studies say the most dangerous thing they do for the rats' health is letting them eat all they want," Avery said. "You cut your cancer risk by eating five fruits and vegetables daily regardless of how they were grown."

Avery concluded with a plea for people involved in agriculture to tell agriculture's story in a way that gets through to urban people. "People say, 'We just want to be left alone to farm.' Sorry, part of the price of staying on the farm is telling people about the good you do."

— Lynnette F. Harris
UAES Information Office
At a new
Ripple in the
Amber Waves

Watching grain grow might be as boring as white bread to most people, but it’s held a life-long fascination for barley breeder Rulon Albrechtsen, whose best variety yet could be making amber waves in the next century.

His newest irrigated spring variety, which he’s named Millennium in recognition of the momentous calendar change and which Albrechtsen didn’t see much future in four years ago, will be released in 2000 and available to commercial growers in 2001.

Although at first glance at trial plots in 1996 Millennium had the look of an “also ran,” a year later it yielded best among 29 other varieties entered in the 1997 Western Regional Barley Nursery.

“You’d think after all these years I could spot potential for good yield,” Albrechtsen says. “But Millennium just wasn’t very attractive.”

Breeders like to see stands of barley that look as stiff as a crewcut and so thick that you feel as if you could walk across it, Albrechtsen says.

Despite its wispy appearance, in regional trials last year Millennium yielded 10 to 12 bushels an acre more than other entrants, reaching 170 bushels an acre in one California test plot.

During three years of trials in Utah, Millennium yielded on average 140.5 bushels per acre. Other popular varieties yielded 131.9 bushels (Brigham) and 124 bushels (Steptoe).

In other characteristics comparisons, Millennium scored an average of 13.2 percent protein versus 12.9 percent for Brigham and 12.6 percent for Steptoe. And the three-year average test weight for Millennium was 51.9 pounds per bushel, compared with 50.9 pounds for Steptoe.

In addition to higher yields, Millennium has exceptionally strong straw, which makes it much less susceptible to lodging, a regular problem in irrigated barley (see sidebar on page 14.) During three years of testing at 12 Utah

Albrechtsen holds a stalk of the new Millennium variety (taller one) along with one of its parents.
irrigated sites, Millennium averaged only 2 percent lodging, Albrechtsen says.

The release manages to overcome a long-standing problem—short stature barley often produces short heads. Albrechtsen identified two very short stature (6 to 8 inches tall) selections that had normal length heads—he labeled them as “short 1” and “short 2.” Neither was suitable as a variety but both were used extensively in crosses (beginning 12 years ago) as a new source of short, stiff straw. Brigham and Millennium were products of two of these crosses.

Millennium is Albrechtsen’s eighth and his last barley release. He will retire in January after 40 years as a plant breeder. Besides the barley releases, he has released one oat variety and one flax variety. He also oversaw the program that led to the release of four spring wheat varieties.

Plant breeding involves extensive amounts of time, patience and attention to detail. And after you’ve been working with a plant 10 or 12 years, you start to feel a little like a parent, he says. “That’s probably the reason that new releases are given a name instead of just a number; you spend all this time bringing this plant along and you feel like you kind of know it and then you just kind of send it out into the world to prove itself.”

Which is where a new variety ultimately makes it or not. Factors that determine how it does are sometimes fickle. Farmers decide if they even want to try a new variety, and if they do, and for some reason the weather or
other conditions make the season a bad one, the new variety, not the situation will get the blame.

"The fact is all this time can go into improved strains, and there's no assurance that it will become widely used," Albrechtsen says. "But if it is well accepted, and if growers like it, it's a great feeling." Utah produces about 100,000 acres of barley annually, most of which is used as feed.

Albrechtsen says he is often asked why breeding programs even exist. "People tend to think that by now we ought to know all we're going to ever know about grain," he says. "The problem is we're always not only trying to improve yields, we also have to stay ahead of Mother Nature constantly bringing us new diseases and insect pests to deal with. We're here doing our best to come up with the best resistant varieties, and nature is out there coming up with its best new strains of pests."

One of those pests, barley stripe rust, has recently begun showing up in the West. By sheer coincidence, not intent, Millennium shows signs of being resistant to that fungus since the disease was not a problem when the cross was made. However, if the disease continues to become more prevalent, and Millennium's resistance continues to hold up, the new variety might have as long a future as its name implies.
WHAT IS LODGING?

