divining rod

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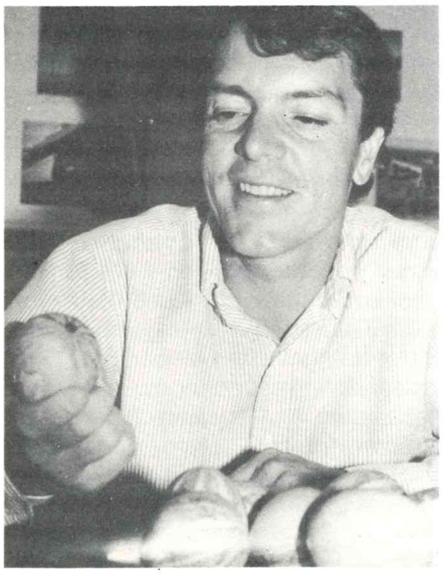
Gourds are potential energy source



Jack Whittier says the green and yellow buffalo gourd can be found alongside highways and railroad tracks.

Sometimes success in research is just a matter of timing. Take the buffalo gourd for instance. Researchers recently found that this native southwestern plant can grow under the worst conditions while producing the stuff of ethanol, insecticides, and feed supplements. But by then, the energy crisis had waned and the government had lost interest in alternative fuels.

Jack Whittier, a researcher with New Mexico State University's Energy Institute, is philosophical about the "political winds" that change direction in mid-research. "It's like new technology that has a 20 year life cycle where its technical competence must be proved before it can be introduced in the market. Buffalo gourd could follow that pattern," he said.

"Buffalo gourd grows in marginal soil, its water requirements are trivial, and it is the highest producer of ethanol of any crop after sugar cane," Whittier said. His research, which was sponsored by the New Mexico Water Resources Research Institute, showed that buffalo gourd also tolerates irrigation with moderately saline water. That characteristic could be a commercial plus in New Mexico where the area's abundant saline water supplies could be used to supplement scarcer fresh water supplies.

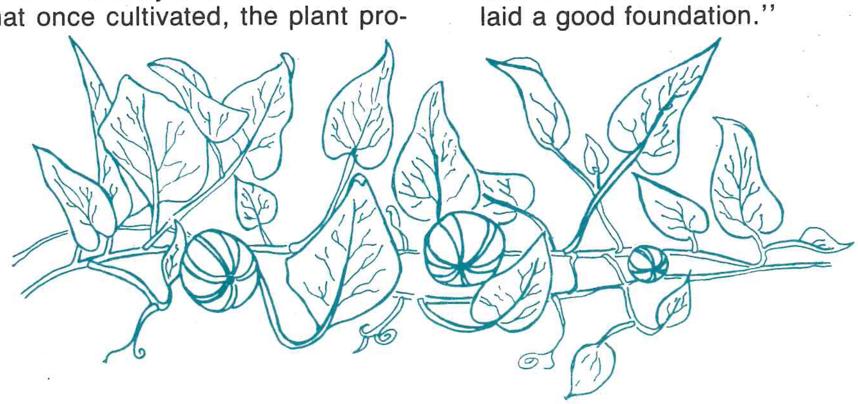
Buffalo gourd grows primarily as a weed in disturbed soils, and can be found in abandoned fields, along roads and railroad embankments, and in low areas in open country. Each plant produces several stems and shoots from a central tap root, forming a dense vegetative mat. The lemon-sized gourds grow around the edges of the plant.

Earlier research in Arizona had evaluated the gourd's root starch and seed oil as potential food sources. Based on the Arizona studies, New Mexico researchers believed the seed oil could be mixed with diesel fuel as a fuel extender and the starch could be fermented for fuel ethanol production. What they found, in fact, was that once cultivated, the plant produced very few gourds. "We never produced enough vegetable oil to run a test engine," he said.

So instead, research concentrated on the plant's roots. Although there were some harvesting and storage problems, the roots turned out to be a good source of ethanol. He said the lack of proper harvesting tools and processing equipment could be overcome by "some clever guy in agricultural engineering."

"Buffalo gourd has a promising future," he said, but added that its success depends on the market for ethanol fuels. That market, in turn, depends on who the government favors with tax incentives, and right now, he said the government is not promoting alternative fuels. Eastern New Mexico, which once supported as many as 23 ethanol plants, now has only two. Although he doesn't see any change in the near term, stricter enforcement of EPA air pollution regulations and trade sanctions against low cost ethanol imports once again could favor domestic ethanol production.

