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Farmland Preservation: A Broad Perspective From Indiana

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FARMLAND PRESERVATION:

A BROAD PERSPECTIVE FROM INDIANA

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This is a background paper written with the purpose of placing farm preservation legislation within the wider scope of economic and legal history and environmental considerations.

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and laws of property shape our responses. This study tells a story of one agricultural area and is meant to prepare a background for future decisions about farmland preservation.

ECONOMIC HISTORY

The early explorers of the Northwest Territory spoke of the lands that they had found as being unsurpassed in climate and soil for a future agriculture. Though not farmers, they recognized the wealth to be had in the abundant dark soil of this region of forest and grassland. With less enthusiasm were described the inhabitant Miami Indians, who though healthy and rarely hostile, were unresponsive to Christian conversion. The Miamis had arrived centuries earlier from the South. They hunted in the winter, but established camps in the summer for farming. Squash, beans, and an unusual variety of corn were grown in small fields.

The Indians farmed to feed their own tribe. Many of their agricultural practices conformed to conserve the land and make good use of the soil. Corn, beans, and squash were interplanted in the same field, which allowed the amount of cultivated land to remain small. The interplanting of crops exhibited an awareness that a succession of plants with differing requirements of light, space, and nutrients could be grown simultaneously from a single tract of land. The nitrogen-fixing bean and the unharvested remains of plants helped to maintain soil nutrients and tilth. The small fields with their variety of crops discouraged insect attack. The Indians' impermanent settlement and satisfaction with a lifestyle of primitive comfort allowed the environment to restore itself, as their farming methods encouraged a balanced and minimal demand upon the earth.

New settlers moved from Virginia and Pennsylvania in the North, and from the Carolinas in the South, along the Ohio River and through the Kentucky Mountains to inhabit the Indiana Territory. For a time the Miamis retained a portion of the land but soon the whole was the workplace

of the pioneer. Thomas Jefferson had suggested that land in the Northwest Territory be surveyed according to a grid pattern. The flat or gently rolling ground in the central and northern parts of the territory encouraged the use of this surveying system as the basis for land sale. Speculators found the grid pattern ideal for the sale of lots in the still imagined towns. Today the grid pattern has been made permanent by concrete in the form of the country roads and city streets.

Farmers drained low-lying land and cleared some of the forest. Concurring with the Indian's selection of food plants, corn and beans were grown along with grains to replace the natural varieties of the grasslands. The environmental effects of early farming did little to strain the land's capability to recover. A variety of animals and crops were tended. Manure from animals was spread on the fields and a part of the harvest was returned to the animals. Crops were rotated to lessen the tax on the soil. Buildings were located on a walking scale with houses built on favorable terrain. Barns, garden and pasture were arranged around the house. For every cluster of houses and barns there were 100 to 300 acres of land.

Production did not long remain at a subsistence level. New plows and harvesting equipment and the development of a hybrid corn replaced the work of men. Grain was transported in the form of pigs and cattle to the stockyards. Chicago prospered off the surplus of the farms, building packing houses and railroads in order to trade food with the rest of the nation. Towns and cities matured with the growth of manufacturing and began to absorb the workers released from the farm by new equipment. "Four-square" brick houses on the farm and the Victorian and Colonial mansions built in town by retired farmers were visible evidence of the prosperity of this time.

World War II accellerated the shift in population from rural to urban areas. In the next thirty years, there was further technological development in farm machinery along with the introduction of fertilizers and insecticides. The amount of land tended by each farmer expanded to over 600 acres. The short-term result was a surplus in production. The Federal Government stored grain and established land banks to help the farmer maintain a reasonable income. The problem of surplus ended when demand for food depleted grain reserves. Land banking was discontinued and most available land was put into use as the nation began trading with the world. Agricultural products have become an important part of our balance of payments. The observation by the Old World explorers of the value of this land for farming has been dramatically shown by the shipment of grain to foreign countries.

The farming methods of the last thirty years have placed demands on the environment not previously found. For centuries energy from the sun was the base of all agriculture. With the aid of the sun in photosynthesis, plants grew and matured. Some of the harvest was fed to the animals and manure was scattered on the soil to replenish nutrients. Into this biologic cycle were added farm tools, extensions of the farmer's hand, to allow him to do more work. The metal tools made from the earth's mineral resources increasingly supplemented the sun in production. The sun's energy, absorbed by plants, compressed and trapped in the earth in the form of gas, oil, and coal, were tapped to run engines on the farm and also became the chemical base for fertilizers and insecticides. The use of earth resources and stored sun energy increased the amount of work that one farmer could do. But the burned gallon of oil could not be used again. The refinery could only use mined ore once. Machinery

could be recycled but this would require the use of additional energy. The farmer's dependence on mined resources to any significant degree has therefore become precarious because of their eventual scarcity and high cost.

It is only in recent years that the intimate connections between industrial production and pollution have been identified. The new farming methods in taking full advantage of manufactured products have not escaped this dilemma. The use of large amounts of fertilizer pollutes ponds and streams. Insecticides are found to be hard to control both in their application and in measuring their more lasting effects. The ease with which fertilizers and insecticides promote plant growth, and controls weeds and insects, encourages a laxity in some of the traditional agricultural practices. Crop rotation often becomes simplified to the rotation of corn and soybeans. Fields expanded to accomodate larger machinery are more prone to erosion. The monoculture crop is more prone to insect attack. The neglect of soil tilth results in compacted soil which leads to fast runoff of water that collects in low spots or carries silt into a stream. For each farmer, who must tend increasingly large acreages in order to clear a profit, the strain is relieved by labor-saving efficiency at all levels of production. It is sometimes hard for him to be both a caretaker of the earth and a businessman. When one looks out upon the weedless summer fields of corn, genetically bred for high production and aesthetically pleasing dark green color and large tassel, it is hard to question the success of the new farming methods, but the whole cost of so thorough a taming of a portion of the land is still to be measured.

From Indian and early settlers to agribusiness, trade of farm products has grown from local to national to world scale. The increases in population and the commitment to improving the diet of those suffering from malnutrition haveplaced new demands on America's food reserves. Over the last decade, the building of highways and suburbs, the disruption of land by mining, and the present abandonment of land unsuited to modern agriculture have caused concern that large agricultural areas are being lost. The reassuring answer was that at the present rate of development only three percent of prime agricultural land would be lost by the turn of the century and that remaining land could comfortably feed the American people. This figure disregards the conversion of agricultural land in other countries and the growing food demands of the rest of the world which if included would make any loss more significant. The change in thinking from national to world needs has just begun but is quickened by acceptance of Midwestern farm products as valuable commodities in international trade.

