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Land Use in a National Perspective

Melvin L. Cotner

Land use and land use planning are controversial topics. Among these topics is a concern about the preservation of agricultural land. There is little disagreement that the supply of agricultural land is limited, that the competition for it is increasing, and that public policy is needed to assure its wise use. However, there is disagreement over how far public land policy should go to maintain privately owned land in agricultural uses.

Some of this disagreement stems from a lack of understanding of all the objectives revolving around the preservation issue. For example, my emphasis focuses on a national perspective of land use and our future U.S. agricultural production capacity. But, assuring an adequate national food and fiber supply is by no means the only reason to consider policies to preserve or conserve agricultural lands—there are also concerns over suburban sprawl, aesthetics, recreation, air and water quality, and the future viability of agriculturally-based communities. Conclusions I draw about land use and our future food supply should not detract from the very real concerns over these other vital issues.

I make this point because our assessment is that the United States *will* be able to meet its anticipated domestic food needs and moderately high export demands. In addition, I will briefly review research that would be useful in the development of viable public policies and programs on agricultural land, and land use planning.

We Are Approaching Our Cropland Limits

Our current use of land for crop production is about 367 million acres, compared to a 50-year high of 387 million acres used for crops in 1949, a

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dip to 333 million acres in 1969, and a subsequent rise to 361 million acres in 1974. During 1961-72, land set aside or diverted from crop production under federal programs ranged from 37 to 65 million acres.

Today, with growing world demand for our food and fiber and in the absence of federal supply management programs, farmers are edging toward the upper limits of the cropland readily available for use. Future advances in farm output will depend upon increases in productivity and development of more cropland through shifts from other uses.

What Are the Chances for Higher Productivity?

U.S. farmers have boosted total food output by 50 percent since 1950 by relying more on machinery, fertilizer, and other modern inputs than on the traditional inputs of land and labor. Will this trend continue?

The most obvious question lies with the energy crunch and its impact on fuel and fertilizer supplies for agriculture. But, as recent shortages demonstrated, farmers are likely to get priority energy allotments and, with them, further increases in productivity are possible. The productivity of additional application of fertilizer may not be as effective as in the past.

To make very specific predictions about the advance of technology and productivity is dangerous if not foolhardy. The range of scientific disciplines involved and the varying adoption rates of new technology in agriculture are mindboggling. On the positive side, the following factors are of interest:

- Commercially available hybrids of wheat, barley, and soybeans are not far off.
- Grains are being restructured to enhance their protein quantity and quality.

- Wider adoption of crossbreeding and artificial insemination could spur beef production by as much as 20 percent.
- Substitution of more vegetable protein for animal protein in the human diet would reduce cropland needs significantly. An acre of land in legume crops will produce 10 times the protein for human consumption, compared with an acre in feed grains used to produce protein through beef cattle.
- Weather modification to change precipitation patterns, reduce hail losses, and minimize storm damage appears possible and may significantly influence productivity in the Western regions.

But, mirrored against these and many other potential advances are some definite spoilers. Because of our increasing concern over environment and health, some production inputs such as the pesticides DDT, 1080, aldrin, and dieldrin have been discontinued. Withdrawal of each output-increasing or cost-reducing input lowers production unless substitute inputs are developed and used.

Some climatologists argue that the American farmer has experienced unusually favorable weather patterns since WW II. Less favorable weather for one or two decades could significantly affect our rain fed agriculture.

Another potential constraint on farm output is the price of commercial fertilizer. Like grains, prices of elemental fertilizer nutrients have more than doubled in recent years. As indicated, we expect fertilizer and fuel to be available for agricultural purposes, but higher prices would encourage farmers to use less, thereby reducing production levels.

Balancing these natural phenomena, higher costs and environmental constraints against oncoming technology suggests that our farm yields will increase but at a dampened rate. At best, increases in productivity per acre are not expected to exceed the rates of increase of the last three decades.

