Agriculture and Natural Resources in the West: The Next 100 Years

Marion Clawson

A Bicentennial date is a good point in history to look backward and forward, to try to appraise from whence we came and to estimate where we are going. There is, of course, nothing magical about a 200th anniversary, but it sounds more impresive than either the 199th or the 201st ones do.

In the perspective of world history, 200 years is a brief time. In our preoccupations with what we did yesterday, what we are doing today, and what we might do tomorrow, we sometimes lose sight of the longer historical perspective. I spent two years in modern Israel, as many of you know. It was brought to my attention that Crusader kings ruled in Jersalem for 150 years and in seacoast towns for 250 years, yet the Crusaders are but one episode in that Land of the Bible. We like to think, at least in our more optimistic moments, that the civilization we have built is permanent or at least will not quickly succumb as have so many other civilizations in the world. None of us will be here to test our civilization's ability to survive for 500, 1,000, or more years but we might well be cautious in our predictions.

What we think of as a modern society is much newer in the western third of the United States than it is in the eastern-most two-thirds of the country. Most of our Western States only recently celebrated their 100 anniversaries as States. By any tests one cares to apply, the modern society, economy, and culture arrived here a couple of hundred years later than it did along the Atlantic Coast. Whether that proves that the West is rawer or that the East is more decadent is a matter I leave for your opinion.

It is true that the forefathers of the Indians occupied the West before they did the East. Those peoples crossed the Bering Straits at dates variously estimated from 13,000 to 20,000 or more years ago, and spread down the Pacific Coast and across the present country. It is also true that Spanish exploration or settlement or influence spread up from the South at dates roughly corresponding to those of the early East Coast settlements. While no one familiar with the West should under-estimate the effect of those cultures in our modern world, yet that world is dominately shaped by the tide of migration from the East.

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Role of Outside Influences in Western History

As I look at the long period of pre-history and the shorter period of history in the West, I conclude that outside influences have affected the life and culture of the area more than purely indigenous influences. Both, of course, have been involved. Outside forces and infleunces are always modified by the society into which they intrude. There is little to be gained by a debate on the relative force of imported and of indigenous factors and developments, but I think there is something to be gained by a quick review of the ways and the extent to which imported influences of one kind or another have affected life in the West.

The Indians almost surely brought many skills, artifacts, and ways of living with them, when they first crossed to the North American continent, and their culture evolved in many different ways by the time it had penetrated both North and South America. Although this process continued over some thousands of years, it was enormously briefer than it would have been had Man evolved from some different creature here in the New World.

When the Spanish brought the horse to North America, this profoundly and very quickly affected the Indians, especially here in the West. Natural grass and other feed for the horses, vast areas of

open land over which horsemen could move easily, and the enormous productivity of the horse for hunting and for war brought a technological revolution. Again, the time involved for these changes was but a tiny fraction of that which would have been necessary for the domestication of some native animal that might have served a similar role to the horse. Indeed, it is notable that the Indians domesticated no animals or birds on any significant scale, even in the several thousands of years they occupied the western world before white men came, although they apprently brought dogs with them.

The beginnings of modern society in the West came with the explorers, the miners, and the fur trappers. One can easily get into a lively argument by suggesting that one or another of these groups played a less important role than the others—as I have found out, the hard way, more than once. The explorers were, by definition, first but they often left little in the way of permanent settlement or even permanent influence. The fur trappers were often next but they too were transitory. The miners came early to many parts of the West; while their settlements were often transitory also, they did frequently lead to population movements and to types of economic activity other than mining. But, regardless of who was first or of how permanent and forceful was their influence, all of these groups were motivated by influences outside the West and each brought to the West an extensive culture, including artifacts. The European and other markets for furs and the worldwide demand for gold were far more influential in the development of the West than were the local markets or than was the indigenous culture.

When the railroads came to the West, approximately a century ago, they embodied the results of invention and of industry first developed in far distant lands. Likewise, the capital to build the railroads came, not from the West for the most part, but from the more populous East. The railroads were the first big step in the transformation of the West, but they were imported, not indigenously developed.

Education, science, and the arts were also initially imported to the West, not indigenously developed. Likewise, the form and functioning of government was an import, for the most part. Institutions of many kinds were imported, modified with experience, but basically remaining much like those of the East. It was only in the development of mining and water law that the West broke sharply with the Eastern United States. Western water law, at least, had some precedent in Spanish water law. Today many of us are dubious about the merit of the West's contribution of the mining laws.