"Buffalo gourd doesn't have an easy future," he said, "but as arid lands crops become more popular, it may come into its own. When that time comes, this research will have laid a good foundation."



NMSU traces 100-year well history

As New Mexico State University begins its centennial celebration, the New Mexico Water Resources Research Institute is also taking a 100-year look back--at windmills, wells, and water systems.

The institute has that 100 years worth of information because NMSU graduate student Calvin Lashway has spent the past several months digging it up. His report on NMSU's well history is not just a record of wells, it is also a history of how the university has coped with its water problems over the past century.

The college drilled its first windmill wells in 1890. That October, college President Hiram Hadley wrote, "The wind-mill which we put up works finely, but it will not supply enough water to do much at irrigation."

The lack of a reliable source of water proved to be the major stumbling block to the growth of the college during its first two decades. In 1895, for example, work in the Chemical Department had been suspended for lack of water and water was not available for the botany, zoology or physiology laboratories. Samuel P. McCrea, college president, wrote in 1895, "The amount of water furnished by the windmill well (The one at the experiment station) always proved insufficient and aggravatingly uncertain."

At the turn of the century, drought and bad luck also plagued the college. The summer and fall of 1900 were exceptionally dry and in 1901 a washed out diversion dam left the acequia dry. By 1902 a new well was drilled east of the Experiment Station's Seed House. The new system proved itself during the 1904 drought when the Rio Grande was dry for four months. Convinced of its benefits, the Experiment Station reported it was "making the study of irrigation problems its chief line of work."

During the years between 1908 and the end of World War II, increased enrollment brought more demands on the domestic water supply for new facilities, fire protection and improved campus grounds.

As promised, irrigation research received top priority. For some 15 years, the mesa lands east of the Rio Grande were used to test the feasibility of irrigated crops. And in 1929, the Board of Regents approved construction of the college's first swimming pool, which later also would be used for irrigation.

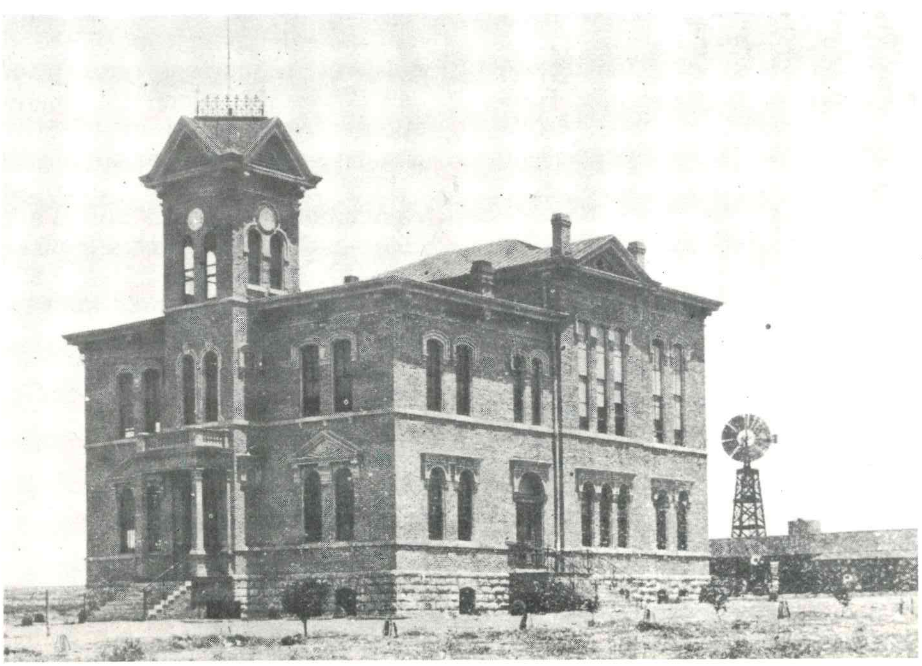
During World War II, one of the college's contributions to the war effort was to cut water rates to nearby off-campus residents to "assist the water user in producing a Victory garden." The end of the war and the new G.I. Bill combined to escalate student enrollment. To meet this anticipated demand, the college began drilling new wells in 1946.

During this time, the Experiment Station also was faced with a shortage of irrigation water. Albert S. Curry, associate director of the Experiment Station warned that the shortage could cause a crop failure and a resulting loss of experimental data. The situation finally was remedied in 1951 by the addition of a new well.