More Crop Acres—How Many Can We Develop?

There has been a slight drop in land identified as cropland over the last several decades. Some land drops out because of economic obsolescence and other land is reclaimed. Newly developed land has recently appeared at the rate of about 1.3 million acres a year. This has come about through

expanded irrigation, drainage, land clearing, and development of dryland farming. In Florida, it has been through irrigation and drainage. Land-owners in the Delta have cleared and drained land. Improved dryland farming techniques in Northern Montana and drainage, clearing, contouring, and leveling in the Corn Belt has added to cropland. And, in the Far West and the Great Plains irrigation has been a major factor for new land being added to our cropland base and for increasing as much as several fold the output of other land previously dry-cropped. Oklahoma, Kansas, and Nebraska have also experienced large increase in irrigated acreage.

But cropland has been released to other uses at the rate of 2.7 million acres a year, especially in the States south and east of the Corn Belt except the Delta and Southern Florida. Low soil fertility, terrain unsuited to modern machinery, and small uneconomic field units are among the reasons for these declines.

Urban encroachment accounts for about 500,000 acres of the cropland loss each year. While large, the loss to urban development is not extremely significant when compared to the existing cropland base of 385 million acres. We develop more new cropland each year than we lose to urban development. But, this loss can be significant in local areas; moreover, urban areas tend to compete for the better agricultural lands and these conversions tend to be permanent.

On balance, average productivity per acre has probably increased because of the cropland change. Much of the new cropland development has been in areas with more productive soils or land better adapted to improved technology. The land dropped from crop uses, except for urban conversion, generally has lower productivity.

Much land that is not presently being cropped potentially could be. A 1967 inventory by the Soil Conservation Service identified almost 266 million acres of tillable land that currently are in pasture, forest, and other uses.

Of the 266 million acres of land with potential for regular cultivation, about 110 million are considered to be physically well adapted for conversion to cropland within one or two decades. A substantial part of this acreage is in the Great Plains region. If we assume that 110 million acres can be brought into production, feed grains, in particular grain sorghum, cotton, citrus, wheat

and soybeans could increase significantly. Much of the potential cropland is not used for pasture. Present surveys in Alaska indicate that 18.5 million acres of land appear to be suited to barley production. Alaska also has considerable range forage capacity if it can be utilized.

The basic question concerns what conditions would be necessary to induce production on this reserve of cropland. It may be more difficult than most anticipate if recent experience is any indication. With acreage limitations removed and farm prices up, no major shifts to bring more land into production have yet been observed since 1972.

Demand for Farmland Is Mounting

The demand for food, fiber, and timber products will increase. The growth in basic demand for food, fiber, and timber stems from a complex set of factors:

- World population now exceeds 4 billion and may reach 7 billion by 2000. While population growth rates have diminished in the developed nations, the growth rate tops 2.5 percent in less-developed nations. In the face of rising populations in areas unable to provide enough of their own food, increased commercial and food-aid exports will be needed. Our foreign policy may call for more exports and thereby place added stress on our agricultural capacity. The production from 3 out of every 10 acres is now exported for both commercial and food-aid purposes.
- U.S. population is expected to reach 264 million by 2000. Population growth rates have been reduced to near the replacement rate. In spite of this fact, sufficient numbers of our population still are, or soon will be, in child bearing age which will continue to increase the absolute levels of population. Also, immigration is a factor in current population growth and could become more important.
- Perhaps an even more important demand factor than mounting populations is growth in incomes. Here and abroad, those with greater wealth and higher incomes demand animal protein diets which spur demand for feedgrains. For example, a third of the world's population—those in the developed nations use nearly as much cereal for livestock feed as the other two-thirds—in the low-income nations—use directly as food.
- And policies of foreign nations enter the equation. A political decision by the Soviets to pur-

chase grains to cover shortfalls in their production has been felt worldwide the past several years. Their demands on our wheat supplies have been unprecedented.