Importations of cultures, technology, and artifacts are, of course, inherent in the spread of one people across a territory previously occupied by others. The dominant facts, in the Western United States are the speed with which the process of import spread and the extent to which the imported items overwhelmed the indigenous ones. Had white man's occupation and settlement of the United States west of the Mississippi taken a thousand years, or even three hundred, to reach the kind of development which existed by 1900, the kind of culture and economy which developed might have been quite different than it actually was.

The Intensification of Western Resource Use

The more than 100 years of white man's use of natural resources in the West can be summarized in one word: intensification. That is, to the natural resources of climate, soil, water, forests, minerals, and wildlife in the West, which existed when the first explorers crossed the region, have been added increasing amounts of labor, capital, and management. The basic heritage of natural resources has not changed, though it has become better known. The potential natural resources have been converted into actual usable resources by Man's efforts. To the basic resource endowment has been added large quantities of complementary inputs to produce both more outputs and more varied outputs than were possible in the era before white man's exploration and development.

For instance, the West has always had millions of acres of grasslands and other vegetative types suitable for the grazing of herbivorous animals. The buffalo and other grass-eaters utilized this native forage, and the Indian largely lived on these animals. White men began using the Plains and other Western grazing areas in a big way in the years immediately after the Civil War. Cattle replaced the buffalo in a very few years. Grazing is still the major economic use of millions of acres of Western lands, but modern ranching differs

from the earliest ranching about as the modern airplane differs from the saddle horse, as a means of personal transport. More knowledge about the grasses has led to their more valuable utilization; crop production has provided feed for winter weather, to eliminate the heavy winter losses due to inadequate feed; and improved breeds of livestock, plus modern veterinary medicine, has greatly increased the meat output from the same feed intake. The natural ranges, though valuable, are only a relatively small part of the whole western livestock industry today.

But modern irrigation differs considerably from that which the Mormons introduced into the Salt Lake Valley in 1847, and even more from that which Indians had practiced for preceding centuries elsewhere in the West. Water storage, water conveyance, and water application to the land have all changed. These alone might not have been so productive, but they have been a necessary part of an intensive scientific irrigated agriculture—a high cost, high output agriculture. Merely producing more crops and livestock might not have been profitable, if they could not have been marketed efficiently to reach urban consumers in distant markets. The sun, the rain, and the soil may be the same as the earliest explorers found, but their use and their output is very different today.

Crop production from relatively low rainfall but nonirrigated land has also been greatly intensified over the decades. I was amazed a few years ago to observe in the Columbia Basin of Washington, on lands that not many years earlier we had considered submarginal for wheat, high wheat yields obtained very largely through careful husbanding and careful use of the limited rainfall. Modern machinery enables the farmer to capture moisture and to turn it into wheat or other grain in a way that was impossible not long ago. Again, it is relatively high cost but high yield agriculture—relative, that is to the natural conditions on which it occurs.

More than 25 years ago, Wendell Calhoun and I wrote a BAE report on the longterm outlook for western agriculture. One relationship we discovered and measured was this very matter of increased intensification of western agriculture. Converting various types of land to a common denominator, as best we could from available data, we found that from 1900 to 1940 the gross output of agriculture per acre (of irrigated land equivalent) had been rising at an annual rate of nearly 3% compounded for California and at a slightly lower annual rate for the other Western States. I need not remind this audience that an output rising at a constant annual rate, even at a modest rate, in a comparatively few years increases a great deal. In part, this increased output represented higher and more valuable yields of the same kinds of crops and livestock, but in considerable part it also measured the shifts toward more intensive uses of the same land and associated resources. We found for instance, that output from various kinds of fruit orchards had risen more than had acreage, not only because yields of mature orchards had risen but also because increasing proportions of the orchards were in the heavier bearing age groups.

As nearly as I can estimate from a quick examination of the data available to me, this process has not only continued in the years since we made that study, but has accelerated. Recent cash income, deflated to the same price level we used, is considerably higher per acre of irrigated equivalent land than a mere extension of earlier trends suggests. This type of comparison is unavoidably only approximate, but it does reveal further major intensification of agricultural production in the west.

This process of intensification has taken place in many forms of natural resource use other than agriculture—in mining, for example. The earliest miners were interested primarily in gold and their tools were picks, shovels, wheel-barrows, gold pans, and simple sluices. Gradually interest spread to other metals, such as silver, copper, and associated metals, and then to the fossil fuels of oil, gas, and coal. Today large, expensive, complicated machines permit the removal of vast quantities of ore and overburden, at a minute fraction of the cost per ton of the comparable materials when hand labor dominated mining. Methods of mineral extraction from ores have also changed, and many of us have seen old dumps and tailings ponds worked over, to yield profitable amounts of metal from what were once waste materials. Metal deposits are worked in the West today with metal content far below what would once have been considered the threshold for economic operation.