Despite some success in breeding against it, farm managers still haven’t figured out how to prevent or adequately recover from lodging in grain crops.

The bending over or breaking of the crop plants in high winds or wind-driven rains is still considered one of the single most important threats to yield and quality in irrigated barley.

Because small grains are by nature top heavy, stems are extremely susceptible to lodging, and it is not uncommon to see broad sections of a field lying down or bent over after a storm.

Some other crop plants aren’t as susceptible because their weight center is lower. In corn, for example, the ear is borne mid-way up the plant and the root system provides a wider base of support.

Lodging results in direct yield loss and deterioration of quality, with few plants becoming upright again. It disrupts the highly organized plant leaf canopy, resulting in greater mutual shading and reduced air movement and carbon dioxide supply.

The degree of stem lodging—the angle at which stems deviate from the perpendicular—can vary from slight slanting to flat on the ground.

It can occur at any stage of plant development, although it most often occurs when the weight of the grain is greatest.

If lodging results in a sharp bending of the stems, flow of water and nutrients to the roots or developing grain will stop.

Lodged grain is difficult to harvest, and because access to it is easy for them, birds may eat much of the crop. Lodged grain also becomes an ideal habitat for rodents and mold.

Lodging has been called “abundance disease” because it often occurs under highly productive environmental conditions.

USU plant breeder Rulon Albrechtsen says efforts continue to try to balance optimum yield with minimal lodging in new grain cultivars.

The development of grain with reduced plant height has been a giant step forward, Albrechtsen says. Short plants have much less wind resistance, and as a result, winds put less torque pressure on the roots and lower parts of the stem. However, short straw and strong straw are not necessarily synonymous. The straw must be strong regardless of its height.

Ultimately, however, climatic and weather variables are beyond human control, he says. Lodging can be reduced but the potential probably won’t ever be eliminated.
RECENT GRANTS AND CONTRACTS

Roger Kjelgren, Plants, Soils and Biometeorology, is analyzing ways water purveyors in Salt Lake City can budget and audit landscaping water usage for the Bureau of Reclamation.

Conly Hansen, Nutrition and Food Sciences, has a National Pork Producers Council grant to investigate new products from culled animals.

Wynn Walker, Biological and Irrigation Engineering, has a Defense Department grant to develop optimal groundwater extraction and recharge strategies for groundwater managers.

Dan Drost, extension vegetable specialist, has a USDA grant to study seasonal patterns for root growth and carbohydrate partitioning in asparagus.

Jeanette Norton, Plants, Soils and Biometeorology, has a USDA grant to study the linking of ammonia oxidizer communities to nitrification kinetics in soils treated with dairy waste.

Deborah Gustafson, Nutrition and Food Sciences, has a National Institutes of Health grant to develop a multi-ethnic dietary survey for the elderly.

Lynn Dudley, Plants, Soils and Biometeorology, is studying the electromagnetic, electrochemical and geometrical factors of soil for the USDA. He is also modeling water and salt stress in plants for the U.S.-Israel Binational Research and Development Fund.

Lawrence Hipps, Plants Soils and Biometeorology, has a Bureau of Reclamation grant to study water use by vegetation located near riparian areas.

Richard Peralta, Biological and Irrigation Engineering, has a private grant to research optimal water transport models.

Richard Kranich, Sociology, Social Work and Anthropology, has a USDA grant to assess rural economic development associated with storing high-level nuclear waste.

Donald Roberts, Biology, has a USDA grant to improve ultra-violet tolerance of a fungus used to control insects.

NEW FACULTY

James H. Smith, who is currently studying the quality of life of recent graduates with degrees in agriculture, has joined the Agricultural Systems Technology and Education Department at USU. He was most recently visiting lecturer and coordinator of student teaching in the Department of Agricultural Education at Texas A&M. He received a Ph.D. in agricultural education this past May and has a master's in vocational agriculture from Louisiana Tech.

Nicole Haynes, whose dissertation topic was determining a production possibilities model for natural resource decision-making, has joined the USU Rangeland Resources Department. She completed her Ph.D. in forest and environmental economics in July at Colorado State. She has a bachelor's from the University of Idaho and has helped develop two textbooks.

