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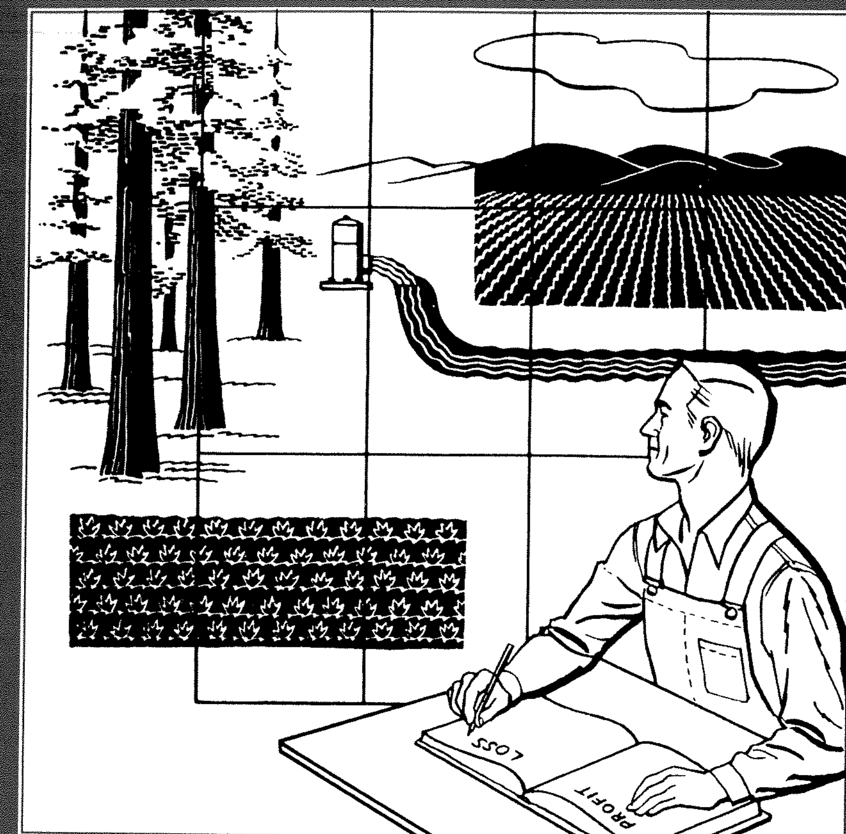
Dollars and Sense in Conservation

S. V. Ciriacy-Wantrup



Preface to the
Natural Resources Conservation Service
Reprint of

"Dollars and Sense in Conservation"
By: S.V. Ciriacy-Wantrup

University of California
Agricultural Experiment Station
Circular 402
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The Natural Resources Conservation Service is reprinting, with permission from the University of California, S.V. Ciriacy-Wantrup's 1951 California Agricultural Experiment Station Circular, "Dollars and Sense in Conservation." Ciriacy-Wantrup, a pioneer in resource economics, explained how economic principles help us understand the conservation behavior of farmers and ranchers. Knowing these principles is still important, not just to the resource economist, but to anyone involved in furthering conservation on agricultural lands. It is remarkable, after more than 40 years, how timely and relevant the topics and issues remain. To fill the need for a better understanding of farmer and rancher behavior, the Natural Resources Conservation Service is making this circular available to its employees and others in the conservation field.

Resource Economics and Social Sciences
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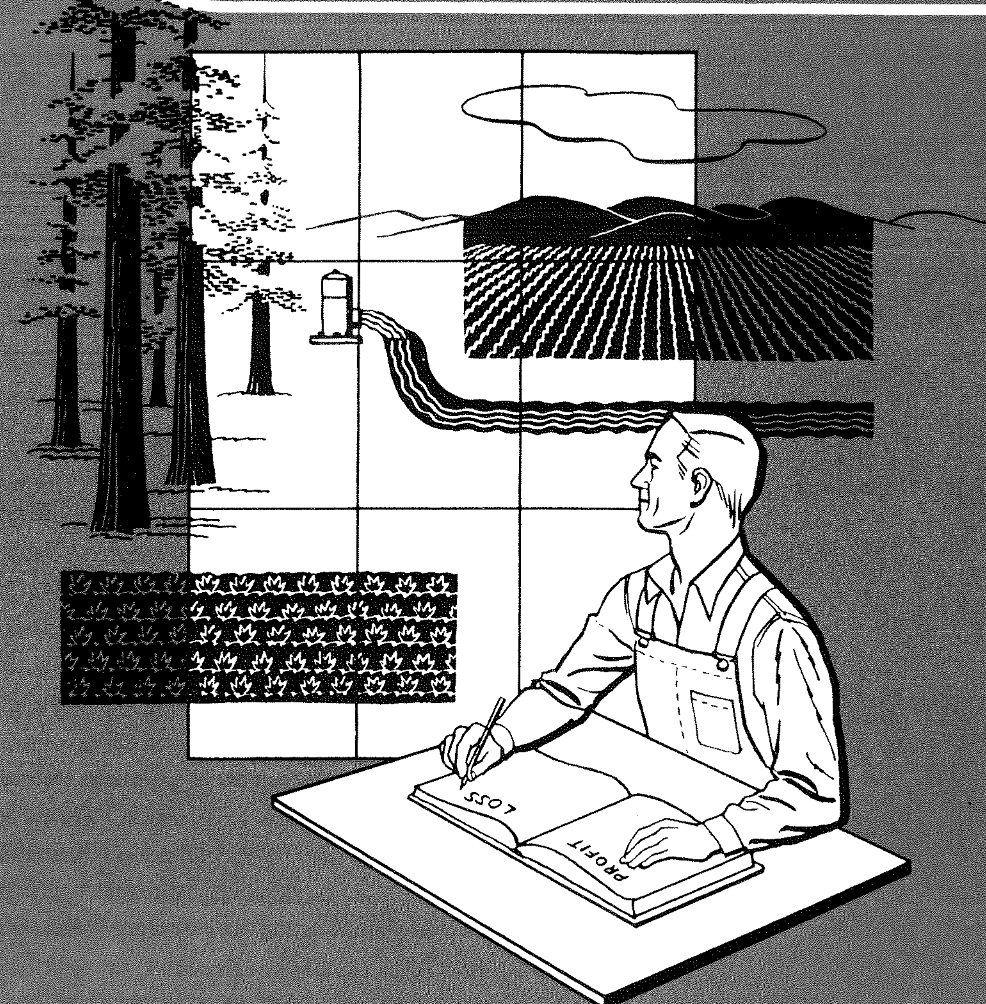
DOLLARS AND SENSE IN CONSERVATION

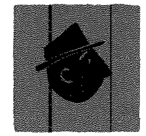
S. V. CIRIACY-WANTRUP



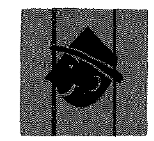
CALIFORNIA AGRICULTURAL EXPERIMENT STATION · THE COLLEGE

This circular shows how . . .

. . . these discourage conservation—



these encourage conservation—



Dollars and Sense . . . in Conservation . . .

. . . are too often ignored when efforts are made to encourage conservation.

For a farmer may be forced to deplete his farm, not because he does not know how to conserve it, nor because he does not want to, but because he cannot afford to.

On the other hand, values paid and received in the market place do not *alone* determine what farmers can do about conservation. Dollars are important; but farmers with common sense and a sense of their responsibilities as citizens also take broader values into account when they make conservation decisions.

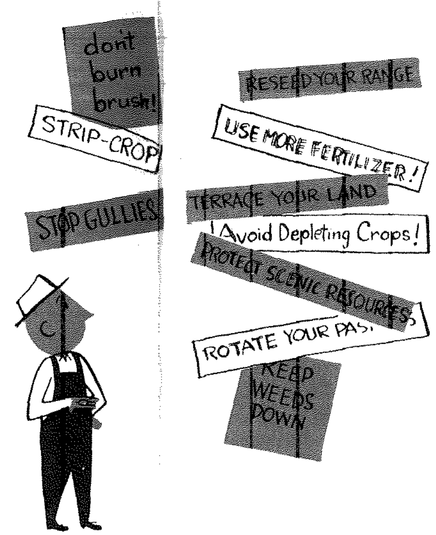
THIS CIRCULAR is intended for the farmer who is interested in conserving his farm and the natural resources of his country.

It does not tell how to lay out a contour orchard, or prevent gullies, or reseed a range.

Rather, it analyzes what a farmer must consider when he decides whether such practices will pay. It is intended to help him adjust his conservation decisions to changes in economic forces.

It shows that if needed conservation practices do not pay, the reasons are often man-made, and can be changed.

And it suggests practical steps to make dollars and sense work for conservation. Some of these steps are ones a farmer can take in cooperation with his neighbors, his banker, or his landlord. Others require public action. Farmers as a group have a powerful voice in shaping public conservation policy. If they understand what is needed, they can, through their representatives and organizations, help to bring about changes that will conserve their own and the nation's resources.



MR. WANTRUP is Professor of Agricultural Economics and Agricultural Economist in the Experiment Station and on the Giannini Foundation.

THE CIRCULAR IS BASED on the author's book, *Economics and Policies in Resource Conservation*, now in press. Readers who are interested in a fuller and more technical presentation of the matters discussed in this circular are referred to the book, which deals also with other types of resources than those covered here.

. . . of farm resources, much study has been devoted to technical problems: how to prevent erosion, what fertilizers to use, how to control pests and diseases and to improve plant varieties and animal breeds. These and other studies have often helped farmers conserve their resources.

The economic problems have been neglected

Little research has been done, however, on the economic problems of conservation.

Yet economic considerations often keep a farmer from adopting a conservation practice after its technical problems have been solved. This is the core of the problem we are dealing with here. Why is it that a farmer may not be able to afford some practice that is needed to conserve his resources?

We can find a sound answer only by careful analysis of economic forces

The answer to this question is neither easy to find nor simple. Most California farmers sell the bulk of their products in the market. Hence they and their resources are affected by all the forces that govern our complex economy.

We cannot find a sound answer by ignoring these complexities, by oversimplifying. We must trace the various economic forces that are at work, and see why and how they influence farmers' conservation decisions.

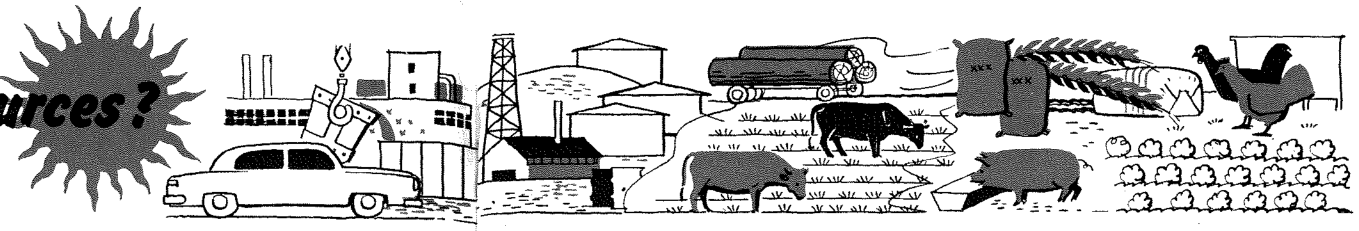
Farmers can help solve public conservation problems

What the farmer does with his resources is not of concern to himself alone. The public has become concerned about the depletion of some resources. It is asking: What sort of public action could be taken to encourage their conservation?

In a democracy, solution of conservation problems depends on well-informed voters. If farmers understand the economics of conservation, they can help to solve public conservation problems, particularly ones that concern farm resources.

