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legislative principles of soil conservation

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PREFACE

With the universal concern for environmental protection on the increase, more attention is being given to the introduction of adequate legislation and institutitions for preventing or controlling soil degradation.

Thus, the purpose of this publication is to present a comparative analysis of soil conservation legislation and institutions to provide for the improvement or introduction of national legislation in soil conservation.

While the publication is mainly concerned with soil conservation legislation, it should be considered within the framework of problems relating to the national management, development, and conservation of the soil as a natural resource. Legal and institutional aspects of land, including soil conservation, contribute, together with other technical, economic, financial, and social factors, an essential means of implementing policy decisions for the development of land resources consistent with their conservation.

To be effective soil conservation legislation and institutions should be viewed within the broader context of land use planning; the purpose of which is to ensure a harmonious and suitable allocation of land to various essential uses, such as agriculture, urban planning, industrial and recreational development, and to ensure that these uses are selected and carried on rationally in order to balance the concept of development with that of conservation.

A well defined land use policy is required, and whenever such a policy is lacking, rational land utilization and conservation may be retarded or misdirected.

Because of the impact soil conservation legislation may have on the management of land resources, it should be considered within the bounds of land use policy. However, legislation by itself does not constitute a panacea for solving all of the problems connected with soil conservation and may be ineffective and inefficient if it is not complemented by institutions at the appropriate and required level (i.e : local, basin national, regional, international).

This publication has been prepared by Mr. Lawrence Christy, a legal consultant, and represents a joint endeavour of the Legislation Branch of the Legal Office and the Soil Resources Development and Conservation Service of the Land and Water Development Division.

Valuable ideas were contributed by these technical Divisions:

- Forest Resources, Agricultural Services, Economic Analysis, Plant Production and Protection, and Animal Production and Health.

The publication aims at making a contribution to the study of the legal and institutional aspects of soil conservation as a means of environmental protection. Inasmuch as it represents the first FAO study on this subject, comments are welcomed with a view toward preparing a future edition.
Comments should be sent to: Chief, Legislation, Legal Office or to Chief, Soil Resources Development and Conservation Service, Land and Water Development Division.

INTRODUCTION

The general object of soil conservation legislation is to induce those whose activities affect the soil to act in a manner that preserves its desired qualities to a greater extent than their normal manner of operation would do. Conservation is a relative term, so one of the basic decisions antecedent to legislation is the determination of the level of conservation to be practised. Partly the decision may be moral or aesthetic, consisting in the concept of stewardship for natural resources which belong to future generations as much as to the present. But conservation is also an economic function. In the usual case investments must be made or the maximum level of exploitation foregone, at least initially. Even if the resource cost can be borne, the level of administration required to induce the appropriate behaviour in all those responsible for soil quality may be beyond national means. Wise legislation must therefore reflect a determination of what level of conservation a society can afford.

A. DEFINITIONS

1. Soil

Soil and water are almost inextricably joined in the production of plants, but this study will not generally deal with water except as it involves a relatively permanent change in soil quality. The two principal such relationships are the role of soil in the storage of water and the effect of water in the erosion of soil. In general, the goals of water management and soil conservation will coincide: one wishes to get the water into the soil. "Consequently, a soil that is in the ideal condition for water management is automatically in ideal condition for soil conservation." 1/ In succeeding sections, this relationship between soil and water will be assumed without special mention.

"Soil is that part of the earth's crust that is penetrated by plant roots," 2/ and upon which the world depends for most of its food supply. That soil which is most significant for conservation is the upper layer, containing nutrients, plant humus, and microbiological activity. 3/ Some topsoils are directly underlain by rock, so that destruction of the surface renders the land useless. Other soils may have their more desirable qualities in lower layers, so that some loss from the surface improves the land. And very deep loessial soils are relatively uniform, so that soil loss does not destroy productivity. 4/ But even in the last case, topsoil contains the most valuable nutrients, so its loss will at least temporarily reduce production. Most soils will react similarly. 5/ The exceptions illustrate the point that soil is a complex resource, of different types (and uses) requiring different management.

1/ Helmut Kohnke & Anson R. Bertrand, Soil Conservation 235 (New York 1959).
2/ Id. 27.
3/ See Food & Agric. Org. of the U.N., Soil Erosion by Water: Some Measures for its Control on Cultivated Lands 4 (Rome 1965); R. Burnell Held & Marion Clawson, Soil Conservation in Perspective 21-23 (Baltimore 1965).
4/ Kohnke & Bertrand, supra n.1, at 43.
5/ See id. 42.

2. Conservation

Conservation has been defined in various and conflicting ways according to the purpose of those who have defined it. 6/ "There are a great many people in favour of conservation no matter what it means." 7/ What conservation means for soil is complicated by the nature of the resource. In part, soil is a non-renewable or "stock" resource. 8/ The rate of geological formation of new soil from rock is so slow that lost soil is essentially irreplaceable. Soil also contains nutrients which can be depleted and replaced. It has a structure that can be altered. These attributes are renewable within limits.

Since even physical removal of soil can be reversed over sufficient time (although not at a rate appreciable by people of finite life expectancy), a distinction between permanent and reversible changes in soil quality is not quite accurate. This paper will instead distinguish between "depletion" and "impairment of basic productive capacity." 9/ Depletion refers to the loss of qualities within the range of economic reversibility (one could always transport topsoil to bare rock, thus reversing "irreparable" damage, but the effort would be prohibitive). Impairment of basic productive capacity refers to economically irreversible loss of soil qualities.

Soil conservation will be used to describe actions designed to prevent or retard impairment of the soil. Without the limitation, conservation can be applied to any activity designed to maintain or improve plant production, including irrigation, fertilization, and the introduction of hybrid corn. 10/ These activities may contribute to soil conservation, 11/ but they are principally designed to increase present agricultural output.

Even under a system of conserving basic qualities, soil could suffer permanent damage. The only physical measure of soil conservation is the geological rate of new soil formation. Any faster exploitation implies that someday the soil will be entirely consumed. But the geological rate of soil formation imposes a very low limit of exploitation which will rarely be adhered to in practice. 12/ So as a relative term, conservation will describe practices that maintain the soil at a higher standard than other types of management.

Conservation as an economic term implies the "greatest" total use of a resource. 13/ Economists define conservation as a present investment that produces greater future resources. The economic problem is then to determine the relative costs of different systems of conservation of exploitation. The definition of "greatest" entails severe difficulties because use may occur at different times. Preserving soil quality often presents the choice between greatest present production, which impairs the soil, and a lower rate of production that can be maintained indefinitely. The economic problem is to compare a short period of high production with a long period of lower production, which requires establishing a present value for future amounts. This is done on the basis of a discount or interest rate. At any interest rate above zero there will be some preference for present income.

6/ See Anthony Scott, Natural Resources: The Economics of Conservation 16-22 (Toronto 1955)

7/ Id. 16 (quoting William H. Taft).

8/ See S.V. Ciriacy-Wantrup, Resource Conservation - Economics and Policies 42 (rev. ed. Berkeley 1963); cf. Held & Clawson, supra n.3, at 9.

9/ See Held & Clawson, supra n.3, at 23-24.

10/ Cf. id. 69-75

11/ J.B. Peterson, The Relation of Soil Fertility to Soil Erosion, 19 J. Soil & Wat. Conserv. 15 (1964)

12/ See E.R. Swanson & C.E. Harshbarger, An Economic Analysis of Effects of Soil Loss on Crop Yields, 19 J. Soil and Wat. Conserv. 183 (1964)

13/ But cf. Scott, supra n.6, at 17-19

Individual income preferences will not necessarily accord with socially desirable land use. Part of the job of legislation is to alter the conditions of individual advantage so that practices acceptable to the community will be preferred. For this purpose, the economics of individual land use must be understood. At the same time an understanding of the social economics will allow the state to value the net cost of soil conservation programmes against alternative investments.

There are other values in soil conservation which cannot satisfactorily be subsumed in an objective analysis of national choices. For example, the eventual degradation of productive land into desert would be a catastrophe beyond the scale of more mundane calculations of farm economics. Even less drastic diminuation of the environmental possibilities of future generations is morally disturbing, whatever the balance sheet may indicate. Such factors cannot be ignored merely because they cannot be given a number. But they must be analysed separately so that a nation can take advantage of available techniques for measuring those values that can be measured. Thus it may at least reduce the sources of uncertainty in its policy making, even though it cannot thereby abdicate the responsibility for deciding.

This publication is designed to illuminate the problems of soil conservation for the developing countries, where low production and a shortage of investment capital compel consideration of the economics of public programmes. Other important values are inherently difficult to analyse, and they are so much a function of subjective choice that even the opinions of experts tend toward personal preference. Therefore, the economic definition as well as the physical aspects of soil conservation will be considered in the following chapters.

B. PARAMETERS OF LEGISLATION

Legislating an "economic" level of soil conservation occurs in a specific national context. Techniques which require substantial alterations in existing farm practice cannot be introduced if a trained farmer education staff does not exist. Eroding land cannot easily be converted to pasture if there is no market for animal products. Where tenancy arrangements give the land-user no interest in its preservation, inducing him to conserve the soil is unusually difficult. Even in the absence of such structural problems, conservation is a very complex goal.

Land uses that appear currently desirable may conflict with future needs that are not easy to foresee. Even presently, preserving one resource may increase pressure for the exploitation of others. 14/ Balancing the claims of different resources and time periods will depend in each country upon the total natural resources, the types of uses, and the financial and administrative strength of the state. No general rule can define the place of soil conservation among so many local variations.

14/ Cf. Food & Agric. Org. of the U.N., Soil Conservation - An International Study 77 (Washington 1948).

SOIL IMPAIRMENT AND ITS PREVENTION

Soil conservation policy depends upon the types of soil damage that occur, upon the technical means for preventing or repairing the damage, and upon the value and uses of the threatened soil. Soil is subject to relatively permanent impairment from a variety of causes, but the greatest loss occurs through erosion. 1/ And the most important site of erosion is on cropland, which may occupy the best soils and produces the most valuable yields.

A. EROSION OF ARABLE LAND

The action of wind or water on unprotected soil detaches soil particles and removes them downhill or downwind, permanently. 2/ Erosion may occur naturally at a tolerable rate, 3/ but clearing land for crops has accelerated the process, 4/ removing topsoil faster than it can be formed. Here "erosion" will be used to describe accelerated erosion caused by human activity. Such erosion is importantly associated with crops because they expose the land surface more directly to the damaging effects of weather than other uses normally do. The pressure for land makes cropland degradation especially important, because agriculture is forced to expand into highly erosible areas.

1. Water Erosion

The most important cause of soil erosion is the action of water. 5/ Under sufficiently intense rainfall or rapid flow of surface water, soil particles are detached from the land. Erosion occurs when the detached particles are transported from their original position. This requires a sufficient flow of water, 6/ which in turn requires a rate of rainfall exceeding the rate of infiltration into the soil. 7/ The excess flows at a rate that increases with the steepness and length of the slope. 8/ The increase of velocity on a longer slope, due to the accumulation of runoff from uphill portions, may produce a soil loss of approximately half again as much when the slope length is doubled. 9/

1/ Food & Agric. Org. of the U.N., Soil Conservation - An International Study 77 (Washington 1948).
2/ See M.F. Baumgardner, et al., The Argentine Situation Erosion - A National Hazard, Conservation - An Urgent Need, in First Pan Am. Soil Conserv. Cong., Pro. 93, at 95 (Sao Paulo, n.d. [1966]).
3/ Helmut Kohnke & Anson R. Bertrand, Soil Conservation 50 (New York 1959).
4/ Food & Agric. Org. of the U.N., Soil Erosion by Water: Some Measures for its Control on Cultivated Lands 22 (Rome 1965).
5/ Cf. Richard C. Haw, The Conservation of Natural Resources 35-36 (London 1959).
6/ Compare FAO, Water, supra n.4, at 43, with Kohnke & Bertrand, supra n.3, at 51. But see FAO, supra, at 37.
7/ FAO, Water, supra n.4, at 23.
8/ Id. 37, 40.
9/ Kohnke & Bertrand, supra n.3, at 103-04.

