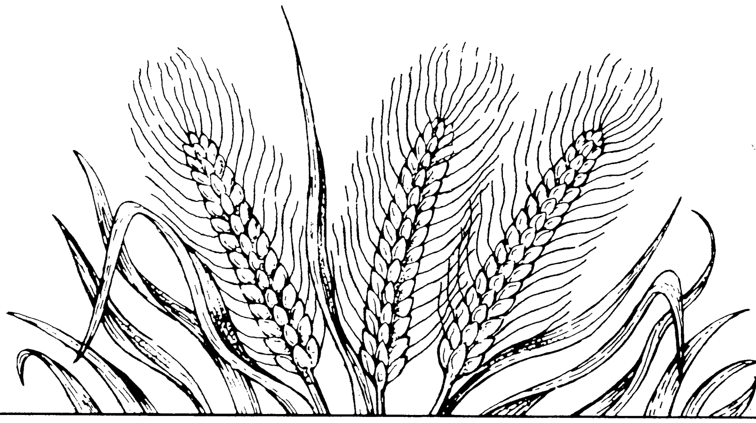
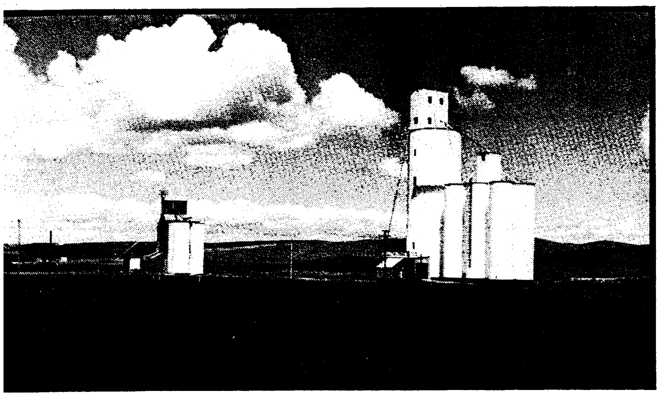
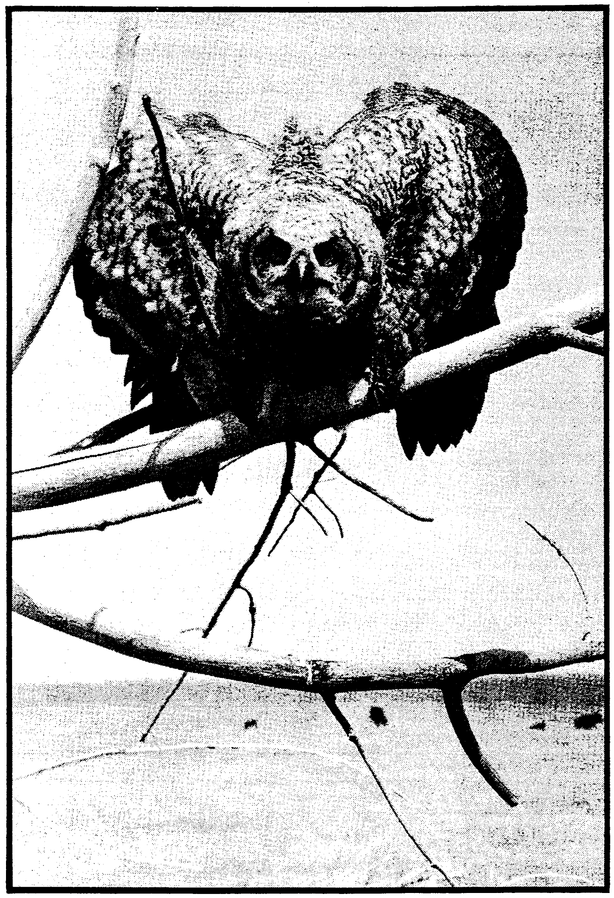
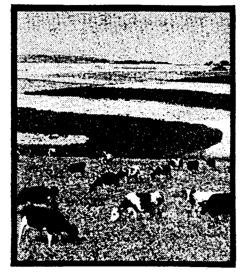
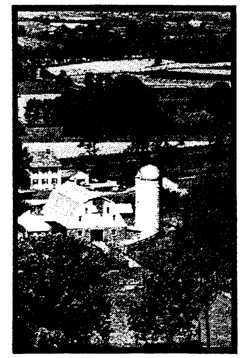
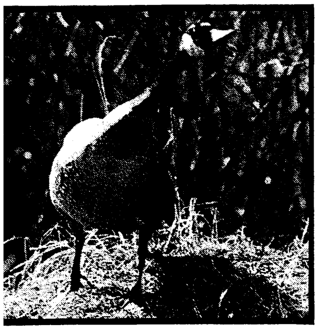


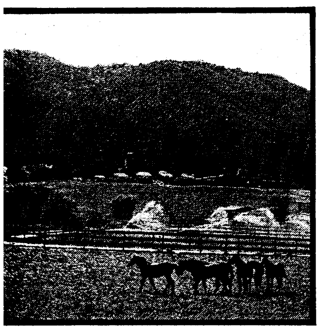
National Agricultural Lands Study

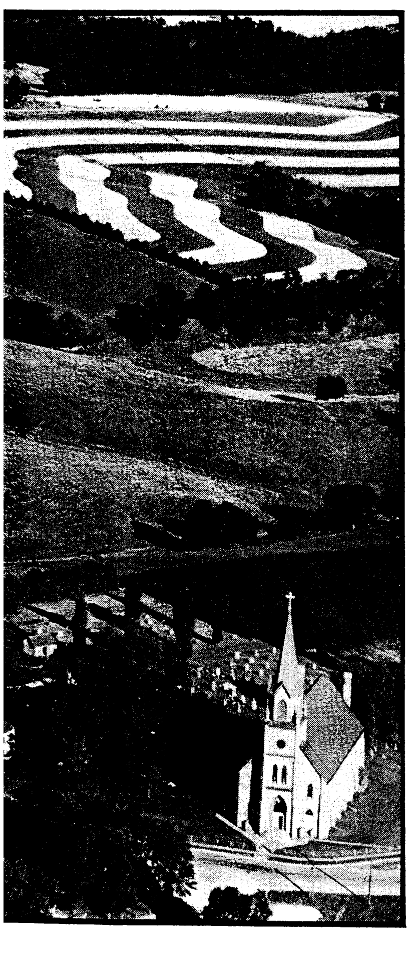
Interim Report Number Three

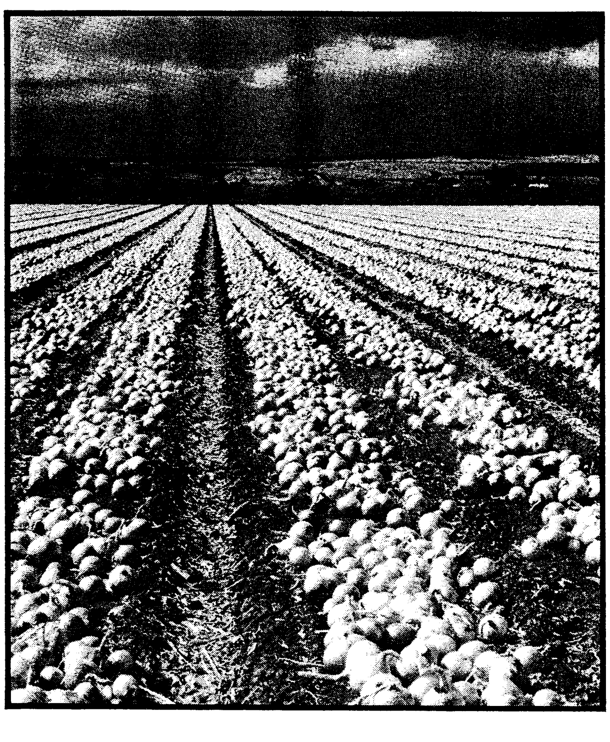
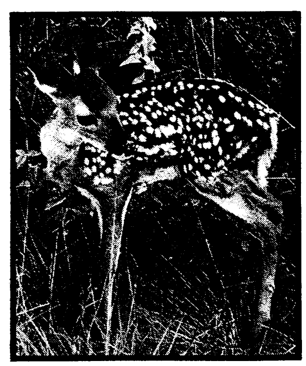
Farm Land and Energy: Conflicts in the Making

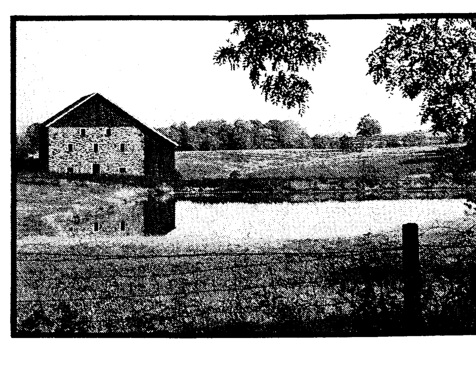








National Agricultural Lands Study

Farm Land and Energy: Conflicts in the Making

by
W. Wendell Fletcher

Vice President
American Land Forum
Washington, D.C.

PREFACE

The National Agricultural Lands Study has now been in operation for a little more than a year. In a few months, NALS will submit its final report to the President.

During the course of the 18-month study, we will continue to release interim reports covering a variety of subjects that relate to the availability of U.S. agricultural land. The purpose of these reports is to illuminate issues that affect the status of our agricultural land, and our ability to produce food, fiber and wood for the future. These interim publications are not parts of the final report, nor do they contain recommendations for legislative or executive actions.

Interim Report Number One outlines the study's program of research. Interim Report Number Two presents basic information about the American agricultural land base in concise wall chart form. The agricultural land data sheet focuses upon non-federal lands only. On an individual state-by-state basis, it shows the total acreage of crop, pasture, range and forest lands; total prime farm land, and the number of agricultural acres converted to non-agricultural use in each state between 1967 and 1977.

Interim Report Number Three, contained within this publication, describes the possible future effects of energy development on our agricultural lands. It addresses some of the conflicts that may arise as the nation's energy program evolves in the months ahead.

