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## USES OF NEW MEXICO'S SALINE WATER: VIEWS FROM AN ECONOMIST

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### Introduction

Thank you very much, Jo; thank you ladies and gentlemen.

You can't hang around with the people I hang around with, like Tom Bahr, agricultural economists, politicians, and bartenders without developing and maintaining a strong interest in water policy. So I was particularly pleased when Tom asked me to speak to you today; to serve as one of the token college professors on this year's program.

Some would argue that we could dispatch with the theme of the conference rather quickly, that is, respond to the question--"The New National Water Policy: Will it Work in New Mexico?"--with an unqualified "No!" For example, you overload Steve Reynolds' pacemaker and awaken the slumbering masses when you suggest that federals have anything to do with management of New Mexico's water resources. I have the impression, after listening to Steve this morning, that he wasn't exactly pleased with the national water policy, particularly those aspects that deal with management. A fair, non-partisan statement would be that we, collectively, in New Mexico are very sensitive about water resources, and with the exception of our relationship with our good Texas friend, Jesse Gilmer, feel very provincial about water use, abuse, allocation, pollution, and so on--as possibly we should. Our geography is somewhat unique, our ethnic background is unique, as are our rates of growth and development. Most truly New Mexican considerations have been captured in the strongest water laws in the United States; water laws dealing with both allocation and quality. Secondly, we can respond "No" to the question because we feel there has been a propensity, at least on an occasion or two, for well-meaning federal politicians and bureaucrats to overshoot the mark in quest of our salvation. (The canons of the economics profession require I note that the latter comment has elements of a personal value judgement.)

But even the most serious non-believer must admit there is a role for the federal government in water resources policy and in the subsequent solution of our water problems. It has been argued for more than 200 years, and can be argued today, that government should do for folks those things we cannot do for ourselves, or cannot do well for ourselves, and perform the functions necessary to protect and enhance national welfare. If there is a national water policy which would fit in this context, it certainly would include a call for more basic research in water resources; basic research in water efficiency, quality, conservation, and augmentation.

I did not detect, in the presentation on the national water policy and in my perusal of the proposed policy, the focus on research that should

exist. In fact, Jerry spoke often of planning and management, but I do not understand how government is to plan and manage without basic information--information generated in the research process. This deficiency has been a major revelation of New Mexico's Section 208 planning.

### The Status of Basic Research

Hal and Jerry both missed some great opportunities. Even the most avid, redneck government-hater in New Mexico could be sold on the necessity of scientific inquiry, simply because the future of New Mexico depends on it. But federal politicians and bureaucrats are hardware oriented. Hal spoke of the demonstration plant destined to be in Alamogordo. Politicians and bureaucrats like to invest in such plants but, as we assess national policy, it seems fair to ask--why is the relative status of research in the national water policy so low relative to hardware?

Let's admit, right off the top, that basic research is a long-run consideration. Most basic research takes a long time--particularly basic research in water resources. Politics is short-run. We elect Congressmen for two years, elect Governors in this state for four years (in other states, two years), and elect Senators for six years. Hence, politics is a short-run phenomenon requiring, within the relevant time periods, a visible payoff for political decisions. A Senator would much rather have his photograph taken next to a plant--a large silver plant in Alamogordo that distills or otherwise purifies saline water--than he would have his picture taken by some small plant like alfalfa or cotton. When people drive by a cotton field, it is a cotton field. You don't look out there and say, "That's what our Senator did for us, folks, when he served in the United States Senate." When you drive by the building, Clinton P. Anderson Hall, you remember the great United States Senator from New Mexico and his contributions. You don't always remember basic research contributions. As a consequence, when contemplating research policy--we are reminded of the long-run nature of research and the relationship to Dirkson's first two laws of politics, get elected, and get reelected. Research does not necessarily lend to reelection.