Forestry, too, has changed in the West over the decades. Whereas once the interest was almost exclusively in cutting and processing only the

highest grade timber for relatively crude products, today there is great interest in more intensive forestry to grow trees, to take advantage of the other outputs of the forests, and to process the wood and other products far more intensively than formerly. Forestry may be on the verge of a substantial economic revolution, as I believe to be the case, but it has also changed greatly in the past.

Natural resource use in the West has become more intensive for personal services as well as for commodity output. Outdoor recreation, for instance, has grown steadily, at a rate close to 10% annually, and in the process has changed enormously. My father, if he were alive today, would be amazed at the amount, variety, and usefulness of the camping gear of the modern camper, for instance. Outdoor recreation has become more intensive, not only in its application of labor and capital to the land, but in its application of the same outputs to the consumption process. The enormous proliferation of summer homes is another aspect of this recreation intensification.

I could go on, citing other examples and dimensions of the natural resource intensification which has so characterized Western history for the past century, but I think I have made my point adequately.

In thus tracing the general trend toward intensification in the use of Western natural resources, I do not wish to leave an impression that all resource decisions have been wise or without permanent cost. Investment of capital and of labor have been made in resource development which have not paid off, or have not paid off well. Scars have been left on the landscape or on the environment. Some irreversible changes have taken place, that most of us would classify as degradations. Quite naturally, the best prospects for resource development were chosen for use and development, so that remaining undeveloped resources are, by and large, less easily developed or likely to yield less in relation to investment than previously used resources. We have, for instance, built dams on the likeliest dam sites, and as the resultant reservoirs gradually fill up, less attractive sites remain for future development. But too much should not be made of the mistakes, the scars, and the irreversibilities; they are probably no worse in the West than elsewhere in the United States or in the world, and there remains in the West an attractive and productive environment for future generations. If Man as a species is determined to multiply persistently, then he can scarcely expect to leave his environment unchanged.

What of the Future?

My review of the past is prelude to my consideration of the future. Modern Man, with his preoccupation with the present and the future, is ordinarily interested in the past as he finds therein helpful hints as to the future. My discussion today is no exception.

The Western United States is today and for the foreseeable future will be enormously more self-generating than it was 100 years ago, or even 50 years ago, or even a decade ago. The population, industry, commerce, and total economic activity and wealth of the West is greater than that of many fairly important nations today, or than that of the whole United States not so many decades ago. Regional markets, regional economy, regional science, regional education, and other aspects of regional life have developed to a self-generating level. The West could be a viable economy and society today, were it a separate nation. The relative domination of outside influences which so characterized earlier decades has greatly changed. The region consumes more of its output and exports relatively less today than in earlier times, and this trend will surely continue.

In fact, the influence of the West on national affairs has grown steadily in the past few decades and is likely to continue to increase in the future. California is now the most populous State, with all that this connotes in political and economic terms. The National center of gravity of population will shortly shift west of the Mississippi River.

But influences originating outside of the West will continue to have strong influences on the life and economy of the West. Important as are the regional markets for all kinds of Western products, export is still highly important. The nature of the markets elsewhere will continue to have major influence on Western production of all manner of products originating from natural resources. The West will continue to use and to consume many production and consumption materials and products originating elsewhere, including many originating from outside of the United States. There

will surely continue to be a substantial movement of people, into the West from elsewhere in the world, and from the West to other places for living and working. Important as are Western centers of research and education, they are not self-sufficient and will not be so; instead, there will be constant import and export from these centers. The West is very much part of the United States and of the larger world, and its cultural exchanges with other regions will continue to influence the West very much.

It is highly probable that the past trend toward more intensive use of natural resources in the West will continue. More capital, more labor, more management, and more advanced technologies will all be applied to the present natural resource base, as a means to the achievement of more outputs for human consumption and use. I think this intensification trend will continue for virtually all natural resources for virtually all uses.

For instance, I think the West will use its limited water supply and its limited area of really first class cropland more intensively in the decades ahead. Agriculture has been encouraged to waste irrigation water, by the system of water rights which make water transfers away from irrigation so difficult and also by the extensive subsidization of irrigation water costs. While these factors will continue in the future, I think irrigation use of water will come under increasing pressure to yield value products as great as might be achieved with the same water elsewhere. There remains little unused potential cropland in the West, but the intensive margin of cultivation can be pushed a long way beyond its present level.