These points of potential conflict bear careful consideration so that U.S. energy and agricultural policies can be as mutually supportive as possible.

August 1980

Robert J. Gray
Executive Director
National Agricultural
Lands Study
Washington, D.C.

Acknowledgement

The connections between energy policy and farmland involve a number of subject areas, and many colleagues have provided valuable assistance. I should especially like to thank Michael Brewer, Research Director of the NALS, Suzanne Wellborn of the Department of Energy, and Joseph Biniek and Susan Abbasi of the Library of Congress. Charles Benbrook of the Council on Environmental Quality, and Don Van Dyne, Joe Barse, Ron Meekhof, Melvin Cotner, Kathryn Zeimetz, Thomas Frey and Robert Otte—all of the Department of Agriculture—provided many helpful suggestions for which I am grateful.

W. Wendell Fletcher
Vice President
American Land Forum
Washington, D.C.

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One: INTRODUCTION

The intensifying effort to develop domestic energy resources could have unintended repercussions for the country's agricultural land base. Efforts are now underway to expedite development of new coal mines, power plants, synthetic fuels facilties and other kinds of energy facilities. These projects may compete with agriculture for land, and could have other consequences, such as increased air pollution and intensified competition for water, which would affect the country's agricultural land base and production potential.

In addition, an effort is now underway to produce alcohol fuels from biomass—-agricultural crops and residues, trees and other organic matter that can be produced on a renewable basis. Many uncertainties exist at this point about how rapidly production of alcohol fuels from biomass will expand. But, if a major industry does develop, demands currently being placed on the agricultural land base to produce food, fiber and forest products could be compounded significantly. Moreover, concern exists about possible land degradation problems that could result from this intensified demand.

These energy initiatives are occuring at a time when many long-held assumptions about the productive capacity of the nation's agricultural land base are being reevaluated. The country once was thought to have more than enough land to meet any foreseeable agricultural needs, with plenty left over to absorb the other land requirements of a growing population. But, as foreign demand for U.S. food has mounted rapidly in recent years, uncertainty has developed about whether we will have enough land to meet long term demands for traditional food, feed, and fiber products.

During the 1950's and 1960s, U.S. agricultural production increased dramatically, while the amount of land used for crop production actually declined. Many factors contributed to this situation, but modest energy costs, generally favorable weather, advances in agricultural technology, and, by today's standards, moderate world demand for U.S. food, tended to keep the amount of agricultural land in production fairly stable. By the mid-1970s, however, most previously idled cropland had been brought back into production—largely in response to escalating world demand for U.S. food.

Between 1969 and 1977, land in crops increased from 333 million acres to 376 million acres—a very high proportion of the 413 million acres that the USDA Soil Conservation Service considers to be in the country's total cropland acreage.

U.S. agricultural exports have continued to grow in subsequent years, and have become a major factor in offsetting U.S. trade deficits incurred because of the high cost of importing oil. In Fiscal Year 1978, for example, agricultural exports amounted to about $27 billion, while oil imports cost the U.S. $42 billion. Without agriculture's offsetting influence, the overall U.S. trade deficit would have doubled.[1] To meet this escalating world demand, U.S. farmers now export agricultural products from over 100 million acres of cropland each year[2]—twice the acreage dedicated to meeting export demand a decade ago.

Many factors, such as improved agricultural production in other parts of the world, and breakthroughs in agricultural technology, could reduce the amount of land used for crop production in the future. But few analysts anticipate a return to the low levels of cropland utilization that occured in the 1960s.

At the same time, the country's agricultural land base is now widely perceived to be more limited in extent, and subject to greater development pressure, than was once thought. A decade ago it was believed that about 266 million additional acres could be brought into crop production if the need arose. Today, the Soil Conservation Service believes that only about 127 million acres have a high or medium potential to be added to the cropland acreage of about 413 million acres. And, of this, only 36 million acres can be readily converted to tillage without clearing, draining or other expensive land preparation measures.[3]

SCS also believes that about three million acres of rural land are being converted into housing, water impoundments, highways and other non-agricultural uses each year—about a third of which is prime agricultural land.[4] Although uncertainties exist about the comparability of this survey with earlier surveys, it was formerly believed that only about one million acres of rural land each year were converted to non-agricultural use.[5]

The potential effects which energy policy decisions could have on the agricultural land base have not received a great deal of attention from energy planners. In part, this may stem from a feeling that developing domestic energy supply alternatives is such a crucial matter that other conerns will have to give way. It would be ironical, however, if new energy initatives come into conflict with agriculture. For agricultural policy and energy policy now interact in complex ways. U.S. agricultural exports already play an important role in offsetting trade deficits incurred from oil imports, and, in the future, alcohol fuels produced from agricultural products could help reduce petroleum imports.

Yet the potential for conflict is there. Without careful assessment of their full ramifications, policies to encourage alcohol fuels production could affect traditional agricultural activities in unintended ways. At the same time, efforts to expedite development of power plants, mines and other energy projects could come into conflict with policies to protect agricultural land.

In order to provide a basis for assessing this potential for conflict, subsequent sections of this report discuss various topics related to energy development and agricultural land in greater detail. The first is a discussion of the land implications of growing "energy crops." The second deals with the land implications of more conventional forms of energy development, such as coal production and utilization. A final section discusses policy implications at the federal level which are relevant to the conflict between agricultural land and energy development.

Two: ENERGY CROPS: FUELS AND LAND

It has been known for decades that ethanol, an alcohol produced from grain, could be used as an automotive fuel—either as a supplement to gasoline, or as a direct replacement for it.[6] Early automobiles were designed to run on either gasoline or alcohol, and, during World War II, grain produced in Nebraska, Kansas and Illinois was converted into ethanol for fuel use.[7] Because the security of U.S. oil supplies was threatened, considerable research on ethanol, as well as other petroleum substitutes, was also undertaken at that time. But, for most of the automotive era, gasoline was so cheap and so readily available that alternative liquid fuels seemed of little importance.

Between World War II and November 1978, when Congress exempted "gasohol" blends from the $.04 per gallon federal sales tax, virtually no ethanol fuel was produced from agricultural commodities. The tax exemption is equivalent to a $.40 per gallon subsidy of ethanol for use in "gasohol" blends of one part ethanol to nine parts gasoline. Since the subsidy, ethanol fuel production has increased rapidly. In 1980, an estimated 80 million gallons of ethanol will be produced—enough to produce 800 million gallons of gasohol when blended with gasoline.

Ethanol currently displaces only a tiny fraction of U.S. gasoline consumption (now over 100 billion gallons a year) and is not likely to provide more than a small portion of total automotive fuel requirements if grain is used as the feedstock.[8] But, in January 1980, President Carter announced a major new program aimed at increasing ethanol production to 500 million gallons a year by the end of 1981.[9] Administration sources are hopeful that as much as 1.8 billion gallons of ethanol per year could be produced by the mid-1980s.[10] If this ethanol were blended with gasoline in a one to nine ratio, enough gasohol would then be available to provide about 20 billion gallons of unleaded gasoline annually, one-third of the demand for unleaded gasoline.[11]

While commercial-scale production of ethanol for automotive fuel markets has received a greater amount of publicity, small-scale, decentralized production of ethanol for on-farm use is also attracting considerable interest. On-farm energy consumption by U.S. agriculture amounts to about 1.2 quads of energy per year. A portion of these energy requirements could be met by production of fuels on farms themselves, or on a cooperative basis among several farmers.

The Department of Agriculture, the federal agency with primary responsibility for not only agriculture but also forestry, recently has given alcohol fuels production a major new emphasis. In describing the Department's new program to Congress, Deputy Secretary of Agriculture Jim Williams noted: "This alcohol fuels program represents a basic policy change. The USDA is now including production of farm commodities for alcohol feedstocks as a major objective of agricultural policy—alongside the production of food, feed, and fiber. Grain reserve targets, commodity price supports, acreage diversion and other related agricultural policies are being managed to include the grain requirements for alcohol equally with other consumers of grain.''[12]

To what extent, and how, will alcohol fuels production affect the agricultural land base? This question has only recently begun to receive much attention—a circumstance that is not surprising, given the fact that alcohol fuels themselves have only recently been considered as an alternative source of energy. The answer will, of course, depend upon a great many factors, such as the future level of alcohol fuels production, the kinds of biomass that are used as feedstock, the care that is taken to minimize soil erosion, and the extent to which new innovations will affect the land.

Little certainty exists at this time about how much ethanol will be produced in the future. Ethanol is not yet cost competitive with gasoline without substantial subsidy. Moreover, uncertainty exists about whether conversion of biomass into alcohol will yield a positive energy balance, since it requires energy to produce grain, to transport it, and to process it into alcohol.

One recent assessment of gasohol concluded that, with standard agricultural practices, and conventional distillation technology, the net energy balance for gasohol is likely to be negative. With energy-conserving farming practices, energy-efficient industrial technology, and burning of crop residues as distillery fuel, however, a positive net energy balance may be achievable.[13]

Even if gasohol may not yield a positive energy balance in some instances, it could help to reduce petroleum use—not only because of displacement of gasoline in automotive fuel, but also because other fuels, such as coal, can be used to fire distilleries.

Projections of Feedstock Availability

Although future levels of alcohol production can not be projected with much confidence, a recent Department of Energy study concluded that enough biomass theoretically could be made available to support a very large ethanol industry.[14] The DOE study projected that it would be theoretically possible to produce 12.2 billion gallons of ethanol annually by the year 2000 from food processing wastes, grains and sweet sorghum (a high sugar content crop which is not currently produced in large quantities in the United States). In deriving this maximum figure, DOE apparently excluded agricultural commodities projected to be needed for food, fiber and export markets, but assumed full utilization of existing cropland.[15]

DOE stressed that such a high level of

ethanol production represents a "maximum case" projection, and does not necessarily represent what is likely to happen.[16] In fact, the main body of the report held that a realistic assessment of ethanol production through the mid-1980s would be 660 million gallons a year. The DOE analysts held that this level of production could be achieved by using food processing wastes, and distressed or substandard grain. Over the longer run, according to DOE, "an upper limit" of approximately 4.7 billion gallons of ethanol could be produced each year "by bringing into production all existing grain land and by supplementing food processing wastes with sugar surpluses and fermentable municipal solid wastes." DOE cautioned that "achieving this limit would be expensive and would reduce the flexibility of U.S. agricultural land and restrict options for food production."[17]

Far higher levels of ethanol production could become possible if efficient technology for producing ethanol from wood, wood wastes, and agricultural residues becomes commercially available. While the technology exists to convert these biomass sources into ethanol, their high cellulose content results in relatively high production costs.