It had been hoped that the new farming methods could be exported to underdeveloped countries. In many instances, particularly in the introduction of more productive strains of plants, there has been success. It was found, however, that farm equipment designed for over a century for the relatively flat land and dense soil of the Midwest, was unsuited for the terrain and soil of foreign countries. Though this problem is being corrected, more serious difficulties have occurred as population growth has negated increased production and the adoption of American farming practices have seriously disrupted the delicate web of foreign cultures. The short range successes of modern farming methods displaced large numbers of the poor who migrated to the slums of cities which

pointed to our misunderstanding of the labor resource of underdeveloped nations. We are still geared for the mechanization of the world's agriculture but rising costs of oil and machinery have dampened expectations. The prospect of the underdeveloped countries relying on tractors and fertilizers is becoming less optimistic when the resulting demand on the earth's resources is accounted.

The shift from the dependence on the physical exertion of man and animal to oil and machine has made American farming energy intensive. It takes more energy to grow corn than is returned from the harvested grain. This was not the case when the labor of agriculture was the burden of the farmer and his draft animals. Plants collect a part of the total energy released from the sun for their development. The rest of the energy is not able to be used. When man or his animals eat from the plants, some of the stored energy is not utilized, and some is burned up, as the components of the plant are restructured by the body to become flesh. The argument that we should depend on grain instead of meat for food is based on this waste of energy that occurs in the change from grain to meat. Oil, the remains of long dead plants, also contains energy from the sun. When oil is burned in farm equipment or applied as fertilizer it becomes an additional source of energy to production. When a plant collects some of the dissipated solar energy, the sun's resources are being utilized and not the resources of the earth. When oil is used to aid production the earth diminishes its finite reserve of past energy collections from the sun.

In the future, oil reserves will run short and a struggle will arise between agricultural and other interests who have come to depend on this energy source. Agriculture may be forced to return to its traditional

reliance on the sun. It is encouraging that a few studies have shown that good land, carefully tended, can produce relatively high yields without the application of fertilizer. However, farmers whose land requires irrigation or heavy fertilization will eventually conflict with other users of oil and water resources and raise difficulties in allocation. When there is the possibility to make deficient land fertile it is easy to forget the value of those areas that are naturally suited for the growing of crops. But when a city drains water from a river or depletes its supply of ground water, irrigated land will be threatened and when the products from oil and coal become more expensive, the use of fertilizer to enhance marginal land may become prohibitive. When such trade-offs are common the need for the preservation of prime agricultural land will further rise. Reclaiming secondary land for production after prime land is lost will be accomplished at much greater cost.

The conservative disposition of the farmer and the illusive tranquility of his occupation hid his steady adoption of new farming techniques. After the development of the automobile, companies offered slightly redesigned vehicles for farm use. The demand was unexpectedly high and it was not long before even the small farmer owned car, truck, and tractor. When rural electrification programs were introduced, it was assumed that the farmer would only desire to light his house. Instead, electricity was used to light barns, to refrigerate, to heat, and to operate all types of machines. The isolation of farm life diminished with increased communication by telephone, television, and interstate highway. The farm and city have shared in the advancing technologies and their resulting problems. The farmer who irrigates and the city dweller who waters his grass often draw on a limited supply

of water. Insecticide application and factory emissions sometimes spread harmful chemicals into the air. The release of untreated sewage into a river and the release of feed lot waste contributes to pollution of water. And gas burned by cars and fertilizer spread on the soil consume increasing amounts of oil reserves.

The farm and city are now joined in their adopted technology and economic system. When the early settlers first removed the Indian and cleared the land, they lived far from the influence of the city. But almost from the beginning the farmer traded his produce for the cities' necessities and luxuries. Commercial ties have grown to the point where city and farm are intimately connected and business interests tend to overshadow the farmer's basic concern with the land. The recent dependence on oil and its products has encouraged a simplistic view of our shared wealth from the soil. In fields of corn, a section may be found to stand a little higher than the rest. One explanation is that this area was the past site of a hay mow which partially decomposed and enriched the earth. The variation in the uniform stand is a reminder that in the beauty of the unchanging field is a dependence on heavy doses of fertilizer often to the neglect of the properties of the soil which make it alive for the growth of plants. When resources become scarce farmer and city dweller will have to preserve what land is left and relearn the complexities of the ecology of plants and their conformity to sunlight.

LEGAL HISTORY

The Indian's society, based on the divisions of the tribe, had a common view of property that was little more than knowledge of a general territorial boundary that separated one tribe from another. Though groups might return to a certain area to farm, property rights moved with the tribe and did not lie with the land. The religion of the Miamis encouraged him to draw a close connection with his environment. A piece of ground was different from another because of variations of terrain, and of plant and animal life. It was a place that you passed through and used but did not own. This conception of property was disrupted by the European settler. The early traders and explorers perceived of land as did the Indian, a terrain to be explored, or a region to trap furs. When posts were established, their permanence was small compared to the land unclaimed. But when the Indiana Territory was divided into two parts the Miamis saw it as a defeat by the tribe of white men while the settlers viewed the event as establishing a permanent line of property. A misunderstanding over the meaning of property as a general territorial boundary as opposed to a divided piece of ground for the use of one man led to much of the bitterness in the battles between settler and Indian and prevented a compromise.

From England came the laws eventually made permanent in the colonies. The property law that was inherited was based on a feudal system where the King was the owner of all land who distributed it among the Lords who supervised the farming serfs. The small amount of land in England and the impermanence felt by the Lords in view of the King's power made it very important to control property and gave rise to a complicated

system of conveyance. The ownership of a defined piece of property was so strong that at a sale, it was required that a part of the land, usually a handful of soil, be physically handed over to the next person. It was a long time before a written document could transfer property, and when explorers visiting America were given charters for land, the way of thinking about property as being something defined and owned had already been established. The purchase of the Northwest Territory created a new area for settlement. The laws of property for the small island, England, and Thomas Jefferson's grid surveying pattern were merged to form the land law of an expanding America.

The United States Constitution established a government in which powers were apportioned between the national government and the governments of the states. This was a political necessity given the former independence of the colonies. Generally the states were given a power over the land and natural resources within their boundaries. The advantages of the law-making power of the many states was the possibility for experimentation and an adjustment of the laws to conditions peculiar to a region. The disadvantages were a profusion of laws, many contradictory, and a lack of cooperation between the states. This system of many governments encouraged the development of land. Though the seat of the Federal Government might be far away, a settler had recourse to his state for the protection of his interests. The rapid spreading of the population encouraged the growth of markets and businesses in newborn towns and cities. The federal and state governments were further divided into executive, legislative, and judicial branches, which by a structured separation hoped to preserve justice through reason. Because of its philosophic focus on man the American political system, which worked

well for most conflicts, was less successful in perceiving environmental problems which it found were often hard to catch in the traditional sieve of judicial reason.