I think it virtually certain that western forests, private and public alike, will be pushed into more intensive management for all kinds of forest outputs. Western forestry still labors under the psychological handicap of a vast heritage of mature timber; the shift to *growing* timber, as contrasted with merely harvesting it, has begun but needs to go much faster and much further. Some forested areas of the West have low economic potential for wood growing, and might better be reserved as forests for other uses. But some western forests can grow wood as cheaply as almost any forests in the world. Their output will be valuable to the West. Due to transportation handicaps, such as the Jones Act which makes water shipment to other parts of the United States nearly impossible, some of the western forests can produce wood products for export economically when they cannot produce wood for the eastern half of the United States.

The West will increasingly be the outdoor playground for the rest of the United States, as well as for its own residents. Mountains, lakes and streams, seashores, and other desired recreation areas will continue to be in demand, including as sites for vacation homes. Heavy subsidization of outdoor recreationists, in the form of low or zero user charges, stimulates demand, results in substantial income transfers, and reduces the incentive for private land owners to provide outdoor recreation. The free or nearly free campground is the recreation counterpart of the heavily subsidized irrigation water.

The special form of outdoor recreation known as wilderness use will also continue to increase in demand. Some form of rationing use on the more popular areas is already necessary and the need for rationing will increase. The rationing may be by higher charges, by degradation of quality until demand falls off, or by actual administrative rationing such as by permits, or by some combination of these measures. Management of wilderness areas is just beginning but surely will increase in intensity as use pressures mount. It is altogether possible that wilderness use produces the highest social values from certain areas, but so far it has produced almost no income to the supplier.

Even land used for urban purposes may well be used more intensively in the future. The rapid spread of the low density and sprawled suburb may well be approaching an end, almost regardless of population changes. The opportunities for more intensive use of urban land are many. In a great many metropolitan areas in the West, as elsewhere in the country, there is a lot of idle land within the metropolitan boundary. It is perfectly possible to device social policies to bring pressure on land speculators to put such lands to use.

The intensification process will almost surely continue for metals and fuels also. The demand for these products will be a force leading to their greater development, including the development of the leaner ores; but environmental pressures and requirements will make the exploitation of some minerals and fuels more difficult. A few years some of us thought that oil shale was a natural resource whose time had come. Now we begin to wonder if it is a potential resource which time has

passed by. The western coal deposits, unused for so long, largely ignored because apparently so remote from development, are now coming under intensive development pressures. Environmental factors will be serious here too, but the demand for electricity and the capacity of these coals to generate it make their development highly probable. The real questions turn on the circumstances surrounding such development.

Waste or residual disposal is a mounting resource problem in the West as elsewhere. In my youth no one thought about air pollution and empty tin cans and other refuse were dumped at some convenient spot just outside the town. Those days are clearly gone forever—as, unfortunately, may be clear western air. In the past quarter century or so we have discovered that the West is peculiarly susceptible to air pollution—that air inversions and the consequent stagnant air pollution are common in our western valleys. The West has other special waste disposal problems—beer cans rot more slowly in the western dry air and are covered up more slowly by the more slowly growing weeds on the roadside, for instance. Does the West have special waste disposal advantages? I have often wondered what advantage, if any, could be taken of the numerous closed drainage basins of the West, from which downstream drainage is absent.

Does the West have special advantages for the development of solar energy? Many but not all western areas have a lot of sunshine, but is this sufficient to give them an economic advantage in commercial development of solar energy?

Surprises?

The foregoing is a fairly conventional attempt to project or to forecast the future. As such, it examines the forces which have shaped the past, tries to see how these forces will operate in the future, and includes any new forces that seem apparent. The process has great utility, especially if one does not get too enamored of his product.

But what are the possibilities of some "surprise," some wholly new force or factor, not now perceived, perhaps impossible for anyone to perceive now? I have in mind such things as the current debate over nuclear power, which in 1940 was unforeseen by ordinary people, perhaps unforeseen in its present dimensions even by those physicists who believed nuclear power releases were possible. As one looks back into history, the role of the unexpected development has often been very great.

There is a certain illogic in any query about surprises. If any development can be foreseen, then it is not a surprise, in this terminology; and if it is a surprise, then it cannot be foreseen and speculation about it is fruitless. But I think it is still worth asking the question: What event, process, relationship, or factor not now evident might possibly arise, that would drastically change the direction or the shape of agriculture or of natural resource use in the West, away from the course which I think is probable in view of past and present trends?

I cannot answer my question, and I shall not try. I hope only to stimulate your imaginations.