Before we can discuss any conservation problems intelligently, we must first be clear as to what we mean by "resources" and "conservation."

What Are Resources?



Resources range from ground water to human labor

Most people would readily list soil and water and forests, oil and coal and metal ores as resources. But resources are by no means limited to these familiar ones.

The sun's radiation is also a resource. So are plants and animals. Fish and game, state and national parks, mountains and seashore are resources for recreation.

All these and many others are *natural* resources. There are also cultural resources, ranging from machinery and houses to systems of education and forms of government. And there are human resources—the labor, skill, and talent of people.

"Resource" implies PEOPLE, NEEDS, and KNOW-HOW

Every resource is something people *can use* to satisfy their needs—anything from ground water and grasses to musical compositions.

There must be a person or group of persons—perhaps the community as a whole—who plan to *use* the resource. And we must have learned how to use it: uranium ore became a resource only when we developed the know-how.

For resources are not static. They change as people, needs, and know-how change. The rich farmlands of California meant nothing to the Digger Indians; they were not a resource until the white man came.

Agriculture and forestry use renewable natural resources

The earth has a limited stock of such resources as metal ores; the supply is not renewed. These are called *nonrenewable* resources.

The supply of such resources as plants and animals, on the other hand, is renewed from time to time; there is a flow of them. Hence they are called *renewable* resources. The period it takes to renew the supply may be long, as with forests, or short, as with range grasses.

Like other thoughtful citizens, a farmer may be concerned about nonrenewable resources as a national problem. But he uses few of them as such in his business. Most of the natural resources farmers and lumbermen use are renewable.

The use of some resources may influence their flow

We have no way of influencing the flow of such resources as the sun's radiation. Storage is important for some of these: whether or not we learn to influence rainfall, we can store the water in reservoirs.

With many renewable resources, however, the *amount* we use in one period affects the flow in some future period. Cutting timber one year, for example, affects timber growth the next.

Often the *way* we use a resource affects future flow as much as the amount we use. Up-and-down-hill plowing may have greater effects on soil productivity than the plant nutrients we take out through the harvests.

If the flow of such resources is decreasing through use, we may be able to build up the flow again. If the forage on a range has become depleted through overgrazing, a rancher may be able to increase it by reseeding, fertilizing, or rotation grazing.

Some resources have a danger zone

The flow of some resources can be restored only if we act in time. If we let the flow fall too low, we may not be able to reverse it. For example, we cannot restore an animal species once the breeding stock has been destroyed. This has happened with some of our wildlife resources, such as the passenger pigeon.

Resources such as these have a DANGER ZONE. *If, through use, we allow the flow to fall below the danger zone, we either cannot restore it at all or can do so only at great cost.* Soil resources are renewable, but some of them have a danger zone.

Resources are related to each other

By using one resource we always affect others, whether we intend to or not. This is because resources are related to each other in many ways. Whenever we, either as individuals or through government action, are deciding what to do about any one resource, we need to consider what effect our action may have on other resources.

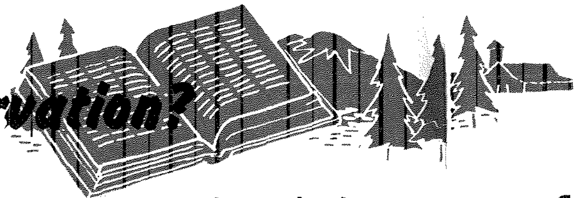
Soil, plants, and animals are closely related

Relations between resources are complex in farming. The growth of plants and animals is the joint product of many resources. Seeds, the sun's radiation, rainfall, and plant nutrients in soil are used together to produce plant growth.

We often speak of the soil as though it were a single resource. Really it contains a group of resources—mineral elements, organic matter, soil water, oxygen in soil air. These resources are related in many ways and can be used only by growing plants in the soil. With *crop* plants, still other resources enter the picture—machinery and human labor, for instance.

With such a group of resources as there are in the soil, it is hard to measure a single one. For practical purposes, we often measure the flow of soil resources by crop yield. If we do this, we should keep in mind that yield really measures the use not only of the whole group of soil resources, but also that of the sun's radiation, human effort, equipment, the seed used. An improved plant variety may result in higher yields even though the nitrogen flow has actually decreased.

What Is Conservation?



"Conservation" is often used vaguely, is frequently confused with other ideas. Sometimes the word is applied to projects that are not conservation. On the other hand, we may limit it too strictly by thinking only of what it means in a particular situation.

Conservation does *not* mean non-use

When it is not used with resources, "conservation" means preservation—keeping something from changing. Some people speak as though conservation *of resources* could likewise be restricted to this meaning. But can it?

First of all, conservation does not mean non-use. Resources, as we know, are things which people plan to use for satisfying their needs (p. 4). Something that is conserved for no use would cease to be a resource. Thus conservation is always concerned with an aspect of use. Some people believe that this aspect is keeping use constant over time.

Conservation does not *only* mean keeping use constant over time

If a good farmer takes over a badly eroded place, he may try not only to stop further erosion, but also to build up his soil. He may try to increase crop yields, not just prevent them from decreasing. But he would say that he was practicing conservation.

When a rich virgin soil is first cultivated, it may have an abundant productivity that is the result of years of undisturbed accumulation of organic matter. It is difficult, and seldom economical, to keep such a soil as productive as in its virgin state. But it may be economical to slow down the decrease in crop yields. A farmer who does that would say that he was practicing conservation.

In special cases conservation does keep the use of a resource constant at the present level. For example, a farmer may plan a fertilizing program designed to balance the depletion of plant nutrients caused by the harvests. But conservation cannot be restricted to such special cases.

Conservation is concerned with the WHEN of use

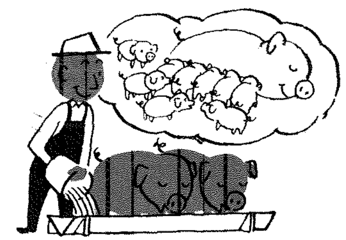
Conservation, then, may increase use of a resource above the present level, may keep it constant, or may slow down the decrease. The important point is that conservation practices change the *when* of use: they change the time distribution of use. This is the aspect of use we are concerned with here.

Conservation (or depletion) always implies comparison of two or more time distributions of use. We may compare expected yields if new practices are adopted with what yields would have been if the old practices had been continued. We may compare several production plans merely by calculation, by budgeting. Or we may compare two or more practices that have already been carried out.

In all such comparisons, we need to take account both of the amounts of the changes and of their distribution over time. The more distant the future in which use is increased by a given amount, the greater the degree of conservation. Conversely, the greater the distance a given amount of use is shifted from the future toward the present, the greater the degree of depletion. In a workable definition of conservation and depletion, the *when* of use is no less important than the amount.

Conservation may be achieved in several ways

A farmer can conserve his resources by reducing present use, which means that he foregoes some present returns in order to realize greater future returns; or he can conserve resources by expending present effort or costs without reducing present use—sometimes even with increases in it. Sometimes he has a choice; sometimes only one is possible; sometimes he uses both. Thus a cattleman may conserve a depleted range simply by deferred grazing, or by reseeding and fertilizing, or by cross-fencing and rotation grazing.

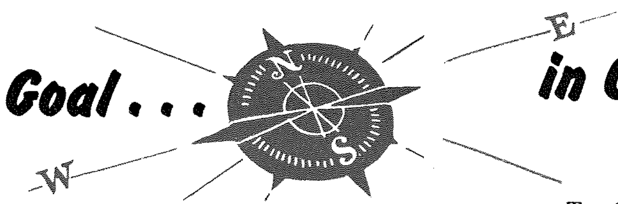


Conservation may be wasteful

Conservation is not always economical. There is an economic limit, somewhere, in conservation: there is a point beyond which increasing future use by reducing present use or by expending present costs will not pay. *The most profitable state of conservation for a given resource depends on the cost in other resources—natural, cultural, and human.*

The farmer cannot afford to practice conservation of one resource that is wasteful of his other resources. How does he decide what conservation practices to adopt—which ones would be wasteful, which ones would make sense?

The Farmer's Goal . . . in Conservation



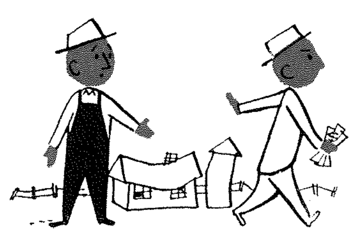
A farmer makes conservation decisions whenever he makes plans that affect the future productive capacity of his resources. For, as we have seen, conservation and depletion are concerned with changes in the way the use of resources is distributed over time. Farmers cannot avoid conservation decisions; such decisions are required by the very nature of the farm business.

Farmers sink money into long-time investments

Farmers have to sink relatively large sums in investments that can be recovered only through future income. Such recovery demands production plans for the future. If a farmer invests in land, buildings, a drainage or irrigation system, trees, equipment, or breeding stock, he has to make plans for the use of his soil that will enable him to recover such "sunk costs." He has to make decisions about the *future* income-producing capacity of his land. Most of his actions *now* affect this capacity.

Farmers have to consider the value of their assets

Even if a farmer has the opportunity of selling his farm easily and thus is able to recover his sunk costs at once in the sale price, he cannot avoid conservation decisions. For the *buyer* considers the future income-producing capacity of the farm. Soil depletion, run-down buildings, or poor inventory of livestock, tools, and supplies affect the sale price.



Any decrease in the value of a farmer's assets will also come home to him if he wants a good tenant or a loan. At such a time, depletion practiced in earlier years may turn out to be rather expensive and inconvenient. Both tenant and creditor consider the future income-producing capacity of the farm.

Thus whether future costs and returns accrue to a farmer year by year or are realized through a change in the value of his assets, a farmer must consider them in his plans.

Economists assume that a farmer's goal is maximum present profits

How does a farmer decide what plan will be the most profitable? Economists usually assume that farmers base their decisions on what will in the long run "maximize present profits"; that is, a farmer adjusts his plans so that the present value of all future profits will be as high as could be obtained from his land.

To find the present value of future profits under a given plan, a farmer estimates the profits he expects to make each year of the period he is planning for (and the value of his assets at the end of this period). Then he discounts these values—that is, he decreases them—let us say $4 per $100 for each year they are distant in time. He does this because he is less interested in $100 next year than in $100 now; moreover, if he invested $100 now he could earn interest on it during the year. The interest rates he uses in discounting are considered later.

After discounting each year's expected profits and the value of his assets at the end of the planning period, he adds the results to get their total present value. Then he can compare this with the present value of other plans to see which one promises to be the "best" plan.

A farmer uses time discounts, even if he doesn't call them that

A farmer may not sit down and make exact calculations of time discounts at a certain interest rate. He may not call what he does do "discounting."

Many a farmer just has his "druthers." He may say to himself that he'd rather have his profits now unless by waiting he can get more. How much more may be just some standard in the back of his mind; he may not think of it in terms of interest rates.

Still, in effect, whether he calculates it all out on paper or figures it out in his head according to some standard of his own, any sensible farmer discounts the profits he has to wait for.

So far, then, we can agree with the economist's thesis. What about the rest?

Money profit is not all a farmer considers

One shortcoming of maximum profits as the farmer's goal is that it considers only dollars. Even a hard-headed business farmer takes other things into consideration. He may prefer having some good game habitat on his farm to getting a few more dollars from cash crops. He may want time to go fishing. He may prefer to remain in sole control of his business rather than borrow money to cover the cost of adopting new practices that he thinks would increase his returns. He may paint his buildings as much from pride or for his own pleasure as to lengthen their economic life.

These values are not priced in the market. But that does not keep a farmer from considering them. It is only good sense to include them in returns when we discuss conservation in farming.