USDA estimates that over one billion dry tons of residues and wastes are produced each year from agricultural and forestry operations.[18] Only a portion of these residues could be converted into energy without risking major soil deterioration problems. Many economic and technical problems may limit the extent to which residues could be used in the near future.

The DOE study projected, however, that such biomass sources in theory could provide enough feedstock to produce nearly 42 billion gallons of ethanol by the year 2000 if more efficient conversion technologies become available.[19] Thus, according to DOE, the theoretical maximum production of ethanol in the year 2000 would be 54 billion gallons—12 billon from food processing wastes and 42 billion from lignocellulosic materials.

Few would anticipate that such a major increase in ethanol production will take place in such a short period of time. But ethanol production levels even a fraction of this size could be of major importance to agricultural land use.

Currently, agricultural commodities, such as corn and grain sorghum, are providing the primary feedstock for the nascent alcohol fuels industry. The technology for ethanol production from grain is well established and commercially available, and new distilleries can generally be brought on line in less than two years.

USDA estimates that it will require about 200 million bushels of corn—about 2.5 percent of the 1979 corn crop—to meet President Carter's goal of producing 500 million gallons of ethanol in 1981. Although the Department expects that this will have minimal immediate impact on food prices,[20] concern exists about continued reliance on agricultural commodities for feedstock if the market for ethanol expands significantly in the future.[21]

USDA, however, views current reliance on agricultural commodities for feedstock as a short-term measure, since, in the future, it may be economically feasible to produce ethanol from wood, wood wastes, agricultural residues, and municipal solid wastes. "The present availability of grains and other starch and sugar crops which are readily fermentable represents significant sources of biomass feedstocks for alcohol production," says Deputy Secretary of Agriculture Jim Williams. "This should serve as a bridge until new technology will permit economic production of alcohol fuels from cellulosic biomass such as crop and woody products, either as residues or grown specifically for energy production."[22] Williams reported progress with this technology development, but could not project when it would be available for commercial use in this country.

At present levels of ethanol production, land requirements for commodity feedstocks are relatively small. It would require about 1.8 million acres planted in corn to meet President Carter's 1981 ethanol production goal—about 2.2 percent of the corn acreage harvested in 1979. The amount of cropland that may be used to provide ethanol feedstock in the future will depend upon many different factors—some of which already have been discussed. If it becomes possible to rely on wood as a primary source of feedstock, the potential for direct competition between alcohol fuels production and food production will be reduced. Moreover, coal could become an important feedstock in the future.

If agricultural commodities continue to be used as a primary source of feedstock, a very large alcohol fuels industry could greatly increase demands being placed on the cropland base. For example, if corn were to be used to produce enough ethanol to fuel the country's current automotive fleet with gasohol in a one part to nine blend with gasoline, about 38 million acres of prime corn land would be required—more than half the corn acreage harvested in 1978.[23]

Cropland requirements would, of course, vary by location and kind of crop. A recent USDA[24] study assessed potential land requirements that would be needed to supply eight quads of energy—about 10 percent of total U.S. energy consumption at present—from various kinds of crops produced in different conditions. If corn silage were produced under conditions similar to those in Indiana, for example, then 268 million acres would be needed to produce 10 percent of current U.S. energy requirements. But if the same feedstock were produced under conditions similar to those in Missouri, 410 million acres would be required. About 100 million acres of sugarcane grown under conditions similar to those in Florida would be required to produce 10 percent of current energy requirements.[25] (Currently, however, less than one million acres are planted in this crop, and its high temperature and moisture needs would limit the opportunity to expand production.)[26]

While terrestial biomass energy production will necessarily add to pressures on the land base, a number of factors could moderate these pressures. For one thing, the process of producing ethanol from grain results in a useful by-product (called distillers grain) which can be fed to livestock. (The distillers grain contains protein not only from the grain itself, but also from the yeast used to ferment the crop.) Other potential uses for the by-product are also being investigated. The fact that both fuel and feed can be produced from the same crop means that ethanol production and livestock feed production complement each other to some extent.

At this time, widespread agreement does not exist about how much distillers grain could be absorbed by the livestock feed market. Distillers grain is not a complete livestock feed. It reportedly results in less rapid weight gain than soybean meal, and is therefore not a preferred feed.[27] Moreover, uncertainty exists about the effects of sudden increases in distillers grain on the price structure of feed supplements.[28] Only about 425,000 tons of distillers grain was marketed in 1977, but vastly increased quantities could be produced as ethanol production increases. Proponents of gasohol production believe that it may be possible to utilize land now used for feedgrain production (about 105 million acres) for production of ethanol feedstock without greatly affecting current levels of livestock production.

Investigators at Washington University, for example, have worked out an approach that they believe could meet current livestock production needs and still produce about eight quads of energy a year.[29] About 15 percent more land than is now used for feed grain production would be required. Most of this land would be used to produce crops (such as corn and sugar beets) that can be converted easily into ethanol. The distillers grain byproducts would then be fed to livestock, together with some hay. Manure from the livestock would, in turn, be used to produce methane gas through anerobic disgestion with the residue being returned to the land as fertilizer. While promising, more research will need to be done before the potential of this approach can be fully assessed.

Another possibility is that special "energy" crops or trees—plants that are especially useful for energy—will be grown more extensively in the future. As has been mentioned, sweet sorghum, although not planted widely in the United States at present, is considered by Department of Energy analysts to be a very promising potential source of ethanol feedstock because of its high sugar content. They estimate that about 14 million acres of cropland planted with sweet sorghum would produce 8.3 billion gallons of ethanol a year.[30] Genetic experimentation and plant breeding could also result in new varieties of plants with characteristics favorable for energy use. Moreover, an effort is now underway to identify plants that have an unusually high level of hydrocarbons that could be tapped directly as a source of liquid fuel.[31]

As has already been mentioned, improved efficiency in the technology for converting cellulosic materials to alcohol could eventually result in a shift of reliance from agricultural crops as a feedstock, to wood, wood wastes, crop residues and municipal solid waste.

Even if such advances do reduce land needs, however, much of the land potentially available for biomass production is already needed or could become needed for other uses in the future. Regardless of how serious the nation's energy problems may be, the potential impact of a major alcohol fuels industry on the quality and quantity of the agricultural land base needs careful assessment.

Limited Cropland Availability

Some proposals to increase ethanol production have suggested that idle cropland could be utilized to produce energy crops. Yet, in contrast to the 1950s and 1960s, when the federal government paid farmers to idle between 37 and 65 million acres a year, a much higher proportion of the nation's 413 million acres of cropland has been utilized in the 1970s—reaching a high point of 376 million acres planted in 1977.[32]

While a modest federal "set aside" program was re-instituted in 1977, few anticipate a return to the kind of set-aside programs of the past—at least within the foreseeable future.

The major stimulus for this increase in cropland utilization has been mushrooming foreign demand for U.S. food. This demand has tripled in a decade, and many believe that further increases are likely in the future. This, in turn, could further increase cropland utilization. One USDA projection, for example, estimates that 407 million acres of harvested cropland—an 81 million acre increase over 1974—would be required in 1985 if projected "worst case" demand levels were to be met.[33] Such a major expansion is not likely to happen in such a short period of time, but it is likely that land needs for crop production will remain high.

In addition to land that is currently used for crop production, there is about 127 million acres of land now used for pasture, forest and range that is considered by the Soil Conservation Service to have a high or medium potential for conversion to crop production.[34] This "potential cropland" could be turned to "fuel crop" production, but this could have consequences that merit careful consideration. For one thing, much of this potential cropland already is used for timber production and grazing, and these existing uses presumably would have to be accommodated elsewhere. Moreover, if this land is used to produce feedstock for biomass energy production, a difficult choice may have to be made in the future between food and energy crops.

In the near term, of course, this reserve cropland may not be needed for food crop production. Moreover, future land needs for food production may not be as great as some now believe.

But in 1979, the Department of Agriculture cautioned against proceeding with a large-scale commercial effort to produce grain alcohol fuels without fully taking into account its potential impact on agriculture. For one thing, because there is little existing surplus distilling capacity, a major alcohol fuels program would require the construction of a large number of new distilleries to meet the up to ten billion gallons-a-year ethanol requirements of a nationwide automotive gasohol fuel program. The construction of distilleries to meet this increased capacity or even a significant portion of this capacity, the Department stated, "would tend to lock the Nation into allocation of grain feedstock approximating total plant capacity."[35] This demand would be in addition to the demand for grain for food. It would constitute an upward pressure on the price of the commodity as well as food and fiber prices.

Small-scale, decentralized technologies aimed at producing liquid fuels for on-farm use might pose less of a potential for conflict with traditonal markets for food, feed and fiber products. As fuel costs have risen, and uncertainties about future agricultural fuel allocation have increased, a number of farmers have expressed interest in producing alcohol fuels for on-farm use.[36]

As with large-scale ethanol production, a number of uncertainties exist at this time about the practicality of on-farm fuel production. A recent report by the Congressional Office of Technology Assessment (OTA) concluded that "as an economically profitable venture...on-farm ethanol production is, at best, marginal under present conditions."[37] OTA noted, however, that "for some farmers the cost and/or labor required to produce dry or wet ethanol may be of secondary importance.

"Obviously, State and federal subsidies can improve the economic competiveness of on-farm fuel production. The value of some degree of energy self-sufficiency, and the ability to divert limited quantities of corn or other grains when the price is low may well out-weigh the inconvenience and the cost."[38] Moreover, on-farm fuel production could become more practical in the future if relatively automatic and inexpensive distilleries become available.