The governmental system was designed when a majority of citizens lived on farms. Each property holder was given a bundle of legal rights along with his land which he could defend against rights held by another person. These rights were developed from legal tradition and did not suggest that a person had an absolute right to use the land as he pleased, though it was not uncommon for a settler to argue the fact over the point of a gun. Until recent times, property meant primarily land. The house was often incidental. In a land-based society the inheritance of land was carefully planned, the laws complicated. When the population shifted to urban areas and factory replaced the farm as a place of work, the laws of property were slow to change. With the expansion of business interests a large body of contract law was developed. The dangers in the new industry brought changes in tort law with the protection of purchased goods and workman's compensation. The altered economy that required the growth of these bodies of law for the most part failed to draw property law away from its past.

With the growth of cities and then suburbs property was no longer so important as land but as buildings. Families occupying many-storied apartment complexes had little relation to the ground. The mobility in the country led to frequent home sales. With every exchange of ownership the law still required a lengthy owner search in the courthouse records. A further change occurred in housing when companies began manufacturing homes. Here the property law shifted to view the house as being subject to product liability. With the increase in renters

the law straddled contracts and property in an uneasy limbo. Though the suburban home with its patch of yard on a small scale imitated the landed estate or farm, underneath there were important shifts in the concept of property that the law was forced to adjust to.

The rapid spread of urban areas, along with the heavy use of the automobile and an influx of the poor encouraged some form of planning beyond city beautification efforts. The nuisance laws were expanded to protect homes from the more obvious forms of pollution, and restrictive agreements in neighborhoods were allowed to create certain housing patterns. A new direction in planning was begun in 1926 when the Supreme Court ruled in favor of a town zoning ordinance. The Court held that the town's comprehensive plan, setting aside some areas for strictly residential housing was a valid use of the state's police power which can be invoked for the health and general welfare of the people. The Court ruled that further decisions on this issue would have to come on a case by case basis. From this decision zoning became a part of city and town planning throughout the United States. In federal and state constitutions was the statement that the "government shall not allow property to be taken without just compensation." This taking issue prevented cities from acquiring open space without paying for it and prevented land from being restricted to agriculture without some form of compensation. With the advent of zoning laws, an additional layer of legal control was imposed upon the land.

Though it was hoped that zoning laws would provide a basis for good land use, they were often found weak in withstanding the need for competing cities to attract new industry in order to expand. The flat land best suited for agriculture was also best suited for industry and low-cost

housing. Through numerous decisions by zoning boards there was an incremental growth that resulted in the loss of agricultural land which the laws could not stop. Courts originally held that after a comprehensive plan had been established, there could be no major alterations. In the ensuing years it was recognized how inflexible these plans were to changes in city needs. Where previously a major change in a zoning area, called spot zoning, could be legally stopped, the courts now upheld plans which allowed for sequential development zoning where the laws were redrawn to account for new expansion. The planned unit development was another zoning technique adopted to relieve the rigidity in previous plans. It allowed the planner to arrange a certain density of housing in an area without the usual restrictions beginning with lot size. Though the courts would not allow cities to absolutely stop their growth, the law was beginning to consider the carrying capacity of the land and the difference between permanent homes and vacation homes. These and other considerations may alter urban growth patterns in the future.

Combined with zoning were laws regulating the development of subdivisions and prescribing minimum standards for housing. By narrowing the choices for growth, the laws had the effect of producing cities and suburbs laid out in simplified and redundant patterns. Minimum standards for housing and laws which contained uniform setbacks and yard size were often developed to the detriment of the natural terrain and though proposing a relief from the city created a monotonous landscape. Zoning laws split up areas of low density and high density housing, and residential use from industrial or recreational use. Though many of these laws were absolutely necessary to bring some

order to the great influx of people into the city, it had the effect of changing the basic character of urban areas, unravelling some of their previous complexity and spreading a thin level of development across the land. The problems of zoning laws which created uninspired urban sprawl were in part a failure of the planners to understand the nature of the city and the fact that the countryside is not recreated in the suburb but is destroyed by it. Zoning legislation along with the federal support of mortgages for single family homes prepared the mechanism for unprecedented growth of urban areas.

When agricultural land, lost to urban development, became a significant problem to rural citizens, who were often forced to pay higher taxes, counties enacted their own zoning laws. One technique was to require new homes to have lots of five, ten, or more acres. It was hoped that by increasing the cost of the land they could limit the numbers of people who could afford a house in the country. The effect was often to convert an even greater amount of agricultural land. Because of the longer commuting distance made possible by better roads and an increasing desire to get out of the city, satellite suburbs were built. Often located miles away from city or town, this form of country development exhibited some of the worst aspects of the zoning laws. The satellite suburb patterned after its city counterpart, stood detached from both urban and natural environments, isolated and surrounded by corn and soybean fields, a potential nuisance to the farmer. Rural counties also had to face the problem of the proliferation of vacation homes, usually built for seasonal habitation only. Besides encouraging vandalism and raising taxes, the second homes frequently were shoddily constructed and lacked proper site planning. The satellite

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suburb and vacation home were luxuries of the automobile and cheap energy which were particularly wasteful of agricultural land and the quality of rural areas.

In the last hundred years America has experienced the rise of an industrial market economy along with the growth of a relatively affluent population. Though the rural economy has always been important, it is in the urban economy that the population has centered. The laws have had to adjust to the large proportions of people living in the city and their mobility. Some of the hardest questions courts will face in the future shall be over what property rights should be held in private hands and what rights should be owned by the public. As access to information becomes more important than physical possession of resources even the definition of what is property is likely to undergo further change.

In the most recent period, cities are beginning to recognize that agricultural open space is not free open space for expansion. Rural areas are beginning to see that they are connected to urban areas not just economically but in a shared interest over allocation of land. This final linking has in part given rise to regional planning, regions being a city with its surrounding counties or a much larger geographical region. The development of regions is a first step in understanding land use problems in terms of interrelated rural and city human environments and the larger natural environment. Just as the planned unit development adjusted individual property rights to natural conditions, so do regions offer planning opportunities for entire geographical areas whose borders cross the traditional legal boundaries. The next legal level along this line is likely to be international environmental regions

for the earth's land masses similar to those being developed for the oceans.

The legal institutions introduced in the early years of the nation worked admirably in the settlement of a large country and the promotion of growth leading to a strong market economy. It is only in the past few years that it has become apparent that the laws of property which worked so effectively to ensure justice between men often illustrated the weakness of social relations that do not match with environmental relations. Indianapolis, though politically centered in the state, was unfortunately for its residents, built upon a swamp. Steel companies built the town of Gary in northern grassland to be near related industries and markets. It was unfortunate that neither land nor citizen was considered as the city was laid out as an unrelieved cross-hatch of streets at a time when the same officials were encouraging a more natural design for their own city, Chicago.