Three obvious means exist for reducing the erosiveness of water. The soil can be protected from the force of water, the length and steepness of the slope can be reduced, and the effective rate of water infiltration can be increased. Some specific measures do more than one of these. Because action against erosion will be directed to altering the effects of water, soil conservation practices will also affect water conservation. In general the goal of both programmes will be to get as much rainwater as possible into the soil. Some measures combat soil erosion but reduce the amount of water usable for crops. Normally, however, soil and water conservation are complementary activities.

The technical means of controlling erosion by water are numerous, and their variations almost infinite. The basic reason for such variety is that the appropriateness of a particular practice depends upon the soil, climate, crops grown and the ability of the farmer to adopt new techniques. Permeable clay soil may require no treatment under conditions where sandy soil would erode badly without extensive precautionary practices. And the same soil on the same slope requires different levels of protection according to the intensity and duration of rainfall. Before a conservation regimen can be recommended on technical grounds, significant investigation of local conditions is required.

All technically appropriate soil conservation practices are not necessarily feasible for the actual land user. Some measures, such as contour cultivation, 10/ are relatively simple to install and increase crop yields as well as protect the soil. But others require heavy equipment (broad-based terraces) or remove land from production of the most profitable crops (strip cropping and other rotation practices.) Even the simplest practices may require some technical assistance and persuasion before the farmer will adopt them. Nonetheless, traditional farmers have been building elaborate bench terraces for thousands of years because the local conditions justified the effort and made the need obvious. Before a soil conservation advisor can recommend any particular practice, he must understand the characteristics of the land users, as well as the peculiarities of soil and climate which determine the usefulness of a technique.

2. Wind Erosion

Soil erosion by wind usually occurs in different climatic areas than erosion by water, but many of the same practices are effective against both. Water conserving measures are obviously helpful in the management of dry land. Wind erosion also requires some unique countermeasures, and adaptation of others may render them ineffective against water erosion. 11/

Wind erosion occurs when the soil is loose, dry and fine, the surface is relatively smooth and bare, the field is sufficiently large, and the wind is strong enough to initiate soil movement. 12/ At some point near the surface, wind velocity will be zero. Above this is a layer of smooth flow, and above that an area of turbulent air flow. It is the turbulent air which causes soil particles to move. The particles themselves, once movement is initiated, abrade the surface and magnify the effect of wind, a process known as avalanching. 13/

10/ Describes the practice whereby plant rows and tillage lines are placed at right angles to the surface water flow.

11/ E.g., contour plowing may be used against wind, but then the rows must be perpendicular to the predominant wind direction. If winds blow across the slope, the furrows would form up and down hill channels which would concentrate the force of runoff.

12/ Food & Agric. Org. of the U.N., Soil Erosion by Wind and Measures for its Control on Agricultural Lands 3 (Rome 1960).

13/ Id. 8-12.

The obvious solution to wind erosion is to maintain a surface which cannot be moved by wind. Plant cover would offer complete protection. But where this is impractical, the soil must be worked to create large particles and a rough surface. The smallest possible field size is desirable to prevent avalanching. And the force of the wind can be lessened by barriers of various kinds. One of the greatest difficulty experienced in combatting wind erosion is that cover crops and other vegetative wind barriers often compete with the principal crop for scarce water. Some places lack sufficient water to support a tree barrier alone. 14/ Practices designed to prevent wind erosion must therefore be carefully planned on the basis of accurate knowledge of rainfall and ground-water behaviour and of the water needs of any vegetation to be employed.

B. SPECIAL PROBLEMS OF FOREST AND GRAZING LAND

Forest and grazing lands possess characteristics which create special conservation problems. Although it is convenient to treat forest and range as separate topics, it should be remembered that erosion damage remains the eventual result of over or mis-use of the soils.

1. Forest

Forested areas areimportant both for the timber they contain and for their vital role in water catchment. Appropriate soil is necessary for both of these functions. Trees are often the only means by which forest soil can be protected. They reduce the effect of wind and rain, while fallen organic matter protects the surface and improves the fertility and water capacity of the soil as it is incorporated. 15/ Some forest soil is an exceptionally thin layer that cannot be maintained except under forest cover. 16/ Tropical forest soil may be low in nutrients and susceptible to hardening when exposed to sunlight. Only the fact that vegetation stores most of the nutrients of the system and provides shade for the soil allows it to be productive. 17/ In these cases, cutting must proceed with care, and permanent clearing may be disastrous. In any event forest clearing involves the establishment of a new biological regime. It must not be done recklessly. 18/

A special problem of forest exploitation is shifting cultivation, a form of agriculture with a short cropping phase and a long fallow period. Usually the fallow period is a time of forestation, the growth of which is cleared for the next cropping cycle. The continuance of shifting cultivation as population increases prevents the full process of forest restoration. The loss of nutrients, erosion of the soil, and

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14/ Id. 24.
15/ FAO, Soil Conservation, supra n.1, 59-60.
16/ See e.g., Food & Agric. Org. of the U.N., Mediterranean Development Project - Syria Country Report, c.3, at 33 (Rome 1959).
17/ FAO, Soil Conservation, supra n.1, at 114-17.
18/ See Roy D. Hockensmith, Soil Surveys for Planning Economic Development, Pan Am. Cong., supra n.2, at 301, 305.

deterioration of soil structure are not sufficiently repaired by the next time the land is cleared. Consequently yields are lower and soil damage greater. 19/ The end result can be permanent destruction of the forest. 20/

Shifting cultivation is essentially a primitive method of fertilization. Where yields can be maintained through chemical or manure fertilizers, the abandonment of cleared plots is not so necessary (although soils which deteriorate structurally under tillage must be handled specially to prevent long term damage). A grass fallow system, with suitable cooperation between cultivators and graziers, can maintain desirable soil structure and provide a good source of manure. 21/ Rotations designed to maintain maximum fertility have also demonstrated their value. 22/

2. Range

Grazing may take place on farms or in forests as well as on range, but it presents distinct problems from other activities with which it may share physical proximity. The dominant problem of grazing is overgrazing (although understocking can lower range quality because animals can concentrate on the best grasses, allowing less desirable varieties to take over). 23/ Ranges in developing countries are a third more crowded than in the developed world, so it is in these areas that the problem is most severe. The severity is enhanced by the encroachment of cultivation onto range areas, further crowding those remaining. 25/ Even without shrinkage of range areas, overgrazing is a progressive phenomenon. As the animals grow less productive there is a tendency to increase stocks, despite the fact that the range has even less capacity than before. 26/ As the desirable grasses are depleted, progressively omnivorous animals are introduced, ending with goats, who can eat practically anything (including young trees). browse too close for regrowth, and whose small hooves are especially effective in breaking down soil structure. 27/ The end result of overgrazing is almost bare land and devastating erosion. 28/

19/ See René L. Ambroise, Rapport au Gouvernement du Mali sur la Conservation du Sol 3 (Rome 1969); FAO, Soil Conservation, supra n.1, at 42, 117; A.J. Kerr, Shifting Cultivation, in Conf. on Middle East Agric. Devel; Pro. 102, 103-04 (Middle East Supply Centre Agric. Rep. No. 6, 1944).

20/ Cf. Conserv. Fdn. & Food & Agric. Org. of the U.N., Soil Erosion Survey of Latin America (pt. 2), 9 J. Soil & Wat. Conserv. 214, 215 (1954).

21/ FAO. Soil Conservation, supra, n.1, at 112-13; Kerr, supra n.19, at 104-05.

22/ FAO, Soil Conservation, supra n.1, at 118-23. See generally F. Jurion & J. Henry, De l'Agriculture Itinérante à l'Agriculture Intensifiée (Bruxelles 1967).

23/ Haw, supra n.5, at 40.

24/ Ralph W. Phillips, Animal Agriculture in the Emerging Nations, Agricultural Sciences for the Developing Nations 15, 20 (A. Moseman ed., Washington 1964).

25/ FAO, Soil Conservation, supra n.1, at 111.

26/ See, e.g., Muhammad Rafi, Erosion Control and Soil Conservation in the Northern Uplands of West Pakistan, in Sympos. on Soil Erosion & Its control in the Arid & Semi-Arid Zones, Pro. 271, 282 (Karachi 1957); cf. FAO, Soil Conservation, supra n.1, at 58.

27/ See FAO, Soil Conservation, supra n.1, at 57; cf. Cyprus Min. Agric. & Nat. Resources, Forest Dep't, Jt. Sub-Comm'n on Mediterranean Forestry Problems, 10th Sess., Country Rep. - Republic of Cyprus, pt. 2, at 4 (1968).

28/ FAO, Wind, supra n.12, at 60.

Another significant source of range problems is the practice of burning. It is done to clear brush, and to eliminate old grasses, providing better forage on the tender new growth. Burning creates serious erosion problems on slopes because it bares the ground usually just at the onset of the rains. 29/ In fact burned mountain areas can slide even without rain. 30/ Some soils of high iron content may be irreversibly hardened if burning is practised. 31/ On the other hand burning does have advantages, especially in curtailing the growth of woody species. 32/ Haying would assure renewal of tender grasses, but it requires the complex adjustment of all grazing control. 33/

C. OTHER PROBLEMS

Soil conservation is generally used exclusively to indicate action directed against erosion. Since erosion is the most significant source of soil degradation, it is almost the only recipient of legislative attention. There are, however, other types of soil damage. This paper will not emphasize them because of their lesser total importance and because of the paucity of legislative experience in developing countries. But where other problems are well in hand, the lesser or more distant threats to soil quality are appropriate subjects for action.