Brett Adams, a zoologist and an assistant professor at the University of Iowa, has recently joined the biology department at USU. Adams has current grants with the National Institutes of Health and the American Heart Association. He has extensive teaching experience and received his Ph.D. in biological sciences at the University of California, Irvine. He has bachelor's and master's degrees from Oregon State University, both in zoology.
The USU Cooperative Extension Service has a contract with the University of Wyoming CES that will allow USU's five dairy specialists to work on a limited basis with dairy producers in Wyoming.

The University of Wyoming has not employed dairy specialists for many years but in response to a request from the state's dairy producers, administrators have approved obtaining support from USU.

Ron Boman and Allen Young, two members of the USU Extension team spend time each month in the Star Valley area providing information to and responding to questions from farmers.

Other members of the USU team are Clell Bagley, extension veterinarian and Jeff Walters, editor of the dairy newsletter.

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A RIGHT TIME TO MAKE HAY

Dairy cows perform better on alfalfa hay that is harvested in the afternoon than on hay harvested in the morning, according to a 10-week study conducted at USU.

They will eat more, gain more weight and give more milk if their feed ration includes 40 percent afternoon-harvested hay, the production test showed. The mid-lactation cows that received hay harvested in the afternoon produced about 10 percent more milk while the cows that received a ration with the same portion of a.m.-harvested hay produced less milk and lost weight.

The cows do better because the sugars and starches, the most digestible portion of the plant, are much higher in the afternoon than in the morning, said Glen Shewmaker, University of Idaho forage specialist at Twin Falls. If the hay is harvested in the afternoon or early evening, the higher concentrations are captured and will remain in the plant through cutting and drying.
A TEACHER AMONG TEACHERS

Gary S. Straquadine, Agricultural Systems Technology and Education department head at Utah State University, received the 1999 Teaching Fellow award from the National Association of Colleges and Teachers of Agriculture during the association's annual meeting in Virginia.

Straquadine has served on USU's faculty for 10 years and has previously been honored as teacher of the year in the College of Ag and as the university's top advisor. He teaches undergraduate and graduate level courses that prepare students to become high school agricultural education teachers, a position he formerly held.

He has twice directed efforts to develop Utah's agricultural science and technology curriculum and is currently Vice President of the American Vocational Education Association's Agricultural Education Division.

ARTICHOKE S IN UTAH?

Utah is normally an ideal climate for thistle. But the type of thistle that has a market value—the artichoke—can't take a Utah winter. That fact hasn't stopped a USU researcher from mapping a future for the plant as an annual vegetable here, however. Extension Specialist Dan Drost says there are ways to make the warm-climate delicacy more at home in Northern Utah, and he is testing different soil types, growth methods and planting dates to bridge the cold winter months. The trick is to find a way for the plant to have the early season growth it needs as well as time enough to set the flower: Drost figures that the vegetable, which is usually steamed for the pulp at the heart of the plant, could yield about 8,000 flowers per acre, wholesaling for about 50 cents each.

More info

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Increasing population, urban sprawl, lack of green space, air pollution, loss of natural resources, affordable housing and quality of life are issues hitting home in a house designed for the 21st century. . .

Housing the New Century
The Utah House, a demonstration residence being built and landscaped by USU, will be a learning center that will show people how to build homes and use land that will conserve resources and actually enhance the environment in the next century.

Located in Kaysville near the center of one of the fastest-growing sections of the Wasatch Front, the 2,400 square-foot house on a less than 1/5th-acre lot will be a state-of-the-art home that will showcase quality design and new technologies, says Leona K. Hawks, Utah House director and Extension Housing Specialist in USU’s College of Family Life.

"Its mission," Hawks says, "is to demonstrate, educate and empower the public about new ways of building homes and creating landscapes that promote the principles of sustainability, energy and water conservation, accessible housing and healthy indoor environments."

The house, which will be part of new Utah Botanical Center, will use much less water than a conventional home of similar size. Rainwater will be 'harvested' and used to flush toilets, do laundry and water plants. All plumbing fixtures will be water-efficient, and paving materials will be pervious to keep as much water as possible on the site.

The structure will be a model of "passive design" for optimum energy use. It will be sited for maximum use of sunlight and naturally ventilated for cooling. Solar power and other renewable energies will be used and overhangs will be designed to let in sunlight in the winter and block it in the summer.

Because reducing use of natural resources is an underlying principle of the Utah House, the design team is considering use of a technique that reduces the amount of building materials yet preserves the structural integrity of the building, Hawks says. Framing walls 24" on center, rather than 16" can save a great deal of lumber.