However, in most instances cities were not an artificial construction imposed upon the land by industry or state government, but developed quite logically on their own in areas rich in resources and near available markets. Many of our recent environmental problems have come when cities through trade have been able to grow independently from the local resource base. This usually resulted in the spread of urban growth into the fertile valleys that had supported the early town. In the last century it has been difficult for the legal system, which generally changes slowly through precedent, to keep up with the rapid accumulation of knowledge and its use in applied technology. The zoning laws and regional plans were from a legal standpoint, radical attempts to retain order amidst rapid change. The restrictions that the environment

imposes upon our activities is a clear warning that our present legal conception of property has yet to merge with the sterner laws of biology and ecology.

FARM PRESERVATION LEGISLATION

The preceding narrative has attempted to point at the rapid change in the levels of economic activity in one area of the Midwest which resulted in the displacement of large numbers of people in their migration from farm to city and led to the legal response centering around zoning to solve the problems of land use. By the 1960's, the problems from many sources grouped under the heading "Degradation of the Environment" suggested that economic and legal solutions then implemented were inadequate. The Federal Government set up a number of regulatory agencies to address some areas and on a smaller scale, cities and counties sought their own solutions to observe environmental difficulties. As a part of this local response, some states passed farm preservation laws to encourage farmers to remain in agriculture. The laws passed in the ensuing years were almost as diverse as the fifty states. It is only in the 1970's that these laws have been looked at as a part of a national land use policy, and on an even broader scale, a part of a comprehensive response to environmental disruptions.

The reasons for passage of farm preservation laws were many. In the last fifteen years farm prices rose dramatically in some areas, placing a tax strain on farmers owning large acreages. Cities, which often were located amidst fertile land expanded at such a rate that even city dwellers came to recognize that their own phenomenal growth was eliminating local sources of food production. Developments along superhighways often brought farmer and suburbanite into legal conflict over dust and smells, or higher utility and school taxes. Citizens in all urban areas experienced rising food prices and observed on television foreign hunger and our country's export of grain. Farmers close to expanding suburbs felt uncertainty over

the continuing availability of a large enough acreage to make farming viable. When farmers refused to make long-term capital investments and folded their operations, cities found around their borders fertile land left fallow. Some heavily populated areas began to view farmland as a source of open space, a visual relief from the din of the city. All of the states have felt more than one of these pressures, but their passage of laws has been far from uniform.

Preservation laws were generally passed in response to a particular problem perceived for each separate state. In Maine and Vermont the interstate highway system opened up areas to vacation homes which consumed forest and agricultural land. In New Jersey, Michigan, and California urban sprawl threatened to diminish local agricultural production and destroy land suited for specialty fruit and vegetable crops. In many of the Midwestern states laws were passed to give the farmer a break in his property taxes to offset the tripled value of his land. Florida was influenced by its large and growing retirement communities to pass protective legislation. Hawaii, which has to import many of its necessities, has a limited amount of available land, and has areas well suited to the growing of specialty crops, adopted a strong law to protect all of these interests. It should be noted that passage of protective legislation has centered on those states having the highest populations and fastest rates of development, and not on states that have the largest amount of agricultural land. This has meant states along the Eastern and Western Seaboards, where the population has concentrated, have passed relatively strong laws while laws in the South and most of the Midwest have remained weak.

The extensiveness of the legislation in certain parts of the country also reflects a political bias. New York and California, states which

have passed some of the more innovative laws, are known for their legal experimentation, so it is not surprising that they were early participants in trying different methods of farm preservation. States in the Midwest and South have traditionally not been eager to tamper with existing laws and this has probably further slowed their study into the forces, local and national, that affect agricultural areas. What emerges is a common legislative pattern, found particularly with environmental issues, of laws first passed to meet a specific local problem; then, as one state's difficulties are linked to another state's, in a manner much like the blind men who described the elephant by its many parts, further legislation and legal organization is adopted to meet the more broadly perceived problem. We are now at the level of the blind men, just beginning to understand agricultural loss as it reveals itself within economic, legal, and environmental relations.

With the exception of Hawaii, which passed a strict zoning land use plan in 1961, the laws have generally been passed in a stair-step fashion toward stronger legislation. The power of the state to tax has usually been the base from which have come most farm preservation laws. The stiffest legislation combines adjustments in taxation with zoning or restrictive agreements. Preferential taxation for farmland has had the widest acceptance with over 40 states participating. The preferential tax allows agricultural land to be assessed at its use value for farmland rather than its possible value if put to other uses. .This lowers the farmer's property taxes. However, in many states, it is common practice for assessors to give a lower valuation to farmland than for other property regardless of whether there is a preferential tax law or not.

This type of law does not provide any restriction on the conversion of agricultural land. Though developers may be prevented from taking advantage of the law by strictly defining farmer and farming, there is no way to prevent the farmer, on retirement, from selling the land to speculators. The preferential law does lessen tax revenues, particularly in rural counties, but it is difficult to describe the law as unfair since it offsets the rise in land and capital expenses over which the farmer has little control. Many states have added a rollback or penalty payment to their preferential tax law which the farmer pays on conversion of his land to other uses. Usually the penalty tax is measured by what the farmer did pay, and what he would have paid if his land had been taxed according to the new use. Though the tax is paid for what the difference would be for the preceding three to five years, the penalty hardly compensates for the profits gained from speculation. The roll-back tax does collect some revenue that would otherwise be lost, but it is a weak tool for land use planning.

The strongest farm preservation laws make use of some form of restrictive agreement or zoning often combined with a use value tax policy. In California, a city or county can establish an agricultural preserve which restricts land use to farming for at least ten years in return for a use value assessment or other compensation. The state then compensates the city or county for some of the loss of tax revenues. Michigan allows a rebate from the income tax when property taxes exceed a certain point. The state also allows for a farmer to contract with the state department for a period of ten years, restricting the land to farm production. A New York law has provisions for deferred taxation and a restrictive agreement that takes the form of agricultural districts. Farmers will

get a tax break from some public service levies and the state shall return to the county some of the tax revenue lost. The restrictive agreements are a positive step toward control of the development of agricultural areas. But up to this time most of the contracts have been entered into by farmers who live outside urban areas, leaving land close to the city open to development. Even if a restrictive agreement system were more effective, it still would be only at the level of short-range economic planning for participating local areas.