1. Agricultural

Modern agriculture involves the application of various substances at least indirectly to the soil. The most natural one is water. However, even the best irrigation water may contain salts. Evaporation increases the salt content of the groundwater, eventually to a point where action must be taken to prevent crop damage. The common solution is to apply water in excess of crop needs. With good soil drainage this will carry away excess salt. 34/ But where drainage is inadequate, the excess water will raise the water table and capillary action will bring water and salts to the surface. "This results in an accumulation of soluble salts at or near the surface and trouble will ensue." 35/ In short, the crop will suffer damage. Even without irrigation, salinization can result from clearing natural growth and introducing vegetation which uses less water. 36/ Improved drainage, and land treatment, both of which are expensive, can reduce the danger of

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29/ FAO, Soil Conservation, supra n.1, at 53, 111.
30/ B.H. Payne, The Importance of Restoration in Upland Watershed Management, Pan Am. Cong., supra n.2, at 535, 539.
31/ FAO, Soil Conservation, supra n.1, at 113.
32/ See A.J. Semple, Grassland Improvement 214-24 (London 1970) (survey of uses of burning).
33/ FAO, Soil Conservation, supra n.1, at 111.
34/ M.R. Lewis, Protection of Arable Land from Soil Alkali, Pan Am. Cong., supra n.2, at 207, 208; cf. H.B. Peterson, et al., Irrigation Efficiency, Leaching (of salts) and Water Conservation Interactions, id. 731
35/ Lewis, supra, at 208.
36/ FAO, Water, supra n.4, app. 2, at 209-10

salinization, but the real solution is to select more suitable land for irrigation. 37/ The general excess of land over water to irrigate it with makes the choice possible, although land classification does involve rather complex predictions of physical and biological behaviour. Nonetheless, land should be classified before irrigation is undertaken. Legislation authorizing irrigation should require a technical report on suitability before allowing a project to proceed. 38/

Various pesticides and even fertilizers are suspected of causing soil impairment, although in most cases it is not permanent. Fertilizer build-up in soils is possible, but there is no evidence of significant concentrations or damage (water contamination is beyond the scope of this publication). 39/ Phosphates are sometimes a source of uranium, but in very low concentrations. 40/ Where concentrations of fertilizer elements in crops are not presently significant, the state may simply monitor the situation. If important dangers should arise, residue tolerances could be prescribed to control specific uses of suspect products. Although the enforcement of DDT tolerances is most familiar, the same approach is generally applicable to any other product which leaves traces in or on the crop. 41/

The effects of pesticides tend toward more noticeable results than fertilizer. Some apple orchards sprayed with arsenic compounds in the 1930's were reported still unproductive in 1967. 42/ In the early days of insecticide use, the persistence of the chemicals was counted a virtue. It reduced the need for subsequent applications and it was not believed that plants absorbed the chemicals. But now it is clear that plants do absorb certain of the persistent insecticides. The spraying of orchards with DDT has produced some high local concentrations, which subsequent root and fodder crops can introduce into the food chain. Such dangerous contamination is relatively permanent because DDT degrade relatively slowly. Consequently, these concentrations may build up with repeated applications until they are picked up by plants or surface runoff. 43/

Other pesticides affect plant growth. 44/ Herbicides naturally damage plant life, but inherently the evidence is immediately apparent. "Buildup of herbicide residues of major significance in surface soils is unlikely," but it cannot be said what happens in subsoils. 45/ Even though the immediate effects of herbicides are visible, damage to later crops can result from excessive applications or from the unexpected

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37/ See John T. Maletic, Land Classification Survey as Related to the Selection of Irrigable Lands, Pan Am. Cong., supra n.2, at 1033.

38/ Cf. Kenya Water Act § 45, Laws of Kenya c.372 (rev. ed. 1962); 43 U.S.C. § 412 (1964).

39/ Cf. George E. Smith, Fertilizer Nutrients as Contaminants in Water Supplies, Agriculture and the Quality of our Environment 173 (N. Brady ed., Washington 1967); Roy S. Rauschkolb, Land Degradation (FAO Soils Bull. No. 13, Rome 1971); Perry R. Stout & R.G. Burau, The Extent and Significance of Fertilizer Buildup in Soils as Revealed by Vertical Distributions of Nitrogenous Matter between Soils and Underlying Water Reservoirs, id. 283.

40/ J.V. Lagerwerf, Heavy-Metal Contamination of Soils, id. 343, at 357; Rauschkolb, supra.

41/ See, e.g., New Zealand Health Act 1956; Agricultural Chemicals Act (No. 5 of 1959).

42/ T.J. Sheets, The Extent and Seriousness of Pesticide Buildup in Soils, Agric. & Quality, supra n.39, at 311, 319.

43/ See id. 311-219

44/ Cf. Richard Bartha, et al., Stability and Effects of Some Pesticides in Soil, 15 Applied Microbiology 67 (1967).

45/ Sheets, supra n.42, at 322.

susceptibility of more sensitive plants. 46/ The possibilities and persistence of such damage suggest that herbicides should not be made available to untutored farmers without careful controls.

Fungicides may present dangers because of concentrations of copper and mercury. Mercury is not generally dangerous except in greenhouses, but excessive copper is poisonous to plants. And its toxicity is increased with acidity, which is commonly supplied in phosphate and nitrogen fertilizer. 47/ Treatment for metal contamination is not simple, and the wrong cure for the plant and soil affected can often make the condition worse. 48/

That pesticides may harm the soil does not imply that they should no longer be used since most common pesticides appear not to have permanent effects. Even those with great persistence have value. In practice it is nations that decide which pesticides to allow and which to forbid. At the least, they must carefully consider the national advantage and loss in the use of each product.

2. Nonagricultural

Nonagricultural activities often act on the soil, although soil conservation laws do not deal with them. Strip-mining presents a particularly visible form of land degradation. The soil is removed from the coal seam and deposited in great mounds. The spoil banks, as they are called, are often toxic, and they are always too rough for farming. They are highly erosive, and runoff of both sediment and acid can ruin downslope streams. Nonetheless, stripped land is not useless. Recreational lakes form where the spoil is not too acid, 49/ and in humid areas the soil will generally revegetate. 50/ But spoil banks can still represent a permanent soil loss. Various American states have attempted to regulate the effects of strip mining by requiring reclamation of spoil banks. 51/ A bond of from $ 100 to $ 1000 per acre is required before stripping is allowed. 52/ One state found that even with a bond worth more than the average value of land in the state, 53/ operators did not reclaim either the land or their money. 54/ The bonding requirement has since been increased, 55/ thus forcing reclamation at a cost in excess of the resulting land value.

46/ See O.C. Burnside, et al., Herbicide Longevity in Nebraska Soils, 13 Weeds 277, 278 (1965); Sheets, supra n.42, at 320-21.

47/ Lagerwerf, supra n.40, at 346-347, 352.

48/ Id. 358, passim.

49/ John L. Roseberry & W.D. Klimstra, Recreational Activities on Illinois Strip-Mined Lands, 19 J. Soil & Wat. Conserv. 107, 109 (1964).

50/ Kohnke & Bertrand, supra n.3, at 256; cf. L.E. Sawyer, Mined Area Restoration in Indiana. 17 J. Soil & Wat. Conserv. 65 (1962).

51/ T.E. Schessler & Richard F. Droege, Strip-Mine Reclamation: A Digest, 20 J. Soil & Wat. Conserv. 17, 20 (1965); see Robert G. Meiners, Strip Mining Legislation, 3 Nat. Resources J. 442 (1964).

52/ Schessler & Droege, supra, at 20.

53/ The average value of Pennsylvania farmland in 1964 was $ 222 per acre. H. Allan Schmid, Converting Land from Rural to Urban Uses 91 (Baltimore 1968).

54/ William F. Schulz, Conservation Law and Administration - A Case Study of Law and Resource Use in Pennsylvania 448-54 (New York 1953).

55/ Compare id. with Meiners, supra n.51, at 463-66, and Schessler & Droege, supra n.51, at 20.

Other forms of soil contamination occur through the deposit of various heavy metals. In agricultural areas, radioactive metals do not pose a serious threat at present. 56/ But the lead emitted with automobile exhaust is heavily deposited in road side soils. It does not appear to be translocated by plants above the roots, but concentrations are becoming larger every year. 57/ Zinc smelting seems to produce nearby soil concentrations with plant damage as a byproduct. 58/ Both roads and smelters have certain economic value, and again regulation of byproducts is a question of the soil value against the benefits of the activity.

Another cause of soil loss is the urbanisation of farming land. Because of the relatively low significance of raw land costs in total real estate values, 59/ building lots can be created from good farmland or desert without significant effect on the selling price. Often planning considerations are dominant in attempts to conserve farmland on the urban fringe, but serious problems of soil valuation are also involved. Several states in the United States have enacted tax laws which assess farm property at its value for farmland if certain agreements to keep it under cultivation are made. 60/ But such blanket treatment does not discriminate between excellent and marginal cropland, except to the extent that marginal farmers, who already have greater incentive to sell, might occupy the least suitable farmland. 61/

There are other threats to soil, but most of them are relatively unimportant. In fact, next to the problems of erosion, salinity and alkalinity, deforestation, and uncontrolled grazing, all other soil problems pale in developing countries dependent upon agriculture for economic progress. The difficult economic, social, and therefore legislative questions arise in connection with basic agricultural practices. Since legislation so far concentrates on them, the present discussion will not emphasize the other problems.

56/ R.F. Reitemeier & Hal Hollister, The Extent and Significance of Soil Contamination with Radionucleides, Agric. & Quality, supra n.39, at 269

57/ Lagerwerf, supra n.40, at 353-56.

58/ Id. 347.

59/ See Schmid, supra n.53.

60/ See William H. Heneberry, Taxes Affect Land Use in Urban-Fringe Areas, 17 J. Soil & Wat. Conserv. 107 (1962); J. Herbert Snyder, Land Use Capability - A Basis for Prime Agricultural Land Conservation in California, Pan Am. Cong., supra n.2, at 1045; cf. Frederick K. Nunns, Hawaii Pioneers with a New Zoning Law, 17 J. Soil & Wat. Conserv. 104 (1962).

61/ Israel more positively attempts to keep urbanization from the best farmland. FAO, Water, supra n.4, app.4, at 215. See also Yugoslavia Act Relating to the Exploitation of Agricultural Land, 19 Oct. 1959, arts. 2, 51-52, 8 Food & Agric. Leg. No. 4 (1959).

SOIL CONSERVATION POLICY

Agriculture, forestry, and grazing are all primarily economic activities, even for land-users not participating in a cash economy. Legislation which affects the level of conservation with which these activities are conducted will therefore also affect the livelihood of the actors. The state's power to compel is limited by the individual's determination to get an adequate income. Attempts to disregard this limitation produce undesirable conflicts between government and populace, and the difficulty of enforcement can outweigh the benefits intended. An understanding of the position of the individual resource user should prevent such self-defeating legislation. At the same time, the state can utilise the fact that individual and social economics will not always coincide. It can exploit opportunities to alter individual positions in a manner that will induce or allow a socially optimal level of conservation.

A. THE ECONOMIC BASIS OF SOIL CONSERVATION POLICY

Conservation implies an alteration in economic distribution between different times and different members of society. At the individual level the most important distribution affected will be intertemporal. There are activities that preserve soil qualities at no cost, or at least at no net cost over a short term. In some cases contour farming will be an example. The cost is not much greater than cultivation on the slope and yields may be greater immediately because of better water retention. 1/ But normally the cost of conservation must be paid either through investments in construction and more costly practices or through lower initial yields. To determine the profitability of conservation the land user must be able to value current costs or loss of income against future greater income. An intelligent determination requires an understanding of the concept of interest.

1. Interest

In a perfect capital market, any resource user may choose either to consume his resource presently, or to postpone use and enjoy the same income through borrowing (or foregoing alternative investment) at the "going rate of interest." 2/ If he postpones

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1/ Food & Agric. Org. of the U.N., Soil Conservation - An International Study 96 (Washington 1948); cf. United States Bur. Agric. Econ., Possible Effects of Conservational Land Use on Production in the Corn Belt and Lake States 37 (Washington 1947).

2/ Anthony Scott, Natural Resources : The Economics of Conservation 6 (Toronto 1955).

consumption, he will value the postponed income at its expected future value discounted at the interest rate. If we assume a rate of five per cent, a dollar today would be equivalent to $ 1.05 next year. Therefore a unit of consumption enjoyed now would be the equivalent of 1.05 units of consumption enjoyed in a year. The process also operates in reverse. A unit of cost incurred today would be equivalent to 1.05 units a year later. Because the interest is compounded, a time is eventually reached that would require enormous future income to outweigh present income possibilities. This point is especially important in soil conservation, because the loss of productive capacity envisaged may be quite distant in time. (In one mountainous area FAO has predicted that growing wheat on extremely thin soil would be possible for twenty years.) 3/ Therefore, the future gains of a conservational over an exploitative land use system must be proportionately high to offset present investment. And it will be seen that the higher the interest rate, the greater will be the rate at which future income is discounted. Professor Bunce explains the same phenomenon in terms of capital value. If the rental value (value of income attributable to the land) of land is capitalized, lower interest rates will produce a greater land value, so the loss of productive capacity will represent a greater monetary loss. Continuing the explanation, he states that it will be "economic to conserve the soil when the capital loss in land value due to the permanent reduction of the productivity of the land equals the gain in annual income resulting from exploitation." 4/

Economic systems alone (although their consideration is necessary) are not sufficient to ensure the "best" development, use, and conservation of natural resources, notably land. While the "discounted present value" concept takes care of part of this concern, it is not entirely adequate in view of today's concern for ecological, social, and human values.