The house will also be a home for any age by using a Universal Design principles that will
make it accessible and convenient for people throughout their lives and make it adaptable for older or disabled individuals.

The house will have entrances without steps, wider hallways and doorways, the master bedroom is on the main floor. Bathrooms will be large with lever-type controls and kitchen work areas and appliances will be adjustable.

The Utah House will also address indoor air quality and the increase in the incidence of asthma and other lung diseases in recent years. Building products and techniques that maximize clean air, control dust, and reduce other compounds in the air will be utilized, plus radon mitigation will be demonstrated. Radon is a cancer-causing, odorless, naturally occurring radioactive gas found in small amounts in the soil.

“A lot of people do not realize that we have some hot spots in Utah with high levels of radon in the soil,” Hawks says. “When building a new home, it is very inexpensive to reduce radon gas coming into the home.”

Hawks says the house, which will cost about $225,000, is targeted to the “move-up” buyer, the largest segment of the Utah housing market. Those homeowners are looking for a house with two or three bedrooms, two or three baths, a home office, a double garage and want durable and low-maintenance materials.

The idea for the house grew out of a grass-roots partnership of various public and private organizations that were interested in the Florida House, a successful learning center and demonstration house in Sarasota. She says more than 50 people are currently working on teams to make the vision of the Utah House become a reality. Construction is to begin in the spring of 2000.

The project is the culmination of a community effort involving contributors from many organizations, government agencies, businesses and individuals. This project would not be possible without help from the Katherine W. Dumke & Ezekial R. Dumke, Jr. Foundation; Bureau of Reclamation; Department of Community & Economic Development-Office
of Energy Services; Department of Natural Resources-Office of Energy and Resource Planning; Department of Environmental Quality-Pollution Prevention and Radon Programs; Home Depot; Wardley Better Homes & Gardens.

The house will be located within a small neighborhood development on the Botanical Center site eventually consisting of four or five residential structures. As an educational facility of broad regional appeal, the site for the Utah House is perfectly situated in a rapidly growing area of commercial and residential development, adjacent to I-15, Utah’s major north-south artery where at least 70,000 vehicles pass each day.

"Utah residents love home shows and want to see what is currently on the market," Hawks says. "The Utah House will never be sold and will continually be upgraded. Many people are searching for information about how to build their dream home or how to remodel their present home. They will be excited about the one-stop shopping that will be offered at the Utah House."

Building professionals such as custom home builders, remodelers, home inspectors, architects, landscape architects, engineers and code officials will be able to visit the Utah House to see the latest technologies for energy and water conservation, sustainability, healthy indoor buildings and making a house accessible to handicapped or older persons. Tours, free information, workshops, and individual consultations will be available at the Utah House. JT

MORE INFO

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The Utah Agricultural Experiment Station 21
Rare is the opportunity for an architect to get to work on an archetype. That chance is the main reason Joseph Linton with Architectural Design West jumped at the chance to help design the Utah House.

The Utah House will be unique in several ways, Linton says, noting that it will simultaneously conserve and generate energy. It will also be “an interesting marriage” of technical advances combined with a return to traditional living space such as a porch and a “great room.”

“One of our goals is to meet state energy conservation requirements and then beat them by a factor of two,” Linton says. “We want to help people educate themselves about conservation, but we’re also going to get them excited about possibilities of home construction in the next century.”

The “great room” concept, for example, incorporates the casual lifestyle of the new century. People don’t tend to entertain by having everyone sit around formally with napkins on their laps, Linton says. Guests tend to be in the kitchen area and want to linger in the area next to it. The two areas are being combined into one great room, he says.

The house will also transform the standard “little box with a locked door” to a being “porch friendly.” People seem to be more interested in getting back some of the human interaction that’s been lost mainly due to automobiles and people not being on sidewalks as they were years ago, Linton says.

The Utah House is to set the standard for the common residence in the 21st century. It will be the model of energy efficiency, water conservation and environmental friendliness.

The house will be the definitive example of “green architecture,” Linton says. Every aspect will address the question, “What can be used in construction that won’t use up resources?”

One answer will be using steel instead of asphalt roofing materials. That saves resources because when the house is demolished or when the roof is replaced, steel can be melted down and recycled, not simply thrown away.

The Utah House will also contain no toxic materials found in many paints and plastic products. New methods for radon mitigation will also be used in which the carcinogenic gas is directed away from the home through pipes in the walls.