The extensiveness and purpose of the present legislation can best be seen in the varied details of the standards and requirements that decide who is protected and who may participate in the preservation laws. It is important to ask whether the law only deals with agricultural land, or speak also of land needed for open space, for recreation, and for forest. Ideally a law involving all of these categories would best prevent city development from being at cross-purposes with agriculture and forest use and might allow for directed growth or multiple use of land. Whether the program is made voluntary or not significantly influences the strength or weakness of the law as a comprehensive land use tool. Productivity and prior use requirements when lax, can encourage the speculator and when too strict, can make the program unavailable to farmers. Some of these requirements involve the classification of land according to agricultural suitability, while others measure yearly production, and still others measure the length of a farmer's residency on his farm. Each of these requirements raises its own questions. Does the residency requirement prohibit the inclusion of rented land? Are production limits based solely on amounts of harvested grain or is production weighed against energy use? Does the classification of land

include nearness to markets, or availability of water or is it limited to soil type or terrain? It is easy to see how even specific requirements can be further broken down to form an even finer grating to choose who and what are protected.

Once agricultural land becomes eligible under these programs it also becomes subject to penalties. Land that carries with it only a preferential tax is often reviewed every year by assessment. Restrictive agreements can limit agricultural land to a single use for a period of up to 20 years. In both instances a breach occurs when the land is put to a use other than farming. Some states include a provision allowing the state to cancel the restrictive agreement without penalty to the farmer. However, most statutes do not address themselves to what happens when there is a forced conversion of the land to other use by federal or state governments, or of a public conversion of the land to other use, or what to do if there is minor to extensive development of buildings or other improvements on the farm. The different rollback provisions are an added attachment to the preferential tax. If there is a change in use the taxes previously deferred must usually be paid for a period of up to three to five years preceding the change. Generally the change in land use is measured on two axes, the first being the length of time and the completeness of the restrictive agreement and the second being the severity of the penalty. So far only a few states have opted for the more restrictive agreements and from a practical standpoint almost no penalty has been severe enough to overcome the profits to be had in speculation.

The majority of farm preservation laws have only been in existence for a little over 10 years. Though it is time for review studies to be

made showing how the laws passed have succeeded according to their original purpose, the difficulty of making a worthwhile comparative review is evident in the problems of accounting for the varied nature of agricultural land and farming practices, the differences in the laws from state to state, and the numerous factors which add or detract from the law's effectiveness. Empirical evidence suggests that the preferential tax section of the laws have generally been accepted by the farmer, particularly those who are distant from speculatory pressures, as a welcome tax break that aids in the cutting of farm expenses. But the laws in many states have had little effect in directing growth or preserving farmland. What seems to be emerging is a concern over two issues. The first is making farmland a viable occupation. The second is preserving agricultural land. Up to this point most farm preservation statutes have at least in rhetoric proposed that they cover both interests, and in those states that have added provisions for restrictive agreements or zoned agricultural districts there are signs on an active attempt to make the laws protect the dual concerns of farmer viability and agricultural preservation. But where it appears that the present laws are only protecting the farmer's financial interest and neglecting the need for preservation then it is important to recognize that fact rather than let the farm preservation statutes provide a false security.

Most of the present statutes developed out of the taxing power of the state. Even statutes that speak of restrictive agreements and agricultural districts are intertwined with providing some form of tax benefits. Preferential tax laws have been accepted in over forty of the states and seem destined to become a solid fixture in any state farm program. The preferential tax laws are best suited for preserving

farmer viability rather than agricultural land. The inheritance tax and farm subsidies are other factors which can aid or hinder the ability of the farmer to continue in his occupation. Though the usual fear is that urban pressure will discourage the farmer, the buffeting of uncoordinated taxes and subsidies can have just as deleterious an effect on the farmer's willingness to stay in business. A future policy might look at all of the taxes and subsidies which can affect farmer viability and move toward a sensible balancing of these programs so that they do not work at cross-purposes to each other. By treating the preferential tax as an aspect of farmer viability rather than land preservation, this might have the effect of presenting other portions of the current legislation in a new light. For example, many states have a rollback payment attached to the preferential tax which is ostensibly there to deter the speculator and possibly perserve farmland. Though the rollback tax may be inadequate or inappropriate for this purpose, it might be very successful as a part of the tax policy to recover the funds that were not collected during the time when the farmer was protected by the preferential tax.

The preservation of agricultural land should probably be further broken down into the concern of protecting land along the urban fringe and the concern of regional, national, and world preservation of agricultural land. The statutes that have allowed for restrictive agreements and agricultural districts have not overcome the speculative landholding at the edge of cities. A variety of legislative proposals have been offered as a solution. One possibility is for the state to purchase the land and then lease it back to the farmer. Problems with this approach are its great expense and the adverse effect of preventing the farmer from owning his land, who must instead live in some uncertainty

over his relationship as a tenant to the state. Another innovative approach has been proposed in the transfer of development rights. The law considers property in terms of a bundle of legal rights. It is suggested that development rights can be split from the bundle and sold separately, as are mineral rights in some states. The transfer of development rights has been used in cities to protect historical buildings which are threatened with destruction because of rising land values. Instead of tearing down the historical building to replace it with a taller, more economical structure, the city would sell off the development rights to surrounding buildings who could then raise additions to their structures instead, leaving the historical building intact. When applied to land, builders must purchase development rights from farmers before they can build in areas selected for development. This would give the farmer adequate compensation while allowing him to remain in farming and would place some control over the direction of urban growth. The largest problem with transfer of development rights is that so far the idea has not found political success which in part may be due to the difficulties in assigning a value to the rights and setting up a program for administering the transfers.

Instead of transferring development rights, legislation has been considered which would provide for the outright purchase of development rights. Since the development right may be worth nearly as much as fee simple, the costs would be fairly high but the program has the advantages of assuring the farmer an adequate compensation and would leave him in control of his land. It would also allow for a substantial control over land development and could be accomplished without complex administration. The purchase of development rights has had some political success and

may be the most promising idea for the future. When land is taken by the state there must usually be compensation. In the case of swampland or land in the flood plain the compensation can be very small because these areas should not be developed anyway. When farmland is taken the compensation required is high because of its development potential. If the courts were to add to farmland's present value, the value of the land for future generations, then there would not be such a great disparity between the market price of developed as opposed to underdeveloped land. As agricultural land becomes more valuable for its food production the courts might move toward a policy of treating farmland as a public trust instead of as another commodity open to the highest bidder. This suggests that not only the legislature but the courts must be considered as possible factors in forming a policy for farmland preservation.