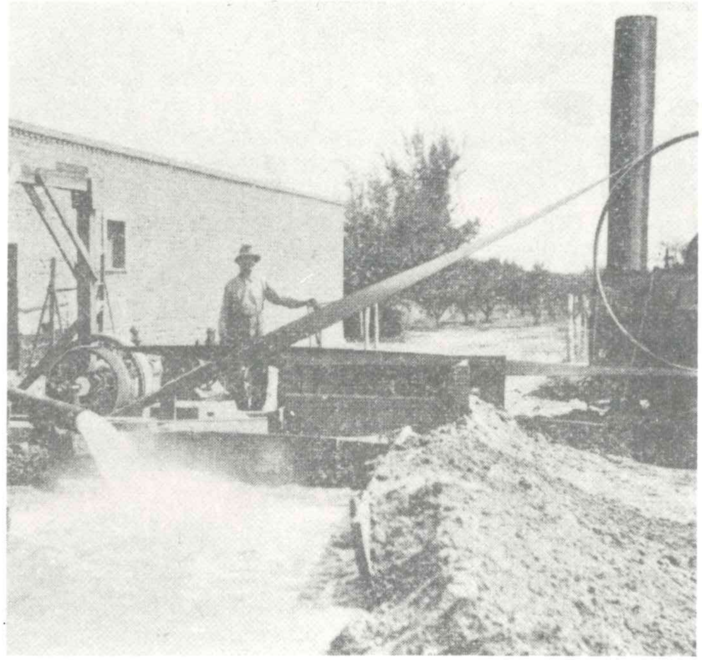
Throughout most of the 1950s, the Mesilla Valley suffered a drought, which in turn caused a shortage of surface irrigation water. From 1951-1957 valley farmers drilled several hundred wells to develop ground water for irrigation. To alleviate its drought problems, the college also drilled several new wells.

If drought was the theme of the 1950's, the following decades were characterized by concern over water conservation. In 1965 a student wrote to New Mexico Governor Jack Campbell complaining about water being wasted on campus. The universtiy responded saying, "We appreciate all the interest and help we can get from anyone to help us conserve water." In 1974 the university took official measures to promote water conservation when NMSU President Gerald Thomas wrote, "I have asked for special studies of alternative approaches to landscaping in view of the need to conserve this vital resource."

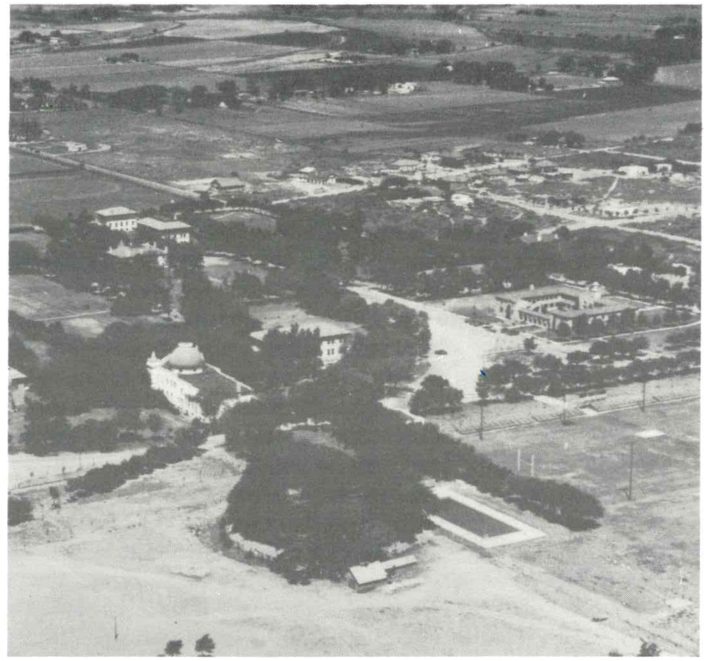
Today, water remains as crucial to the university's mission as it did in 1898 when College President Cornelius T. Jordan wrote, "..without this (water supply) it is almost impossible to do a great variety of work of great importance to the people of this Territory and of the whole arid region."



The old college windmill stands behind McFie Hall as evidence of the young college's dependency on well water. This wooden windmill, built in 1890, pumped water from one of the college's first wells. Courtesy Hobson-Huntsinger University Archives.



This early 1900s well was used for irrigation and in well pump experiments. The well was located across from the present day Seed House. Courtesy Hobson-Huntsinger University Archives.



The college's first swimming pool (lower right) doubled as a source of water for firefighting and irrigation. Courtesy Hobson-Huntsinger University Archives.