A farmer rarely figures exactly how many dollars a certain non-dollar return is worth; but he has no difficulty in deciding whether, for example, the prospect of earning a given amount of additional money is worth going into debt for, and thereby giving up some measure of his independence. There are limits to the amount of dollars he will sacrifice for any one of these other returns, or all of them together.

A farmer wants to avoid any danger of losing his shirt

A second shortcoming of the economist's theory is that it assumes that the farmer can determine exactly how to get peak profits in the future.

But a farmer has only guesses or hunches as to what will happen to costs and prices in the future. How do such uncertainties affect his goals?

The plan that is most likely to bring maximum profits may be one that would mean bankruptcy if his guesses are far off. A farmer can guard against such a remote possibility of extremely heavy losses in various ways (see p. 16), but mainly by choosing a flexible plan.

A flexible plan allows a farmer to make adjustments from time to time as he sees more clearly what is likely to happen. On the other hand, a flexible plan will bring lower profits than a fixed plan based on the most likely guesses—*if such guesses prove right.*

An increase in flexibility has important effects upon conservation. These and other effects of uncertainty upon conservation we will take up later (p. 16–18). Now we are interested in how uncertainty modifies the goal of "maximum profits."

A farmer must often use trial and error

A farmer's uncertainties about future costs and prices are usually so great that he cannot hope to hit exactly the peak of profits. All he can do is to try to move in the right direction; the only course that makes sense is to take one step at a time, try one change after another, improve net returns by trial and error. Most of his trials and errors will be made on paper, by budgeting. In this way a farmer may choose among alternative conservation practices without actually putting them into effect.

A farmer can't make very small changes

In theory, profits can be brought to a peak only by very small, independent changes in each cost factor.

In practical farming, such fine adjustments are seldom possible. A farmer may realize that he could increase returns by adding a few more man-hours of labor in a particular operation. But he can't often hire a man for a few hours a month; he frequently has to hire a full-time worker or none at all. Similarly, he can't buy half a tractor.

Also, a change in one operation may involve changes in others, frequently on a large scale, usually in more than one year. Thus, in terracing, a farmer has to figure not only the cost in man-hours and machine-hours and materials to construct the terrace, but also changes in expenses for repair and upkeep over the years, changes in his irrigation system, perhaps changes in crops involving new equipment and different risks, and other changes.

A farmer cannot estimate what effect each of these changes will have on his profits; instead, he compares the total expected increase in gross returns with the total additional costs. Calculations must be based on interrelated changes made in sets. A conservation practice usually involves such a set.

This type of calculation may not enable a farmer to hit upon the exact peak of profits. But he may be able to decide which of several conservation practices is the best for him.

What can we conclude about the farmer's goals in conservation?

When we consider the realities of farming, we can scarcely accept unmodified the economist's thesis that a farmer's conservation decisions are based on maximizing the present value of profits. As we have seen, the farmer considers values other than dollars. He will avoid a plan

that might lead to heavy losses or bankruptcy if his hunches about costs and prices are wrong, even though it promises the highest profits if his hunches are right. His uncertainties about future costs and prices are so great that he cannot hope to hit the peak of profits, but can only try to move in the right direction a step at a time. And any changes he makes must be in terms of whole conservation practices.

A farmer must change his conservation decisions according to changes in economic forces

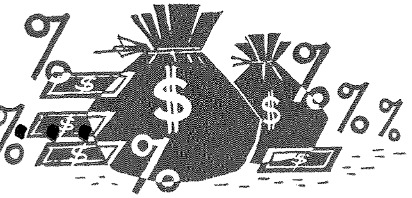
That a farmer makes plans for achieving his goal doesn't mean that he keeps his plans unchanged. Changes in economic conditions force him to change his conservation decisions from time to time.

An understanding of how economic forces affect conservation decisions is highly important for the farmer and for the public. To help in such an understanding is the major purpose of our study.

Let us examine therefore how changes in such economic forces as interest, uncertainty, prices, property rights, taxation, and many others affect a farmer's conservation decisions. Let us inquire, further, whether these forces could be modified in such a way as to work *for* conservation rather than *against* it.

As we do so, we must keep the farmer's goal in mind. For we cannot reach any conclusions that are valid, or find any solutions that are workable, if we lose sight of what the farmer is actually striving for when he makes his conservation decisions.

Interest, Income . . . . . . and Conservation



Interest rates and economic forces related to them are among the most powerful factors that influence conservation.

As we saw in the preceding section, when a farmer compares two or more conservation practices, he *discounts* the future profits he expects from each plan.

How will a change of the interest rates he uses in discounting affect conservation?

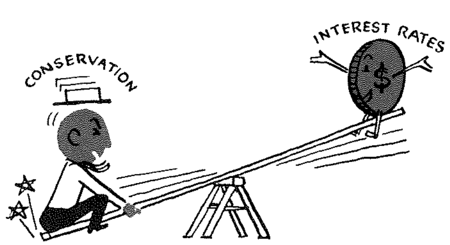
A rise in interest rates discourages conservation

When the interest rates a farmer uses in discounting go up, the present value of his future profits goes down. More distant profits are lowered more than those nearer to the present.

Therefore when interest rates go up, a farmer will try to shift profits to years closer to the present. He can do this either (1) by shifting *gross returns* toward the present, or (2) by shifting *costs* further toward the future.

1. Except by reducing storage (a limited possibility in farming), he can shift gross returns toward the present only by increasing production in years closer to the present at the expense of production in the more distant future.

2. He can shift costs toward the future only by reducing sunk costs (p. 8). For example, he may reduce his investment in improvements, equipment, and breeding stock. But any such reduction in sunk costs means that future costs will be increased or future production decreased.



Thus whether a farmer shifts the time distribution of his gross returns or that of his costs, *when interest rates go up*, he will shift the use of his resources from the more distant to the less distant future; in other words, *he depletes his resources* (p. 6). A rise in the interest rates discourages conservation.

By the same reasoning, when interest rates go down, conservation is encouraged.

Does a farmer use market interest rates in discounting?

What interest rates does a farmer use in discounting? Offhand, we would probably say that he uses market rates, such as the rates charged by the federal land banks or by commercial banks in his community.

Suppose that a farmer can borrow at 4 per cent; or that he can sell his farm at a price based on capitalizing expected future profits at that rate. Then he would be short-sighted to use a 5 per cent interest rate in discounting; for a plan based on the higher rate would be more depleting. Instead of lowering the market value of his farm by depletion, he would be better off to sell or lease his farm; or, if he wants to stay in business, borrow money.

Similarly, he would be better off to base his plan on the market rate than on a *lower* rate, which would be more conserving. In this case he would get higher profits now if he used the market rate;

he could use these profits to buy or lease more land or lend money.

Thus, a farmer would use the market interest rate in his plans *if he could actually get money at that rate* (or sell his assets capitalized at that rate) *or could actually invest money at that rate.*

If all farmers could do that, the situation would be what economists call a "perfect market." But is the market for farm assets and loans perfect?

In a perfect market the price is the same to all

A "perfect market" is one in which all individuals can buy and sell any desired quantities at the prevailing price. The spread between selling price and asking price is small and explained by the costs of marketing.

The wheat market comes close to this situation. The price is approximately the same to all—buyers or sellers, large or small.

The market for farm assets and loans is far from perfect

The market for *physical farm assets* is imperfect for a number of reasons: There are usually only a few buyers or sellers of farm assets in a community. No two farms are alike. Most farm assets—land, buildings, fences, trees, drainage and irrigation systems—cannot be moved as wheat can be. Farms can seldom be divided into any sized portions a farmer may wish to buy or sell. And farmers often do not have adequate knowledge about general market conditions for farm assets.

Each farm sale or lease is a special transaction, complex and important. A farmer cannot undertake such a transaction easily and often.

The fact that a farmer cannot readily move or change jobs—that his skill is specialized—adds to the difficulty of buying or selling a farm.

The market for *farm loans* is likewise imperfect. Lenders are few and well organized as compared with the farmers who want to borrow. The assets with which the loans are secured are, as we have seen, not interchangeable. The higher the proportion of loan to assets, the higher the interest rate.

Thus there is usually no single rate at which all farmers can get or invest money. The spread between borrowing rate and lending rate is wide, changes from time to time—for example, between booms and depressions—and is different for different communities and farmers.

Hence farmers may use their own time-discount rates in their conservation decisions

Suppose a farmer cannot borrow or lend money readily at a general market rate—let us say 4 per cent for first mortgages—and cannot buy or sell farm assets at prices corresponding with such a rate. Rather than sell or borrow at a much higher rate, it may be more economical for a farmer to deplete his resources. Or it may be more economical for him to invest in resources through conservation than to buy land or lend money at a much lower rate.

In such cases we may say that the farmer uses in his conservation decisions an interest rate based on *his own need of money now*—his own time-discount rate—rather than a market interest rate.

If he does, then a change in his time-discount rate will have the same effect on his conservation decisions as a change in the market interest rate would have, and for the same reasons.

But what causes differences in different farmers' time-discount rates, or causes a given farmer's rate to change?

Time-discount rates go up when incomes go down

It has been observed in many studies of economic behavior that, in general and on the average, the lower a farmer's income, the more each dollar of income *now* means to him. Therefore:

1. A farmer with a low income *level* needs money now more than does one with a higher income.

2. If a farmer's income *goes down* (as during a depression), his time-discount rate will go up; he will be less willing or able to wait for income. And the change in his rate will be greater if his income was low to start with.

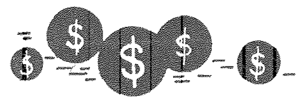
Conservation is discouraged when income goes down

Since conservation is discouraged when a farmer's time-discount rate goes up, it is discouraged when his income goes down.

But all farmers may not be affected to the same degree. If a farmer is struggling to make ends meet, even a small decrease in his income may force him to deplete his farm. Whereas the same change in the income of a well-to-do farmer may not force him to change his conservation decisions.

Economic forces that affect income affect conservation decisions

Under these circumstances, economic forces that affect farm incomes will be especially important for conservation decisions if they bear differently on low and on high farm incomes. Such forces include prices of farm products, subsidies, costs, and charges (for interest, loan payments, taxes, and so on).



Similarly, costs and charges will be important for conservation decisions if they do not go down when incomes do, during depressions.

Low-income farmers often get lower prices

Small-scale farmers often get lower prices than large-scale farmers. It costs them more to market their products, they generally know less about markets, and it is harder for them to contend with monopoly conditions. Then, too, they consume at home more of the products they raise, so that they have a smaller proportion to sell.

For these reasons, price increases—for example, through government supports—do not encourage conservation as much as if the same total increase in farm income (for all the farmers affected by the price increase) came through a direct income subsidy. Income subsidies have the further advantage, from a conservation standpoint, that they can be adjusted to conservation needs on particular farms.

Low-income farmers often pay higher costs and charges

For much the same reasons that they get lower prices for their products, small-scale farmers sometimes have to pay more for the goods and services they buy. Thus debtors with low incomes sometimes pay higher interest rates than those with larger incomes. Rents per acre are often higher for small farms. Some taxes, such as the property tax, are often proportionately higher for small farms. Those costs that bear more heavily on low farm incomes than on high ones discourage conservation.

In depressions, fixed charges discourage conservation

Fixed charges (property taxes, fixed cash rents, and interest) are ones that do not go up and down with farm income. They leave a lower net income when incomes go down, and a higher one when incomes go up, than flexible charges would.

