IRRIGATION USES, PRACTICES, PROBLEMS

James F. Cole[1/]

When one atom of oxygen is mixed with two atoms of hydrogen, and this gaseous mixture is ignited, the resulting product is water. Probably the most impressive mass demonstration of this basic chemical fact in history occurred at Lakehurst, New Jersey, May 6, 1937, when the German airship, Hindenburg, caught fire and burned.

For a product frequently used to extinguish fires, water in the West, has stimulated many heated and fiery controversies, sometimes with a minimum of light. In the past, it often caused lifelong friends to strap on their hardware and even today, few subjects can more quickly arouse ill-considered comments.

As the major consumptive user of water in the West, irrigation is sometimes the target of bitter invective. Since water rights provide water users with a measure of security, laws governing water rights are also attacked.

Consider this sample from a national magazine under the heading "Prior Appropriation Strangles the West."

"Sportsmen of seventeen states of the West are held helpless to fight for wildlife in the iron grip of a legal principle as outmoded as the one-horse-shay. Under this principle, judges must rule in favor of one, at the expense of many...simply because a law made to apply to the unique circumstances of one century does not work when applied to the entirely different circumstances of the next century. The law that is today being used in the West by a small but vicious vested-interest group is called the law of 'prior appropriation'."[2/]

From the Hearings before the Senate Select Committee on Water Resources comes this:

"My second point is the fact that our group is anxious that cooperation may be obtained in the multiple use concept in the use of water and all other natural resources and public property. We are firmly convinced that any people or group

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2/ Carhart, Arthur H., "Prior Appropriation Strangles the West," Sports Afield, Vol. 140, No. 1, New York: July, 1958

of people that want something for their own use only and to heck with the other fellow, are simply narrow-minded and have no concern of their children or their fellowman, or for the well-being of the Nation."[3]

Water laws are not the only laws attacked by segments of the population. Laws regulate human activities and are, therefore, destined to come in conflict with human desires and beliefs. The United States Constitution, containing the basic law for our unique form of government, is constantly under attack.

Here is a statement from a widely publicized and highly influential sociological study:

"This conservation in fundamental principles has, to a great extent, been perverted into a nearly fetishistic cult of the Consitution. This is unfortunate, since the 150 year old Constitution is in many respects impractical and unsuited for modern conditions.... Modern historical studies of how the Constitution came to be as it is, reveal that the Constitutional Convention was nearly a plot against the common people."[4]

The criticisms strike directly at the institution of private property. The incentive to develop, maintain and improve the efficient use of resources has its roots in the American concept of property rights. It is fundamental to the continued operation of our economic system as we know it today. The institutional factor of law is not the basic framework. It merely serves to modify economic influences. Many who would be furious and would strenuously oppose suggestions to have land declared public property of the state, see no parallel when such action is proposed for water. If we intend for property to seek its highest and best use, tenure must be assured and restrictions on use held to the minimum. Lack of tenure certainty will cause buyers to refuse to pay as much for property if a protected right cannot be conveyed, and holders of a right will hesitate to make significant development when there is a risk of seizure.

When an individual invests in land, buildings, equipment, or an irrigation system, he expects to recover these sunk costs. A farmer or any other investor, in a developing irrigated area with no well-defined water law, may be uncertain about the reliability and cost of his future water supply. As a result, he will probably hesitate to make permanent improvements and could probably find scant credit assistance for such improvements. He may even disinvest over time, in that he allows

3/ Water Resources, Hearings before the Select Committee on National Water Resources, United States Senate, Albuquerque, N.M., U. S. Gov't. Printing Office, Washington: 1960.

4/ Myrdal, Gunnar, et. al, An American Dilemma. New York: Harper and Brothers, 1944.

improvements already made to suffer from lack of maintenance and repair.5/

Uncertainty regarding property rights often leads to wasteful depletion. When property rights in resources are indefinite they become "fugitive" resources, to be captured by using them. To defer use gives rise to uncertainty. Competitors may capture the resource in the meantime. This was one of the fundamental issues in the declaration of the Rio Grande Underground Water Basin. Industry, as well as agriculture, requires valid and protected rights to water to protect investment. States without adequate water laws are increasingly confronted with this problem of tenure certainty.