Though some methods look more promising than others, it would be unwise to consider any one as a final or universal solution. In parts of the Midwest where the population growth is not rapid, a strong zoning law may be adequate. In areas where speculation and development are rampant, the purchase of development rights or even fee simple may be the only way to preserve some land. In the case of preservation at the edge of cities, there may be a desire to have a comprehensive program which coordinates the preservation of farmland and of open space, and may provide for multiple use of land around cities. With whatever legislation is passed there will be conflicts and compromises over how much growth and development can be limited or directed into certain patterns. It would not be unlikely that a legislative package would provide for tax preference laws to encourage farmer viability, some form of agricultural districts or zoning law to restrict land to farming

which is located away from urban areas to deter satellite suburbs and vacation home building, and specific laws that a city can avail itself of to control farm loss along the urban fringe.

A second concern is the more general loss of agricultural land. There is need for a comprehensive program to oversee the addition and withdrawal of farmland at the state, national, and world levels. At present, the Soil Conservation Service is preparing a national survey of prime agricultural land. Although this is a start, there is still much basic discussion and controversy on how to define prime agricultural land. The extensive data collected by the Department of Agriculture and made available to farmers through the Farm Extension Service provides an existing and expandable network by which information concerning farm production could be collected and disseminated. The LANDSAT satellites could be combined with conventional maps and data already available to form a sophisticated analysis tool to uncover potential farm problems. At the level of regional planning there is a need for the capability of a refined measurement of population growth and all of the demands of an urban area against the need to conserve energy and resources and preserve land for food production and open space. In order to determine the importance of preserving certain agricultural lands, an effective and comprehensive monitoring service will be required to coordinate planning in both rural and urban areas.

The farm preservation laws with their innovations in the form of restrictive agreements, agricultural districts, and rollback taxes were a good effort in light of the multiple problems faced by farmers in the 1960's. Though not ineffective, it is time to correct some of the weaknesses of current programs. As has been suggested, future proposals

might well deal with the problem of providing a tax policy which would encourage farmer viability and a preservation policy which would account for both the loss of agricultural land along the urban fringe and would set up a comprehensive monitoring system to diagnose those factors which may lead to agricultural land loss or identify land that has a particular value for preservation. Most of the pressure for farmland preservation has been in areas of high population and development. This has presented a difficulty in the Midwest where urban pressures, though present, are relatively small in comparison to the total amount of land that remains in farming. What is unfortunate is that the loss of an acre of highly productive Midwest farmland may mean a greater net loss of food production at lower energy cost than land elsewhere. A future farm policy might take this and other factors into account when measuring the need for preservation in areas which do not feel the obvious pressure of urban growth.

FUTURE POLICIES

The loss of agricultural land is a symptom, just as pollution and the rising costs of resources are symptoms of deeper problems that are as much philosophical and religious as physical. From the Biblical emphasis on man to the rational man of the Enlightenment, there was an emphasis on the human as a unique and independent being rather than as a biological participant in the larger environment. It is not surprising that when Darwin's ideas of evolution became known in the early years of the Industrial Revolution it was denied that man had a similar heritage to that of other animals, but the theories were accepted as support of industrial progress and competition. Man and his new mechanical tools stood apart from the natural world. The machines could increase wealth through production in a way that far outdistanced production in the biological world. In the early part of this century architecture embraced the machine in its skyscraper and its slogan of the home as a "machine for man." The modern version of the mechanical new world was the manufactured house and office building with their controlled internal environments. In economics the supply and demand curve predicted a quantity of goods or units of housing, the graph and its language of quantities and units emphasized a separation of the mechanical process, industry, and cities from the natural resources and environment upon which they depend.

The availability of expensive oil and coal for the development of mineral resources furthered the illusion of mechanical abundance. Facing the present shortages of fuel, the scarcity of resources, and an increase in pollution man is beginning to again recognize his biological origins. In an ecological system each plant and animal is linked to the next, all dependent directly or indirectly on energy released from the sun. When

there is a change in environmental conditions some species thrive on the change, and others fail. It is a gift of man's genius that he discovered more direct routes to tapping the sun's energy, escaping the close combat for survival among the other species. Releasing the sun's energy present in wood, coal, gas, and oil, man increased the power of his tools and brought more of the earth to his own use. Man, as the present successful species of the planet has continued in those activities which first gave him dominance, the increasing use of energy and the manipulation of the earth's resources. The rapid growth in population is in part a reaction to the success with which the world has been made suitable for human life. In the latter half of this century man is seeing his stock of energy run short either in actual supply or in expense of recovery, and in the manipulation of the earth's organic and inorganic resources the ecosystem is showing signs of breakdown.

The conservation of energy and the maintenance of ecosystems will in the next few decades become crucial factors in deciding the urgency for farmland preservation. Modern agricultural practices require energy in the form of gas and oil in the running of machinery and the manufacturing of fertilizer, and the use of electricity for lighting, heating and refrigeration. The high production possible in the new plant varieties is aided by large amounts of fertilizer which is manufactured in a process usually requiring gas. Since the cost of the fertilizer is largely the cost of the gas, when the price of this energy source rises, unless a substitute is found, the cost of fertilizer will go up. The price of electricity is rising along with the threat that large users, which includes some farms, may not be given in the future the favorable rates that they have received in the past. Arid land requires additional energy

to pump water for irrigation and marginal land requires large energy expenditures to reclaim and maintain. As energy becomes more expensive or scarce, the prime land that requires less energy for high production will become more valuable while some arid land or marginal land will be dropped as energy costs make farming prohibitive, though other marginal land may be brought back into farming where lowered production is offset by even lower energy costs. In either case the availability of prime land, particularly near urban areas would deserve protection.

The energy costs directly related to food production are significant but are only a fraction of the total energy used in this country. In America and the other developed nations a large amount of energy is consumed in the processing, packaging and transportation of food from farm to market. In the United States the population is heaviest along the East and West coasts. From the beginning of the century to the present most of this country's grain and beef have come from the Central and Midwestern states, shipped through Chicago, Kansas and other cities to markets long distances away. Population pressures have threatened the specialty crops in many states and in other areas has eliminated local sources of food crops which together have made cities more dependent on imports from outside of their states. As the costs of food processing and transportation rise, the loss of fertile land near urban areas may be increasingly felt. When Michigan studied the loss of farmland it treated the state as if it were an island which would have to produce most of its own food. When the study revealed that at current rates of loss much of Michigan's prime land, located in the southern half of the state, would be gone by the end of the century, turning an agricultural exporter into an importer of food, the state launched an

innovative and strong land use policy. Many states along the coasts face agricultural loss more dramatic than in Michigan. A state whose land use policy is based on the availability of food in other states may find itself paying unexpectedly higher food costs as the prices of processing and transport increase. One of the problems with measuring agricultural loss is that some crops that lend variety to the diet are grown in areas of special climate and soil which if lost cannot be reproduced elsewhere. At present, New Jersey and California are facing the loss of a variety of specialty crops while Michigan is losing its cherry orchards and Florida its fruit groves. The conversion of this land means either a narrowing of the diet or larger expenses in importing the food from further distances or reproducing the crops in greenhouses or other methods which will come only at higher energy and material cost.