If markets for farm assets and loans are imperfect, fixed charges tend toward depletion during depressions; and the depletion is only partly offset by conservation during booms. True, during booms a farmer has more net income with fixed charges than he would with flexible ones; but (p. 14) a change of income has less and less effect on his conservation decisions as his income goes up.

Making economic forces work FOR conservation

We have been considering how interest rates and the forces that affect incomes influence farmers' conservation decisions. We have seen that they may either encourage it or discourage it, according to the direction in which they change. Then could we not try to make them change in the direction that would encourage it? Can we not find ways to make them work for instead of against conservation?

Later we will inquire why and when the public may want to encourage conservation. But the relations between interest, income, and conservation suggest that, if the public does want to encourage conservation, these economic forces may become tools instead of obstacles to its policy.

Lower interest rates would encourage conservation

We have seen that an increase in interest rates discourages conservation. Hence the public could encourage conservation by keeping interest rates low. Just what measures it can use to do this we can see more clearly after we have discussed credit as an economic force. We will return to this problem then.

Better markets for farm assets would encourage conservation

Market interest rates will not influence the decisions of those farmers who do not have ready access to them because of imperfect markets for farm assets. Sometimes the public could encourage conservation by improving these markets.

The public could improve the market for farm loans by various alterations in the credit system (p. 27–28). The market for other farm assets could be improved by providing farmers with better information about the real estate market, by a better and more uniform system of appraising farms, by improving the laws and customs of farm tenancy (p. 24–26), by leasing or selling government land to enlarge farms too small for economical operation, and by aiding cooperative use of heavy equipment and breeding stock.

Income can also be used as a tool of conservation policy

So long as markets for assets are imperfect, any forces that affect farmers' incomes—and hence their time-discount rates—will have an influence on conservation. Conservation would be encouraged:

1. If low-income farmers were at less disadvantage in product prices, costs, and charges.

2. If government action to increase farmers' incomes during depressions were taken through subsidies for conservation rather than through general price supports.

3. If flexible charges could be substituted for fixed charges in interest, rents, and taxes.

We shall see in later sections that there are practical opportunities for public action in most if not all of these directions.

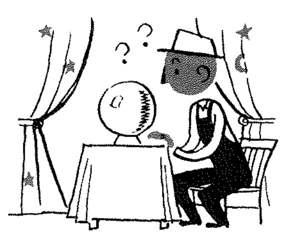
Uncertainty . . .

. . . and Conservation

While a farmer always has to do a lot of guessing about future costs and prices (p. 10), he is more uncertain in some years or periods than in others. He is more uncertain, for example, when demand, technology, or public policies are changing rapidly. Furthermore, different farming systems and different regions differ greatly in the uncertainties of nature to which they are exposed. How are these various differences in uncertainty reflected in a farmer's conservation decisions?

Most farmers dread uncertainty, a wide range in their guesses

Suppose a farmer in making his plans has to guess what the average price of oranges will be next year. Let us say that, *under fairly stable economic conditions,* he guesses the most likely price is $2.00 a box; but that it might average anywhere between $1.50 and $2.50. *If economic conditions are more unstable,* he might still guess that the most likely price is $2.00; but that it might average as low as $1.00 or as high as $3.50. An increase in uncertainty does not in itself make him change his guess as to the most likely price, but *widens the range* from his lowest to his highest guess.



While some farmers like to take long chances, most farmers dread great uncertainty, a situation in which the range of their guesses is wide.

How does a farmer allow for uncertainty?

A farmer does not make the same plans if the range in his guesses about prices is wide as he would if they were narrow. He allows more for uncertainty in his plans if the range is wider. He may make this allowance in any of five ways:

1. He may discount for uncertainty.
2. He may make his plans more flexible.
3. He may hedge against uncertainty.
4. He may pool uncertainties with other farmers.
5. He may spread uncertainties in his own business.

Discounting for uncertainty discourages conservation

As with time discounts (p. 9), when a farmer discounts for uncertainty he decreases the present value of future profits; he decreases them more the wider the range in his guesses about future costs and prices.

The more distant the future, the more uncertain a farmer will be about costs and prices. Even if the most likely price five years from now is the same as that of next year, the *range* would be wider.

If a farmer makes allowance for uncertainty in this way, a change in his uncertainty discount works just like a change of time discount or interest (p. 12): a rise in it leads to depletion; a lowering of its encourages conservation.

As for what rate he uses: Insurance is available for a few of a farmer's uncertainties, such as fire and hail. He can use market premium rates in discounting for those uncertainties. But for most of the uncertainties a farmer faces, there is no insurance, no market risk premium. Therefore only a few farmers make exact calculations of uncertainty discounts; but as with time discounts (p. 9), a farmer will have some standard in the back of his mind by which he can decrease expected profits according to his uncertainty.

The trouble with discounting for uncertainty is that it doesn't safeguard the farmer against the remote possibility of very heavy losses as a flexible plan does.

More flexible plans discourage conservation

As we saw earlier (p. 10), farmers mostly allow for uncertainty by choosing flexible plans, which allow them to make adjustments from time to time as they see more clearly what is likely to happen.

A farmer can make his plans more flexible by keeping a larger part of his assets in liquid form (cash, U. S. bonds); by getting land, buildings, and equipment on short-time leases rather than ownership; by buying less durable equipment; and by postponing investment in improvements—in short, by reducing his sunk costs. As we know (p. 12), a reduction in sunk costs results in depletion.

Hence if a farmer makes allowance for uncertainty by flexibility instead of by discounting, *an increase in uncertainty still discourages conservation.*

? ? ?

Hedging is not very helpful in farmers' conservation decisions

Grain and cotton farmers are familiar with the way hedging works in their products, and many of them make use of it. In this way the bearing of uncertainty is shifted to professional specialists, usually speculators in a futures market.

But most futures markets extend only to the next year. Hence hedging does not cover uncertainties far enough in the future to have much effect on farmers' conservation decisions. So far as it has any effect, it reduces farmers' needs for making allowances for uncertainty through discounting and flexibility. Hence, in a limited way, it encourages conservation.

Pooling reduces uncertainty allowance

By taking out insurance, farmers use pooling in allowing for such uncertainties as fire and hail in wheat fields. The uncertainties farmers can allow for by pooling must be ones that are scattered fairly evenly among the members of the pool in any one year, or among the years over a long period, like major droughts.

The probable total loss for all the farmers in a pool can be estimated more accurately than the chance of loss for any one farmer. Thus the total allowance for uncertainty (the total risk premium) for all is less than if each farmer made his own allowance independently. The larger and more continuous the pool, the more accurately the hazard can be estimated; hence it is important that the pool be large and continue over the years.

For hazards that lend themselves to its use, pooling is effective in reducing farmers' need for uncertainty allowance through flexibility; hence it encourages conservation.

Diversifying the farming system reduces uncertainty allowance by spreading

Insurance will not reduce the uncertainty allowance for such hazards as changes in farming technology and changes in consumers' tastes and incomes. With these, all growers of a given crop are likely to be affected if any are, and they are not scattered evenly over the years. But these uncertainties can often be reduced by spreading.

In farming, spreading usually means diversifying—putting the eggs in more than one basket. The chances are that if the costs or prices of one product change sharply because of changes in technology or tastes of consumers, the costs or prices of another will change less, or may even change in the other direction. Hence if a farmer raises several crops, he can make a smaller over-all allowance for uncertainty than he could if he raised just one. In this way, like pooling, it encourages conservation. Whether diversifying is conserving in itself depends on the farming system resulting from it. It often is conserving, but not always.

Possibilities for public policy to reduce uncertainty

There are a number of ways in which uncertainty allowance could be reduced by properly directed public policy.

Insurance could be used more often to pool against such hazards of nature as weather, insect pests, diseases, and fire. Public policy could help expand its use by furnishing the data on which sound plans could be based; and by enacting regulations to make sure that pools are large enough and continue over the years. The federal crop-insurance program for wheat, cotton, and other crops is an example of the measures public policy could take.

Should the public bear the costs of uncertainty?

The public does not bear the costs of uncertainty if it merely assists in pooling uncertainties—provided farmers pay the full risk premium.

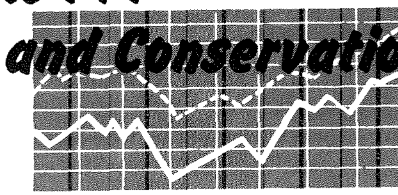
Sometimes a shift of uncertainty bearing to the public may be desirable as a form of subsidy to certain groups, especially during an emergency. But it has a debit side that should be considered.

Public credit and confidence may be hurt, so that the allowance farmers make for uncertainty may even go up.

If farmers do not pay the full premium in a crop-insurance plan for such crops as wheat and cotton, they may be discouraged from diversifying, though this may be the most economical way to allow for uncertainty.

There may be even more serious misdirecting of effort if uncertainty bearing by the public takes the form of guaranteed prices and income. From the standpoint of conservation, these policies are of value if they reduce farmers' uncertainty. In the past, they have been more successful in changing the distribution of income.

Prices, Price Supports . . . . . . and Conservation



In preceding sections we saw how conservation is affected by changes in two particular market prices—interest rates and risk premiums. The effects of these price changes on a farmer's conservation decisions are fairly clear-cut because they have important and definite relations to time: the effects of any given change of interest or uncertainty increase with time. Further, any of these changes affect a farmer's production plans in a definite relation to time. As we know (p. 6), time relations are of basic significance in conservation economics.

Time relations of other price changes are complex

How about changes in the prices a farmer gets for his products and pays for labor and the goods he buys? What effects do such changes have on his conservation decisions? In order to answer such questions correctly, we must know:

1. How a farmer expects price changes to be distributed over time; and

2. Whether a price change (of a farm product, labor, material, equipment) encourages practices that are specifically conserving or specifically depleting.

A given price change affects equally all the years of the planning period *over which it lasts;* its effects do not increase with time, as do those of any change of interest or uncertainty. A present price change expected to last indefinitely would give farmers no incentive to shift production (if practices are not affected).

But in actual life farmers usually do not expect price changes to last indefinitely. A farmer may expect prices to go up or down over a certain period, then to remain at the new level for a few years or return to the previous level, or change in any number of other ways. Such expectations may cause him to shift his production.

There are so many possible ways that farmers may expect prices to change in the future that we cannot make any *general* statement about how expectations of price changes affect conservation. We can, however, find out what happens under certain expectations that are especially significant for farmers.

If farmers expect product prices to go up and stay up, conservation is encouraged

If the prices a farmer gets for his products have for some time been going up (or down) as compared with the prices he pays for what he buys, he may expect them to continue to go up (or down) or at least be higher (or lower) in the more distant future than in the next few years. Since this condition occurs fairly often, it will be worth while to see how this affects his conservation decisions.

A farmer will try to have more to sell at the time he expects prices to be higher. He will try to shift the use of his resources toward the future if he expects prices to be higher then; that is, he will practice conservation. On the other hand, if he expects product prices to be lower in the future, he will tend to deplete his farm; for example, he may try to reduce such sunk costs as fertilizer input and money spent for improvements.

If farmers expect high prices to last only a short time, conservation may be discouraged

Another set of conditions a farmer often faces is that which occurs during wars or booms. Then prices for his products are high, but usually he does not expect high prices to continue very long—perhaps the next three or four years at the most. He will then try to shift the use of his resources toward this period of high prices at the expense of production later on, when he expects prices to be lower. In other words, he will deplete his resources.