Effects on Land Quality

Although biomass energy production is often characterized as an environmentally preferable altnerative to fossil fuel use, large-scale production of feedstocks could result in serious erosion and soil fertility problems unless care is taken to minimize such effects.

Many alcohol fuels production scenarios, assume that crop residues will become an important feedstock for ethanol production as technology for converting cellulosic materials into alcohol improves. Crop residues are normally returned to the soil, where they play an important role in maintaining soil quality.

The extent to which crop residues can be removed without impairing the soil varies from place to place. But, if use of crop residues as feedstock occurs in the future, careful management practices will be needed to assure adequate consideration of soil conservation objectives.[39]

A second land quality problem could arise if the demand for biomass feedstocks results in the utilization of poorer quality land for production of wood or agricultural crops. "Diversion of extensively managed pasture, range and forest to biomass production would less severely affect U.S. production than would the diversion of cropland or intensively managed pasture and forest land," writes Kathryn A. Zeimetz of the Department of Agriculture. "However, the extensively managed forage or woodlands generally have severe quality limitations which would also limit these lands' usefulness for biomass production. Lower biomass yields mean increased per unit costs of energy production. Subjecting marginal land to the high input levels and the repeated radical clearings necessary for acceptable biomass yields would greatly increase the danger of environmental degradation from non-point sources of pollution and erosion. Conservation practices would be costly."[40]

Implications for Agricultural Policy

Production of alcohol fuels from biomass has very suddenly emerged as an important energy development alternative. Two years ago, virtually no alcohol fuels were being produced in this country. Now, increased alcohol fuels production is seen as providing one of the most immediate opportunities for reducing dependency on foreign oil.

Future levels of alcohol production from biomass can not be forecast with any great certainty at this point. But, if biomass is to provide feedstock for a large alcohol fuels industry, the full implications of this for U.S. agriculture and its land base will need careful assessment.

For biomass energy production could be both a promising opportunity and a source of thorny problems for American agriculture. On the one hand, demand for feedstock could strengthen the market for agricultural products and enhance the profitability of farming. This could also enhance agriculture's ability to compete sucessfully with non-agricultural uses for the same land base.

On the other hand, the increased demand for biomass feedstocks could compete with traditional demands for food, feed, and fiber products—a policy issue of the utmost importance in a world that has become highly dependent on U.S. agricultural exports. Moreover, significant land degradation problems could occur if the demand for feedstock results in over-use of crop residues, or the introduction of marginal land into production. And, it is possible that important structural changes in U.S. agriculture may occur in order to accommodate the needs of a large alcohol fuels industry.

Three: ENERGY DEVELOPMENT AND THE LAND

In addition to the land requirements of biomass energy, the effort to develop other domestic energy resources could also have important effects on the agricultural land base—especially in the West and Mid-West. Direct consequences could arise from diversion of land and water resources away from agriculture in order to meet future energy development requirements. In addition, there may be indirect consequences associated with energy development that could affect the availability of agricultural land—stemming from such factors as the sudden introduction of an industrial economy in previously rural areas, increased air pollution, erosion hazards, and disruption of rural communities and their economies.

Conflicts between energy and agriculture already have resulted in significant confrontations in several areas. In Minnesota, for example, farmer opposition to a transmission line which would cross prime farmland has been so intense that guards had to be posted along the route. Transmission line siting conflicts have also arisen in New York State, Illinois, Iowa, and other places.[41] In South Dakota, agricultural opposition to a proposed coal slurry pipeline was so intense that the State's Attorney General in 1975 predicted a need for federal marshalls along every mile of its length if the project were to proceed.[42] Other kinds of energy projects—hydroelectric facilities, surface mines and power plants—have drawn vehement opposition from farm groups when these projects would adversely affect agricultural land.

Most likely, more conflicts between energy and agriculture can be anticipated in the future. Among other goals, the U.S. Department of Energy (DOE) would like to see a tripling of domestic coal production by the year 2000—from 660 million tons in 1978 to about 1.7 billion tons a year.[43] Most studies anticipate that this coal development would be accompanied by a number of synthetic fuels facilities, to liquify or gasify coal and to process oil shale, as well as other facilities, such as coal fired power plants, transmission lines, and, perhaps, new coal slurry pipelines.

While it is by no means certain that the expansion of coal production will be as rapid as DOE projects, energy companies are already proposing an apparently unprecedented numer of new projects. 1976-1977 surveys by the U.S. Department of Interior's Bureau of Mines, for example, identified 1,333 major new energy projects at the planning or proposal stage—including 400 coal mines, 450 electric generating plants, 115 uranium mines, 53 oil refineries, 43 coal conversion facilities, and 46 geothermal facilities.[44] Not all of these projects will be completed, or even reach the construction phase. But in some cases those that *are* undertaken could have significant effects on local and regional agriculture.

While all regions of the country are likely to be affected by new energy development projects to some extent, the most significant impacts upon agriculture are expected in the Rocky Mountain West, the

Northern Great Plains, and the Mid-West.

The Western states, which contain an estimated 40 percent of the country's coal reserves by energy content, as well as major oil shale and geothermal resources, are already undergoing extremely rapid energy development. This development, along with attendant sudden growth in population in rural areas near new energy projects, has led to concern about the availability of an adequate water supply for irrigated agriculture, as well as to concern about land degradation, and possible disruption of local agricultural economies.

The Mid-West may also experience rapid energy development in the coming years. The region's most serious energy vs. agriculture conflicts are likely to arise in Illinois. The nation's third ranking agricultural state in terms of products sold also has more coal in reserve than any other except Montana. A high proportion of the Illinois reserves are considered to be recoverable only through deep mining. But, an estimated 2.4 million acres within the State overlie potentially strippable reserves. Debates over the relative importance of Mid-Western farmland for crop production or coal surface mining are likely to intensify in the future.

Potential Land Needs For Energy Development

Energy development projects and facilities occupy more land than most other industrial activities.[45] Even so, relatively little attention has been paid to the overall land impacts of various federal energy development scenarios.

For example, environmental analysis documents issued by federal energy agencies in connection with proposed national energy plans have generally devoted only a few paragraphs to the land impacts of the proposed plans. Though the relationship has been inadequately investigated, estimates of the land requirements associated with these national energy proposals were substantial—even under the most land-conserving scenarios.

In 1974, the Federal Energy Administration, now part of the Department of Energy, estimated that between 37.1 and 38.5 million acres of land could be committed to energy-related projects by 1985 if the then proposed Project Independence were implemented.[46] This amounts to twenty million acres more than the 17.3 million acres which FEA estimated were devoted to energy purposes in 1972, and is an area larger than all the land the Economics, Statistics and Cooperative Service of the U.S. Department of Agriculture estimated to be in urban use in 1969.

FEA projected even greater land

disturbance if President Ford's proposed-but-never-enacted 1975 Energy Independence Act were implemented.[47] The agency's impact statement on the proposal estimated that over 45 million acres—an area about the size of the state of Missouri—would be affected.[48]

In 1977, however, the Energy Research and Development Administration (now part of the Department of Energy) issued an environmental assessment of the proposed National Energy Plan I[49] which estimated year 2000 energy-related land needs to be less than half the earlier FEA projections. The assessment estimated that only 3.4 million acres were used for all energy sectors in 1975—less than a quarter of the acreage FEA estimated to be used for energy purposes in 1972. By the year 2000, according to the assessment, 8.9 million acres would be permanently used for energy purposes (including some land for biomass energy farms), and an additional cumulative total of 8 million acres would have been temporarily used for energy purposes at some time within the period. (With the exception of scattered references to land impacts, the environmental appendix to the National Energy Plan II omits land use from its survey.)[50]

None of the scenarios specifically addressed the potential effects of energy development on agricultural land availability. Yet, under the three scenarios, a significant amount of rural land—ranging from about 270,000 acres per year under National Energy Plan I to over a million acres a year under the original Project Independence Report—were projected to be converted to permanent energy use each year. Even more land would be diverted to surface mining, waste disposal sites, and other energy-related land uses considered to be temporary in nature.

Given this wide range of estimates, and the apparent discrepancies in some of the data, it is clear that additonal information and analysis is required for a realistic assessment of land impacts associated with national energy programs. Assuming, however, that the truth lies somewhere between these high and low estimates of future land needs, *energy development can be expected to appreciably increase pressures on the rural land base in the future.*

These energy-related development pressures will not be evenly distributed across the U.S. land base. Some areas of the country will be affected to a much greater degree than others. In the discussion that follows, the land use effects that could result from several kinds of energy development are discussed in terms of their possible impact on agriculture.

Surface Mining

An estimated 10.1 million acres in the United States are underlain by strippable coal reserves, according to the U.S. Department of Interior's Office of Surface Mining Reclamation and Enforcement.[51] About a quarter of the strippable reserves are located under prime agricultural land in several states east of the Mississippi River, and additional reserves are located under western alluvial valley floors. The latter frequently have a favorable combination of soils, topography and water availability for agriculture.