“People are big-time energy consumers,” Linton says. “There is a general move by the federal government to encourage people to become more efficient. Housing is on the cusp of that.”

Linton earned his degree in architecture from the University of Utah and began his practice shortly thereafter in 1973. He has designed major buildings across the state from the Primary Children’s Hospital at the U of U to the new football practice arena and the new university president’s home at Utah State University.

People do tend to come “kicking and screaming” to conservation techniques, Linton says, noting that there is huge demand for old 7-gallon toilets that have been made obsolete by the federally sanctioned 3.5-gallon tanks. Despite toilets that don’t flush like they used to, there have been very positive advances because people have generally become more green oriented, he says. Harmful solvents and compounds that were common for years are no longer used.

Progress has been slow, but it is sure, Linton says. Many times, people would like to have an environmentally friendlier approach in building a house, but they aren’t sure where to get information. One of the beauties of the Utah House, he says, is that information not only will be available, it will be visible and functional.
What began as an effort to determine how people—specifically ranchers—adopt new ideas and technology to their work, has resulted in a snapshot of what much of Utah’s private grazing land will probably look like in the near future.

Though the snapshot is still developing, the image looks a lot like a five-acre ranchette and a housing development.

What range scientist Layne Coppock found was that nearly 40 percent of Utah’s beef producers plan to retire soon, and about one-third of them plan to sell their land to developers.

Coppock set out to determine whether producers were investing in improvements to private grazing land following a Utah Agricultural Experiment Station effort in the early 1990s to help producers cope with anticipated restrictions on public land grazing allotments.

Coppock said high beef prices combined with a fear of being forced off of public land prompted producers to send out a call for help in managing their operations. A group of researchers as USU went to
work recommending better management of privately owned pastures, a resource that Coppock believes is still widely underused.

But another combination of factors in the later half of the decade—low beef prices, less perceived threat of being forced off federal land, and producers’ growing older—has resulted in very few investments in improving Utah’s private pastures.

“We found that if age and macroeconomics are what people base decisions on, then throwing information at them doesn’t change their practices or plans,” Coppock said. “Some people won’t want to hear this, but it looks as though ranchette owners may be our only growing constituency.”

Coppock found that producers that use public land own have larger herds. But 62 percent of all beef producers in Utah are in the business as a hobby or sideline and are less likely to invest in improvements on their land. Another statistic that weighs on the minds of those advocating agricultural land preservation is that just 3 percent of producers are age 35 or younger.

Coppock said he doesn’t consider the changing picture of Utah’s agricultural land to be a completely gloomy prediction, but it does represent a change in society and the loss of some important resources.

“We don’t need agriculture just for food production,” Coppock said. Utah already imports the majority of the food we eat, but he says, to keep costs down for transporting food here there must be commodities, such as alfalfa, for the trucks to carry away.

“We also have to ask what the consequences are for a proliferation of development in terms of water quality and wildlife habitat,” Coppock said. “Agriculture plays many roles in managing the environment and how will those be replaced?”

He also fears that as older generations of ranchers and farmers retire, a wealth of land management experience goes with them and will be lost. Coppock said perhaps lingering war memories, including widespread food shortages, in Europe have created a greater commitment to keeping people on the land. But, he added, the European system depends on regulations and heavy subsidies that Americans would find unpalatable.

“I am somewhat surprised that, given the history of the state, that Utahns don’t have more commitment to sustainability and that we are so complacent about preserving
agricultural land and open space,” Coppock said. “Open space preserved today could be a food bank tomorrow. If a food crisis came about in 40 years I don’t see us plowing up Walmart’s parking lot to plant crops.”

There may be alternatives to acres of stuccoed housing developments replacing pastures. What may result from producers selling private land is that some larger agriculture operations, with diversified interests and money to invest, may buy the land and keep it in production. Also, there may be more hobby ranches run by on-site managers for wealthy owners who live elsewhere most of the time.

Coppock said although it’s impossible to know exactly what Utah will look like in the near future one thing is certain, changing land ownership and land use will mean a whole new set of research questions. He wonders what the next statistical snapshot will look like.

— Lynnette F. Harris
UAES Information Office

MORE INFO

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Farm Income by Age

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<th>90%</th>
<th>80%</th>
<th>70%</th>
<th>60%</th>
<th>50%</th>
<th>40%</th>
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The Utah Agricultural Experiment Station 25
For those who might be wondering what science has done for them lately, the USDA has been collecting bushels of answers from universities across the country the past year.