There are, of course, many other factors, including the agricultural productive capacity of other nations, changing weather patterns, as well as emerging trade opportunities that affect the demand and supply of agricultural land. The demand for agricultural land is much more complex than a simple extension of the demand for agricultural products. Conflicts between competing uses may multiply pressures on our agricultural land base:

- There is a food-energy trade-off when strippable mineral and energy deposits are located beneath prime land.
- In some areas, competition for limited water supplies from industrial and municipal users may reduce the supply of water for irrigation.
- Use of water for energy production as in coal and oil shale conversion may preclude irrigation or reduce the quality of water for irrigating large areas of potentially productive land.
- Some lands are unique—with special soil, climatic, or location factors which make them well suited for specialty crops. If these lands are converted to nonagricultural uses, domestically produced supplies of these crops may be permanently reduced.
- Urbanization, of course, presents a continuing source of conflicting demand for residential development, open space, waste disposal, industry, and agriculture. At the time of the last Census, nearly 15 percent of all cropland in the United States lay within areas immediately surrounding our major urban centers.¹

Implications for Agricultural Land Policy

The evidence suggests that the national agricultural land base is certainly adequate for domestic needs. And, sizable world needs can be served. Nevertheless, there is sufficient uncertainty regarding factors affecting future productivity to warrant careful consideration of our policies concerning

¹The phrase, "... within areas immediately surrounding our major urban centers," as used here, is a surrogate for the standard Metropolitan Statistical Areas (MSA) which is a county or group of contiguous counties containing at least one city of 50,000 inhabitants or more.

farmland use and conservation. Potentially important future constraints on production include: energy costs, water availability, increasing costs of nonland inputs, environmental restrictions, a declining rate of advancement in agricultural technology, continued conversion of productive farmland to nonagricultural uses, and volatile export demands.

Perhaps the most compelling justification for increased concern about the conversion of agricultural land to other uses, however, comes not from the national production perspective but from the state and local perspective. Maintenance of land in agricultural uses may serve important public purposes which are not readily apparent when viewing the situation from the national vantage point. Agriculture is very important to the economy of many States and local communities. Continuation of land in agricultural use may be helpful to the maintenance of air and water quality in many areas.

The cumulative weight of the arguments implies that land use decisions should give full consideration to farmland. Let me draw some implications from what I have said:

1. There is an increasing amount of interdependence between land uses and among regions in the use of land.
2. The traditional market system is not sufficient in providing for the wise use of our lands.
3. Land use planning and the coordination of programs at the national, state and local level are essential if we are to make wise use of our lands.
4. Efforts to limit the unwise conversion of agricultural lands to other uses are in the public interest. Our most productive lands should not be withdrawn from agriculture without full consideration of the impact of such actions.

Research Could Help in Land Use Policy Decisions

Many information needs exist concerning agricultural land use issues. Improved data on the supply, availability and use of land, as well as the demand for land, would be useful in decisions about policies and plans for land use. In addition

to an improved resource data base and monitoring systems, multi-disciplinary research is needed in the following areas:

Resource Ownership

We have little information about the ownership of our natural resources. Information on the characteristics of the owners, their current and future plans about the use of their land holdings, and other tenure characteristics would aid in assessing land availability for various uses. Information on the ownership of sub-surface, as well as surface rights, would be helpful in determining potential conflicts in use and means for resolving resource control problems.

Competition for Agricultural Land

While the thesis of this paper is that our agricultural production capacity will not be impacted significantly by urban demands, many competitive forces need to be studied and monitored. Recent trends in population shifts suggest that non-metro areas may experience increased rates of growth in the future. The demand for small acreages for primary and secondary residences may increase. Some of this land effectively is not used for agricultural purposes. The extent and impact of the demand for small parcels for residential use needs additional study.

Energy and mineral development also impacts the availability as well as the quality of our land and water resources. Some mineral extraction can disturb vast areas of land; water used for mineral processing and/or transport (slurry pipelines) also becomes competitive in irrigated areas. These and other competitive forces need assessment.