A resource is something that people can use--land, water, ores, grass, machinery, labor. The object must have use to be a resource. Ground-water districts meant little to the Apaches. This water was not a resource until the settler developed it. A dictionary printed about thirty years ago defines uranium as follows: "A worthless metal, not found in the United States." In the light of present day exigencies, uranium has achieved resource status.

Conservation of resources does not mean non-use. Conservation refers to the rate of depletion. Conservation of such things as minerals is meaningless outside of this concept. Conservation has both economic and technical aspects. Technology concerns such matters as geology, hydrology, biology, or engineering. Economic considerations often prevent the adoption of conservation practices even though their technical feasibility has already been demonstrated.

The economics of conservation deserve more careful study. Natural resource users may use these resources wastefully, not because they know no better, but because they are compelled by economic forces to do so.

The theoretical efficiency framework for water resources decisions has developed slowly because we have only recently begun to think of water as a scarce resource. Most resources can be used for any one of a number of purposes. Allocation to one purpose, often means foregoing, or deferring, or reducing their use for other purposes. Economics has much to contribute to the solution of water problems but meaningful economic analysis requires large quantities of technical data.

5/ Hirshleifer, Jack, James C. DeHaven, and Jerome W. Milliman, Water Supply Economics, Technology, and Policy. Chicago: The University of Chicago Press, 1960.

The principal economic device used in balancing resource allocation in a competitive economy, is the pricing system. Individual wants and desires differ. In economic terms, people derive varying degrees of satisfaction or utility from the use of resources. In an exchange economy like ours, price allocates resources. If, for example, industrial use of a resource gives a higher net return than agricultural use of the resource, then, in a free economy, industry will purchase the resources from farmers.

In the allocation of resources, under a market system, the economist must emphasize--not the existence of unsatisfied wants or needs, but the effective demand--the measure of willingness and ability to buy. I may want or need a new suit, and do, but until I take cash in hand or an acceptable promise to pay to the local clothier, he will refuse to relinquish the suit. I want, and have rationalized that I need, more time off. Here again, the market system confronts me with alternatives. A less demanding job would probably not be hard to obtain if I were willing to forego some income and other satisfaction. No matter how badly I may need or want these things, it is highly unlikely they will come my way without some tangible commitment of my own resources and the more scarce the objects of my desires become, the greater the required commitment to obtain them.

Conservation has regretably become involved in moral, political, and enigmatic issues that add little to the solution of conservation problems. Resource conservation decisions involve carefully considered choices between uses within the framework of a market economy.

New Mexico water law meets two fundamental economic criteria. It provides the requisite security, so that investors may make improvements free from the threat of arbitrary action. Lending agencies feel free to commit their depositors' money. At the same time, New Mexico water law has incorporated within it the necessary flexibility to permit voluntary transfers of water rights within the market system. Changes in ownership, place of use, method of use and point of diversion have occurred and are occurring constantly within the administrative framework of the law so long as such changes do not impair existing rights.

New Mexico laws governing water rights closely adhere to the principles of Prof. Frank J. Trelease's Model State Water Code, a widely acclaimed pattern for water allocation legislation. Prof. Trelease says, "Prior appropriation, in the balance, seems to be the best extant system of law for river basin development in the United States....and the best of this law could be used as a model by any state to meet its local needs. The west has had a century of experience with water

shortages; the east is just beginning to fear them. The doctrine of prior appropriation has shown that it contains elements of remarkable flexibility and an ability to grow. It has made the transition from a pioneer system of acquiring water rights to a modern system of state control of water resources. Practically every suggestion yet made for the improvement of eastern water law has been based upon ideas, techniques or practices now current in the west."6/

Students of water law have marvelled at some of the farsighted water legislation adopted in our state. In addition, New Mexico has been blessed, as has been noted in previous conferences, with a practically unbroken series of able, and dedicated public servants in the office of the State Engineer. I'm sure that the group attending this conference will agree with me that the current occupant of that office exemplifies the highest standard of public service.