Because most energy development scenarios envision a major increase in surface mining in the coming years, concern has arisen about its potentially adverse effects on agriculture. This concern is greatest in the West, with its enormous reserves of untapped coal, and the Mid-West where substantial reserves of strippable coal are located in the midst of some of the nation's most productive agricultural land. Although the Federal Surface Mining Control and Reclamation Act, enacted in 1977, has stringent reclamation requirments for prime agricultural lands and alluvial valley floors, difficulties in implementing this Act, as well as legislative proposals to limit its scope, make its promise for protecting agricultural land resources uncertain at this time.[52]

Coal surface mining has already increased significantly in the 1970s. A nationwide survey by the U.S. Department of Agriculture's Soil Conservation Service in mid-1977 found that 1.66 million acres that had been surface-mined for coal now needed reclamation—a 58 percent increase in a little over three years. About 1.1 million acres of the 1977 total was not under any reclamation requirements[53]. Of this land, 264,000 acres were cropland, 135,000 acres were pasture and 127,800 acres were forest land prior to mining.[54]

While numerous economic, environmental and political considerations could affect the rate of future increases in surface mining, coal companies already are planning to expand surface mining to another 312,000 acres between 1980 and 1985. If these plans are carried out, an additional 120,000 acres will be disturbed to provide for initial placement of spoil, topsoil storage, coal piles, haul roads, and related needs. Although it is not known how much of this acreage is prime agricultural land, *approximately one quarter of the planned expansion would occur in states with major prime land holdings.*[55]

Over the long run, of course, substantially more acreage could be required for surface mining. One recent study of energy development in eight Rocky Mountain sites estimated that between 1000 and 1500 square miles could be disturbed for surface mining in these states alone by the year 2000, and up to 18 percent of some individual counties were seen as being disrupted.[56]

Estimates of land needs for energy development over the next 50 years in the northern Great Plains—an area that includes Montana, North Dakota, South Dakota, Nebraska and Wyoming—range from a low of 240,200 acres to a high of 1,473,140 acres in 2035.[57]

In the Mid-West, according to a forthcoming report by the USDA's Economics, Statistics and Cooperative Service, about 226,000 acres of agricultural land are likely to be out of production because of surface mining in any given year between now and the year 2000,[58] with lost agricultural production on these acres of about $17 million per year.

Surface mining often is characterized as only a temporary disruption of the land, because of the potential for reclaiming the land to productive use after mining is completed. However, there has been an ongoing argument about the success of reclamation practices—especially as they apply to the semi-arid West. *Morever, there is uncertainty as to whether surface mined prime agricultural land can ever be returned to a fully productive state.*[59]

Synthetic Fuels Facilities

Development of a major synthetic fuels program—involving the production of oil and gas substitutes from coal and oil shale—is a frequently proposed means of reducing our dependency on foreign oil imports. The snythetic fuels industry is not yet well developed in this country, but interest in accelerating synfuels production is growing. President Carter has proposed the creation of an Energy Security Corporation, which would oversee the development of a 1 to 1.5 million barrels per day synthetic fuels industry by the year 1990.

The impact of a major synthetic fuels program for agriculture has not been intensively studied. A July 1979, Department of Energy environmental analysis of siting issues for synthetic fuels identified 159 counties in 15 states with adequate coal reserves to support a 100,000 barrel-per-day synthetic fuel facility for 25 years. After considering air quality constraints, DOE narrowed this list to 41 counties in eight States—including ten in Montana, eight in Illinois, seven in North Dakota, six in Wyoming, and five in West Virginia—which would appear to provide a "siting opportunity" for synfuels facilities.

However, among the factors explicitly excluded from the siting analysis were: (1) "need for land use that is prohibited or that requires extensive reclamation, such as prime agricultural lands" (2) "institutional transfer problems for water availability" and (3) "cumulative impacts of large-scale facilities and associated mining."[60] All of these omitted factors are, of course, centrally important for assessing the impact of a synfuels program on agriculture.

Although not addressed in terms of acreage impacts upon agriculture, the DOE siting analysis estimated that 31 of the 41 counties were likely to have "boomtown" growth conditions as a result of synthetic fuels development. A sudden influx of new population into these rural areas could make the practice of agriculture difficult if not impossible on some land in these counties.

Power Plants and Transmission Lines

Power plants and related transmission lines require substantial amounts of land. At the end of 1978, when the U.S. electric utility industry had an installed generating capacity of about 579,000 megawatts (MW) utilities projected that an additional 308,000 MW of capacity will be brought on-line by 1987.[61] While it is difficult to estimate land requirements on the basis of these figures, well over 100,000 acres for new power plants are likely to be involved.

Transmission lines and related rights-of-way require a very substantial commitment of land. The most recent national survey of such rights-of-way, conducted in 1970 by the Federal Power Commission (now the Federal Energy Regulatory Commission), estimated that 4 million acres—an area about the size of Connecticut—was dedicated to rights-of-way at the time, and that an additional 3 million acres of rights-of-way would be provided by 1990.

Although agriculture and certain other uses are permitted at the present time in and around many rights-of-way in the United States, increasing controversy surrounds continued use of rights-of-way under extra-high-voltage transmission lines.

Research conducted in the Soviet Union and elsewhere has suggested that prolonged exposure to electromagnetic fields near extra-high voltage transmission lines may have harmful health effects, and hence use of such-rights-of-way has been restricted there. Research on this problem has been undertaken in this country only recently.[62] But it is possible that, in the future, regulations will be adopted which would restrict agricultural use of such rights-of-way.

Transmission line rights-of-way can also make agriculture more difficult and costly. A 1977 University of Wisconsin report notes that these frequently run across fields, rather than following fencelines and roads where less disruption would occur. Some fields, thus bisected, may then become less profitable to farm.[63]

Hydroelectric Facilities

Hydroelectric facilities and reservoirs generally require more land than other kinds of electrical power plants. Typical impoundments may be 1000 to 20,000 acres in size, and some are much larger. Since most of the larger reservoirs are designed to simultaneously serve a number of uses—flood control, irrigation, and recreation among them—their size may exceed that required for power generation alone.

Nationwide estimates of land currently covered by water to provide hydropower are not available. However, it is probable that at least ten million acres are so used. Hydroelectric facilities currently account for about 21 percent of the nation's electric generating capacity. Some believe that a significant increase in hydroelectric capacity will be undertaken in the years to come, because this source of power is renewable—and because it is pollution-free. Recently, considerable interest has been expressed in small-scale hydroelectric projects involving relatively small impoundments (500 acres or less.)

In addition to existing sites, the Department of Energy estimates that 500 such small dam sites could be developed by 1985.[64]

Beyond the issues of land displacement for hydroelectric power, there is the related matter of competition for the water itself. The U.S. Water Resources Council projects that water use for energy purposes could *quadruple* by the year 2000—from 3.8 billion gallons per day in 1975 to 16 billion gallons per day in the year 2000.[65]

The possible adverse consequences of this increase in energy-related water use upon agriculture, which currently accounts for more than 80 percent of all water consumed in the nation, has become a topic of considerable concern, especially in the semi-arid West.

The Department of Energy's environmental assessment of the National Energy Plan II identifies five western regions of the country which may encounter water shortages in the future due to agricultural, energy and industrial demands. While no acreage impact can be predicted, the report does note that "obtaining water supplies for new energy facilities in (these) water-short regions could involve availability and institutional conflicts with other users. If such conflicts cannot be resolved satisfactorily, projections for development of certain energy technologies and fuel resources may have to be revised."[66]

Secondary Impacts of Energy Development: Energy "Boomtowns."

Energy development projects conducted in rural areas can attract a sudden influx of new population into the region. This new population, with its requirements for housing, services and facilties, has already created growth problems in many western areas. Considerable attention has been paid to the social and economic consequences of such "boomtown" conditions for small towns and communities. Although little analysis has been conducted on the effects of "boomtowns" on agriculture, some effects almost certainly will be unfavorable.

Damage to Crops from Air Pollution

Evidence is steadily accruing that air pollution is affecting crop production and forest yields to some extent.[67] Although the damage nationwide is not yet accurately known, considerable concern is developing about possible increases in sulfur oxide (SOX) levels that could accompany greater utilization of coal as an energy source—particularly if clean air standards are relaxed to encourage the use of this fuel.

A recently published Department of Energy report estimates that sulfur dioxide emissions from coal-fired utility boilers could increase by 15 percent by 1990 even if Federal Clean Air Act requirements were properly implemented. The effects of conversion to coal by other industries could be much greater—an increase up to 149 percent by 1990 over 1975 industrial emissions.[68] If less stringent emission requirements are permitted, greater emissions can be expected.

Long-range transport of air pollution, with subsequent deposition in distant areas—frequently 1000 kilometers away—has long been recognized to be a major air pollution problem in Scandanavia, where a significant amount of air pollution from industrial centers in Continental Europe falls out as highly acidic rainfall. This acid rain is reported to have adversely affected aquatic life and forest growth, and has corroded building structures.

An increase in the acidity of rainfall has been noted in several areas of the United States. Initially detected in the Northeast, the phenomenon has apparently spread westward and southward,[69] so that it now extends from Illinois eastward. Increased acidity may also occur in the western United States as a consequence of the expected construction of a large number of coal-fired power plants in the coming years.

Nationwide estimates of the economic costs of air pollution in terms of damage to vegetation and buildings range from several hundred million dollars to $1.7 billion per year. Such estimates are based on acute air pollution episodes.

In this regard, a recent report by the U.S. Environmental Protection Agency notes that "dollar losses incurred from long term, chronic, low level exposure of crops, forests, and natural ecosystems to air pollutants remain virtually unmeasured nationwide."[70] If crop yields are measurably affected by such chronic, low level exposure, however, the amount of land required to achieve a given level of agricultural production may need to be increased in the future. If the effect were, say, at one percent of yield, annually, as some suggest,[71] this would be roughly equivalent to the *annual loss of production from 3.5 million acres of cropland.*

Problems in Measuring Effects

From the foregoing analysis, it is clear that energy development could have significant direct and indirect effects on the agricultural land base. The direct effects—land diverted away from agriculture to energy development—are not necessarily the most important, even though they may be the easiest to estimate. Thus, it would be a mistake to simply aggregate statistics on the land requirements of energy development as a means of estimating the impact of this development on agriculture. Such an aggregation might very well overestimate acreage yet underestimate the real impacts.

Four: CONCLUSION: LAND AND ENERGY POLICY

This report has endeavored to show the potentially far-reaching implications that energy policy decisions could have for the nation's agricultural land base. To recapitulate:

- In the future, a portion of our energy needs may be met directly by growing "energy crops" on agricultural land. While uncertainties exist about the economic feasibility of such biomass energy approaches, literally tens of millions of acres would have to be dedicated to this form of energy production if biomass energy were to make a major contribution to the nation's total energy budget.

- Other kinds of energy development could also have significant effects on the agricultural land base. Direct impacts would stem from diversion of land to coal mines, power plants, transmission lines, synfuels facilities, and other kinds of energy development. Indirect effects could arise from intensified competition between energy and agriculture for water, and from possible adverse effects on crop yields from energy-related air pollution.