Labor and most equipment may be used either to conserve or to deplete

As we noted before, the effects of price changes depend not only on their time distribution but also on whether they encourage practices that are specifically conserving or specifically depleting. These effects are highly complex in their relation to conservation. A farmer may use a tractor or plow for exposing slopes to water erosion or semiarid grasslands to wind erosion; or he may use it for building terraces or for contour furrowing. He may use a bulldozer or scraper for stopping gullies; or he may use it for clearing land. Thus much of the equipment and materials a farmer buys may be used either for conservation or for depletion. Labor likewise can be used either in conserving or in depleting practices.

For labor, and for materials and equipment that can be used either for conservation or depletion, we can, therefore, make no general statement about how price changes will affect farmers' conservation decisions. Only with those materials and equipment that are used mostly for conservation, or mostly for depletion, can we say how a change in prices will affect conservation. Conserving materials are, for example, fertilizers and legume and grass seed.

Farm products in themselves are neither conserving nor depleting

Soil conservationists sometimes speak of certain crops as "conserving," of other crops as "depleting." They may, for example, call alfalfa and grasses "conserving" and tobacco "depleting." It is true that an increase in the price of alfalfa that leads farmers to increase alfalfa acreage at the expense of some other crop will often result in soil conservation. And an increase in the price of tobacco that leads farmers to increase its acreage at the expense of some other crop sometimes results in soil depletion. But the result depends on the changes in the whole production plan: what crops they replace and what practices are used with them.

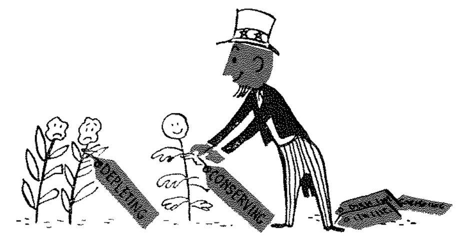
In many parts of the world, peas and soybeans are important in soil conservation; but the increase of the prices for peas during World War I led to soil erosion in the Coast Range of California, where farmers expanded pea acreage at the expense of permanent grasslands. And some soil experts believe that the expansion of soybeans when prices went up during World War II went too far from the standpoint of soil conservation under the farming systems in the Middle West.

Sometimes the ideas of "conserving" or "depleting" crops or materials or equipment may be helpful as a sort of shorthand approximation in understanding and predicting results. But we must remember that in order to predict results correctly we have to assume a certain time distribution of price changes and a certain effect of the changes on conserving or depleting practices under a particular farming system.

Subsidies for "conserving" crops may not always encourage conservation

We can see from the cases just mentioned that we cannot safely classify any crop or other farm product as "conserving" or as "depleting" under all conditions. To

make such a classification, and then to subsidize "conserving" crops and penalize "depleting" crops is therefore not always in the interest of conservation. On the contrary, classifying *crops* (rather than production plans, practices, or farming systems) on this basis confuses theoretical and practical issues and may lead to a waste of public funds. An example taken from United States agricultural policy of a few years ago may illustrate these points.



Before the last war, certain crops were classified as soil-depleting, and penalties (deductions from AAA benefit payments) were imposed for growing them. Until 1941, corn grown for silage, sugar beets, grain sorghums, peanuts, potatoes, truck and vegetable crops, field beans, peas, soybeans harvested for seed, flax, and summer fallow, among others, were officially classified as soil-depleting. Some of these crops are valuable for soil conservation under most farming systems because they may serve as a basis for a more diversified livestock economy, or because they may be helpful in eradicating weeds through row cultivation and shading effects, or because they can be fertilized heavily without danger of lodging, or, with the legumes, because nitrogen-fixing bacteria grow in the nodules on their roots. One seems justified in concluding that these crops were classified as soil-depleting, not for the sake of conservation, but rather to reduce the acreage for other ends, such as maintaining parity prices. With the growing demand for crops during World War II, the label "depleting" was generally taken off of these crops.

Price supports do not always encourage conservation

When we considered how a farmer's income affects his conservation decision (p. 14), we concluded that a direct income subsidy, especially for low-income farmers, encourages conservation more than price supports do. This conclusion is strengthened by the relations discussed in this section.

Farmers know that such supports depend on the political fortunes of a government, a party, or a pressure group. They are uncertain whether price supports will be continued after another party comes into power. Hence, as with any increase in uncertainty, farmers will try to shift their use toward the present, when they are surer of price supports. This means depletion. If the government states that price supports will be discontinued at a certain date, this will tend to encourage depletion still more.

Under some conditions—for example, to speed up mining of ores and other nonrenewable resources during a war—it may be important to encourage such depletion. But price supports in agriculture will encourage conservation only in those few special cases where they are sure to continue over the whole planning period and where they really encourage conserving practices.

Caution is needed in predicting the effects of price changes on conservation

Some readers may be disappointed that we can find no hard and fast general rules about the effects of price changes on conservation. Changes in the prices of farm products, of labor, and of what farmers buy have far-reaching effects on farmers' conservation decisions. But we need to use great caution if we try to find out whether the changes encourage or discourage conservation, and how great their effect is.

Property Rights . . . and Conservation

The economic forces discussed thus far—interest, uncertainty, and prices—are strongly affected and partly produced by property rights. These rights have effects on farmers' conservation decisions in addition to their effects on interest, uncertainty, and prices.

Property rights are a bundle of rights of control over resources. These rights, sometimes called "tenure," include not only ownership, but also the rights an owner surrenders to a tenant when he leases, or to a creditor when he borrows. They include also such public rights of control as taxation.

Tenancy, credit, and taxation each have special effects on farmers' conservation decisions, which we will take up in later sections. Let us first examine the over-all relations between property rights and conservation.

Indefinite property rights lead to depletion

With some resources, property rights are not well defined, either by law or in other ways; the user must "reduce them to possession" before he has definite rights. Such resources are called "fugitive" because they must be "captured" through use. Wildlife in the United States is a fugitive resource. Before the Taylor Grazing Act, range forage in the Public Domain was one. Percolating ground water is a fugitive resource if unregulated draft by several users exceeds replenishment in a certain ground-water basin.

Definite property rights in these cases belong only to those who are in possession—those who get there "fustest with the mostest." Every user tries to get as much as he can while the getting is good. When the public range is a fugitive resource, a rancher is uncertain whether he will get any more forage next year if he limits his herd or his period of grazing this year.

Such uncertainty tends to encourage depletion (p. 16–18). If future rights to the resource were more definite, such depletion would be uneconomical.

Unstable property rights lead to depletion

Property rights may be well defined, but may be unstable; they may change frequently. This is particularly true of tenant's rights, as we will see in the next section. Likewise, an owner who has high interest and amortization payments to meet must fear he will lose his land in times of drought or depression, and may have no more interest in soil conservation than a tenant with a short lease.

In periods of political change, when strict government regulations, confiscatory taxes, or outright socialization threaten a sudden and radical change in property rights, all resource users will hesitate to make long-time investments.

In all these circumstances a farmer will adopt a plan that he would regard as wasteful depletion if his property rights were more stable.

Unbalanced property rights lead to depletion

Property rights also affect conservation because they determine how future costs and returns are distributed among owners, tenants, and any others. Usually the person who makes conservation decisions considers only those returns he gets himself, and only those costs he himself has to pay. Returns and costs to others may be determined by his decisions but do not influence them.

Thus a farmer may find it profitable to deplete cheap foothill land and move on. The resulting runoff and soil erosion may do great damage through washing or deposition on valuable valley land and through siltation of essential water reservoirs. Still, property rights in most cases are such that these costs have no influence on the foothill farmer's plans.

On the other hand, laws on private property rarely grant public support, for example, to farmers who take pride in a well-kept landscape free of gullies, billboards, and rural slums, and in so doing conserve scenic resources. In such cases the public shares the returns but not the costs.

Farmers often cannot afford a conservation practice from which they do not get all the returns, if those who share the returns do not also share the costs. They may be indifferent to costs of a depleting practice if those costs are borne by someone else. Hence unbalanced property rights frequently lead to depletion. In the following sections we will see this again and again in cases of unbalanced property rights between owner and tenant, between borrower and creditor, between different farmers, and between farmers and the public at large.

Are there remedies?

The depleting effects of indefinite, unstable, and unbalanced property rights are the result of the laws, regulations, and customs that govern these rights.

Property rights can be better defined

In California, rights to percolating ground water are not sufficiently covered by statute; but definition of these rights is gradually being worked out in the courts. Ownership of this important resource is vested collectively in all those who have rights (Correlative Rights Doctrine). A farmer is entitled to "reasonable beneficial use" of the water for land overlying the basin. Any surplus above such use by the overlying landowners may be appropriated and taken for use outside the underground basin. If an overdraft exists in the basin, shares of both overlying owners and appropriators in the common resource may be adjudicated in the courts, which are permitted by statute to refer any case to the State Division of Water Resources for investigation. The statute also provides for a Water Master Service to administer adjudications.

The Taylor Grazing Act of 1934 furnished the basis for unified control over the public range. This act established grazing districts, administered by the Grazing Service (now in the Bureau of Land Management, Department of the Interior) in cooperation with local stockmen. Ten-year, renewable grazing permits are issued to individual ranchers. By custom, fairly secure rights have been established, with the result that, in many cases, grazing permits are capitalized in the value of the permittee's home ranch.

Property rights can be made more stable

Unstable property rights are such an important cause of resource depletion that they warrant detailed consideration. This will be undertaken when tenancy, credit, and taxation are discussed.

On the other hand, the needs and the ideas of our society with respect to property rights slowly change. The legal body of property rights must change accordingly. If it does not, political stresses and strains are created. The resulting uncertainties are just as undesirable for conservation as unstable property rights.

Property rights can be better balanced

There are three general ways that unbalanced property rights can be remedied.

1. Through the principle of compensation, costs and returns can be distributed to those who are responsible for them. This can be done both by perfecting existing legal instruments, such as civil laws covering damage, and by devising new ones, such as government subsidies to conservation.

2. The public can prohibit those kinds of resource uses in which the distribution of costs and returns is badly out of balance. Examples of this remedy are zoning restrictions and nuisance-abatement ordinances.

3. Or the public, instead of prohibiting certain uses, may require certain practices. Examples are some land-use ordinances by organized flood-control, irrigation, soil-conservation, and range-management districts.

We will take up these three tools of conservation policy in more detail later.

Tenancy . . . . . . and Conservation

In California, both owner and tenant usually have something to say about production plans. In such cases we are interested in how tenancy affects both owner's and tenant's conservation decisions.

The general ways in which tenancy may discourage conservation have already been mentioned: through instability of tenure, through unbalanced distribution of costs and returns between owner and tenant, and through fixed rents. Here we will consider how these effects could be modified and how tenancy could be made to work *for* conservation.

Tenancy could be made more stable

A tenant's feeling of insecurity does not depend entirely on the legal status of the lease contract. Farms are often leased by oral contract for a year at a time. Legally the tenant's rights are very insecure, but well-established local customs may make them quite definite and secure. Many tenants renting bean lands in California under year-to-year oral leases have farmed the same land ten to fifteen years.

However, customs and traditions cannot quickly be established where they do not exist. In such cases, adoption of longer lease contracts, at least for three to five years, would encourage conservation. Such contracts should contain clauses that require each party to notify the other, a year or more before the lease expires, whether and under what conditions he wants to renew. Compensation should be given if either party, without such notice, refuses to renew.

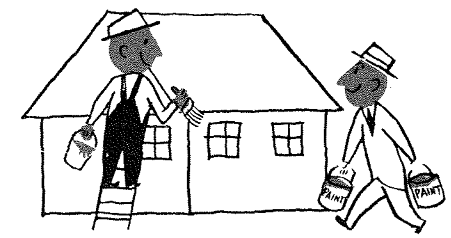
Longer leases will not be used as long as both owners and tenants find the shorter ones to their advantage. Both parties may not wish to tie their hands for a long period because they are uncertain about general economic conditions and uncertain about friction between themselves. What can be done to reduce these two reasons for short leases?