The beginnings of irrigation in New Mexico are lost in antiquity. The state has the oldest recorded history of irrigation development in the United States. Archeology has turned up well-developed stone reinforced irrigation systems dating back well before the Crusades, and when Coronado arrived in 1540 he and his men found flourishing irrigation systems along the major river systems.

Irrigation development continued to advance, utilizing the community acequia system that prevails even today in many parts of the state.

In 1846 Brig. Gen. Stephen W. Kearny entered New Mexico and promulgated the Kearny Code, which recognized previous water rights.

The Treaty of Guadalupe Hidalgo and the First Territorial Legislature laid a more solid basis for the doctrine of appropriation.

In 1850, improved land in farms in New Mexico totalled 166,201 acres and the value of farm property was $3.2 million. It was estimated that about two-thirds of the improved land was irrigated.7/

6/ Trelease, Frank J., A Model State Water Code for River Basin Development. Reprinted from the symposium on River Basin Development. Published as the Spring 1957 issue of Law and Contemporary Problems, Duke University School of Law and Contemporary Problems, Durham, N. C.

7/ United States Census data.

Post-Civil War Development

This year, 1962, marks the 100th anniversary of the signing of the Morrill Act by President Lincoln. This act set up the nation-wide system of higher education of which New Mexico State University is a part. I had hoped, in my research for this paper, to find some significant tie-in with developments following the Civil War. Several authors alluded to the rapid influx of settlers. During the period 1870 to 1880 New Mexico's population went from 91,874 to 119,565, an increase of about 30 percent in the ten-year period. The value of farm property went up five-fold and the acreage of improved land in farms increased nearly 66 percent. The big crops were corn, wheat, and other cereals.8/

The population was concentrated in the northern counties and settlers cultivated a considerable acreage under rainfall conditions. The community acequia system still flourished but enterprising individuals began to develop private diversion and distribution systems.

From 1880 to 1890 there was only a small increase in the improved lands in farms. The acreage of alfalfa more than doubled during the period, largely at the expense of small grains. In 1890 New Mexico had 91,745 irrigated acres divided among 3,085 farms. The big irrigated areas were in Mora, Dona Ana, San Juan and San Miguel counties.9/

During the next ten years, the number of irrigated farms trebled and total irrigated acres more than doubled. The acreage of alfalfa continued to increase faster than any other crop.

New Mexico State University was founded in 1888. The following year it became a part of the Land-Grant system of education, research, and service; and the Agricultural Experiment Station was established. Research work was immediately instituted on agricultural problems.

In the Fourth Annual Report of the Experiment Station (1892-93) R. F. Hare, Asst. Chemist, reported on his analysis of Rio Grande River waters. Irrigation research on various crops, including small grasses, alfalfa, sugar beets, fruits and vegetables, was furnishing valuable data for the rapid influx of farmers, most of whom knew little or nothing about irrigation techniques.

The first farmers' institute ever held in the territory met on this campus in January, 1896, only a few hundred yards

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8/ Ibid.

9/ Ibid.

from the site of this meeting. One of the major subjects for discussion was windmill irrigation.[10]

In 1900, nearly 90 percent of all crops produced in the state were irrigated. The average value of all irrigated land was $29.00 per acre but it ranged up to $369.00 per acre on the Carlsbad Reclamation Project. In 1900, the big irrigation counties were Mora, Dona Ana, San Miguel, Rio Arriba, Chavez, Colfax, and San Juan, in that order.[11]

1907 Water Code

The office of Territorial Engineer was established under the 1905 laws and in 1907 the basic water code in force today was passed by the Territorial Legislature.