Economics of Land Use Adjustments

Urban influences on the use of rural lands are inevitable. The demand for residential land will continue, and we expect the desire for parks and recreation areas to remain strong. Public demand for the reservation of land for scenic and environmental purposes also is expected to expand. The co-mingling of agriculture and urban uses creates conflicts and potential impacts on all uses. The costs of sewer and water facilities may be increased. The agricultural base may be reduced to the extent

that local suppliers and processors for the farm sector become inefficient or close operations. Increased land values and speculative holdings influence farmland use and investment patterns. These and related adjustments should be studied to determine appropriate actions to facilitate and guide land use change.

Investments to improve land for agricultural use are possible in many regions. Drainage of wet soils, irrigation, land clearing, and conservation measures, represent investments to increase agricultural capacity. At the same time, agricultural areas are being abandoned representing disinvestment and the loss of national agricultural capacity. Many of these adjustments are made at the economic margin representing high risks for both new and existing investments. These potential adjustments may impact the supporting agricultural industries and likely will influence the community infrastructure. Analysis of these adjustments will be helpful in the development of policies and programs to minimize the social cost of these adjustments.

Controls on the Use of Resources

Increasing public concern over land use and the failure of the market to allocate resources in accordance with these concerns suggest that states and local communities will be trying a variety of mechanisms to achieve a blend of public and private interests in the use of land. Studies are needed to improve the land use planning process to improve capabilities to consider the several interests in land use decisions. Arrangements are needed especially to ensure that the broad public and social interests are reflected in land use matters.

With the increasing concern to maintain our better farmlands near urban areas in agricultural production, improved mechanisms are needed to encourage or regulate lands for desired uses. Approaches such as state-wide zoning, separation of development rights from agricultural uses, sanctions and incentives, need analysis to determine their possible role in achieving desired land use. The intergeneration transfer of property often results in taxes and legal costs which influences ownership patterns and uses. Studies are needed to assess the effectiveness of these mechanisms and suggest improvements and applications.

Environmental Issues Associated with Land

Recent legislation dealing with point and non-point sources of pollution requires planning and

actions by state and local governments to deal with these issues. Soil movement resulting from erosion carries nutrients and chemicals that create water quality problems. Restrictive erosion limits could influence land use patterns and, in some instances, reduce the amount of land in agricultural use. Regional land use patterns could be affected. These potential impacts, along with possible measures to ameliorate the effects, should be studied.

Rural lands are prime targets for urban wastes. New sites are needed for land fills. Methods are being developed to convert organic wastes to sludge for application on land. Research is needed to improve land site selection and operation of land fills; work also is needed on the economics of sludge application as a means of improving resource utilization.

Concluding Comment

On balance, I am optimistic about the availability of lands for agricultural production in the U.S. and for sizable export markets. This is not to say that we have the capacity to solve world food needs. Our agricultural plant clearly is incapable of providing food for all the malnourished and starving in the world. As a practical economic matter, the purchasing power of less developed countries for food imports appears to be a significant constraint on the demand for land for agricultural purposes. Food aid programs could expand our exports, however, the egalitarian motives within the U.S. may limit agricultural expansion, especially when such programs are translated into increased domestic food prices, taxes and regulation. We should not become complacent about our land base, however. Conversion of productive lands to other uses when other less desirable agricultural sites would suffice for these uses seems irrational. Even though other uses have legitimate claims for use of our lands, I feel that we should follow policies to maintain our agricultural capacity options as long as possible.

An equally important reason for a concern with land use is the attainment of rational land use patterns surrounding our cities and towns that reflect both private and public interests in the use of the nation's land. Maintaining viable economic communities based on agriculture and related industries can be combined with measures to preserve open space and achievement of other environmental objectives through research, planning and public discussion of options available leading to desired uses of land.