A sliding-scale cash rent varying with prices, instead of the common fixed cash or share rent, would help to decrease owners' and tenants' objections to long leases on account of general economic uncertainties. (We will discuss other advantages of sliding-scale rents in later paragraphs.)

A fair determination of rent and a detailed, written lease setting forth clearly the rights and duties of both parties helps to avoid misunderstandings and frictions. Fair rents can be determined by carefully computing how much each party contributes to the net returns of the leased farm.

Compensation could help to balance property rights

A tenant's conservation decisions would come closer to those of an owner if at the time he left the farm the tenant were compensated for returns yet to come that are due to his actions; and if the owner were compensated for future costs due to the tenant's actions. The tenant may be required by contract to surrender the farm in the same condition as it was when he took it over. If future production is increased through his conservation practices, the owner compensates him; if depletion has taken place, he compensates the owner for the cost of restoring productivity. Tenant and owner may agree



to join in conservation practices, the tenant furnishing the labor and equipment and the owner the materials and supplies.

Special tenancy courts could make tenancy more stable and balanced

Economic conditions and customs vary so much from district to district within the state that it would not be wise to enact and rigidly enforce detailed regulations about compensation and length of leases. But general rules could be laid down in a state land tenancy act and special courts of tenancy arbitration could be provided to administer them. Such courts could be composed of owners and tenants with an experienced judge as chairman. Owners and tenants should both be free to appeal to these courts in any question involving interpretation or execution of the lease.

These courts could draw up and recommend types of lease contracts suitable for their district. The mere existence of such courts would reduce the uncertainty due to unstable tenancy. Many frictions between landlord and tenant and many expensive and slow suits before the regular courts could be avoided. Such tenancy courts have worked well in several European countries.

These special courts might be given the combined functions of tenancy arbitration and debt adjustment (see p. 27).

Rents could be made more flexible

Cash rents expressed as a percentage of net returns would avoid the depleting effects of fixed cash rents. But it is hard to determine all costs, so that such rents are rarely used.

Cash rents that vary with *gross* returns are somewhat more practical, and give some of the same benefits. The various sliding-scale cash and share rents now used in California are of this type. For example, cash rents for dairy farms often vary with monthly butter production and prices; pasture rents may vary with beef or lamb quotations; share rents for cotton, raisins, prunes, and other crops vary with prices. The U. S. Forest Service charges grazing fees to its tenants that vary with livestock prices as a percentage of a base rate per cow-month or per sheep-month.

The effects of fixity of rents can also be avoided by variable payment plans. Under such plans a surplus over the normal rent is paid during periods of high incomes, and payments are reduced below the normal rent if low production (for example, because of drought) or low prices (as during a depression) lead to a dangerous fall of incomes. This principle has been used with interest and amortization payments on farm loans, and there seems to be no reason why it could not be used for rents.

From the standpoint of effects on conservation, the common fixed share rent is usually better than the common fixed cash rent. However, if the owner belongs to a low-income group and has much to say about conservation decisions, his influence may be in the direction of depletion when the value of his share goes down because of falling prices (p. 14). Under these conditions a cash rent might be less depleting. In other cases a share rent or a cash rent varying with income is better.

According to some students of tenancy, the crop share lease tends to force tenants into less conserving use of the land than a stock share lease. But do an owner and tenant decide to grow crops because they have a crop share lease? Or do they adopt a crop share lease because they intend to grow crops? The latter seems more probable. In any case, growing crops is not always more depleting than stock raising. The crop share lease is not in itself depleting as compared with the stock share lease.

Should tenancy be replaced by ownership?

We have seen that a system of tenancy could be devised in which a tenant's conservation decisions would not be much different from an owner's. Under such a system, tenancy might even encourage conservation, because it tends to counteract the imperfections of markets for farm assets. A farmer who cannot finance purchase of a farm may be able to rent one. An owner who cannot get a reasonable price for his farm may be able to lease it.

We cannot expect that the tenancy system will be improved so fast that it will in a reasonable time be better than ownership from a conservation standpoint. Hence attempts to transform tenants into owners, as in the Bankhead-Jones Tenant Farmers Purchase Act of 1937, are in line with conservation goals, provided the new owners are set up in economic units and without too great debts.

But the process of eliminating tenancy is slow and costly at best. As long as there is tenancy, it is just as important—perhaps even more important—to improve the system of tenancy. This does not conflict with attempts to increase the proportion of owners. Both plans may be pursued at the same time.

Credit . . . and Conservation

We have already mentioned the general ways in which the credit system, like tenancy, may discourage conservation: through instability of tenure (of *owners* as well as tenants); through fixed interest and amortization payments; and through imperfections of the loan market. How could these effects be modified, and how could the credit system work *for* conservation?

The threat of small equities could be reduced

If the farmer's equity is small in relation to his creditors', then ownership does not guarantee stable property rights. The creditors may even recall the loan before it actually becomes delinquent, as a precaution. If the farmer is unable to fulfill the contract, and if the loan is recalled, this usually happens when—for example, during depressions—it is difficult to refinance or liquidate assets through sale. The result is bankruptcy and foreclosure.

This threat cannot fail to influence the farmer's conservation decisions. His allowance for this uncertainty may lead him to liquidate his assets through depletion before foreclosure prevents him from saving his own equity. If an owner has a heavy debt, his allowance for uncertainty of tenure may be as great as that of a tenant with an insecure lease.

These effects of the credit system on conservation could be reduced by providing special courts for debt adjustment without foreclosure. Such courts could be set up like the special tenancy courts (p. 25) or could be combined with them.

Such adjustments of the loan contract would remove the threat of small equities *after* it has arisen. Preventing such a threat from arising would be much better for conservation. This can be accomplished to a considerable extent by "built-in" flexibility in the loan contract.

Credit charges could be made more flexible

Interest and amortization payments on loans are almost always fixed charges. Their depleting effect (p. 15) could be reduced by making them vary with income.

One way to do this is by variable payment plans, such as were suggested for rents. Such a plan for credit charges is provided under the Bankhead-Jones Act mentioned earlier. Farmers who borrow under this plan pay a surplus in years of above-normal production or prices, and this is used to reduce payments when production or prices are low. Similar plans are being used by some private creditors in the Great Plains states. The Bureau of Reclamation and irrigation districts sometimes adjust the annual repayment of construction costs according to changes of farm income.

Another way is to express the loan, amortization payments, and interest in terms of the main farm product or products, such as oranges, wheat, cotton, or units of so much grain and so much livestock. This takes care only of changes of farm income that are due to changes in prices—not of those due to changes in yields.

Evening out income by built-in flexibility of credit charges is good not only for the borrower but also for the lender: it decreases the need for moratoria, refinancing, and foreclosures during depressions; and it protects the purchasing power of interest income in periods of prosperity.

Imperfections in the loan market could be reduced

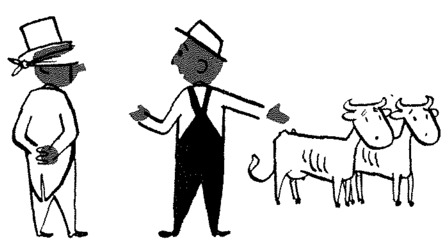
If a farmer who needs money now could borrow it easily, he would, as we saw earlier, be better off to borrow than to deplete his farm and thus lower its market value. A good credit system would encourage conservation.

But the market for farm loans is imperfect; the farmer often cannot borrow money at a general market rate. Because a good credit system is important for conservation, it will be worth while to consider means of reducing its imperfections.

If the market for loans is imperfect because of too few private lenders, competition can be increased through public banking institutions, such as the Farm Credit Administration, and by assisting cooperative efforts of borrowers.

Public credit, preferably in the form of credit insurance, may also be needed for small and scattered farmers, who are often at a disadvantage in obtaining loans. This sort of credit is handled by the Farmers Home Administration and other agencies.

The market for farm loans may be imperfect because methods and policies of lenders have not changed as economic conditions changed.



In a new region and in new enterprises, interest rates include a high allowance for uncertainty; and lenders may not reduce these rates as much as is justified when the region or the enterprise and economic conditions become more stable.

Methods of appraising assets may be outdated. Estimates of costs for administering loan contracts may need revision—for example, because of better communication in rural areas.

Lenders may defeat their own purpose by insisting on certain types of collateral in spite of changes in physical and economic conditions. On western ranges, for example, the collateral for loans is often livestock, and the number grazed is the basis for loan rationing. Lenders may object to having the number of livestock reduced even though the value of the collateral may be reduced by loss of weight on overgrazed ranges.

A change in these obsolete practices would eliminate a cause of depletion that is serious both for the borrower and for the lender.

Loan contracts could include conservation clauses

Credit could work for conservation in still another way, which could become important: both public and private banks could make proper conservation practices a condition for lending. The Federal Land Bank of St. Louis and some private banks in the Middle West are doing some valuable pioneering in this field. Creditors have a special interest in the future productive capacity of farms on which they lend. It is surprising, therefore, that the banks have not shown more interest in the economics of conservation.

Taxation . . . . . and Conservation

The tax system has important effects on farmers' conservation decisions. Often these effects are not intended nor recognized by tax authorities.

Time relations must be considered with taxes as with prices

If we try to understand the conservation effects of taxes, we face problems similar to those with prices (p. 19). We have to know two conditions about the time relations of taxes: (1) how farmers expect taxes to be distributed over time; and (2) whether a tax encourages specifically conserving or specifically depleting practices.

Much of what was said about prices applies to taxes which are directly imposed on products or services. Many taxes, however, are not of this kind. The tax on a farmer's income, for example, is the same whether he raises alfalfa or tobacco, or uses motor vehicles or horses.

Farmers may expect taxes to be different in the future because the government may announce that a given change of taxes will last for a limited time. Or because of past experiences. Or because farmers know that some present event (a war, a depression) will lead to great changes in fiscal needs.

In farmers' production plans the tax base (income, value of property, and so on) may be different in different years. If farmers expect a future tax change, they will try to have their tax base highest in years when they expect rates to be lowest. They can do this by shifting costs or returns or both, as we have seen before (p. 12). If farmers expect tax rates to be higher in the future than they are now, the shift will result in depletion; if they expect them to be lower later on, in conservation.

This is an effect that is shared by all taxes—if farmers expect future changes in them. Often, however, farmers do not expect future changes; they expect a tax change that occurs *now* to last indefinitely. Hence when we now discuss different types of taxes (property, income, and so on), we will assume that farmers base their plans on this expectation.

Property taxes tend to discourage conservation

Property taxes are among the most important in their effects on conservation. Because taxes on personal property are now largely evaded, the general property tax has become mostly a tax on physical assets—natural resources, improvements, and equipment. Thus the property tax is especially important in farming, grazing, and forestry.

The goal of most tax authorities is to make the assessment proportional to the present value of assets; that is, to the sum of discounted future profits which these assets are expected to yield.

Thus we can regard annual property taxes on the present value of assets as a special type of tax on future profits. If the present value is the sum of discounted future profits, then each year the tax is paid, profits of all future years are taxed. Therefore, the more distant profits are in the future, the more often they are taxed.

Hence a farmer will try to reduce the number of times they are taxed: He will shift profits toward the present. Once more we must remind ourselves that shifting profits toward the present results in depletion. Property taxes, therefore, affect farmers' conservation decisions in much the same way as interest.