Historian is well detective

For the past few months, history graduate student Calvin Lashway has been working in the realm usually reserved for hydrologists and civil engineers. He recently completed a 100-year history of New Mexico State University's water well development. While he admits that knowing more about well drilling would have helped him, the project was truly a job for a historian.

He first began work on the well project in 1986 when NMSU Physical Plant Director Doug Black asked NMSU history researcher Julia Tuten Lee and Lashway to identify the campus wells and locate documents relating to earlier wells. He said Black wanted the information in preparation for the university's long-range water plan. That six-week project laid the ground work for the larger, more detailed 1987 study, which included the location and uses of all past and present wells on campus.

In his research, Lashway has sorted through records at NMSU's archives and the Physical Plant Department, read reports from the Experiment Station and the Board of Regents, and interviewed retired professors and grounds keepers.

Calvin Lashway inspects NMSU Well No. 7, which was originally drilled in 1935. The Seed House (background) has served the Agricultural Experiment Station since at least 1895. Several early wells were drilled in the vicinity of the Seed House, which today is used as a dry lab and for storage.

That was the easy part, he said. "The hardest part was trying to find documents you know existed at one time." He also had to sort through a tangle of conflicting records to straighten out the identity of the wells. The same well would be given different names and numbers over the years, leading to confusion over whether it was an old well with a new name or an entirely new well, he said.

Lashway will graduate in December with a master's degree in history, with an emphasis in public history. A public historian, he said, works under different deadlines and demands than the academic historian. "In academia you can spend many years researching a topic, while a public historian usually has a limited time to find the most useful information from the best possible sources." Although public history is a relatively new field, he said it is becoming more in demand as administrators realize the value of history in establishing policy.

Using saline water to reap profits

New Mexico's 15 billion acre-feet of saline ground water could be used to help solve at least two water problems facing farmers in the Roswell area. According to New Mexico State University Agricultural Economist Robert Lansford, the state's vast saline water supplies could profitably supplement fresh water irrigation. The conserved fresh water could then be used to pay New Mexico's Pecos River water debt to Texas.

Lansford, Agricultural Economist Tom McGuckin and Agricultural Engineer Ted Sammis recently completed a study that showed farm profits increased by 17 percent when 33 percent of the total irrigation was from saline water. Of the four crops studied, they found that cotton and barley were the best candidates for supplemental irrigation using saline water. "Cotton and barley can be produced with a fresh water irrigation at the beginning of the growing season, followed by almost continuous irrigation with saline water during the season," Lansford said. The best level of saline irrigation is between 8 and 14 acre-inches per acre.

When the researchers compared results of their irrigation scheduling computer model with similar irrigation practices of a farm near Hagerman, New Mexico, they found the results were about the same. "Trial and error make good economics," Lansford said. The farmer, who had one fresh water artesian well and two wells producing saline water, had experimented with varying mixes of the two supplies. Out of necessity, he said some farmers already are using saline water for supplemental irrigation.

One major problem with using saline water for irrigation is that to be profitable, the farmer needs more than the 3.5 acre-feet of water now allowed by the New Mexico State Engineer Office. Because salinity tends to dry out the soil and decrease the movement of fresh water into the plant cells, higher levels of water are required under saline irrigation.

Lansford said that unless the State Engineer Office relaxes the 3.5 acre-feet limitation, the farmer will not benefit from using saline water. He said if saline water use would be categorized separately from fresh water use, the farmer would be encouraged to use saline water. Using more saline water would in turn lessen the demand for fresh water.

The fresh water conserved as a result of increased dependency on saline water also could be used to pay New Mexico's water debt to Texas. A 1986 court ruling determined that New Mexico owed Texas 340,100 acre-feet of Pecos River water as its past debt and another 10,000 acre-feet a year to bring it into future compliance with the terms of the Pecos River compact. To pay the debt, irrigation rights from Roswell to Carlsbad may be forced to shut down.

Lansford said the saline water alternative will become more attractive as the water table for fresh water declines, energy prices for pumping increase, and as others outside agriculture compete for the limited fresh water supply.

Proposal deadline

The New Mexico Water Resources Research Institute and the U.S. Geological Survey are accepting applications for the Section 105 Matching Grants for Fiscal Year 88 Water Resources Research Program. These proposals may be submitted directly to the USGS or through the WRRI. Areas of particular interest include ground water quality, water quality management, institutional change in water resource management, and climate variability in the hydrologic cycle. The deadline for proposals submitted through the WRRI is Jan. 8, 1988. The deadline for proposals submitted directly to the USGS is Jan. 22, 1988. For more information call Project Coordinator Darlene Reeves at 646-1194.

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