In his First Biennial Report (1907-08), Territorial Engineer Vernon L. Sullivan acknowledged the assistance of the United States Reclamation Service and the Geological Survey. He observed that the citizenry was becoming aware of the rules promulgated to conserve water and perfect water rights. In an optimistic vein, Sullivan predicted that by 1915, two million or more acres would be under irrigation. Based on an assumption that forty acres would support an average family of four people, he predicted a farm population of close to 200,000 plus a substantial increase in the population of towns and business centers supported by agriculture.[12]

"The first prerequisite of a model state system of water law," says Trelease, "is that it should encourage, or at least not deter, maximum development."[13] The Basic Water Code passed in 1907 appears to have met this criterion.

The first ten years of the twentieth century saw the most rapid development of irrigation in New Mexico's history. Between 1900 and 1910, total irrigated acreage jumped from 203,893 to 644,970--a whopping 216 percent increase. The value of farm property trebled during the ten-year period.

10/ Annual reports of the New Mexico Agricultural Experiment Station.

11/ Census, op. cit.

12/ Biennial reports of the Territorial and State Engineers of New Mexico.

13/ Trelease, op. cit.

Eastern capital was attracted to the territory. Population increased 68 percent during the decennium. The number of acres in hay quadrupled, occupying about half of the irrigated area. Other major crops were wheat and corn.[14]

The $4 million invested in the Carlsbad Project represented almost half the value of all irrigation construction in the territory. Except for that project, development was financed largely by private and cooperative effort. All over the territory irrigation development was booming. It was a promoter's paradise. In San Juan County, one project alone proposed the development of over a million acres.[15]

The Pecos Valley Improvement Association had, a few years earlier, made an extensive development, including two irrigation systems, on the lower Pecos. One of these was washed out in the 80,000 second ft. flood in 1904 and the system was subsequently sold to the United States for a reclamation project. The upper project was "one of the best managed and most prosperous projects in the west." Called the Northern Canal, it took water from the Hondo River and later became the property of J. J. Hagerman. Near Maxwell, 6,800 acres were in cultivation on the Maxwell Irrigated Land Company Project in 1907, with expansion to 20,000 acres expected by 1908.[16]

At Elmendorf, on the Bosque del Apache Grant, the Socorro Company proposed to irrigate 22,000 acres of sugar beets, grain and alfalfa; and Engineer Sullivan urged that a sugar factory be established. Sugar beets were also to be the major crop of the Farmers Development Company of Springer. Also located near Springer was the French Land and Irrigation Company, contemplating the development of 43,000 acres; and the Lake Charette Reservoir and Ditch Company, which sought to appropriate the waters of Ocate Creek.[17]

Charles Springer of Cimarron owned the following projects: Cimarron, Ponillo, and Vermejo and the well-known Eagles' Nest, where a dam was to be constructed.[18]

14/ Census, op. cit.

15/ Biennial reports, op. cit.

16/ Ibid.

17/ Ibid.

18/ Ibid.

West of the Rio Grande two companies were at work on the Rio Puerco. Development of some 21,000 acres in the Blue Water and San Mateo Valleys was in progress. Projects were underway in Union, Taos, Otero and San Miguel counties and the big project, already in the planning stage, was Elephant Butte--planned to irrigate over 100,000 acres from storage in the "largest artifical lake in the world."[19]

The 1909 irrigation district legislation permitted the setting up of public corporations in order to bond land as security for construction loans. Noting the tendency to exaggerate the water supply, a bond schedule proportionate to the water to be appropriated was set up in 1910, to reduce speculative filing.[20] Three years later Director Fabian Garcia of the Agricultural Experiment Station observed that the get-rich-quick attitude was beginning to disappear.[21]

Ground-Water Development

During this whirlwind of activity involving surface waters, a few artesian wells were drilled (some as far back as 1860), and by 1910 there were over 400 flowing wells in the territory. In 1891, the first large, flowing well in the territory was drilled in the Roswell Artesian Basin. About 1902, farmers began to use artesian water for irrigation. At the time, the supply was considered inexhaustible; however, from 1905 to 1914 a noticeable lowering of the artesian head occurred and more and more farmers had to shift to the use of pumping equipment for the artesian acquifer.[22]