Rural energy use may not significantly affect prices but the consumption of energy in cities can easily draw the price of all energy upward. Urban areas in America developed and matured during a period of cheap energy. Both the city filled with skyscrapers and the sprawling suburban community are the unfortunate results of this history of profligate consumption of resources. Either by being overbuilt in the form of skyscrapers or underbuilt in the form of scattered single-family homes, or built in the wrong places with urban areas which must make extra effort to subdue climate and terrain for humans, they have a direct effect on resources available to agriculture. Cities that are wasteful in energy and resource use raise the costs to farmers and can alter farm production just as easily by freezing out the availability of resources at reasonable cost as they can by building on the land.

In the last few years the definite need to encourage agriculture in foreign nations has been realized. This seems necessary to alleviate world food shortages and to encourage stability. The agricultural practices recommended will require substantial amounts of fertilizer with its inherent energy cost. A much greater energy cost will arise out of the need for irrigation and for the roads, dams, and support facilities necessary for this kind of agricultural expansion. Many of the areas chosen for future farm development are distant from the population centers which means there will be a need for the processing and transporting of the food products after harvest at additional energy expense. It is hoped that by improving agricultural production along with some industrial development, the average income will rise in the foreign countries and this will encourage a decline in the rate of population growth. Whether this policy will be successful or not, the provision of goods and services will raise resource use which at present is very low when compared to that of the developed nations. The resources and energy necessary to aid the developing nations will be large and may ultimately affect what resources and energy supplies are available and at what cost to developed countries.

The preceding litany of energy expenses must currently be paid for out of a limited stock of oil, gas, and coal along with the continuous flow of energy from the sun. Nuclear energy, with its own inherent problems will not be an abundant source of energy in the short run and even in the long run may prove to be expensive. The availability of cheap energy in America has encouraged a kind of development in which the country is seriously faced with digging under crop land in some northern Central and Western states for the deep seams of coal beneath.

Besides the questions of reclaiming the land and finding enough water to process the coal, there is the question of whether the coal might be better used in fertilizer production rather than burned in power plants. Future fuel demands may make this question moot. It is important that all of the energy uses that are claimed to be needed in the near future by agriculture and cities are considered together when deciding on the urgency of farmland preservation.

It is likely that those land use policies that preserve land near cities to cut processing and transportation costs, that preserve areas in which specialty crops are grown, and preserve prime land which does not require irrigation, expensive reclamation or fertilization, and land use policies that recognize the effect of city planning with its resulting energy use on the prices of supplies for agricultural production may all become necessary in just a few years. Plants are most beneficial to man when they depend primarily on the sun for their energy. The increased population and established farming practices make it difficult to move in this direction, but unnecessary steps in the other direction towards increasing energy use only makes man's place on the earth precarious. In the long run a policy of energy conservation at every level is necessary and a part of this would be the preservation of fertile land naturally suited to crops without the addition of large amounts of energy, and the preservation of farmland near population centers.

The preservation of ecosystems is the other major factor for considering the urgency of farmland preservation. When nature is left to itself, the niche that is left for man is like that of any other animal. He is open to harsh climates and to the constant risks that are imposed upon all species. By gathering in a group man bettered his chances of

providing food through the collective success of the hunt. At some point a group stopped its migration for food, and developed a proficiency in the use of tools, the control of fire and the necessary social organization to begin to manipulate the environment so as to form a crude garden that would sustain his primitive city. Neither the garden nor the city are to be found in nature without man's presence. Both are creations of man bending the chaotic activity of nature toward himself and ordering it to his benefit. Since that early time the cities have grown into vast urban areas and gardens have expanded into a developed agriculture. When man first began his city building and garden tending his effect on the complex interrelationships of other plants and animals was significant but not greatly detrimental. But there is a point where the bending goes too far and ecosystems break down damaging both other species and man. Agriculture can flourish over long periods of time only when its conscious manipulation of biological systems does not surpass the tolerance of the many plants and animals which support it.

Modern farming techniques require new productive strains of plants which can respond readily to the application of large amounts of fertilizer. The plants must be protected by regular application of herbicides and pesticides. In nature, a large number of plants have parts that are edible for man but they are usually not in a large enough quantity to support a nonmigrating population. When large numbers of persons settled in one place, a more organized and practiced agriculture was demanded. To increase the amount of food, the most likely of the many possible plants were chosen for domestication. The best lands were selected for agricultural use and it is no surprise that settlements, cities, and civilizations developed in areas with inherent agricultural

potential. After many years of use the land often became infertile. Various methods were developed to maintain soil fertility including a rotation of cultivated and fallow land, interplanting legumes and other nutrient-fixing plants with other crops, and frequent application of manures. While this allowed a sustained agriculture to continue, other methods were searched for to increase production.

From early times man had bred certain animals for meat and skins, strength and beauty, or other traits that were then desired. The animals became dependent on the conditions provided by man for survival just as man became dependent on the animals for what they supplied. At the turn of the century a deepening understanding of the basic principles of genetics allowed this breeding process along with its dependencies to be extended to food plants. To draw full advantage from the hybrid plant strains every part of the new plant's ecosystem had to be made as ideal as possible. This undertaking matured in the Midwest where there was already a deep fertile soil, flat land, available groundwater, a long growing season and a regular pattern of rainfall. All of these traits contributed to the tolerance of the Midwest for the replacement of native plants with those selected for agricultural development. If the population had been dense in the Midwest a different style of farming might have been encouraged; but because the population was sparse machines evolved parallel to the new plants to bring as much of the land as possible into agricultural production. A further condition which allowed the adaptation of the Midwest to agriculture was that much of the land before farming had a climax stage that was not forest but grassland, and so to replace the wild grasses with varieties bred for food was not to make an abrupt change in the natural conditions already present.

For a number of reasons agriculture in the Midwest underwent a further change in the development of an ecosystem wholly controlled for the purpose of encouraging the bloom in a small number of crops in a continuous cycle of high production without the old rotations and manuring. Those chemical elements of the soil which were taken up by plants and were lost when the grain was removed from the farm were added in the form of fertilizer, most of which was derived from a subsidiary process in the refining of oil and gas. Other chemicals in combinations not found in nature, were applied to stop the growth of undesirable plants and eliminate harmful insects and pests. Further genetic research was carried on to develop strains of plants that could take advantage of the large amounts of fertilizer distributed into the soil. Recently, scientists have given renewed attention to the life beneath the ground which breaks down the soil, fixes nitrogen and contributes to the building of humus. The effect of large applications of fertilizer and frequent use of pesticides and herbicides on soil life is not entirely understood but may become important in determining whether modern practices which are tolerated by the soil of the Midwest will be similarly tolerated by quite different soils.