Under 18 categories of concern about the U.S. food supply, the agency has culled hundreds of ways the partnership between it and the land-grant universities are finding solutions to problems and questions faced by Americans every day. In a 20-page report called "Impact," the agency offers ways science and education have addressed topics such as water quality, food safety, and agricultural competitiveness.

Here are some of their findings. (The complete reports for 1999-00 and 1998-99 can be found on the World Wide Web at reeusda.gov/success/impact.htm)

- A breakthrough vaccine saves producers $200 million a year and protects baby chicks against three major diseases at the same time by injecting the vaccine directly into the eggs.
- A gene from pond algae will help what plants grow quicker and stronger on less fertilizer.
- A color-based diagnostic test deters the presence of a protein that predicts bull fertility and increase it by about 17 percent.
- Applying soluble calcium to potatoes between July and September markedly reduces tuber defects and losses to soft rot in storage.
- Using DNA markers, researchers have found the gene combination that regulates beef milk production, which significantly affects calf-weaning weight and possibly increasing that weight by as much as 20 pounds.
- Researchers have developed an efficient method for producing eggs that are high in omega-3 fatty acids, a form of fatty acid that has been shown to reduce heart disease in humans. Eating two of the eggs a day can reduce the amount of serum triglycerides in a person's blood by 14 percent.
- A biotechnology-produced bug that breaks down plant waste into ethanol, a widely used industrial chemical and natural fuel.
- A canola-based oil has been shown to work as well as the petroleum-based version but without the environmental drawbacks. The oil is about the same weight as 10w-30, cuts hydrocarbon emissions by a third and disposal is worry-free.
- Mixing tart cherries with ground beef means lower fat and less carcinogenic charring from cooked meat.
- The Food and Drug Administration recently revised its recommended daily allowance for folic acid because research showed that deficiency in this form of vitamin B increases the risk of anemia, birth defects and heart disease.
- To give low-fat products a better chance for consumer acceptance, researchers are identifying flavor compounds that will give the products the same sensory properties as their full-fat counterparts.
- Utah State University researchers have developed flavor enhancers that are helping reduced-fat cheeses capture nearly 25 percent of the $1.1 billion cheese market.
- A Utah State extension agent is helping hay producers earn an additional $30 per ton when they certify their hay won't spread noxious weeds on natural ecosystems.
- More than 97 percent of food-borne illnesses could be avoided by improving food handling practices at home and in restaurants.
- About 75 percent of the cases of diarrheal diseases at childcare centers could be prevented just with proper hand washing.
*Though cases of salmonella food poisoning from eggs are rare, research may make it nearly nonexistent through pasteurization or ultraviolet light.*

*Minute changes in cattle diets can reduce the amount of *E. coli* bacteria excreted, which reduces the risk of it being transferred to the food supply during meat packing.*

*Research at Utah State is increasing the time necessary to test for *E. coli* from days to minutes.*

*Scientists have found that just because a burger patty looks brown it may not be safe. Premature browning is related to pigment in the raw meat. This finding helped change food safety guidelines to rely on temperature rather than color to determine if ground beef is cooked properly.*

*Less than 1 percent of bachelor's degree recipients at land-grant schools were still looking for work six months after graduation.*

*Land-grant university scientists and extension specialists are finding important uses for plant parts that have to be thrown away during harvest and processing. Researchers at Oregon State have helped find uses for 6,000 tons of waste from alfalfa seed production. California has recycled more than 1.2 million tons of plant waste into compost for various crops.*

*Altering chickens' diets can reduce phosphorus levels by up to 80 percent, making the manure a suitable fertilizer for crops.*

*Compounds that control fleas, heartworm and intestinal parasites in pets have been developed. New vaccines are to be on the market within the next five years.*

*Brucellosis, a serious reproductive disease that threatens beef cattle and dairy cows, has been dramatically reduced by coordinating vaccinations efforts.*

*Veterinarians estimate that 30 percent of the U.S. swine are infected with a new viral disease that specialists are starting to control with vaccines.*

*Preventing contamination of livestock with cyst-laden dog feces is helping reduce spontaneous abortion of calves in the dairy industry.*

*Animal scientists have shown they can clear up fatty liver in dairy cows, a condition that can cut a cow's milk production in half and costs U.S. dairy farmers $150 million to $300 million per year.*