The theory of interest is complicated in practice by distortions in the capital market and by the indivdual's need to insure against unacceptable losses. The individual discount rate may be quite low if alternative investments have low yields. But a small farmer may not be in the position to make alternative investments. Rather he may be a chronic debtor, paying extremely high interest. In that case, additional costs or reduced income would raise his level of borrowing, and the return from a conservational system of farming would have to be as high as the cost of money to him. One cannot state a general individual discount rate, but one can and must be aware that it might be considerably higher than the "going rate". 5/

A conservation programme will only be economical when the discounted future profit equals or exceeds present costs. If only this standard is used, the individual profitability of soil conservation may be problematic. Some authorities have concluded that"conservation pays" in the general case. 6/ Others find that gains may be marginal. 7/ The soil conservation programme in the United States has raised total output, and its activities have encompassed good farm management as well as conservation in a strict sense. 8/ Therefore it is sometimes difficult to identify the effects of purely conservational practices. And in some cases the recommended soil programme may result in

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3/ Food & Agric. Org. of the U.N., Mediterranean Development Project - Syria Country Report, c.3, at 33 (Rome 1959).
4/ Arthur C. Bunce, The Economics of Soil Conservation 83 (Ames, Iowa 1945).
5/ See Scott, supra n.2, at 8-9.
6/ See Helmut Kohnke & Anson R. Bertrand, Soil Conservation 269-70 (New York 1959).
7/ Milton R. Gertsch, Conservation of Agricultural Resources by Orderly Profitable Exploitation, in First Pan Am. Soil Conserv. Cong., Pro. 941, 944 (Sao Paulo, n.d. [1966]); R. Burnell Held & Marion Clawson, Soil Conservation in Perspective 261, 265-73 (Baltimore 1965).
8/ Held & Clawson, supra, 69-75.

reduced total yields of some crops. 9/

2. Risk

Even if a conservational pattern of land use is economical when all values are discounted, the risk may induce the individual to make such further discount that exploitation continues. Strictly, risk is merely a measure of the probability of expectations maturing, and it should be accounted for in estimating the probable returns from an investment. But in fact people seem to discount by an additional factor which is usually assigned to risk. 10/ As the period increases, so do uncertainties, and a correspondingly greater discount will be made for risk, until finally future profits will be discounted to nothing because of the uncertainty of their occurence. This period may in fact be quite short : "Generally speaking, a farmer must be able to anticipate economic gains within five or ten years if he is to adopt a soil-conservation measure." 11/

The poorer a land user is, the higher he must rate risk. In traditional farming, where the level of income is so close to the bare subsistence level, almost any risk of loss is intolerable. 12/ Increases in debt might be possible, but would bring with them the risk of permanent income loss if future income were not certain to exceed present income plus additional interest costs. Even among richer farmers, "if the conservation plan does not provide an acceptable level of living, exploitation will probably be reintroduced whenever it will yield even a small increase in net income." 13/ Temporary periods of substandard income could be compensated with loans, but too great a debt load increases the risk that the entire living could be lost through foreclosure. Commercial lenders force recognition of this by refusing to lend to the full value of farm property. The alternative is then limited to "borrowing" against the capital value of the soil by exploitative farming.

3. Lack of Knowledge

The assumption of rational behaviour by the land user is limited according to his perception. A programme to combat erosion could accord with the farmer's time and risk discount, and yet fail to be adopted because of his unawareness that erosion was occuring, that anything could be done about it, or that it would be beneficial to him to do it. Farmers have been unaware that sheet erosion was occuring 14/, and even those who knew often underestimated its seriousness. 15/ There is ample evidence of low yields and soil impairment because of farmers' ignorance of better methods. 16/ Determining if conservation would be economic may require "a complete farm budget analysis," which "few farmers have the necessary facts to make." 17/ Indeed, even conservation experts

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9/ Id. 261; see Food & Agric. Org. of the U.N., Soil Erosion by Wind and Measures for its Control on Agricultural Lands 69, 75-76, 80-81 (Rome 1960).
10/ See Scott, supra n.2, at 78-82.
11/ Kohnke & Bertrand, supra n.6, at 265.
12/ Theodore W. Schultz, Transforming Traditional Agriculture 167 (New Haven 1964).
13/ Bunce, supra n.4, at 160; see FAO, Soil Conservation, supra n.1, at 18, 20-21.
14/ Sheet erosion is the removal of a thin, uniform layer of soil. It is the most widespread type of erosion. Kohnke & Bertrand, supra n.6, at 51.
15/ E.g., Held & Clawson, supra n.7, at 254-55.
16/ Scott, supra n.2, at 76-78.
17/ Bunce, supra n.4, at 109.

do not find it easy to measure the effects of some individual practices. 18/

4. Social economics

Conservation practices that are not economic - or not perceived as economic - to individuals may be highly economic to society. Government intervention can reduce individual risk, eliminate anomolies in the capital market, and provide informational services. Governments can also alter situations where the costs of exploitation or the benefits of conservation do not accrue to the land user (for example where a tenant is unaffected by the improvement or deterioration of the land he farms).

Government programmes to encourage private soil conservation can be quite expensive (programmes of soil conservation cost an average of $ 683,000,000 per year in the United States from 1959 to 1963). 19/ Therefore it is worth examining the cases where public action may be justified on economic grounds.

The case where the costs or benefits of land use extend beyond the direct user is probably more common than not. Such extended effects are usually termed externalities by economists. Externalities are especially noticeable where a product of activity escapes from the actor's land to that of another. Smoke from a factory, or sediment from farmland are two examples. In neither instance is the - usually unwilling - recipient of the product likely to collect for his inconvenience nor to pay for any benefit he may receive. But for a society there are relatively few externalities. Smoke, water, and sediment may all cross borders, but less frequently than they cross property lines.

There are many types of externality which encourage exploitation at a socially uneconomic rate. Tenant farming is the most pervasive. Both in economic theory and agricultural observation, there is overwhelming agreement that tenancy implies depletion, 20/ and the less secure the tenancy, the greater the depletion. 21/ "Unless the lease mentions the condition of the farm at the end of tenure, the landlord is likely to charge a rent high enough to compensate himself for soil mining, and the tenant to mine the soil to find the rent." 22/ The tenant who conserves may still be saddled with a rent based on exploitative profits. Even a practice with immediate returns may be uneconomic if he must pay all costs for half the crop. 23/

18/ Arthur C. Bunce & George W. Collier, A Method of Estimating the Economic Effects of Planned Conservation on an Individual Farm 2 (U.S. Dep't Agric. Misc. Pub. No. 463, Washington 1942).

19/ Held & Clawson, supra n.7, at 87.

20/ Bunce, supra n.4, at 95; Held & Clawson, supra n.7, at 279-82; Muhammad Rafi, Erosion Control and Soil Conservation in the Northern Uplands of West Pakistan, in Sympos. on Soil Erosion & Its Control in the Arid & Semi-Arid Zones, Pro. 271, 281 (Karachi 1957); Schultz, supra n.12, at 167; Scott, supra n.2 at 117-18; Rushed Bey Zok, The Effect of Land Settlement on Agriculture, in Conf. on Middle East Agric. Devel., Pro. 180 (Middle East Supply Centre Agric. Rep. No. 6, 1944). But see FAO, Soil Conservation, supra n.1, at 24-25.

21/ Sources supra.

22/ Scott, supra n.2, at 118.

23/ Schultz, supra n.12, at 167.

Another sort of externality exists when one with no legal interest in land is affected by activities occuring there. A forested area might be depended upon the non-owners for water catchment. The forest owner, receiving no compensation for maintaining the forest, would not suffer if he cut the lot, reducing water supply and sending sediment into reservoirs. For him sustained yield forestry might by marginal; whereas if the entire catchment area were in single ownership, the conservational system would be followed. 24/ A different situation results in the depletion of grazing land. Where land is not controlled by an individual grazier, or limited by some authority, each grazier is in competition with the others to get fodder. If one foregoes exploitation, he will not benefit because the others will simply use his share. But if one man (or firm or cooperative) controlled the land, he could operate most economically by limiting grazing in order to produce greater yields over time. 25/

A different kind of diseconomy in individual resource use arises from the high interest rates small users must pay, their high valuation of risk, and their ignorance. Where the most rational course for an individual may be to mine his soil, it does not follow that the state should allow him to do so. If artificially high interest rates are the cause, exploitation represents a shift of natural resources from the soil to the moneylender's pocket. (The moneylender might of course invest his profits in local industry, but there is no guarantee he will do so.) Overvaluation of risk causes a refusal to invest, that prevents future growth which the whole society may need even if the individual can survive by present practices. A nation cannot afford certain risks, either, but it can take the chance that some farmers will do less well in a situation where aggregate production is increased. The individual farmer is usually confined to the possibilities of his plot of ground, but a nation must see and avail itself of the opportunities of the whole land. It can afford to shift millions of hectares from crop to pasture even if the farmer acting alone cannot afford to shift any. And the nation collectively can see the advantage in doing so.

B. A SOCIAL POLICY OF SOIL CONSERVATION

Social conservation policy should be based upon an appreciation of the unique position of the state with respect to cost, risk, and perception of problems and solutions. The individual cannot be ignored, because for the most part, he will have to carry out the policy. But a national programme can alter the position of the individual to reflect more accurately the social interest. This is the basic task of soil conservation legislation.

Government action to overcome individual disabilities in finding capital, covering risks, and learning better methods is appropriate because of the advantages of size in these activities. In the discussion of interest it was pointed out that the individual interest rate may be substantially higher than the "going rate." In some cases the individual rate simply reflects the higher costs of administering small loans. But part of this cost may be peculiar to the lending institutions. An extreme, but common, example is the the traditional village money lender who must produce a living from a very limited capital. His knowledge will not be much greater than that of his customers. He will not be prepared to take great risks, either. A standard programme of loans for conservation (or general agricultural development) could operate on the best knowledge, could take more sanguine view of risk, and could distribute personnel economically. The cost of the money itself

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24/ See Scott, supra n.2, at 118-19.
25/ Compare id. 62-64 with Cyprus Min. Agric. & Nat. Resources, Forest Dep't, Jt. Sub-Comm'n on Mediterranean Forestry Problems, 10th Sess., Country Rep. Republic of Cyprus, pt. 2, at 4 (1968).

should be the lowest available, 26/ and administrative costs should not exceed those of a private operation. Government loans would not even dislocate the local money lender, since he would not be competing in the conservation loan market. (If the money lender were put out of his living, that would represent part of the social cost of the programme.) The programme would not be without cost, since the government does not have unlimited access to capital, and especially in a developing economy, there are many competing demands for finance. But where market anomolies create a sufficient discrepancy between socially desirable and individually possible conservation, the intervention will be socially economic. 27/

Sometimes a farmer will be prevented from introducing measures such as terraces, or converting to a livestock operation because of rigidities in the market in which he deals. There may be no local rental market in equipment, or at an even more basic level, the farmer may not have access to a bullock at the time needed for conservation work. 28/ A market for slaughter beef will not exist until there is a supply of beef for slaughter, but a small farmer cannot afford to raise a product for which he has no assurance of market. A co-ordinated conservation programme can rent bullocks or tractors, and it can remove the uncertainties of market and supply where new products are indicated. If neither cattle nor terraces are otherwise desirable for the society, such facilities might find no takers, but where a need exists and proper coordination alone is lacking, relatively simple government intervention can produce significant gains.