Because of the demand for food, some variation of the modern farming practices brought to maturity in the American Midwest are trying to be introduced into foreign nations. Though we are becoming more sophisticated in our understanding of what portion of the knowledge drawn from the experience in the Midwest can be used by lands having a much different climate and soil, expectations of higher food production should be tempered by what we do not know about how far ecosystems can be bent to serve man before they break. For example, the difficulties

of bringing tropical soil into production, with its tendency to leach minerals when the vegetation is cut down, its multitude of insect and plant species which must be controlled, and the need to develop the strains of food plants that will be productive in this area, are problems which will be hard to surmount in providing a sustainable agriculture. All of this is not to discourage the necessary research in these areas, but to point out that the land so valuable for production in America is very tolerant of agriculture and that caution is necessary when predicting the success of agriculture in lands that are less tolerant. The urgency for preserving lands known for their agricultural success may rise as our knowledge of ecosystems deepens.

This study has assumed that though energy, resources, and technology may combine in new ways that will mean greater food production without prohibitive cost or damage to the environment, a conservative outlook toward these possibilities is called for because as was discovered in the success and later difficulties of the Green Revolution, the biological world is far more complex and reluctant to change than is the mechanical world whose rapid development we have become accustomed to. Energy use and protection of ecosystems have been emphasized because any improvement in food production will have to measure its ultimate success against these two factors. It has been suggested that nuclear power plants creating large amounts of energy will solve many of our current problems. Even disregarding the dangers of radiation and thermal pollution, such a large supply of energy would encourage further use of material resources, which, if the past is any measure, would have a further adverse effect on ecosystems.

Some scientists have suggested that the production of algae, the synthesis of proteins from coal, or feeding the roughage left over

after harvest to animals are sources of increased food production. Support facilities for the algae tanks would require large amounts of energy and material resources. The synthesis of protein from coal is possible but would probably be less energy efficient than a more normal biological product. Both of these ideas may be too expensive for underdeveloped countries to adopt. It is possible to feed the roughage left over after harvest to animals but this would lessen the amount of material available for building up the humus in the soil. There will likely be many technological improvements to food production in the future but it should be kept in mind that until that time, the most economic and efficient methods of food production are a sustaining agriculture depending primarily on sunlight for farming.

At the beginning of this study, an economic and legal history was sketched in order to show some of the rapid changes that have taken place in both fields since the turn of the century. There is evidence that more fundamental changes shall take place in the near future, particularly in regard to agriculture and land use. The laws of property transmitted to this country from England instilled in this vast unsettled land a belief in an essential right of property and the right of the settler to do with it as he pleased. In the last hundred years the citizen's bond to property has been altered, and those who remain as landholders find their right to use property more strictly balanced against the public good. As the need for more food becomes critical, farmland may be increasingly protected, to the chagrin of the speculator and possibly the retiring farmer who had expectations for its conversion.

The degree of industrialization has nowhere been as extensive as in the United States where even agriculture is patterned in the style of factory production. The economy has flourished in this period of industrialization, but the limits of resources and energy have had a sobering effect on future expectations. Though man can survive without many industrial products, his requirement of food is a constant. Energy and material resources have been used to raise food production, in spite of a decrease in the total number of acres under cultivation. When these resources become short, agriculture will have a hard time shifting away from these expensive additions to production unless there is available land that can be brought into use. Economic and legal theory will be forced to absorb a few of the underlying rules of biology and physics in order that they can provide a social basis for adequate land use and food production.

At the center of land preservation is the need tc aid the farmer so that he may continue in his occupation. The rising costs of energy and materials places a continuing burden on the farmer, who is often forced to shirk long-term planning and conservation practices for short-term gain. The small margin of profit to which the farmer is held discourages experimentation which might risk lowered production. In battles over material and energy resources the city with its much higher population and political clout is more likely to succeed in its demands than the farmer whose numbers have steadily decreased. The large size of farms encourages efficiency over conservation and the rise in rented land carries with it the concern that this land will not receive the personal attention that has been the strength of the wholly owned farm. The tax laws have been slow to compensate for

the inflated value of land and rising capital costs. The belated concern of cities over agricultural problems has diminished the trust and cooperation necessary for the painful adjustments required of both groups. In surveying the future needs of farm production and the need for preservation of agricultural land, a major task will be to develop those policies which will help ensure that the farmer's work will be something more than a frustrating and unfruitful occupation.

AFTERWORD

In the Old Testament the prophet Joel described the punishment of a locust plague that would befall those people who had lost sight of their heritage and would leave the vineyard withered, the fields barren, and the people filled with unhappiness. If the rest of the world's fields were like those of the Midwest in America, with vast expanses of flat land, deep and fertile soil, a long growing season and a mild climate then they might tolerate as does this region, a simplification of plant variety to a small number of food crops and a land that can absorb the large amount of fertilizer that means full development of the hybrid strains now grown, and a land that can stand the runoff of soil that yearly turns the Wabash River, which the Miamis called the River of White Stones, into its present muddy flow. Since man stopped surviving off the hunt, agriculture has been the mainstay of the population which has come to live in cities. As we hope for more food as we increase our knowledge and refine its application Joel's metaphor of the locust plague should be kept in mind, that we may not exceed the limits of biological manipulation, and threaten our life as we extinguish the life in its many forms that have evolved with us.

Toward the end of his writing Joel proclaims:

> Multitudes, multitudes, in the valley of decision;
>
> for the day of the Lord is near in the valley of decision.
>
> The sun and the moon are darkened and the stars withdraw their shining.

If we do not stand in the shadow of these words today, then it is not far off when we will: As we aspire to reproduce the sun on earth

in the form of nuclear fusion, our population grows and we are bound in an intricate struggle with our own species to develop food, yet not destroy the chains of ecosystems which much of our agriculture strains against, and to give all humans some of the benefits of our own life, yet not exhaust the energy and resources which our life-style consumes in such abundance. It is a recurring story in evolution that those plants and animals that become overly specialized are the first to be destroyed by changed conditions, natural and man-made. Man, by the remarkable development of his brain, has remained one of the most adaptable of earth's creatures, developing through the use of tools rather than by a slow irreversible genetic alteration. In the rise in population, the finiteness of the planet, and the effects of technology including the introduction of chemicals and in the future, new genetic combinations that owe their existence solely to man rather than to the fortunes of a more complex evolution, man is specializing the earth to his own use. There is no evidence that this will avoid the precarious existence that was the risk of other types of specialization. The preservation of farmland is also the preservation of flexibility and time, that we may prepare and not needlessly darken our future.

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