The second reason basic research does not rank with hardware as a priority item among politicians and bureaucrats is the economics of hardware is much easier to calculate. We understand the economics of cleaning up saline water with various techniques. We can talk with confidence about construction costs, energy costs; about feedwater quality and product water quality. But we are not as articulate about research. To use a College of Agriculture example, consider the dollars we've spent trying to solve the mastitis problem in the dairy industry. Mastitis has been a problem in the dairy industry ever since I can remember. After millions of dollars of research, about the best we can report from research is that if you are nice to your cow, she might not get mastitis!

On the other hand, consider the hybrid corn success story. We have paid for agricultural research in some states many times over with hybrid corn, a product of basic research. In this region, all basic agronomic research may be more than covered by successes in cotton and chile. But--you never know--so budgeting for basic research is much trickier than budgeting for hardware.

Lastly, basic research does not rank high among politicians and bureaucrats because the research lobby has just now discovered the exact location of Washington, D.C. When you make or fake a living as a thinker, it is tough to soil one's palms by grubbing for money. Researchers live with the illusion that everyone thinks they are grand! Yet, in reality, few know water resources exist. Researchers have never taken the time to present the case, and therefore, we can't expect to show up very high on the list of things a Senator, Congressman or bureaucrat wants to do.

### The Case for Saline Water Research

Saline water research is an example of research system failure. The lack of political visibility, uncertainty of economics, and failure of researchers to communicate is reflected in the very disappointing commitment of the federal government and the state to basic research in saline water resources, particularly basic research which might lead to utilization of saline water in raw form.

We are crazy about desalting. We all understand that if you desalt water, it tastes good. It tastes just like any other kind of water--it's wonderful stuff to drink. But it is very expensive. The federal government has chosen to go the desalting route instead of investing money in finding options for using saline water--straight or on the rocks!

The case for using raw saline water resources in New Mexico is very persuasive. We all agree New Mexico could use a few more quarts of water. But, as we look at the projections from the recent "Water Assessment for Policy Purposes," in the year 2020 we would expect over subscription of our water resources because needs may vary from a projected low of 3.6 million acre feet per year to a high of 4.1 million acre feet per year while supplies will be 3 million acre feet of water per year. But we do have plenty of saline water not included in these calculations; saline water resources that are distributed throughout the state. There is a popular hypothesis, in political circles, that the only saline water in the state is in the Tularosa Basin, that the basin has captured all our saline water. What they have captured is all of the politicians who are interested in saline water. Folks in Tularosa and Alamogordo have presented their case to the people, their representatives, and bureaucrats and the case has been heard in the Legislature. Of the twenty billion acre feet of groundwater reserves in New Mexico, fifteen billion acre feet of these reserves are classified as saline. So, if the supply is good, three-fourths of our resources are not being used.

New Mexico struggles with low per capita income--we sort of bounce between 44th and 50th depending upon who reports it and for what purpose. Any state struggling as New Mexico struggles needs to introduce new resources. The Gallup-Grants area is booming as a result of new uranium activity. Coal has provided a great economic stimulus to the San Juan County area. So--why don't we consider saline water a resource--a new resource--which might serve as an engine of development. A resource becomes an engine of development when it does one of two things; substitutes for another scarce resource, or when it is brand new. When resources are added to inventory, productive capacity should increase.

## Some Successes to Date and Some Possibilities

One could add saline water resources to the inventory with a minimum of basic research. Countries, such as Israel, have been forced to do some research and have achieved significant results, particularly in the application of saline water to food production. They have: developed a greenhouse that produces fresh water plus abundant harvests by solar distilling salt water, investigated the impact of using saline water on cotton and sorghum with some successes, and discovered that production and quality of oranges were not affected in the short run by irrigation with saline water. Of course, the potential for orange production in New Mexico is not great, but researchers have discovered certain plants can physiologically tolerate saline water. Saline water serves as a necessary stress factor for some plants that require stress to produce. For example, guayule produces latex rubber to protect the plant when stressed by extreme heat, extreme cold, or salt.