The first irrigation by pumping was largely from windmills. Adaptation of the centrifical pump to irrigation around 1900, greatly stimulated interest in ground-water development. In 1900, a little over 1,000 acres of New Mexico crop land was watered from wells. Two years later, New Mexico College of A & MA sunk a 48 ft. well near what is now the seed house (about ½ mile west of the New Agriculture Building), and began testing various types of pumping equipment. An Experiment Station Bulletin published in 1903 described pumping problems and in 1905, the first experimental data on cost of pumping in the territory, was published by the station. The pumping plants were steam powered, using gasoline, oil, or tornillo wood as

19/ Ibid.

20/ Ibid.

21/ Annual reports, Agricultural Experiment Station, op. cit.

22/ Biennial reports, op. cit.

fuel. The lift was about 35 ft. and the discharge 1,325 g.p.m. Total cost of water per acre foot, ranged from $2.21 to $13.20, depending on the type of fuel used. The average total cost per acre foot was about $6.00; closely comparable to present day costs. The college had some experience with well development prior to 1900. Records of the Experiment Station show that $591.00 was spent for the development of an artesian well at the Pecos Valley Substation in 1897.[23]

Pumping tests continued and in 1908 R. F. Hare and F. L. Bixby, staff members of the Agricultural Experiment Station, conducted pumping tests in the newly developed Estancia, Deming, and Pecos Valley areas.[24]

Cooperative irrigation work with the United States Department of Agriculture was initiated in 1898, and I am proud to say that this cooperation is continuing in 1962.

Pump irrigation was initiated in the Portales Valley about 1910, by the Portales Irrigation Company; although prior to that time, a few farmers irrigated small tracts with windmill flow. The company installed an electric generating system and had 69 pumping plants in service. During World War I the generating system was dismantled and sold. About 1925, irrigation interest revived and by 1931 more than 166 pumping plants were in operation.

The Mimbres Valley around Deming had a similar experience. Development began about 1908 and expanded rapidly to a peak of about 200 wells in 1915. Farmers were inexperienced, costs were high, and by 1919, only 25 plants remained in use. In 1927 land owners and business men conceived the idea of forming an irrigation or conservancy district and asked for a ground-water survey. A period of renewed activity followed and ground-water development increased steadily to a peak of almost 35,000 acres in 1953.[25]

In 1920, there were 461 irrigation pumping plants in the state, irrigating some 24,000 acres. An additional 37,000 acres were irrigated from flowing wells, making the total acreage irrigated from wells--61,000. Ten years later, in 1930, this total had increased by only 4,000 acres. In the meantime, the acreage irrigated by flowing wells had gone

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23/ Annual reports, Agricultural Experiment Station, op. cit.

24/ Ibid.

25/ Biennial reports, op. cit.

steadily down and by pumped wells--steadily upward. About 12 percent of the irrigated land in the state received water from wells.[26]

By 1940, the total acreage irrigated from wells had nearly doubled to 120,566 and 21 percent of the irrigated land in the state received water from wells.[27]

After World War II, under the impetus of high prices for farm commodities and a mobile population, irrigation in ground-water areas expanded rapidly; and in 1960, nearly two-thirds of the irrigated land in the state received water from wells. During this period, irrigation development was initiated in Hidalgo and Curry counties and greatly expanded in Lea, Eddy, Dona Ana, Torrance, Luna and Roosevelt counties.[28]

In the fiteen years between 1940 and 1955 the number of irrigation pumping plants increased nearly five-fold. The big factor in this increased acreage was cotton.