Given the extremely high value individual farmers seem to place on risk, government insurance appears to be almost costless (except for the risk any insurer must bear). If the conservation plan is otherwise feasible, failure of the land user to institute it represents a social loss in proportion to his overvaluation of the risk. One means of insuring a conservation programme would be to allow liability for loan repayment to depend on yields. 29/ This would remove the risk of impossible debt. If the perceived risk lies in doubt that the new method will work, income can be guaranteed. This has many objections, but an income guarantee could be established for a trial area. 30/ If the trial succeeds the farmer may perceive a much reduced risk and extend the plan without special insurance. Premiums, whether in the form of higher interest or direct payments can be deferred without upsetting the economics of the programme.

Two limits should be established for any government risk-bearing programme. First, in an economy where the average income is sufficiently low, a satisfactory level of living could not be guaranteed. Insurance only reduces risks to the average, and in the case supposed, the average expectation would be unsatisfactory. Secondly, the type of insurance discussed here is suggested as a means of removing the diseconomy of overvalued risk. If the government guarantees induce people to use land in a manner which is uneconomical because the risk is objectively great, the programme will be uneconomical. It may also result in exploitation. For example, the combination of drought insurance and guaranteed prices for wheat may result in the farming of dry areas which are highly susceptible to wind erosion. 31/ This result should be avoided by a careful study of whether a risk is overvalued from a social point of view, or whether the private calculation represents an accurate prediction of loss.

26/ Bunce, supra n.4, at 116-20.
27/ Id. 89-90.
28/ See Rafi, supra n.20, at 281.
29/ Cf. Warren R. Bailey, Resource Management Under Conditions Of Uncertainty, Pan Am. Cong., supra n.7, at 955, 959.
30/ See United Nations Research Inst. For Social Devel., Methods to Induce Change at the Local Level - A Survey of Expert Opinion - First Report 97 (Geneva 1965).
31/ Held & Clawson, supra n.7 at 81.

Government intervention against lack of knowledge is necessary to any soil conservation programme. If anyone is to do soil studies, it will not be the individual farmer. It requires a large unit to assemble the necessary personnel, and to disseminate the results broadly enough to justify the effort. Farmers must be informed of new knowledge, they must be convinced of its truth and relevance to them, and they often must be taught how to apply it. But effective means of disseminating information and assistance must be identified, especially where there is a general shortage of rural development personnel. Efforts could then be directed in the most likely paths, and the legislative programme could be fitted realistically to the administrative possibilities. Failing this, scarce personnel will be wasted on activities producing less than optimum results.

Government action to eliminate externalities - or to allocate costs according to benefits - does not require anything as thorough as total land reform. Tenancy's effect on conservation practice can be largely eliminated by provisions in conservation laws allocating the cost and profit from conservation measures between tenant and landlord. 32/ Security of tenure laws can provide for the expulsion of tenants whose method of farming creates undue soil losses. 33/ Such laws would not be especially useful where other factors made it uneconomical, or even impossible for conservation to be undertaken, but they could be used in conjunction with appropriate lending, risk-sharing, and educational policies to eliminate the worst pressures upon the tenant to exploit the soil. Where the effects of activities of one land user physically affect the interests of others, legal tools for alleviating the situation exist. Some countries have simply forbidden tree-cutting that disturbs established water catchments or that creates a danger of landslides and downslope sediment damage. 34/ Where positive action is necessary to protect a watershed from floods and siltation, a public body can undertake the work and apportion the cost according to benefit received from the project. 35/

32/ See, e.g., Uruguay Law No. 13.667, 13 June 1968, art. 21, 18 Food & Agric. Leg. No. 1 (1969).

33/ See id. art 17.

34/ See, e.g., Venezuela Forestry, Soil and Water Law 1965, arts. 7, 34, 41, 15 Food & Agric. Leg. No. 3 (1966).

35/ See Stewart H. Jessee, Financing an Oklahoma Conservancy District, 17 J. Soil & Wat. Conserv. 13 (1962); cf. Cyprus Soil Conservation Law § 12(1), Laws of Cyprus c.94 (1959).

PATTERN IN SOIL CONSERVATION LEGISLATION

A. GEOGRAPHICAL DISTRIBUTION

It is not possible to state definitely which nations have soil conservation programmes. Some countries with adequate legislation may not support the laws with the financing and administration necessary to produce changes at the land user level. Others without specific soil conservation laws may conduct important conservation work through a general programme of rural development. But the purely legislative status can be given for large areas of the world.

1. Far East

In the Far East there is frequently legal authority for the appropriate minister to control erosion even in the absence of particular soil conservation legislation. 1/ Specific soil conservation legislation is more common. 2/ In addition, forestry - and in some cases grazing - legislation may be found in most of the countries with soil conservation laws. 3/ Other countries sometimes have special legislation for control of particular problems such as streambank erosion, but they do not apparently have more general legislation controlling land use or forest exploitation.

1/ Brunei Water Supply Enactment 1962; Burma Canal Act 1905; Hong Kong Waterworks Ordinance 1950 and regulations; see 1 Econ. Comm'n for Asia & the Far East, Water Legislation in Asia and the Far East 51 (New York 1967) (Republic of China). See generally id. (2 v.) for relevant legislation in Asia.

2/ See 2 Econ. Comm'n for Asia & the Far East, supra, 29-31 (Victoria, Australia); id. 79-80 (India); Ceylon Soil Conservation Act (No. 25 of 1951), and Regulations, 16 Dec. 1959; Fiji Land Conservation and Improvement Ordinance, Laws of Fiji c.120 (rev. ed. 1967); Japan Erosion and Flood Control Emergency Measures Law (No. 21 of 1960); Republic of Korea Erosion Control Law (No. 977 of 1962); Malaya (Malaysia) Land Conservation Act (No. 3 of 1960); New Zealand Soil Conservation and Rivers Control Act (No. 12 of 1941), as amended; Philippines Republic Act No. 3082, 17 June 1961 (5 year soil investigation); Singapore Hill Lands Ordinance, Rev. L. Singapore c.247 (1955).

3/ See Australian state legislation (e.g., Western Australia Forests Act (No. 8 of 1919), as amended; Land Act of 1933, as amended; pt.IV (pastures)); Cambodia Order of Gov. Gen. on Forestry, 21 March 1930; Ceylon Forest Ordinance, c.451; Fiji Forest Ordinance, Laws of Fiji c.128 (rev. ed. 1967); India Forests Act (No. 16 of 1927); Japan Forestry Law (No. 249 of 1951); New Zealand Forests Act 1949; Teofilo A. Santos, A National Progress Report on Forestry, Asia-Pac. Forestry Comm'n 8th Sess. (1969) (Philippines); Philippines Pasture Land Act; Western Samoa Agriculture, Forestry and Fisheries Ordinance (No. 6 of 1959).

2. Latin America

In Latin America, forestry laws are almost universal, reflecting the regional importance of forest lands, even for grazing and agriculture. 4/ Some other countries possess regulations to control clearing, burning, or other particular activities. 5/ Soil conservation laws as such exist in Chile, 6/ Colombia, 7/ Costa Rica, 8/ Guatemala, 9/ Haiti, 10/ Mexico, 11/ Uruguay, 12/ and Venezuela. 13/ There is also some less comprehensive legislation. 14/ Although some of these laws are quite recent, there is a broad base of Latin American legislative experience in soil conservation. Improvement and extension of soil conservation in the region can draw on this local experience.

4/ General forestry legislation exists in Brazil (Act No. 4771, 15 Sept. 1965), Colombia (Ley sobre Economia Forestal de la Nación y Conservación de Recurses Naturales Renovables (No. 2 of 1959)), Costa Rica (Ley Forestal, 9 March 1959), Dominican Republic (Decreto No. 3777, 9 June 1969, regulating felling), Ecuador (Supreme Decree No. 1211, 4 Oct. 1966, 16 Food & Agric. Leg. No. 1 (1967)), Guatemala (cf. Decreto No. 543, 9 Feb. 1956), Haiti (Act Modifying the Rural Code of 1864, 24 May 1962), Honduras (Forest Law of 1961, as amended), Mexico (Forest Act 1960, 9 Food & Agric. Leg. No. 4 (1960)), Nicaragua (Decree No. 1381, 27 Sept. 1967, 19 Food & Agric. Leg. No. 2 (1970)), Panama (Decreto-Ley No. 39, 29 Sept. 1966), Peru (cf. Resolución Ministerial No. 2432, 14 July 1961 (approving forestry regulations)) and Venezuela (Forestry, Soils and Water Law 1965, 15 Food & Agric. Leg. No. 3 (1966)).

5/ See Argentina Decreto No. 4516, 2 May 1957 (forest clearing); Argentina Decreto No. 8971, 8 October 1963 (credit facilities for initiation of forests); Uruguay Decreto No. 266/966, 2 June 1966 (forest conservation plan for particular area).

6/ Cf. Decreto No. R.R.A.4, 16 Jan. 1963.

7/ Ley sobre Economia Forestal, supra n.4.

8/ Act No. 1540, 5 March 1953, 2 Food & Agric. Leg. No. 1 (1953).

9/ Decreto-Ley No. 187, 24 March 1964.

10/ Act Modifying the Rural Code of 1864, 24 May 1962.

11/ Soil and Water Conservation Law 1946.

12/ Law No. 13.667, 13 June 1968, 18 Food & Agric. Leg. No. 1 (1969).

13/ Forestry, etc. Law, supra n.4.

14/ See, eg., El Salvador Acuerdo No. 530, 16 July 1964 (establishing circulating fund of 30,000 colones for soil conservation and irrigation); Food & Agric. Org. of the U.N., Las Leyes de Aguas en Sudamerica 221 (Rome 1956) (Argentine states of Jujuy, La Rioja, and Santiago del Estero).

3. Africa

Sub-Sahara Africa bears some legislative similarities to Latin America. Forest legislation is ubiquitous, 15/ but laws aimed at cropland problems are less frequently encountered. Soil conservation legislation exists in the resources laws of Mali, 16/ and Zambia, 17/ and separately in Ghana, 18/ Kenya, 19/ and the Malagasy Republic. 20/ In addition to the above, formal responsibility for soil conservation exists in Burundi, 21/ Cameroon, 22/ Chad, 23/ Guinea, 24/ and Niger. 25/ These laws and orders represent a mixed lot of experience, mainly because so many of them originated during the colonial period. Independence has brought different national needs, and an altered agricultural structure. Many of the laws that exist need to be re-examined in light of the changes brought by independence. Some of the recent legislation suggests that this is being done, but too many cases still exist where laws are outdated, have not yet been introduced, or have not yet been adopted to recent trends in agricultural.