*Tests have been developed to detect feline leukemia and immunodeficiency viruses in cats. The first diagnostic test for parvovirus, which can be fatal to puppies has also been developed.*

*Special ear tags to control a common fly that recently developed resistance to a common pesticide became available this year.*

*Nationally, herbicides account for more than 90 percent of the pesticides that farmers use on corn, soybeans, wheat and cotton. When weeds are left unchecked, losses can total more than 90 percent. Genetically altered plants that can withstand herbicides and reduce herbicide applications are being developed.*

*In finding ways to prevent pollution and improve water quality, scientists provide a better understanding of how agricultural nutrients, pesticides and other potential contaminants move from the land where they are applied into rivers, streams, lakes and groundwater aquifers where they can pose a risk to human health and the environment.*

*Researchers have developed a new process that extracts 96 percent of the cholesterol from egg yolk while maintaining the egg's original protein and flavor.*

*The kind of fiber found in oranges together with fish oil helps prevent colon cancer.*

*Native Americans are 2.4 times more likely to suffer from diet-related diabetes than any other group in the United States. The average life expectancy for a Ute Tribe member is 47 years. Specialists with the Expanded Foods and Nutrition Education Program at Utah State are working with Utah and Ouray tribes to help them avoid the disease through proper nutrition. JT*
Regardless of whether you believe the new millennium technically begins this January or next, there's something unnerving about all those zeros clicking over on the time/space odometer. Perhaps it's the combination of that milestone and the 6 billionth human (nine zeros) cropping up in October that is making folks in agriculture pull over and ponder how it will meet the demands of the new century and all those mouths.

The traditional annual reports from ag research agencies have an almost dire tone this year. Scientists around the world seem to be pausing to remind people that despite the ease with which developed countries feed themselves these days, the question of where's the food going to come from has not gone away, and that a closer look at that root issue turns up a lot of tillers:

- Humankind is farming the same 6 million square miles of land that was farmed 40 years ago but is feeding 80 percent more people. To keep pace with anticipated population increases, agricultural production from the same land must triple in the next 40 years.

- Advances in crop science has limited the impact of drought and disease but the threat from insects, nematodes, fungi, bacteria and viruses remains a moving target and annually produce huge losses worldwide.

- How will the taken-for-granted, high-quality, diverse foods in the U.S. and other developed countries continue without threatening food security or without drastic increases in food prices?

- The geometric decline in the number of consumers who have any knowledge of the methods or technologies used to generate food will continue.

**PHOTOQUIZ**

Clue: Used in soil testing and has something to do with suspended particles.

- Will the so-called second “Green Revolution” in agriculture meet the diverging demands of farmers, environmentalists and the public or is it more an optimistic illusion?

- Despite claims that pesticides are unnatural, risky, toxic and unethical, average human life spans have more than doubled during the past 100 years, in part through medical advances but also through safer, sufficient supplies of food.

- Organic produce might be detrimental to health because of increased levels of natural plant defense products, and more importantly toxins produced by the very agents of plant disease and food spoilage that are removed by pesticides. Aflatoxins, which form after infection of the ubiquitous fungus Aspergillus flavus, are the most carcinogenic and teratogenic substances known yet they are entirely “natural.”

- The hard truth is that to feed 6 billion people, current intensive agricultural practices are reliant on pesticides. Pressure for drastic reductions without sufficient research into alternative crop protection strategies will create more problems than they solve.

- Although the trend has been toward the development of increasingly safe chemicals, some highly toxic compounds such as aldicarb and methyl bromide are still in use.

- Elitism and doom-saying about agriculture by the environmental movement in affluent countries will continue even though they have never personally experienced poverty nor produced a single ton of food.

- The total acreage of and the controversy over genetically manipulated food will both increase. There were 60 million acres planted in GM crops worldwide in 1999; almost 50 percent of all U.S. crops are transgenic.

- The schizophrenia of the well-fed will continue, with expectations that produce be uniform, pretty and perfect like any manufactured good in conflict with their irrational demand for zero pesticide use.

The reports collectively sigh that science will be demonized, creating the popular misperception that it is part of the problem rather than the solution.

Concern about the demands agriculture makes on a fragile ecosystem must become practical methods to harmonize production with protection. But this will only occur through technological and scientific advances. The new millennium literally depends on that.
Utah Science is on line.
Check out our Web page at:
http://agx.usu.edu/agx/

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