- The consequences of secondary growth and development which may be stimulated by energy projects conducted in rural areas must also be considered.

The implications of these three categories of energy activities for agricultural land have not been intensively studied by energy planners. But they could be of far-reaching importance not only to agriculture, but also to energy policy itself.

Biomass energy production, by increasing the demand for food, feed and fiber products, could result in greater utilization of the existing land base. This could have either positive or negative consequences for the agricultural land base—most likely some combination of the two.

Greater demand for productive land could make it easier for agriculture to compete with non-agricultural uses of land. Moreover, small-scale alcohol fuels production facilities—either on-farm or at the community level—could help farmers meet some portion of their liquid fuel needs directly by, in effect, growing their own fuel supply.

Potentially negative effects include greater soil degradation problems—a problem that could become acute if poor quality land is brought into production to meet the increased demand for feedstocks, or if unacceptably high levels of crop residue removal occurs. Using agricultural commodities for fuel use also raises fundamental questions about priorities between use of agricultural land to meet food production objectives, or for energy purposes.

At present levels of production, alcohol fuels do not have much effect on agricultural land one way or the other. But policies to encourage rapid expansion of the alcohol fuels industry have already been adopted. *While research on the potential effects of alcohol fuels production on agriculture is increasing rapidly, there is a danger that a major alcohol fuels industry* *will be established before the full ramifications of that industry for agriculture are understood.*

More traditional forms of energy development are being proposed without much consideration of their direct or indirect effects on agricultural land. This may lead to conflicts over the use of land that could be avoided with more careful planning of energy projects. It also could be, from an energy perspective, somewhat self-defeating, since the integrity of the agricultural land base and its productive capacity is of considerable importance to U.S. energy policy.

Agricultural exports are a significant offsetting factor in ameliorating current trade deficits that have arisen largely because of our dependency on high-priced crude oil imports. And, the availability of enough high quality agricultural land to meet traditional demands plus the demands that could be exerted by an alcohol fuels industry is in itself a concern of importance for energy policy.

Yet, efforts to protect agricultural land and efforts to facilitate traditional forms of energy development may be on a collision course.

Momentum appears to be mounting at all levels of government to protect high quality agricultural land.[72] However, severe energy problems have led to concern that environmental and other regulatory requirements could delay or block energy projects considered by their sponsors to be of critical national importance. Various legislative proposals are now before Congress to expedite, and in some cases pre-empt, existing federal, state and local agency review and approval procedures for energy projects held to be critically needed.[73] Moreover, as has been noted, the Senate has recently passed legislation delaying certain aspects of implementation of the Surface Mining Control and Reclamation Act.[74] Opponents of this legislation argued that the bill would adversely affect the prime lands provision of the Act—an assertion rejected by the bill's supporters.

Inevitably, trade-offs between energy development and agricultural land protection objectives will occur when the two come into conflict.

In any search for solutions to this food and energy trade-off dilemma, it must be recognized that the setting is anything but static. Development pressures in rural areas, the crucial role of agricultural commodities to the U.S. balance of trade, and a rapidly evolving energy technology make the energy-farmland interrelationship a slippery policy conundrum.

REFERENCES

[1] It should be noted that the net agricultural trade balance in FY 1978 was $13.4 billion—because of importation of such products as coffee, meat, sugar, and coca.

[2] U.S. Department of Agriculture, *1979 Handbook of Agricultural Charts,* Agriculture Handbook No. 561, (Washington: USDA, 1979) p. 77.

[3] U.S. Department of Agriculture Soil Conservation Service, *Potential Cropland Study,* Statistical Bulletin No. 578 (Washington: USDA, 1977) and *National Resources Inventory* (unpublished summary, 1979).

[4] *Ibid.*

[5] It should be noted there is considerable debate within the Department of Agriculture about the accuracy of past and present estimates of land use classifications and categories. The three million acres cited above is from the most recent SCS survey.

[6] Although gasohol—a blend of nine parts gasoline to one part ethanol—can be used in automobiles without apparent engine damage, design changes would be required to run automobiles only on ethanol. Methanol—an alcohol that can be produced from wood or coal—could also be used as a gasoline supplement, but because it is more corrosive than ethanol, greater engine modification would be required.

[7] U.S. Department of Energy, *Report of the Alcohol Fuels Policy Review.* (Washington: GPO, 1979) p. 33.

[8] Lester R. Brown, *Food or Fuel: New Competition for the World's Cropland,* Worldwatch Paper #35: (Washington Worldwatch Institute, 1980), p.20. Brown notes that converting the entire U.S. grain crop into alcohol would only produce about 30 billion gallons—about 30 percent of current gasoline demand.

[9] *Weekly Compilation of Presidential Documents* (Vol. 16, No. 2), January 14, 1980, p. 61.

[10] John Sawhill, Jim Williams, and Stuart Eizenstat, *Announcement on Gasohol.* (Washington: The White House: January 11, 1980.)

[11] *Ibid.*

[12] Statement of Jim Williams, Deputy Secretary of Agriculture, before the Subcommittee on Science and Technology, Subcommittee on Energy Development and Applications, U.S. House of Representatives. February 22, 1980, p.9. Other USDA initiatives described by Williams include: (1) provision of $100 million of Farmers Home Administration loan guarantees for commercial scale alcohol fuel distilleries; (2) a new $10 million FmHA demonstration program, along with expanded technical assistance, for farm or community alcohol fuel plants; (3) increased emphasis on research and development; and (4) increased emphasis on export sales of alcohol by-products.

[13] R.S. Chambers, et. al., "Gasohol: Does It or Doesn't It Produce Positive Net Energy," *Science,* November 16, 1979, p. 795.

[14] *The Report of the Alcohol Fuels Policy Review.* op cit., p. 54.

[15] *Ibid.,* p. 41-42. The report notes: "The meaning of 'available' feedstocks requires some comment: in general, available is taken as non-competitive with what are clearly higher values of the particular feedstock. Thus, for example, 'available wood' does not include any resource that would be used for lumber or paper. Available grain crops are assumed to be those which could be grown on existing cropland in the absence of any USDA policy of production restriction, and which is (sic) not needed for the projected demands of food, feed or export markets. In other words, we have assumed no new marginal cropland is brought into production but that all land which is not now used because of USDA set aside of diversion payment programs, is brought into productive crop use."

[16] The "maximum case" projection was based on DOE's estimate of biomass feedstock that might become available for ethanol production, and does not reflect judgements about the economics of ethanol production. DOE apparently took into account food, fiber and export demand for agricultural crops,

but assumed that there would be no land set aside for diversions. The year 2000 projection also assumes that about 14 million acres of sweet sorghum would be brought into production to provide ethanol feedstock. Without this source of feedstock, according to DOE, expansion of the existing cropland base would be necessary to increase ethanol production beyond 4 to 5 billion gallons a year.

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[17] *Ibid.*, p. 13.

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[18] Statement of Deputy Secretary of Agriculture Jim Williams before the U.S. Senate Committee on Agriculture Nutrition and Forestry Subcommittee on Agricultural Research and General Legislation, March 11, 1980, p. 2.

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[19] *Report of the Alcohol Fuels Policy Review,* op cit., p. 54. the technology exists to produce both ethanol and methanol (wood alcohol) from wood. If cellulosic materials were used as feedstock for methanol rather than ethanol, DOE projects that enough feedstock could be available to produce 120 billion gallons of methanol by the year 2000. This would mean that food processing wastes, and agricultural commodities would provide the only feedstock for ethanol production.

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[20] Statement of Deputy Secretary of Agriculture Jim Williams before the Joint Economic Energy Subcommittee of the Joint Economic Committee of the U.S. Congress, March 17, 1980, p.8 Deputy Secretary Williams noted: "We would expect minimal immeidate food price impacts with the President's 500 million gallons of alcohol production goal."

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[21] Notes Lester Brown: "Within the food exporting countries, the short run attractions of converting exportable food surpluses into alcohol fuels are undeniable. Whether the longer term political effects will be as attractive is less clear. In a world that no longer has any excess food production capacity, the decision to channel foodstuffs into the production of automotive fuel will inevitably drive food prices upward. For the world's affluent, such rises in food prices may lead to belt tightening; but for the several hundred million who are already spending most of their meager income on food, continually rising food prices will further narrow the thin margin of survival." *Food or Fuel: New Competition for the World's Cropland,* op. cit., p. 38.

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[22] Statement of Deputy Secretary of Agriculture Jim Williams before the Joint Economic Energy Subcommittee of the Joint Economic Committee of the U.S. Congress, March 17, 1980, p. 9.

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[23]Statement of Secretary of Agriculture Bob Bergland, op cit., p.20.

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[24] Kathryn A. Zeimetz, *Growing Energy: Land for Biomass Farms,* Agricultural Economic Report No. 425, (Washington: USDA, 1979).

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[25] *Ibid.* Table 6, p. 13. The above interpretation is based on Table 6 and additional information provided to the author.

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[26] *Ibid.* p. 8.

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[27]Statement of Secretary of Agriculture Bob Bergland, op. cit., p. 17.

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[28] *Ibid.*

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[29] Barry Commoner, *The Politics of Energy,* (New York: Alfred A. Knopf, 1979) pp. 42-43.

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[30] *Report of the Fuels Policy Study,* op cit., p. 45.

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[31] *Food or Fuel: New Competition for the World's Cropland,* op cit. p. 39.

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[32] According to *Growing Energy: Land for Biomass Energy,* much of the remaining cropland was not planted because adverse weather, illnesses, litigation or probate, and therefore cannot be considered available for other uses. For example, in 1977, idle cropland was under 20 million acres, of which only 5 million acres were idled by Government set-aside programs.

[33] Linda K. Lee, *A Perspective On Cropland Availability,* (Washington: USDA, 1978), p.3.

[34] As has been noted this 127 million acres is about half the 266 million acres of high to medium potential land identified by SCS in 1967. This reduction occurred when SCS took into account other factors besides physical capability in estimating resource or potential cropland. These factors include ownership, location, and production costs.