Cotton was found by Coronado's men as far north as the Upper Pecos River and the 1860 census records that 19 acres of cotton was produced in the territory.[29]

In 1920, the value of cotton produced in New Mexico was $1.4 million. In 1959, it was $73 million. The acreage increased from 10,666 acres in 1920 to a peak of 315,000 acres in 1953. During the 1940's, the acreage of corn steadily decreased; the acreage of barley increased; bean acreage, decreased; oats, decreased and alfalfa remained fairly constant although acreages of all of these crops fluctuated from year to year.[30]

The New Mexico ground-water code enacted in 1931 was originally designed to firm up ground-water rights in order to attract credit to ground-water districts within the state. It has prevented the type of uncontrolled exploitation of ground-water resources which has cocurred in neighboring states--accompanied by rapidly falling water tables and continuing scrambling for the precious water supply by lowering wells and other emergency investments.

One of the painful results of that type of development is rapidly increasing costs of pumping. The deliberate mining of ground-water supplies in declared underground water

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26/ Census, op. cit.

27/ Ibid.

28/ Biennial reports, op. cit.

29/ Census, op. cit.

30/ Ibid.

basins in New Mexico has been found by economic analysis to offer a much more favorable amortization period for private investment, as well as public investment in social institutions.

Surface Irrigation Since Statehood

Over the past 50 years the number of acres irrigated from ground-water supplies has increased ten-fold but the acreage irrigated from surface supplies has remained fairly constant. New appropriations in some areas have been offset by acreage abandoned in others. The big surface water development has been the Tucumcari Project. El Vado Dam was added to improve the control of water on the Rio Grande and several fine flood and sediment control structures have been built on the Rio Grande, Pecos and Canadian river systems.

The proposed Navajo Project is the big hope of the future irrigation development in the state. This type of development raises fundmental policy questions which have been discussed at great length. The major issue raised involved the advisability of public investment in agricultural development in view of chronic crop surpluses. You are all familiar with the argument. It goes something like this: the demand for agricultural commodities in the aggregate is inelastic--that is, an increase of one percent in supply results in more than one percent reduction in price (perhaps on the order of four percent.). It is further alleged that additional production is not now needed and may never be.

Some have even contended that it is sound public policy to invest in new water development programs on the grounds that food and fiber prices will be reduced and the public will thereby benefit.

The opposite view is that such projects produce crops not now in surplus and further, that the present agricultural base will not be able to provide the food and fiber needed by our rapidly expanding population.

The advantages to New Mexico and the Navajos are obvious.

The major problems of surface water irrigation users since statehood have been drouth, drainage, floods, losses to non-beneficial vegetation, sedimentation and seepage.

Recurring drouth has led to some changes in irrigation patterns. In the lower Rio Grande and lower Pecos Valleys, farmers have drilled hundreds of wells to supplement surface-water supplies. Investment in pumping equipment increases capital costs by approximately $80 per acre. These wells are a kind of drouth insurance.

Drought has aggravated the problems of silting, seepage, and phreatophytes. Conveyance losses are like fixed costs in a business. A reduced volume of flow does not reduce seepage losses proportionately. The water salvage work already completed and in progress on the Rio Grande and Pecos rivers has paid and will continue to pay big dividends. We need to make a much larger investment in research on phreatophytes and problems caused by sedimentation but we cannot afford to to wait for final research results. The State Engineer, the Bureau of Reclamation and other agencies involved in this vital work are doing a splendid job.

Drainage problems along the Rio Grande became evident nearly seventy years ago. They cropped up later in the Pecos Valley. By 1907, 58,000 acres in the Middle Rio Grande were badly seeped. Conditions developing below Elephant Butte were just as bad. Nearly two-thirds of the land in the Mesilla Valley had water within four feet or less of the surface. According to Bloodgood, the total irrigated area in the state in 1919 was 538,377 acres of which an estimated 300,000 acres badly needed drainage. Subsequent work by the Bureau of Reclamation has greatly alleviated this problem.[31]

Two of the most violent floods in the history of the Rio Grande occurred in 1929 when the river overflowed its banks near Albuquerque and the towns of San Acacia and San Marcial were wiped out. Damage ran in the millions of dollars. Serious floods have also occurred on the Pecos and Canadian rivers as well as on tributaries of these three systems. Flood control dams and levee reinforcement have largely eliminated the danger of major floods and the dams have also helped to reduce aggradation of stream beds due to sedimentation.