15/ Either a forest service or a forest code exists in Botswana (Forest Ace (No.23 of 1968)), Cameroon (Décret of 3 May 1946 (establishing forest code)), Central African Republic (Code Forestier, Loi No. 61/273 of 1962), Chad (Décret No. 143/PG.-T-EFC., 22 Sept. 1960 (responsibilities of the Organization of Waters, Forests and Hunting)), Congo (Brazzaville) (Loi No. 34-61, 20 June 1961), Ghana (The Forests Ordinance, c.157), Kenya (Forests Act, Laws of Kenya c.385 (rev. ed. 1962), as amended), Malagasy Republic (Arrêté No. 1320, 20 March 1968 (organization of Directorate of Waters, Forests and Soil Conservation); Ordonnance No. 62-121, 1 Oct. 1962 (rules for land clearance and burning)), Malawi (Forest (Amendment) Rules 1964), Mali (Law No. 68-8, 17 Feb. 1968, 17 Food & Agric. Leg. No. 4 (1900)), and Zambia (Natural Resources Conservation Act (No. 53 of 1970)). In addition the former regions of Nigeria had forest laws and Niger has formally entrusted forest conservation to the Minister for Rural Economic Affairs. Décret No. 70-265 PRN/DIR-CAB, 11 Dec. 1970.

16/ Law No. 68-8, supra.
17/ Conservation Act, supra n.15.
18/ The Land Planning and Soil Conservation Ordinance 1953.
19/ Agriculture Act, pt. IV, Laws of Kenya c.318 (rev.ed. 1962), as amended.
20/ Arrêté No. 199 C.G., 11 June 1958.
21/ Décret of 26 Nov. 1958, amended by Décret-Loi No. 1/72, 27 June 1967.
22/ Loi No. 58-3, 9 Jan. 1958.
23/ Décret No. 143/PG.-T.-EFC., 22 Sept. 1960 (waters, forests, and hunting); Décret No. 4/EL, 26 Jan. 1961 (grazing and animal husbandry).
24/ Arrêté No. 4995 MEG, 26 Oct. 1959.
25/ Décret No. 70-265 PRN/DIR-CAB, 11 Dec. 1970.

4. Middle East and North Africa

In the Middle East and North Africa appropriately greater attention is given to grazing legislation than is found in other areas, with correspondingly less emphasis on agricultural soil conservation. Grazing regulations, especially those directed at goats, are quite common, 26/ as are general forest laws. 27/ But general soil conservation legislation is relatively rare. Cyprus, 28/ Israel, 29/ Morocco, 30/ Tunisia, 31/ and Turkey 32/ appear to have the only such laws in the area.

5. Europe and North America

In Europe and North America, forest legislation is almost universal and soil conservation laws generally appear in areas with erosion problems. The soil conservation legislation of the United States is summarized in the appendix. In Europe, only Spain 33/ and Yugoslavia 34/ apparently possess legislation which comprehends cropland erosion. Denmark has legislation on shifting sand dunes, but no provisions for agricultural land. 35/

26/ Cyprus Forest Regulations 1967, 17 Food & Agric. Leg. No. 3 (1968); Tree Planting (Village Areas) Law, Laws of Cyprus c.100 (1959); Goats Law, id. c.66; Sheep and Goats (Shepherds' Licensing and Control) Law, id. c.91, amended 1965, Cyprus Min. of Agric. & Nat. Resources, Forest Dept., Jt. Sub-Comm'n on Mediterranean Forestry Problems, 10th Sess., Country Rep. - Republic of Cyprus pt. 2, at 2 (1968) (summary); Iran Law of 4 Sept. 1967; Iraq Ranges and Their Protection Law (No. 106 of 1965); Israel Ordinance for the Protection of Forests, 1 March 1968; Plant Protection (Damage by Goats) Law 1950; Shepherds (Licensing) Ordinance 1946; Lebanon Forest Law, 1 Jan. 1949; Morocco Dahir No. 1-69-171, 25 July 1969; West Pakistan Goats (Restriction) Ordinance 1959; Syria Forestry Code 1953 (summary in Min. Agric. & Agrar. Reform, Communication, 23 Sept. 1968); Legislative Decree No. 65, 20 July 1966; Legislative Decree No. 45, 15 March 1964; Legislative Decree No. 27, 28 April 1963; Law No. 9, 27 March 1962; Tunisia Code Forestier, Loi No. 66-60, 4 July 1966; Turkey Forest Law arts. 19-22, (no. 6831 of 1956).

27/ Cyprus Forest Law (No. 14 of 1967), 17 Food & Agric. Leg. No. 3 (1968); Forest Regulations, supra; Iran Forestry Nationalization Law, 17 Jan. 1963; Iraq Forest Law (No. 75 of 1955); Israel Forests Ordinance, supra; Jordan General Forest Law 1927; Lebanon Forest Law, 1 Jan. 1949; Libya Law No. 24 of 1950 (Cyrenaica); Law No. 12 of 1956 (Tripolitania); Morocco Forest Law of 1917, as amended; Pakistan Forests Act of 1927, as amended; Sudan Central Forest Ordinance 1932; Provincial Forest Ordinance 1932; Syria Forestry Code 1953, supra; Tunisia Code Forestier, supra; Turkey Forest Law, supra.

28/ Soil Conservation Law, Laws of Cyprus c.94 (1959).

29/ Flooding and Soil Erosion (Prevention) Ordinance 1941.

30/ Dahir No. 1-69-170, 25 July 1969.

31/ Loi No. 63-17, 27 May 1963.

32/ Food & Agric. Org. of the U.N., Control of Erosion of Arable Land and Siltration, annex I (1966).

33/ Act on Conservation and Improvement of Agricultural Land, 20 July 1955, 4 Food & Agric. Leg. No. 3 (1955).

34/ Act Relating to the Exploitation of Agricultural Land, 19 Oct. 1959, 8 Food & Agric. Leg. No. 4 (1959).

35/ See FAO, Control of Erosion, supra n.32, annex I.

B. LEGISLATIVE VARIETIES

1. Law and Policy

Soil conservation legislation reflects a variety of approaches. But two basic patterns are discernible. One is the comprehensive resources conservation law. Zambia represents the broadest example of such treatment. A single law applies to all natural resources, and the Minister of Lands and Natural Resources is given broad authority to define what shall fall under the law. 36/ The more common pattern is to enact laws regulating various resource uses as the need arises. Many countries have separate forestry and range laws and if a soil conservation law exists, it usually applies primarily to cropland. But there are blurrings of the distinction. New Zealand has laws governing mining, forestry, all phases of animal production, and various modes of agriculture, but it also has a watershed and soil law broad enough to cover all land use. 37/ And Venezuela has a single law dealing with forests, soil, and water, but provisions are segregated according to the resource and its use, reflecting the law's development from a series of separate enactments. 38/

A second basic distinction among soil conservation laws lies in their degree of specificity. Normally the basic legislation will leave a great deal to administrative discretion. Greater details are provided in regulations issued under authority of the law, but even the regulations may do little more than reaffirm the appropriate Minister's authority to decide the particular case as it arises. At the other extreme, the basic enactment may list specific activities which are prohibited, for which permission is required, or which may be subsidized. The one pattern may be too inflexible to work, whereas the other risks defeat of national policy through uncontrolled exercise of administrative discretion.

Besides laws usually labelled as soil conservation legislation, there are a variety of enactments bearing more or less directly on soil conservation. Forestry and grazing laws are naturally important. But also health laws can influence pesticide use, tax laws influence the urbanization of farm land, land reform laws can be necessary for the proper working of soil conservation laws, and water, marketing, crop insurance, mining, education, and credit policies will each have their effect. Agricultural land use regulation may be authorized in general zoning laws, 39/ water legislation, or the national constitution. Whether such oblique approaches will in fact be used as the basis of a conservation programme is problematical, but the existence of such enactments could be highly relevant to soil conservation legislation in a specific context.

The unification or fragmentation of laws bearing on soil conservation, and their degree of specificity, are important for the development and implementation of a coherent national resources policy. In the absence of a recognized policy, fragmentary legislation may result in activities which conflict either with each other or with non-resource policies. For example, subsidies for reforestation, available for any land, will conflict with land use policy which seeks to balance conversion of unsuitable

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36/ Conservation Act, supra n.15
37/ Soil Conservation Act, supra n.2.
38/ Forestry, etc. Law, supra n.4.
39/ See Malagasy Republic Ordonnance No. 62-123, 1 Oct. 1962 (rural zoning).

cropland to less intensive use against conversion of appropriate areas from forest and pasture. Or prohibition of forest grazing may interfere with efforts to introduce controlled grazing on rangelands. But if specific enactments are derived from an appropriate general policy, they may serve to direct administrative efforts to those problems which are most important nationally. The basic requirement is that a policy exist, and that legislation of whatever type respond to it.

The issue of specificity is part of the basic problem of ensuring administrative compliance with legislative policy. If a law is so general that the appropriate minister can create his own policy, the legislature has abdicated its responsibility for making the fundamental decisions on the direction of national development. Too much administrative latitude may result in important tasks lying undone while less substantial but easier projects receive more attention than they deserve. Yet a legislative specification of the action to be taken by every land-user is probably unwise. Conditions vary too much even within a nation, and conservation is a policy which requires gradual development. Conservation workers must have the flexibility to respond to local conditions and to develop a specific programme suited to educating and persuading the people actually found on the land. Part of the difficulty can be solved by defining priorities in the conservation programme while allowing expert conservation staff to exercise discretion in choice of means. Periodic reports should be demanded, in which the responsible administrator would be required to relate his agency's activities to the legislative policy. The closest any law seems to come to this requirement is the common law practice of tabling proposed regulations before parliament. 40/ But if regulations are not required to be defended in terms of defined policy, the legislature is not likely to sense the relationship of its intentions and the Minister's proposals. If he had to state his proposals in terms of numbers of goats or acres of forest, their legislative significance would be clearer.

2. Specific Problems

The degree to which legislation can and should coordinate and specify land use practices depends upon situational factors. Where an important harm is apprehended and the means for preventing it are known, the legislature may appropriately direct the activities to be undertaken. But where neither the precise cause nor a workable cure for soil problems is known, greater responsibility must be delegated to agencies possessing suitable expertise.

a. Cropland. - Legislative control of cropping practices exhibits the greatest variety, probably because agricultural plots are so commonly under the sole management of a single user. Many self-contained and self-managed operations, each with its unique characteristics, must be induced to adopt conservation practices without the state assuming the general management of the farm. (The state may assume farm management, but in most developing countries, there may not be sufficient staff to provide even partial guidance to the farm population.) The problem therefore is how the state may play a managerial role while leaving most of the actual management to the present cultivators.

The simplest solution often seems to be a quasi-legislative prescription of practices to be followed. Nationally applicable land use rules exist in Venezuela 41/

40/ See New Zealand Soil Conservation Act, supra n.2, ss 167.
41/ Reglamento de la Ley Forestal de Suelos y de Aguas, Décreto No. 1.333, 11 Feb. 1969.

and Kenya, 42/ and to a lesser extent in Mali. 43/ Two objections may be made to such rules. First, soil, climate, and crop patterns differ so even within one country that general rules for land use cannot be stated. Universal contour cultivation will mean unnecessary effort on some land and the continuing erosion of some other. More elaborate practices may result in unnecessary losses of production without adequately controlling the most severe erosion problems. The second objection is that a coercive approach seems generally ineffective. The farmer must have the knowledge, equipment, and capital to undertake the prescribed practices. If his income is marginal, he must be assured against excessive loss of production under a conservation system. Mandates which do not also provide the necessary aid and assurance may prove to be futile.