Fixity of property taxes increases depleting effects

Property taxes, in contrast to income and yield taxes, are not automatically adjusted when income changes. We have seen before (p. 15) under what conditions such fixity leads to depletion.

Inequalities in assessment increase depleting effects of property taxes

Properties that are in a low state of conservation, such as eroded farmland and overgrazed ranges, are often overassessed.

A vicious circle is set in motion: property taxes encourage depletion most on those properties that are already relatively more depleted.

Tax authorities may desire the shifts in production induced by property taxes

Sometimes tax authorities may deliberately employ the effects of property taxes. For example, they may wish to check speculation in vacant city lots or in large underdeveloped land holdings in young, rapidly growing regions. Income, profit, and yield taxes would not interfere with the owners' plans to hold such resources undeveloped for speculative profits. Property taxes, on the other hand, produce tax receipts immediately and influence owners to develop their properties or to sell to those who will.

For example, property taxes could be used in place of the disputed 160-acre limitation in the Central Valley Project. Receipts from such taxes, imposed by irrigation districts, could be used to repay the economically justified costs of the project. Such taxes would apply to all land in the district on the basis of its potential development. Development of the project lands would be obtained more quickly and smoothly and project costs could thus be spread more widely. Such district taxes, in combination with the capital-gains tax, would also be more effective than the 160-acre provision in reducing unearned increments in land values created by a public project.

Property taxes can be used in this way, however, only if it will pay to develop the resource after the tax is imposed. If the tax is too heavy, it may only cause tax delinquency.

Income and profit taxes *may* affect conservation

Taxes on income and profits are taxes on net returns *this year or last year*. Because they do not tax *future* profits and are flexible with changes of income, they avoid the depleting effects of the property tax. From a conservation standpoint, therefore, income and profit taxes are much more desirable than property taxes.

Still, under present tax laws, income and profit taxes have some important effects on conservation. These effects come from the tax-law definitions of income and profits.

In farming and forestry, many expenses for conservation can be charged, for income-tax purposes, to current costs of production. Part of this can be done under specific provisions of the laws, and part of it because segregating investment from current costs is hard in practice and

harder still for authorities to check. Expenses of this kind are for fertilizer, land leveling and terracing, reseeding permanent pastures, enlarging drainage and irrigation systems, planting trees, fencing, gradual improvement of roads, buildings, and equipment. It is sometimes economical to reduce income taxes by making such investments (even if farmers do not expect the tax to change in the future—see p. 29). For taxpayers can sell their improved properties at a profit and are taxed on the latter only on the basis of their capital gains; and the capital-gains tax is considerably lower than the income tax in the higher income-tax brackets. Thus a high income tax with a lower capital-gains tax may result in conservation.

Estate and inheritance taxes tend to discourage conservation

In the United States, estate and inheritance taxes are based on the present value of the estate. Usually only one payment of these taxes is taken into account. If so, then (unlike property taxes) they would tax future profits only once. Hence if markets for farm assets were perfect, these taxes would not induce farmers to shift the use of their resources toward the present; they would be neutral from the standpoint of conservation.

But as we have seen, these markets are not perfect. Under such circumstances, estate and inheritance taxes tend to discourage conservation.

The testator may tend to reduce his investment if he knows a large portion of it will go into taxes rather than to his heirs. If markets for farm assets are imperfect, such a reduction may mean depletion.

The beneficiaries, in turn, may have to borrow money or liquidate a portion of the inherited assets to pay the tax. If markets for farm assets are imperfect, they may be forced to deplete the resources. This often happens in forestry and farming.

These effects could be avoided if payments were made in installments over a long enough period so that current returns could meet current payments. In Great Britain death taxes on forest holdings need be paid only at the time the timber is cut.

Yield taxes are generally neutral toward conservation

Yield taxes may be imposed on the amount of a product that is *produced*, on the amount that is *sold* (such as the Oregon severance tax on timber), and on the *value* of the product sold (such as the New Mexico severance tax on timber). These are really deductions from current (positive or negative) profits in proportion to rate of production. Thus, farmers will have no inducement to shift their production, either toward the present or toward the future. Yield taxes are neutral from a conservation standpoint.

However, like all other taxes, yield taxes may be used to force farmers or other resource users into less heavily taxed fields or into leisure. Generally, the result is conservation for the more heavily taxed resource. But it may sometimes discourage important conservation practices. In forestry, for example, thinning a young stand increases future growth from the remaining stand. A yield tax on thinnings may make such a practice uneconomical. However, a yield-tax law may be drawn up so as to avoid such effects. In Oregon, the first 25,000 board feet cut are exempt from taxation.

Yield taxes cost less to administer and are more accurate to assess than most other taxes. But because they do not take costs into account, they are not so desirable for conservation as income and profit taxes: they are not flexible in periods of income changes.

Direct Tools of Conservation Policy

The economic forces we have been discussing—from interest to taxation—are largely determined by laws and customs that are not primarily aimed at influencing farmers' conservation decisions; they influence these decisions because they affect costs and returns in production plans. If they are modified to work *for* conservation, they may be called indirect tools of public conservation policy.

Let us now turn to those tools that are directly aimed at influencing farmers' conservation decisions. In addition to education, these tools are mainly zoning ordinances and regulations that require certain conserving practices or prohibit certain depleting ones. The farmer, as the citizen most concerned, can help in shaping and applying these tools; but in his own business he must adjust to them.

Education is important— but no cure-all

The need for education in conservation of resources has often been stressed; and indeed, it is one of the most important tools of conservation policy. It is needed not only for farmers but for the whole voting public, which is becoming more and more urban, and thus less in contact with resource problems. It is needed not only for adults, but perhaps even more for young people. It is needed not only in the technology of conservation practices, but also in recognizing when such practices are needed and are economically justified. It can help both farmers and the general public understand why such direct tools as those discussed in the rest of this section may be necessary.

But important as education is for conservation, it is no cure-all. If dollars and sense considerations keep a farmer from adopting conservation practices, education is not the answer. Other tools are needed then. Often, however, education can be effectively combined with such tools.

When are zoning and regulation of practices needed?

Indirect tools and education have one main disadvantage: there is little chance that all farmers will respond to them in the same way within a certain time. But sometimes a conservation policy will be successful only if *all* farmers respond to it, and sometimes even to a definite extent and within a certain time. If, for example, a practice is needed to prevent fires or pests, one farmer who does not carry it out promptly may endanger the whole area. Economic incentives would not guarantee that every farmer would conform.

In other situations, indirect tools may not be acceptable for constitutional or political reasons, or may be too complicated or costly to administer, or their use in conservation may conflict with their other purposes. Then zoning and regulation of practices may be preferable.

Zoning may be used to conserve natural resources

One of the most common direct tools is zoning. Zoning prohibits certain uses *in a given area.* It is applied through city and county ordinances.

Though zoning is mostly used for other purposes, it can be successfully used to conserve natural resources: For example, zoning against some agricultural uses may be employed to protect soil resources in areas that are subject to severe erosion if cultivated. Forest resources may be protected by zoning against agriculture, grazing, or year-round residence.

Zoning is mainly negative; it prohibits *uses* but does not induce a change of *practices.* Zoning would not be effective, for example, in preventing the spread of weeds from one property to another. For this purpose, regulations that require certain minimum control practices are needed.

Zoning has legal limits

Zoning may benefit farmers who wish to use their resources as permitted under the zoning law; it may protect them against increased costs or decreased returns due to uses by some of their neighbors. But it may decrease the opportunities of other farmers, who wish to make a use of their resources that the zoning law prohibits. It may force them to conserve their resources more than they feel they can afford.

How far can such interference with private use plans be carried, legally? The basis of all zoning is the power of the government to restrain the individual in the exercise of his rights when such exercise becomes a danger to the community. Interference with private rights under this power must, according to the Constitution as interpreted by the courts, be "reasonable" and not "arbitrary."

Zoning has economic limits

Zoning also has economic limits. These are determined by a farmer's opportunities in using his resources under zoning restrictions.

If use must be too greatly restricted, zoning is not feasible. For example, to protect a watershed for a big city by zoning, most other uses might have to be prohibited. Such areas must be owned by the public, or by public-utility districts operating under close public control.

Regulation of practices is especially important for water resources

Regulation of practices is applied not only through city and county ordinances, as zoning is, but also by state or federal law and, particularly, by special districts, such as irrigation and water districts, and districts for flood control, soil conservation, forest conservation, and grazing. Most special districts are set up under state law. They provide a means whereby the farmers directly concerned can regulate themselves. Generally, democratic processes of referendum and election safeguard their use.

• Regulation of practices is better developed with water than with other resources. This is particularly true in semi-arid states like California. The basis for regulation is the principle of "reasonable, beneficial use." It is defined by state law, rules of the Division of Water Resources, court decisions, county ordinances, and regulations of water districts (which may specify certain practices as wasteful under conditions in a given district and may refuse water to those who use it wastefully).

Fewer regulations apply to soil conservation

The soil is affected by fewer regulations than one might expect.

In California, soil-conservation districts do not have regulatory powers under the 1949 revision of the law. Unlike most states, California does grant these districts taxing power, an important tool for cooperative action; but the limit (2 cents per $100 of assessed value) is too low to be of much use.

Assisted greatly by the United States Soil Conservation Service, soil-conservation districts have thus far served to inform farmers about proper practices and have encouraged voluntary cooperation. In the future, they may become an important means of cooperative self-improvement and self-regulation by farmers.

Self-regulation is being tried for forest resources

California is testing out self-regulation in forest resources. The Forest Practices Act of 1945 establishes four forest districts. In each, regulations drawn up by a committee of timber owners and owner-operators are subject to approval by two thirds of the timber ownership of the district and by the State Board of Forestry. If approved, they have the force of law. As yet, the Board has not attempted to enforce the regulations, but has sought voluntary cooperation.

Regulation of practices has legal and economic limits

Regulation of practices, like zoning, has legal and economic limits.

The legal limits depend on how much of an economic burden regulation imposes on private enterprise. The courts have been conservative, but neither negative nor inflexible, in defining a "reasonable" degree of regulation.

The economic limits of regulation might sometimes be expanded by providing compensation for the economic burden on farmers. Most present subsidies, such as soil-conservation payments, apply to practices that are voluntarily agreed upon. But there seem to be no legal obstacles to paying compensation for *required* practices, so long as funds from taxation are spent for "public purposes." The public could pay part of the cost when the farmer who is asked to perform the practice does not receive all of the benefits. Partial compensation has in fact been provided for in a few regulations, such as those for eradicating bovine tuberculosis.

Regulation versus public ownership

As with zoning, if regulations have to be very detailed and strict, or if a large compensation is necessary for some time, public ownership may be more effective and cheaper.

However, economic and technological conditions may change so that certain practices that are socially desirable may also become economical for the farmer. Thus increased knowledge of what fertilizers to apply on given soils and for given crops, together with the fact that fertilizer prices have risen relatively less than prices of farm products, has made fertilizing profitable on farms where it did not pay before.

Where similar changes seem likely, regulation with compensation may be imposed to safeguard resources until conditions have changed enough so that farmers will carry out the practices in their own interest.

The Public's Goal in Conservation Policy

Up to now we have considered conservation from the standpoint of the farmer, and have discussed conservation policy only with respect to its tools. Let us now look at conservation from the standpoint of the public.

This standpoint is of at least as much concern to farmers as to other citizens. A farmer may be as deeply affected by other farmers' conservation decisions as by his own. And with such resources as soil, water flow, forests, and wildlife, farmers are in a better position than most of their fellow citizens to evaluate the various possibilities for conservation.