Seepage losses on farms, in distribution systems, and rivers continue to be a major problem. Seepage losses in canals and reservoirs appear to be large.

As mentioned earlier in this paper, farmers may occasionally use resources wastefully, not because they do not know better but because they are compelled by economic forces to do so. The water user can ill afford conservation of one resource which may lead to waste of other resources. It may be cheaper to leave water untended for certain periods and risk some over-irrigation than it is to hire a man to watch it all the time.

31/ Annual reports, Agricultural Experiment Station, op. cit.

Before investing in productive facilities, the investor wants to know whether the investment will give a reasonable return. There is a tendency to discount for risk, uncertainty, and time preference. The appropriation doctrine reduces risk and dependable water supplies reduce uncertainty but a dollar today is still worth more than a dollar, five years from today. Low incomes discourage conservation.

Favorable commodity prices following World War II stimulated an impressive private investment in water conservation in agriculture. Fields were leveled; irrigation systems, reorganized; irrigation structures, improved; ditches and farm reservoirs, lined; and erosion control structures, built.

Since 1935, and largely since World War II, over four million lineal feet of irrigation pipe has been installed and over four million lineal feet of ditches lined with concrete. Over 300,000 acres of land have been leveled for greater irrigation efficiency. These private improvements plus others mentioned above have involved the investment of some $50 million in conservation.[32/] Emphasis on this type of conservation should be continued.

The duty of water for various crops has not changed much over the years but the efficiency of water use has greatly improved. We are getting much more product and a higher quality product from the same amount of water input.

There is widespread concern that our water supplies are failing and only unprecedented measures will save us. The continued well-being of our economy depends on an abundance of low-priced water. The demand for water is increasing year by year and water is becoming increasingly scarce relative to demand. In casting about for a water supply some quite naturally covet the 95 percent of New Mexico's water allocated, by prior right, to irrigation.

Irrigation development was highly desirable in the early years becuase it brought in settlers, improved the tax base, and greatly increased employment opportunities. Modern agriculture is highly efficient. Commodity prices are low. Less labor is used. Agriculture is diminishing in relative economic importance in the state. I emphasize relative economic importance, since sales of farm products continue to expand but at a less rapid rate than sales in other sectors of the economy. But agriculture holds the water rights which might be used by others.

32/ Estimated from SCS data.

Agricultural development often accurs in areas where unrelated activities could not or would not locate. Foregoing agricultural water uses in these situations would mean no development at all. The irrigator is obviously a direct beneficiary of irrigation development, but the businessman and his family living in a trade center, or handling farm products, or furhishing supplies, is an indirect beneficiary. Social institutions, including hospitals, schools, churches and recreational activities must also have an adequate resource base.

Depletion of a limited ground-water resource may make it possible for a community to thrive sufficiently to enable it to grow and prosper and even bring water in as Los Angeles has done.

Under New Mexico water law the early appropriation of water by agriculture represents a kind of holding action. When it becomes economically feasible to purchase irrigation water for other uses, transfers take place just as transfers of land occur, at a market price. The law permits and even encourages changes in water use, not by encroachment but through the market system.

Any redistribution of resource use has many consequences. Some parts of the economy expand--others, contract. Shifts in water use may impoverish one area to enrich another. Experience in other states emphasize the many problems associated with mass transfers.

I am not prepared to predict the trend in irrigation use over the next 50 years. There are too many variables--economic growth, long term supply, price levels, water salvage propositions, etc. It is possible, however, to say that some ground-water areas will be in serious trouble unless recharge is greatly increased. This is an area of research which merits greatly increased emphasis.

Americans have a huge and growing appetite for water. We use many times as much water by weight than all other resources combined.

Fifty years from now our nation's population will have doubled. What will our water requirements be then? What will our food requirements be? One gets the feeling that somehow or other the Malthusian doctrine has some validity after all.