[35]Statement of Secretary of Agriculture Bob Bergland, op cit., p. 25.

[36] According to information provided by William Davis of the U.S. Treasury Bureau of Alcohol, Tobacco and Firearms, there has been a dramatic increase in the number of applications the Bureau has received for non-commercial fuel alcohol distillery permits. At the end of 1978, there were only 18 such permits in effect. By October 1979, over 700 permits had been issued, and 3,000 applications—most of them from farmers—had been received.

[37] U.S. Congress Office of Technology Assessment, *Gasohol: A Technical Memorandum,* (Washington: OTA, 1979), p. VI.

[38] *Ibid,* p. 9.

[39] For further information, see the March-April 1979, *Journal of Soil and Water Conservation,* which contains eight articles on the soil conservation implications of use of crop residues for energy use.

[40] *Growing Energy: Land for Biomass Farms,* op cit., p. 31.

[41] For case histories of some of these conflicts, see Jack Doyle, Lines Across the Land, (Washington: Environmental Policy Institute, 1979).

[42] *Washington Post,* December 1, 1975.

[43] U.S. Department of Energy, *National Energy Plan II,* May, 1979, p. 48.

[44] U.S. Department of Interior Bureau of Mines, *Projects to Expand Fuel Sources in Eastern States,* Information Circular 8765, (Washington: GPO, 1978) and *Projects to Expand Fuel Sources in Western States,* Information Circular 8719, (Washington: GPO 1977).

[45] Energy facilities and activities, along with agriculture, forestry and transportation are the most land intensive industries. See: U.S. Senate Committee on Interior and Insular Affairs, *Land Use and Energy: A Study of Interrelationships,* (Washington: GPO, 1976) p. 13.

[46] U.S. Federal Energy Administration, *Project Independence Report,* November, 1974, pp. 213-214.

[47] U.S. Federal Energy Administration, *Draft Environmental Impact Statement on the Energy Independence Act of 1975, and Related Tax Proposals.* March, 1975, pp. 2-77.

[48] This figure includes 25 million acres for coal mining, "up to 20 million acres" for hydroelectric facilties, such as refineries, storage tanks, and power plants. (This figure apparently includes cumulative total acreage both for permanent and temporary land needs.)

[49] U.S. Energy Research and Development Adminstration, *Annual Environmental Analysis Report,* 1977, as reproduced in *Environmental Challenges of the President's Energy Plan,* U.S. House of Representatives Committee on Science and Technology, (Washington: GPO, 1977), pp. 134-136.

[50] U.S. Department of Energy, *National Energy Plan-II: Environmental Trends and Impacts Appendix,* May 1979.

[51] U.S. Department of Interior Office of Surface Mining Reclamation and Envorcement, *Final Environmental Impact Statement, Section 501(b), Regulations,* January 1979, p. B III—1.

[52] On September 11, 1979, the Senate passed S.1403 permitting additional time for implementation of certain aspects of the Surface Mining Act. A key issue in the debate was whether the prime lands provision in the Act would be weakened by the bill. Opponents of the measure held that it would, while proponents asserted that these prime land requirements would be in effect. (See the Sept. 11, 1979, *Congressional Record* for details.)

[53] Cited in U.S. Senate Committee on Governmental Affairs, *The Coal Industry: Problems and Prospects,* (Washington: GPO, 1978) pp. 60-61.

[54] Final Environmental Impact Statement Section 501(b) Regulations, BIII-17.

[55] *Ibid.* BIII-4. The estimate of acreage to be disturbed between 1980 and 1985 is based on already planned expansion of coal production through surface mining. More or less acreage could be involved—depending upon such factors as coal demand, and the location of the surface mines. The expected shift to western coal production may reduce land needs for surface mining somewhat. According to *The Coal Industry: Problems and Prospects,* western coal seams average 35 feet in thickness, while those in the East average just 4 feet. Thus, western surface mining may require less land.

[56] U.S. Environmental Protection Agency, *Energy From the West: Policy Analysis Report,* (Springfield, Va: NTIS, 1979), p. 331.

[57] Northern Great Plains Resources Program, *Effects of Land Development in the Northern Great Plains,* p. 56.

[58] U.S. Department of Agriculture, Resources of the Interior Region and Coal Development Working Paper #58 (Draft Manuscript), August 1978, p. 81.

[59] For two views on the reclamation potential of surface mined agricultural land in Illinois, for example, see "Reclaiming Mined Land in Illinois for Row Crop Production," by Allen F. Grant, Journal of Soil and Water Conservation, Sept-Oct 1978, and *Strip Mining in the Corn Belt,* by John C. Doyle, Jr., (Washington: Environmental Policy Institute, 1976).

[60] U.S. Department of Energy, *Environmental Analysis of Synthetic Liquid Fuels, July 12, 1979, p. 15.*

[61] U.S. Department of Energy, *Additions to Generating Capacity,* 1978-1987, October 1978, p. 1.

[62] For a review of such research efforts, see Andre A. Marino and Robert O. Becker, "High Voltage Lines: Hazards at a Distance," *Environment,* Vol. 20, #9, November 1978.

[63] Thomas W. Smith, et al, *Transmission Lines: Environmental and Public Policy Considerations,* University of Wisconsin Institute of Environmental Studies. (Madison, 1977), p. 48.

[64] *National Energy Plan II: Environmental Trends and Impacts Appendix,* op cit., p. II-33.

[65] U.S. Water Resources Council, *Water for Energy: Supplement Report to the Second National Water Assessment,* 1978, p. 3.

[66] National Energy Plan-II: Environmental Trends and Impacts Appendix, op cit., p. 1-36.

[67] For a review of this research, see U.S. House of Representatives Committee on Science and Technology and Committee on Agriculture, *Agricultural and Environmental Relationships: Issues and Priorities,* (Washington: GPO, 1979), pp. 47-97.

[68] U.S. Department of Energy, *An Assessment of the National Consequences of Increased Coal Utilization,* Executive Summary, Volume I, (Springfield, Va: NTIS, 1979), p. 21. Assessment includes a list of projected increases in coal mining and coal electric production between 1975 and 1990 by county.

[69] U.S. Environmental Protection Agency, *Environmental Effects of Increased Coal Utilization: Ecological Effects of Gaseous Emissions from Coal Combustion,* Normal R. Glan, ed., EPA600/7-8-108, June 1978, p. V.

[70] *Ibid.*, p. VII.

[71] *Agricultural and Environmental Issues; Issues and Priorities, op cit., p. 47.*

[72] Policies and programs already adopted include, at the federal level: provisions in the Federal Surface Mining and Reclamation Act of 1977 requiring that prime agricultural lands and alluvial valley floors be restored to full productivity after coal surface mining; a memorandum to all federal agencies from the President's Council on Environmental Quality that impacts on prime lands be considered federal environmental impact statements; and adoption by the Department of Agriculture and the Environmental Protection Agency of internal agency policies to minimize the impact of their activities in agricultural land. Some states, including Wisconsin, Oregon, Massachusetts, Connecticut and Maryland have adopted farmland protection programs, as have a number of localities across the country.

[73] These include S. 1308, the proposed Priority Energy Project Act, approved by the Senate in early October 1979, and two different versions of H.R. 4985, separately reported by the House Interior and Insular Affairs Committee of the House Commerce Committee.

[74] S. 1403. As of April 1980, 1979, the House had not yet considered such legislation.

A SELECTED BIBLIOGRAPHY

In the past few years, many excellent reports and studies addressing agricultural land issues have been published. A few of these reports, as well as citations to more comprehensive bibliographies, are here to aid readers in seeking further information.

Overview Reports

American Land Forum, Land and Food: Preservation of U.S. Farmland, Washington, D.C.: 1979, 63 p.

Anthan, George, *Varnishing Acres, seven-part series published in Des Moines (Iowa) Register,* July 8 through 15, 1979.

Brown, Lester, R. *The Worldwide Loss of Cropland.* Washington, D.C.: The Worldwatch Institute, 1978, 48 p.

Conservation Foundation, *Long-Range Threats Stalk U.S. Farming,* Washington, D.C., August 1980, 8 p.

Couglin, Robert E. et al, *Saving the Garden: The Preservation of Other Environmentally Valuable Land.* Philadelphia: Regional Science Research Institute, 1977, 341 p.

Fields, Shirley Foster, *Where Have The Farm Lands?;* National Agricultural Lands Study, Washington, D.C., 1980, 24 p.

Land Availability and Needs

Dideriksen, Raymond, Allen R. Hildebaugh and Keith O. Schumude. Potential Cropland Study. Washington, D.C.: U.S. Department of Agriculture Soil Conservation Service, 1977, 104 p.

Lee, Linda K. *A Perspective on Cropland Availability.* Washington: U.S. Department of Agriculture Economics, Statistics and Cooperatives Service, 1978, 23 p.

U.S. Department of Agriculture, *Soil and Water Resources Conservation Act: Appraisal 1980.* Review Draft Part I, Washington: 1979.

Zeimetz, Kathryn A. *A Growing Energy: Land for Biomass Farms.* Washington: U.S. Department of Agriculture Economics, Statistics and Cooperatives Service, 1979, 35 p.

State and Local Farmland Protection Programs

Davies, Bob and Joe Belden. *A Survey of State Programs to Preserve Farmland,* Washington, a report to the Council on Environmental Quality and by the N.C.S.L.; 1979, 79 p.

Toner, William. *Saving Farms and Farmlands: A Community Guide.* Chicago: American Society of Planning Officials, 1978, 45 p.

Federal Policy and Programs

Cotner, M.L., *Land Use Policy and Agriculture: A National Perspective,* E.S.C.S., 1976.

Frey H. Thomas, *Major Uses of Land In the United States 1974.* E.S.C.S., 1979.

U.S. Cong. House Committee on Agriculture. *Agricultural Land Retention Act: Report.* 95th Cong. 2nd Sess. Washington: GPO, 1978, 29 p.

U.S. Cong. House Committee on Agriculture. *National Agricultural Policy Act. Hearings.* 95th Cong. 1st Sess., Washington: GPO, 1977, 260 p.