Others have reported an acceleration of cotton and wheat growth with low salt concentrations; there are reported positive results from irrigating pears with saline water. The pear research was undertaken in Iraq in an area where nothing grew--a semi-arid desert similar to some parts of the southwest.

Epstein, in California, is a prominent breeder of salt tolerant plants. He has had some successes with irrigating barley with Pacific Ocean water so perhaps his pioneer work could lead to grain production in New Mexico. (Most of our saline water does not approach the salt concentration of sea water.)

Others have considered using saline water in the production of crambe, a very high quality oil. The interest in crambe is two-fold. Oil is becoming more expensive, and the crambe plant produces an oil that can be substituted for the expensive oil used in transmission fluid. Besides it's potential as a substitute for a very valuable commodity, it is salt tolerant, although the extent of the salt tolerance awaits further basic research.

Dr. Cunningham, with New Mexico State Biology department, is working with salt tolerant grasses. If he could develop salt tolerant grasses, New Mexico's forage production for cattle and wildlife could be greatly increased. Vast areas of New Mexico are subject to pasture improvement if we had some good salt tolerant grasses.

There are other possibilities. Tom Bahr, who likes to think of exotic things, is encouraging investment in a seafood industry in New Mexico. He maintains one can produce fresh-water prawns in saline water and they grow very well. Also, production of brine shrimp, algae for protein, hydrogen, and glycerol are possible commercial uses of saline water in raw form.

Dr. Mulholland in Engineering has proposed using saline water to collect heat in solar ponds. Water convects as it heats, hence some heat is lost. His interest is to develop a heat collecting system that

will maintain pond stability while heat is withdrawn. This development requires basic research, and we are unable to fund it because there is little commitment to basic research on the utilization of raw saline water resources.

Agriculture should look closely at the possibility of developing a greenhouse industry, using raw saline water. Use of saline water in greenhouses may also purify it and, therefore, lead to recycling into other processes. Tom Bahr has some plans to develop a greenhouse evaluation project at the Roswell Saline Water Laboratory--when money for basic research in saline water use is available.

One of the most persuasive arguments for investing in saline water research is the revelation that stress to plants from withholding water is the same stress created by saline water. If a researcher develops salt tolerant plants, he simultaneously develops more water efficient plants. Researchers may need to justify projects on a conservation basis just to get to saline water research.

Additionally, if you consider the marginal cost, as we say in economics, of plant research programs it would be low. We already spend three to four million dollars a year in all kinds of plant research in New Mexico. The infrastructure exists, we have the laboratories, and the researchers to do the job, so an investment in salt tolerant plant research is supplemental. If we pursue desalting research in New Mexico, we start at ground zero and will have to import most of the technology and scientists needed for success.

#### Summary

As you know, economists are prone to judge various schemes through application of various rules and regulations from our textbooks. We are especially fond of the so-called "marginal conditions," and those of you who suffered through economics courses remember these conditions--marginal revenue equals marginal cost, or marginal value product equals marginal factor cost. Possibly the best economic criteria I know is "Randall's Rule." It is, "If it's such a damn good idea, why isn't someone already doing it?" This question must be answered before making a massive investment in New Mexico's saline water resources. A good answer would begin with acknowledgement that using saline water in the natural form is less expensive than desalting, that the supply of saline water is great, the distribution is global, plus good water is in short supply. So it must be a great idea--but why can't we do it?

We lack the basic research to effectively use saline water resources. For example, we do not know: what plants are salt tolerant, the condition of saline water aquifers, or the impact on soils of spraying saline water all over them. If you do not understand the physical and biological facts of life, you cannot calculate the economic facts of life. And if you do not know the economics, you cannot generate investment of consequence. Without investment, there is little development of the saline water resources.

So, in summary, and in response to the question, "The New National Water Policy: Will it Work in New Mexico?", I respond--YES! But for it to work here--stick a little basic research on use of saline water resources in your national water policy!