Farmers can work for the adoption of sound conservation policy through their representatives in Congress, the State Legislature, and local governments. They can also use their organizations to educate their fellows and public opinion.

What is sound in conservation policy depends upon its goals

How can farmers decide what conservation policy is sound?

As with a farmer's conservation decisions, conservation policy depends upon what its goals are. Much that we observed about farmers' goals applies also to the goals of conservation policy. But there are some important differences.

Conservation policy must be based on *social* costs and returns

In the first place, with public goals, we must estimate *social* costs and returns. Even for the same practices, these often differ from the farmer's costs and returns. The public must take into account not only the costs and returns to the farmer himself, but also those to others—his creditors, laborers, neighbors, the general public—who may be affected by his practices. This problem was considered from the farmer's standpoint when we discussed unbalanced property rights (p. 23).

Non-market costs and returns are of greater importance

Second, non-market (non-dollar) costs and returns are much more important in the public's goals than they are in the farmer's. For example, continued prosperity and security of the whole nation and its regions must be taken into account in the conservation of soil, water, and forests; this involves long-range forecasts and correspondingly greater uncertainty than that which confronts individual farmers. Non-market returns in the form of recreational opportunities for all the people loom larger for the public than for individual farmers. Such opportunities become increasingly important as our economy gives us more leisure to enjoy them.

Non-market costs and returns are more difficult to evaluate

Third, it is much harder for the public to evaluate non-market costs and returns. The farmer in his conservation decisions doesn't have to place a dollar value on leisure and independence; he merely chooses between them and alternative dollar returns (p. 9). But for conservation policy in a democracy, we must consider the values *all* citizens place on non-market costs and returns. One possible method to reduce these values to a common denominator is to estimate a money value for them.

The difficulties of doing this are very great. They cannot be discussed here in detail. (Those readers who are interested in this problem may want to consult the book mentioned on p. 2.) Suffice it to say that they can be reduced but never overcome.

Under these conditions what are the practical goals of conservation policy?

Is the public's goal maximizing present social net returns?

According to economic theory, conservation policy should be directed toward maximizing the present value of social net returns.

We found this was not very realistic for a farmer; we had to modify it rather drastically to take account of realities. It is even less realistic for conservation policy.

First of all, the practical goal of conservation policy is to increase social net returns step by step, through trial and error (just as the farmer must; see p. 10), rather than to maximize it.

Further, conservation policy must find some way to guard against the possibility of very heavy losses (just as the farmer must; see p. 10). This necessity requires an even more far-reaching modification of the maximization theory. *On this modification we will focus for the rest of our study.*

Avoiding the danger zone must be the minimum goal for conservation policy

A farmer allows for uncertainty by choosing a flexible plan, so that he can make adjustments later, when he sees more clearly what is likely to happen. He wants to avoid the danger of very heavy losses that he might incur with a fixed plan if his best guesses prove far off.

Conservation policy faces a somewhat similar choice with those renewable resources, such as soil, that have a danger zone (p. 5). These resources are ones that might be used indefinitely if they were not depleted too far; but their flow may be depleted so far that it cannot economically be reversed later. If this actually happens, it narrows and limits the opportunities to make adjustments that may be needed in the future. This means a loss in flexibility.

Both the natural and the social sciences have found that such narrowing and limiting influences tend to make animal and plant species and civilizations specialized. They have attributed the stagnation or the perishing of many formerly abundant plant and animal species and of once-thriving civilizations to their becoming too specialized and inflexible.

Therefore allowing our natural resources to become depleted so far that we cannot economically reverse the flow later *may* threaten continued national prosperity or even existence.

True, we cannot be sure at just what point the flow of renewable natural resources will fall so low that it cannot be economically reversed later. Thus increases in prices of farm products have brought back into cultivation some soils that were abandoned years ago because the costs of restoring them were then considered prohibitive. Nor can we be sure that loss of any given acreage of farmland would actually threaten future national prosperity.

But, nevertheless, these *possibilities* exist and, as serious students believe, have actually been realized in the history of some civilizations. A sound public policy cannot afford to take too great chances. It behooves us to guard against even a remote possibility of national bankruptcy.

Making sure that the flow of renewable natural resources does not fall below the danger zone may well be the minimum goal, the *safe minimum standard,* of conservation policy.

The comparative costs of avoiding the danger zone are moderate

If conservation policy strives to avoid the danger zone of a renewable natural resource, it will probably expend some efforts that will later prove to have been unnecessary. Such wasted efforts are the costs of achieving a safe minimum standard in resource use.

Such costs are moderate as compared with possible losses if the danger zone is *not* avoided. They are also moderate as compared with the costs of guarding ourselves against other dangers to our continued national prosperity and existence—the costs of national defense, for example; or the costs of public-health programs to guard against disease epidemics. In some of these cases also a safe minimum standard is used as a goal of public policy.

The absolute costs of a safe minimum standard vary for different resources. Let us, therefore, consider in some detail what we have to guard against in the case of the most important renewable resources. Then let us see how, with each of these, a safe minimum standard could be defined for practical use in applying conservation policy.

What do we have to guard against—

In ground-water use? If a ground-water basin is impaired through compaction and certain forms of pollution, it may not be economically feasible to restore it. It may become compacted as a result of continued overdraft. It may become polluted through salt-water intrusion made possible by overdraft, through improper drilling and sealing of wells, and through shortsighted methods of disposing of industrial and urban wastes.

In soil use? Topography, climate, and kind of soil in some areas make for a delicate balance between water or wind erosion and the stabilizing force of plant cover. In such areas we may not be able economically to restore soil productivity if it becomes depleted through destroying the plant cover by cultivation, by overgrazing, or by repeated burning. True, the soil that is eroded from such areas is deposited somewhere—in rivers, reservoirs, harbors, on cultivated flood plains. But often such deposits are an additional social loss rather than a gain. Furthermore, accelerated erosion and deposition may make another important resource—surface water flow—unusable for such purposes as drinking, bathing, fishing, and some industrial uses.

As compared with soil under forests and permanent grasses, *agricultural* soil may reach a danger zone at an early stage if depletion is accompanied by gully formation. Gullies quickly make farming operations uneconomical.

In the use of forests and range? In the depletion of forests and range, another factor besides soil erosion must be considered in connection with the danger zone. Both forests and grasslands are associations of plant species—often complex and in sensitive balance. Repeated burning and overgrazing may upset the balance so that valuable species are replaced entirely by less valuable ones. This has happened in some cutover forest areas of the northern Great Lakes states and in the arid grasslands of the intermountain region. There may be a good plant cover and no serious soil erosion. Still, serious depletion has occurred; and the costs of restoring the areas to former uses may be prohibitive.

In the use of recreational resources? Wildlife and native plants cannot be restored if the breeding stock is destroyed or sometimes if their natural tional value of some areas—such as wilhabitat is greatly changed. The recreaderness areas in national parks or especially fine stands of redwoods or sequoias—depends upon keeping them "unspoiled."

We might define a safe minimum standard in terms of RESULTS

How could we define a safe minimum standard for practical use in applying conservation policy?

We might define it in terms of results to be achieved, without stating how the results are to be brought about. For example, we might use the following definitions:

In the conservation of water resources:

Keeping pollution within a certain limit, in terms of total or specific solids, bacterial counts, oxygen conditions, and so on

In soil conservation:

Avoiding gullies
Keeping erosion within so many cubic feet per acre per year

In forest conservation:

Keeping burn within a certain percentage of total forest area
Maintaining a given plant association

In conservation of grazing lands:

Leaving at least so many tons per acre of forage after the grazing season
Maintaining a given plant association

We might define a safe minimum standard in terms of NEEDED CONSERVATION PRACTICES

Or we might define a safe minimum standard in terms of conservation practices that are needed.

First we must remember that mere limitation of use may be an important conservation practice. For example, we might use the following definitions:

In ground-water conservation:

A certain maximum rate of use from a basin, a "safe yield," in acre-feet per pumping season

In the conservation of grazing lands:

A certain maximum rate of stocking, in animal-unit months per acre

In hunting and fishing:

So much game or fish per year taken from a certain area

But definition in terms of use is difficult if there are many products, as in agriculture. It is not very practical to define a safe minimum standard as a maximum use rate for all products, in terms of some such common denominator as calories, pounds of digestible nutrients, or tons of dry matter. It will usually work better in such cases to define a safe minimum standard in terms of other conservation practices. This can also be done even if a maximum use rate could be used. For example, we could define a safe minimum standard by such practices as:

In soil conservation:

Contour cultivation
Mulching
Strip cropping
Terracing

In forest conservation:

Leaving a certain number of seed trees per acre, or seed strips
Removal of slash

In ground-water conservation:

Proper capping and perforation of wells
Specific treatments for polluted surface waters

In hunting and fishing:

Prohibiting certain methods of taking game and fish

To avoid misunderstanding, let us repeat that these practices are merely examples. Others may be better suited to particular situations. The advantage of defining the safe minimum standard in terms of conservation practices is great adaptability to local conditions.

The safe minimum standard in conservation policy—and the farmer's conservation decisions

In many countries, farmers' conservation decisions are keeping the use of resources above the danger zone. In some cases this comes as a matter of custom or tradition, in others from farmers' economic interest. For example, at the present time, farmers in northern and central Europe maintain agricultural soils far above the danger

zone because it pays them to do so. In earlier times in Europe, and at present in many "primitive" societies, a safe minimum standard is guarded by custom and tradition.

In the United States, large areas of agricultural, forest, and grazing lands are being managed by private individuals in a state of conservation at or above the safe minimum standard. Hence adopting the safe minimum standard as a goal of conservation policy would not interfere with many private enterprises—probably the large majority. For the rest, such a goal would mean less public control of individual initiative than any higher goal.

The safe minimum standard should be the base for further steps

Surveys, both by government agencies and individual students, suggest that large areas of agricultural, forest, and grazing lands in this country are being depleted—even though not necessarily below the safe minimum standard.

First things should be put first; but adopting a safe minimum standard does not mean that conservation policy should disregard depletion above such a standard. A safe minimum standard should be striven for under all conditions as the first step, the base from which other steps may be taken. Once we have fully achieved this first step, consideration should be given to the problem of how social net returns could be further increased through conservation.

The tools for such a step-by-step course have been discussed in the preceding pages. In concluding, let us point to a general requirement for applying these tools.

Conservation policy should be steady

The most important general requirement of conservation policy is steadiness, constancy: Once the most appropriate tool has been chosen, it should be used whenever we deal with the cause to which it is best fitted. Farmers and other resource users should have no uncertainty as to whether a tool will be constant over the period they are planning for.

Unless conservation policy has this sort of constancy over the years, the measures it selects may have just the opposite effect from the one intended. We have seen, for example, how price supports may encourage depletion rather than conservation if farmers believe that supports will not be continued after a change in political power.

Conservation policy should not be a political football

Conservation policy has not had such constancy in the past. It has wavered.

Conservation policy has sometimes been used as a political football. It has wavered because of confusion over what conservation means and what conservation goals are. It has been discredited by its strange bedfellows: Because of its emotional appeal, conservation has been used as a slogan for goals that are basically different, such as socialization of resources, a wider distribution of income, farm relief, or breaking of monopoly power.

All such wavering, all such confusion, make conservation policy less effective, may even lead to results contrary to its goals.

Some wavering in public policy is the price we have to pay for freedom in a democracy. But it is of utmost importance that dollars and sense be considered in weighing diverging views and proposals. An understanding of the economics of conservation would make it more difficult to exploit the emotional appeal of conservation for partisan ends and would help keep conservation policy more constant than it has been in the past.

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