U.S. Library of Congress, *Agricultural Land Retension: An Analysis of the Issue. A Survey of Recent State and Local Farmland Retention Programs, and a Discussion of Proposed Federal legislation.* Washington: Congressional Research Service, 1978, 52 p.

Bibliographies on Agricultural Land Issues

Hess, David. *Bibliography of State Land Resources Planning.1970-1975* (supplemental edition) indexed by State, topic, year, agency. (Council of Planning Librarians. Exchange bibliography 845-850) Monicello, Illinoiss: 1975, v. 2.

Bibliography of State Land Resources Planning, 1960-1974 (preliminary edition): indexed by topic, year, state, agency, (Council of Planning Librarians. Exchange bibliography 769-770 and 771 (parts I-III) Council of Planning Librarians. Exchange bibliography 772-773 and 774 (parts I-III). Monticello, Illinois: 1875, v. 6.

London, Alan C., and Wesley D. Seitz, and Clyde W. Forrest, Jr., *The Conversion of Land From Rural to Urban Use.* (Council of Planning Librarians, Exchange bibliography 721) Monticello, Illinois: 1975, 9 p.

U.S. Library of Congress. *Preservation of Agricultural Land: An Annotated Bibliography.* Congressional Research Service. Washington: 1978, 55 p.

NATIONAL AGRICULTURAL LANDS STUDY STAFF

Robert J. Gray
Executive Director

Michael F. Brewer
Research Director

Warren A. Lytton
Administrative Officer (USDA-SCS)

Shirley Foster Fields
Information Director (USDA-SCS)

Research Staff

Charles M. Benbrook, *Agricultural Economist (CEQ)*

Frank H. Bollman, *Water Economist (Water Resources Council)*

Robert Boxley, *Economist (USDA-ESCS)*

David Brown, *Sociologist-Demographer (USDA-ESCS)*

Nancy Bushwick, *Public Involvement Specialist (CEQ)*

Michael Caughlin, *Economist*

Tony DeVito, *Urban Planner (HUD)*

Allen Hidlebaugh, *Resource Inventory and Monitoring (USDA-SCS)*

Hal Hiemstra, *Environmental Planner (EPA)*

Benjamin Huffman, *Planner (CEQ)*

David William McClintock, *International Relations (Department of State)*

Thomas Mierzwa, *Government Affairs Specialist*

John B. Noble, *Attorney*

Charles P. Prentiss, *Soil Scientist (USDA-FS)*

Tom Schenarts, *Forester and Range Conservationist (USDA-FS)*

Joe Yovino, *Fish and Wildlife Specialist (USDI-F&WS)*

Support Staff

J. Daniel Connelly, *Office Aide (CEQ)*

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Jerrold Floyd, *Office Aide (CEQ)*

Eliza Mabry, *Assistant to the Executive Director*

Denise B. Medley, *Secretary (USDA-ASCS)*

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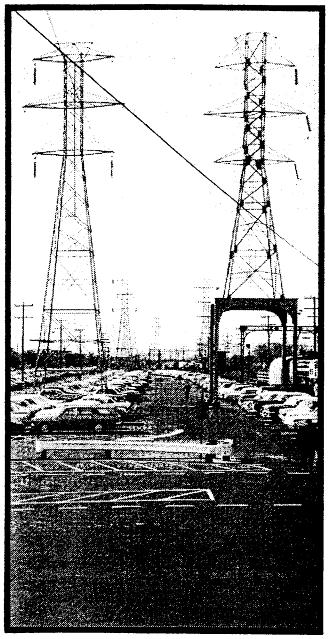



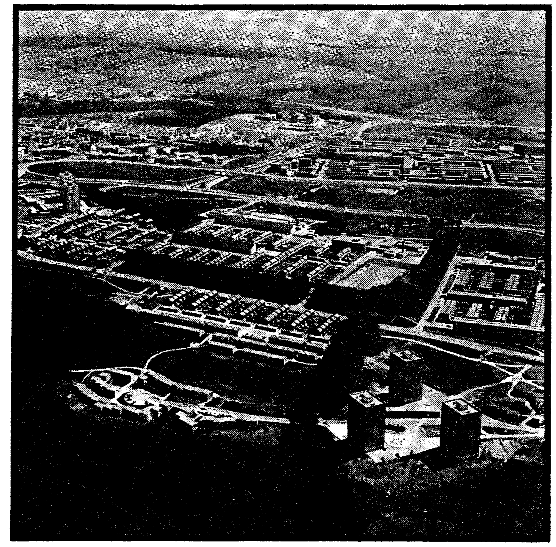
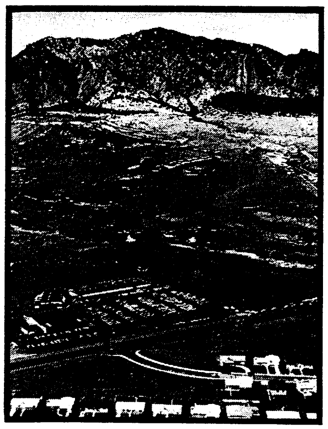
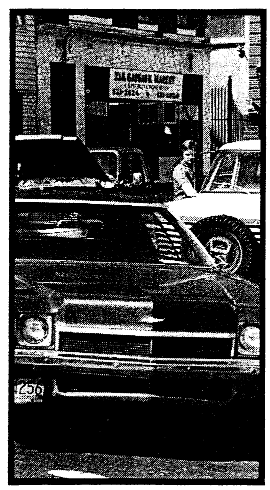
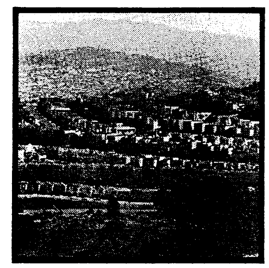

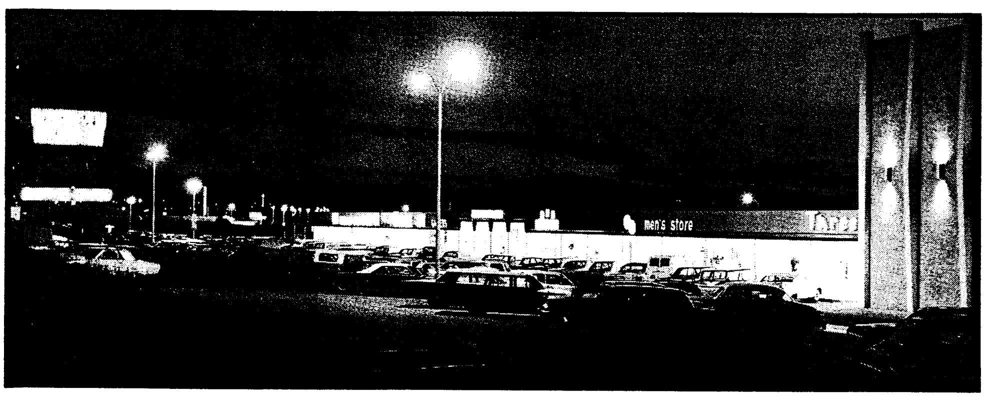

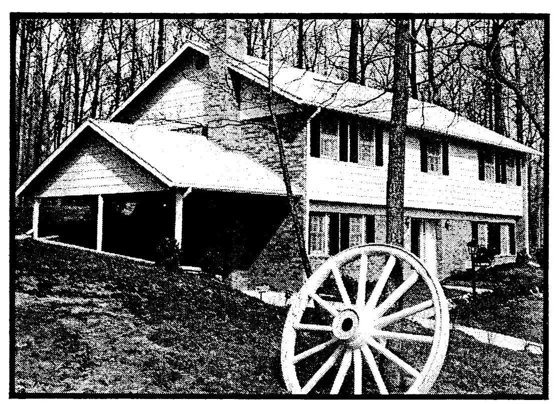
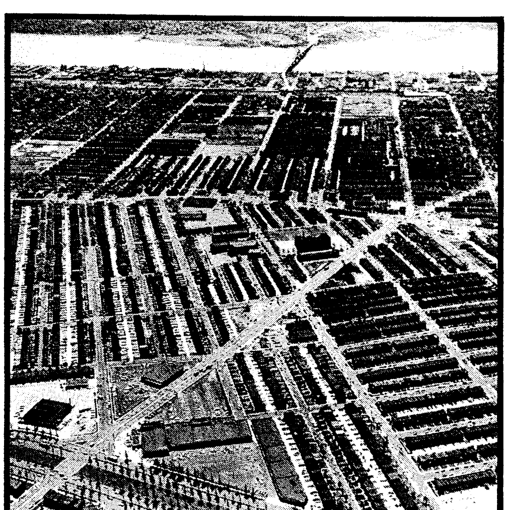

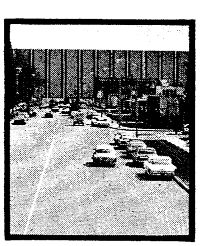
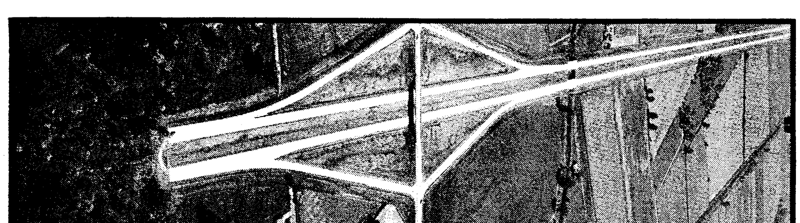

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National Agricultural Lands Study

New Executive Office Building
722 Jackson Place, N.W.
Washington, D.C. 20006
(202) 395-5832

Robert Gray
Executive Director

Michael Brewer
Research Director

Shirley Foster Fields
Information Director

Participating Agencies

Council on Environmental Quality
Department of Agriculture
Department of Commerce
Department of Defense
Department of Energy
Department of Housing and Urban Development
Department of the Interior
Department of State
Department of Transportation
Department of the Treasury
Environmental Protection Agency
Water Resources Council