A more flexible form of regulation is to delegate to a Minister or to a local authority the power to frame compulsory land use rules. This power is an almost universal part of soil conservation legislation. 44/ Delegation is wiser than attempts to frame national land use rules, because the rules thus drafted can be designed for particular conditions. Ministerial power can be used to concentrate on the areas or causes of soil damage which appear most important. Two basic processes for delegated rule-making exist. One simply authorizes rule-making without specifying content or requiring any form of land-user consent. Costa Rica, 45/ Malaysia, 46/ Morocco, 47/ New Zealand, 48/ Spain, 49/ Uruguay 50/ and Venezuela 51/ all authorize such a rule making process. The other approach is to require local approval or consultation before rules can be established. Cyprus, 52/ Tunisia, 53/ the United States, 54/ Yugoslavia, 55/ and Zambia, 56/ require such local consultation. One advantage of the latter procedure is that the rule-making authority can determine local feeling before attempting to enforce rules which may be unworkable in the local context. But in the main it does not appear that rules made under either procedure have been effective in changing farming practices.

42/ Agriculture (Basic Land Usage) Rules, 25 Jan. 1965, 14 Food & Agric. Leg. No. 3 (1965).

43/ Law No. 68-8, supra n.15; cf. Malagasy Republic Ordonnance No. 62-123, 1 Oct. 1962 (rural land use zoning).

44/ Cf. e.g., Costa Rica Act No. 1540, supra n.8, art. 9.

45/ Id.

46/ Malaya Land Conservation Act (No. 3 of 1960).

47/ Dahir No. 1-69-170, 25 July 1969.

48/ Soil Conservation Act, supra n.2, §§ 14-15, 34-35, 37-38, 166-67. New Zealand also provides for regulations to be made by a board comprising a majority of locally elected members. Id. §§ 149-51.

49/ Act on Conservation, supra n.33, art. 9(g).

50/ Law No. 13.667, supra n.12, art. 3(e). Uruguay also provides for local initiative in forming soil conservation districts. Id. art. 8.

51/ Forestry, etc. Law, supra n.4, art. 84.

52/ Soil Conservation Law, supra n.28, §§ 3-16.

53/ Loi No. 63-17, supra n.31, arts. 1-5.

54/ No regulation of farmers is authorized in the United States Soil Conservation Act, 16 U.S.C. §§ 590a et seq.(1964). The programme operates through local districts, which are not mentioned either, but which were originally encouraged to have regulatory power. See R. Burnell Held & Marion Clawson, Soil Conservation in Perspective 49, 277 (Baltimore 1965); Robert J. Morgan, Governing Soil Conservation: Thirty Years of the New Decentralization 66-72, 77 (Baltimore, n.d.1965); William F. Schulz, Conservation Law and Administration - A Case Study of Law and Resource Use in Pennsylvania 418-19 (New York 1953).

55/ Agricultural Land Act, supra n.34, arts. 4, 70-72.

56/ Conservation Act, supra n.15, § 45.

A variation of ministerial rule-making power exists in Malaysia. There the states may make rules, but only if erosion or runoff threatens other lands. They also have the power to declare any land subject to the conservation act, in which case some simple legislative rules apply. 57/ The system establishes some basic principles in a manner that makes it difficult for administrative policy to contradict the legislation, yet the unsuitable rigidity of universally imposed prescriptions is avoided.

Incentive to adopt conservation practices are less common than regulation, but they still occur frequently, generally in conjunction with mandatory provisions. The actual availability of such incentives is difficult to establish because they depend on annual appropriations and on the staffing of appropriate agencies. Furthermore, the usual procedure is not to specify what a farmer may receive, but broadly to authorize the Minister to make loans, grants, conduct demonstrations, and contribute technical assistance and the use of equipment. Such flexibility might be wise, but it does nothing to assure that appropriate measures will in fact be instituted. The balance between flexibility and certainty must obviously be struck differently in each country. But to make it a duty to offer technical aid (such as free conservation plans) would set the priorities between help and compulsion right. Actual assistance would still depend on finance and staff, but the area of responsibility would be better defined. 58/

Incentives usually mean financial and technical assistance. Where the latter is less common it is probably because of the lack of sufficient trained staff to reach many individual land users. Land classifications are often required to be made, but they are less often required to be made for individual farms. 59/ Since most conservation should take place within the constraints of existing land holding patterns, individual land classifications are obviously important. 60/ It is a serious omission not to require the coordination of land classification with other technical assistance, because mere knowledge of what a particular field is best suited for does not enable a farmer to perform the necessary operations. The economic planning necessary to devise a farming system which will combine maximum soil protection with an adequate income for the particular farmer is very complex. 61/ Establishing appropriate crop rotations also requires knowledge of experimental data which the farmer may not commonly have. To leave the farmer unaware of what he must do and how he can accomplish it deprives of all value the information that his soil is eroding.

Financial assistance comes in several forms, and each has a role in the appropriate situation. Direct payments, preferential credit, furnishing equipment, or allocating costs among beneficiaries all may serve as inducements to adopt conservation practices. Direct payments for the adoption of certain practices have the elemental appeal that cash in hand always does. They are not common because of the expense, but where used

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57/ Malaya Land Conservation Act §§ 3-7, 11, 14 (No. 3 of 1960).

58/ A typical provision is South Africa Soil Conservation Act 1969, § 6: "The Minister may, from moneys appropriated by Parliament for the purpose, subject to such conditions as he may determine, pay subsidies or make grants to any person in respect of costs incurred by such person in connection with the construction of any soil conservation works or the performance of any act in compliance with a direction."

59/ Cf. Uruguay Law No. 13.667, supra n.12, art. 3. Only Venezuela establishes a right to have a land survey of one's farm. See Decreto No. 1.333, supra n.41 art. 179.

60/ Cf. Zambia Conservation Act, supra n.15, § 15.

61/ Arthur C. Bunce & George W. Collier, A Method of Estimating the Economic Effects of Planned Conservation on an Individual Farm (U.S. Dep't Agric. Misc. Pub. No. 463, Washington 1942); see Eric Clayton, Economic Planning in Peasant Agriculture - A Study of the Optimal Use of Agricultural Resources by Peasant Farmers in Kenya (Ashford, Kent 1963).

they seem to produce results. 62/ What is more difficult to evaluate is the cost of such payments relative to the soil loss prevented and to other means of preventing it. In the United States certain activities are subsidized, and anyone may collect for performance at an administratively established rate. 63/ In Uruguay the Minister of Agriculture may defray the cost of works on small holdings of low productivity, and elsewhere if the benefits would be substandard for the area. 64/ In New Zealand the Soil Conservation and Rivers Control Council has broad power to make grants or loans under conditions it may establish. 65/ In all three cases, actual rates of payment are determined by the administering agency.

Credit is more common, and probably more appropriate. Where a change in farming methods will benefit the farmer through greater future soil value, he does not have a claim on the public purse as a reward for the change. But he will often be unable to finance the conversion, especially if it involves major construction. Loans for conservation are therefore sometimes given priority in existing agricultural credit programmes. 66/ But apparently nowhere does there seem to be a loan programme tied to the productivity of land under conservation management. 67/ Such a scheme could be an effective inducement. 68/

Equipment may presumably be furnished in effect under provisions authorizing the state to perform conservation works, but it is rarely specified as a form of aid available to land users. 69/ Lack of the proper equipment can be an absolute bar to certain recommended soil conservation activities, 70/ yet it does not seem to have occurred to legislators as a distinct problem. The result is another example of necessary coordination being left to chance. If in an entire village there is no tractor, there seems little alternative to public provision of tractors at least for

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62/ See Horace D. Godfrey, Farmer-Government Sharing of Conservation Practice Cost as Stimulus to Conservation Accomplishments, in First Pan Am. Soil Conserv. Cong., Pro. 405, 407 (Sao Paulo, n.d. [1966]).

63/ 16 U.S.C. § 590h (1964).

64/ Law No. 13.667, supra n.12, art. 15.

65/ Soil Conservation Act, supra n.2, §§ 30-31; cf. Venezuela Forestry, etc. Law, supra n.4, art. 86.

66/ See, e.g., Uruguay Law No. 13.667, supra n.12, art. 20. United States farmers can obtain loans at lower than market rates for conservation projects. 7 U.S.C. § 1924 (Supp. IV 1969).

67/ But cf. Morocco Dahir No. 1-69-170, 25 July 1969, art. 10 (portion of terracing costs payable by orchard owners may be converted into equivalent amount of fruit).

68/ See United Nations Research Inst. for Soc. Devel., Methods to Induce Change at the Local Level - A Survey of Expert Opinion - First Report 97 (Geneva 1965); John Weeks, "Uncertainty, Risk, and Wealth" and Income Distribution in Peasant Agriculture, 7 J. Devel. Stud. 28, 33 (1970).

69/ Provisions for state construction of works at the expense of the land occupier may be seen as a form of equipment hire, but they are not equivalent to equipment assistance for voluntary conservation activity.

70/ Muhammad Rafi, Erosion Control and Soil Conservation in the Northern Uplands of West Pakistan, in Sympos. on Soil Erosion & Its Control in the Arid & Semi-Arid Zones, Pro. 271, 281 (Karachi 1957).

purposes of special consequence. Legislation should specify that the conservation agency may provide equipment, and that it shall do so when necessary for effectuating a conservation plan. Whether or not a charge should be made depends on the same considerations as the offering of other subsidies.

The allocation of costs and benefits is determined in a variety of ways, rarely by statute, except for very general guidance. Some statutes do not assume any apportionment of costs. 71/ Where there is apportionment, the usual formula is that costs should be levied according to the benefit received from a work. 72/ The measuring of benefits can be quite difficult, especially when discrepancies exist between the most profitable potential use for land and its actual use. 73/ Where the assessment is made by a local district and some of the benefits accrue outside the district, difficulties may also arise. But at least "benefit" narrows the choices. And when related to a project undertaken to realize specified benefits, a reasonable allocation should be possible. A provision in Zambia allows the Minister of Lands and Natural Resources to reduce the private share of public works "by such amount as he determines to be the value to the public of such works." 74/ Public is not defined, but it would probably be construed as all those beneficiaries whose individual interest in the work was so slight as to make it impractical to assess them for the project cost. But a broader definition of public could be adopted, in which case significant private benefits could be had with public funds.

Another type of apportionment is potentially important, but seems not to have been used much. Where more than one person (usually landlord and tenant) have interests in the same land, often neither one has sufficient individual interest to desire soil conservation. Even a secure tenant may only receive part of the profit from a conservation measure on which he has done all the work. Without security of tenure he may receive nothing. And the landlord, if he concerns himself at all with management, has no guarantee that the good done by one tenant will not be destroyed by the next. Uruguay has a comprehensive approach to the problem. Tenant constructed works must be paid for by the landlord at their value when the tenancy is ended. 75/ On the other hand, a tenant who refuses to follow official conservation practices may be evicted. 76/ Finally, the land reform agency is required to follow conservation rules established by the Minister of Agriculture, and especially to determine plot sizes with regard to soil conservation. In "each case" the agency must establish the appropriate uses of the soil and prescribe measures for its proper management. 77/ In Spain also land reform must take account of the requirements of conservation. 78/ But these cases are exceptional, and general evidence does not suggest that soil conservation and tenure reform receive appropriately coordinated treatment.

Other programmes of agricultural development can affect conservation greatly, but they seem not to be undertaken with conservation in mind. Liberal agricultural credit, equipment hire and purchase assistance, and provision of improved seeds and fertilizer can either improve soil directly or make it possible to adopt conservation practices. But the opportunities to integrate better resource management with new agricultural factors are not often exploited. 79/ The agency that distributes hybrid corn will have built some goodwill which can be used in persuading the clients to adopt other modern

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71/ See, e.g., Venezuela Forestry, etc. Law, supra n.4, at. 86.
72/ See, e.g., Cyprus Soil Conservation Law, supra n.28, § 12.
73/ See Stewart H. Jessee, Financing an Oklahoma Conservancy District, 17 J. Soil & Wat. Conserv. 13 (1962).
74/ Conservation Act, supra n.15, § 13(7).
75/ Law No. 13.667, supra n.12, art. 21.
76/ Id. art. 17.
77/ Id. art. 8.
78/ Act on Conservation, supra n.33, art. 9(d).
79/ But see Tunisia Loi No. 63-17, supra n.31.

practices, including those that conserve the soil. And the farmer who appreciates the effects of fertilizer might be persuaded to conserve his soil as a condition of receiving more fertilizer. It is not possible to transform all of a farmer's methods in a single season, but it is possible to include conservation in the changes to be introduced over time.

b. Forest. - The basis of forestry regulation is the establishment of state power to control cutting and clearing. Within the general principle of such power, its actual exercise can be broad or narrow according to need and administrative capacity. Two complementary methods of control exist: geographical classification, and cutting permission based on individual application.

Classification normally divides forests into two categories, although intermediate classifications are possible. 80/ Protected forests may comprise only areas immediately adjacent to stream banks and in defined watersheds, and some exploitation may be allowed in them. But they serve to indicate the main purpose of the land they occupy. Even where the appropriate Minister has broad authority to declare protected areas, the existence of the category places him on notice of the legislative expectation that there will be such areas. Such notice should help resolve any confusion arising from the conflict between production and protection.

Where forest exploitation is allowed, it is often subject to prior permission. Large logging operations are often required to proceed according to a previous plan, 81/ which may be drawn up by the forest administration, 82/ by the prospective exploiter, 83/ or by a recognized expert. 84/ Plans are commonly required for forest activities on private as well as public land. 85/ In addition to or instead of a plan of management, forest laws may require specific permission for each tree cut. 86/ Official documentation may be necessary in order to transport any log, and timber found without the necessary documentation present, may be confiscated. 87/ In some countries the apparently simple solution of prohibiting even individual forest clearing without specific permission has

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80/ See Botswana Forest Act § 4 (No. 23 of 1968); Colombia Decree No. 2278, 1 Sept. 1953; Costa Rica Ley Forestal, 9 March 1959, arts. 2-3; Guatemala Orden of 29 Nov. 1962; Iraq Forest Law (No. 75 of 1955) and thereunder Min. Agric. Notification No. 5 of 1967; Malagasy Republic Ordonnance 62-121, 1 Oct. 1962, art. 3; Mali Law No. 68-8, supra n.15, art 20; Nicaragua Decreto No. 478, 1 April 1960, art. 1; Turkey Forest Law art. 23 (No. 6831 of 1956); Venezuela Forestry, etc. Law, supra n.4, arts. 17-21.

81/ See, e.g., Costa Rica Ley Forestal, 9 March 1959, art 4; Turkey Forest Law, supra, art. 51.

82/ Turkey Forest Law, supra.

83/ Nicaragua Decree No. 1381, supra n.4, art. 5.

84/ Venezuela Forestry, etc. Law, supra n.4, art. 74; Decreto No. 1.333, supra n.41, arts. 108, 114, 122-23, 130.

85/ See, e.g., id.; cf. Nicaragua Decree No. 1381, supra n.4, arts. 26-27 (forbids exploitation of private forests contiguous to public lands prior to a boundary survey and requires an application for exploitation of private forests, but a plan of management is apparently not required).

86/ Turkey Forest Law art. 27 (No. 6831 of 1956) (only trees officially marked may be cut in public forests).

87/ Mali Law No. 68-8, supra n.15, arts. 44-47, 64.

been adopted. Costa Rica 88/ Mali, 89/ Mexico, 90/ and Venezuela 91/ prohibit clearing - and Turkey prohibits any destruction of state forest vegetation 92/ without permission. Argentina prohibits destruction beyond a certain amount. 93/

The basic policy according to which foresters are to grant logging permission is not always specified. Usually a minimum of areas to be protected from overcutting will be specified, but no policy for the exploitable land will be established. 94/ Where the forest service is ill-trained or understaffed, there are special dangers in such a failure. Where the forest service itself, through common training and experience, follows an acceptable scheme of management, the deficiency is not so serious. 95/ But even in the latter case an explicit statement of national policy provides an anchor to counter the tendency of organizations to allow policy to drift as great attention is paid to organizational survival. The statement of policy cannot be too explicit, but it should go beyond a phrase such as "wise use". Even that may be adequate if it carries the connotation of sustained yield. 96/ But "wise use" could well mean maximum current exploitation, especially if forest products play a major role in the national foreign exchange position. Sustained yield is more precise, having a sound biological basis in the ability of the land and vegetation to support a certain level of consumption. In the United States sustained yield (along with the less precise multiple use) is the guiding principle of public forestry. 97/ Polish forests are managed for "full productivity", which in its context implies the fullest productivity that can be sustained over time. 98/

Another means of controlling forest management is to require the highest level of approval for cutting. In Cyprus, cutting concessions require approval of the Council of Ministers. 99/ The Dominican Republic requires presidential approval of felling permits. 100/ Such requirements should prevent local administrators from using national resources without central knowledge. But they do not guarantee that exploitation will follow a desirable pattern. The President or cabinet are not primarily forest administrators. It may be appropriate to centralize authority over large contracts, but it must, as in Cyprus, be complementary to legislative policy.

Given some reasonable criteria by which a forest service can judge plans of exploitation, the requirement of forest management plans for large tracts seems particularly wise. Especially where the logger has no long-term interest in the land, and perhaps not even a present interest in groundwater supplies and downstream flood protection, he cannot be counted upon to conduct his operations according to national policy without some supervision. A large operation will have or can be forced to have suitable professionals in its employ. It is reasonable to expect that a technical plan can be presented. A large concern will be likely to have resources which can be reached to assure compliance with the plan (or it will have the capacity to deposit a bond against performance even if most of its assets lie outside the country).

88/ Ley Forestal, 9 March 1959, art. 4.
89/ Law No. 68-8, supra n.15, art. 5.
90/ Forest Act, supra n.4, art. 44.
91/ Forestry, etc. Law, supra n.4, art. 7.
92/ Forest Law art. 14 (No. 6831 of 1956).
93/ Decreto No. 4516, 2 May 1957.
94/ See, e.g., Mali Law No. 68-8, supra n.15, arts. 11, 14, 16.
95/ See Herbert Kaufman, The Forest Ranger - A Study in Administrative Behaviour 161-200 (Baltimore 1960); cf. Anthony Scott, Natural Resources: The Economics of Conservation 26-30 (Toronto 1955) (extreme conservationist policy of traditional foresters difficult to alter even by explicitly contrary state policy).
96/ Cf. Philippines Administrative Code § 1824.
97/ See 43 U.S.C. § 1413 (1964).
98/ See Act on the administration ...of certain... forests and bare lands, 14 June 1960, art. 7, 10 Food & Agric. Leg. No. 1 (1961).
99/ Forest Law, supra n.27, § 7.
100/ Decreto No. 3777, 9 June 1969.

The requirements of documentation for every tree cut, hauled, or sold would, if thoroughly used, largely dissipate the advantages of dealing with large operations. But where forest staff is insufficient to provide continuing surveillance of any one stage of activity, it is necessary to have several evaluable stages so that a random checking system can relate the evidence it finds to the original exploitation permit. Not all documents will be checked, but when a suspicious amount of timber appears on the market, it can be traced to its source and appropriate action taken. Administratively neater controls are impossible to apply with limited numbers of foresters.

To apply the same requirements of specific permission and documentation to individual forest activities is self-defeating in the absence of a large forestry staff 101/ and of alternative activities for the people affected. The first step in controlling individual forest use consists in compiling the types and extent of existing uses. Mali has directed the forest service to provide explicitly for use rights when classifying forests. 102/ Once existing uses are known, a distinction can be drawn between activities presently essential to the lives of the users, and those which only provide income supplements or greater convenience. A second distinction lies between activities, such as the gathering of deadwood, which threaten the forest only slightly, and those which result in major depredations. Uses which are not essential might successfully be prohibited, especially where their effect is great enough to justify the expense of vigorous enforcement. The laws prohibiting clearing of steep slopes or the banks of streams are examples. Where population pressure is not too great, forest activities can be shifted to less vulnerable land. Of similar rationale are regulations prohibiting the cutting of certain species. Especially where forest products are used for fuel or small poles, the needs of the users may be satisfied from the stock of trees less valuable commercially.

Where an activity is essential to the forest user's livelihood and destructive to the forest, the forest service should be prepared to provide alternative employment, either in other fields, or in a rationalised version of the destructive use. Either solution requires the active participation of the people whose life will be significantly altered. Shifting cultivation illustrates the type of problem at its extreme. The activity is necessary to the existence of the actors and the aggregate effect is tremendous. Here is a case where only close work with the land user seems to offer any hope of improvement. This does not imply that every alteration of the pattern must be voluntary, only that the people must be equipped to subsist without destroying the land. Rotations need to be designed to aid in the maintenance of native fertility, forest crops need to be developed to utilize the fallow period more fully, and the farmers have to be accustomed to the idea of more intensive agriculture, stable land holding, and eventually a cash market. Change can be encouraged if along with assistance the state imposes controls on the expansion of shifting cultivation. Legislatively two things are needed. First the state must be given authority to control shifting cultivation. 103/ Then the necessary development work must be supported with adequate finances and personnel. Some work in the Congo (Kinshasa) demonstrates that much can be done in the context of shifting cultivation. 104/

Complementary to control over exploitation is a policy of new and replacement forestation. One type of policy encourages tree-planting through subsidies, tax relief, conferring of land title, or any combination of these, in exchange for planting and

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101/ T. Francois, What Should a Basic Forest Law Contain? 15 Unasylva 140, 146 (1961).
102/ Law No. 68-8, supra n.15, art. 20.
103/ Cf. Malagasy Republic Ordonnance No. 62-121, 1 Oct. 1962, arts. 3-4; Philippines Administrative Code § 2751.
104/ F. Jurion & J. Henry, De l'Agriculture Itinérante à l'Agriculture Intensifiée (Bruxelles 1967).

maintenance. In the United States 105/ and New Zealand 106/ subsidies are available for newly established woodlands. In both cases, the payments continue over a period of years which roughly corresponds to the time needed for the trees to mature. In Costa Rica forestation of certain land is required, but the land is thereby exempted from property taxes. 107/ In Turkey, forestation brings relief from property and personal taxes (presumably those in respect of the land forested, although the law does not say) for a period of fifty years. One who forests state land receives title to it after five years as long as the forest is protected by him. 108/ A similar provision applies in Mali. 109/

Forestation is also a mandatory part of some forest laws. Mexico required all loggers to reforest the cut area. 110/ In Poland, that land which is most suitable for forestry (considering also the economics of the enterprise) must be forested at the owner's expense. 111/ Jordan has attempted to make forestation a public duty. 112/ The Venezuelan Ministry of Agriculture may order reforestation on private land at private expense in "protection zones" (defined areas particularly susceptible to erosion or important for water supply). 113/ For smallholders the application of such provisions would be tantamount to eviction. Where land ought to be forested according to the criteria of national policy, provision must be made for the settlement of the former inhabitants. Only Venezuela seems to make explicit resettlement provisions. 114/

Some laws attempt to treat all forest users equally, and they risk administrative defeat when they do. Illiterate people are in a poor position to file written petitions and plans of exploitation. Cutters of medicinal herbs do not do the same damage as cutters of trees and it is a waste of resources to attempt to regulate the former while the latter continues. What seems to produce such inappropropriate responses to forest problems is a lack of knowledge of what those problems are. In too many cases forests are not demarcated, so even the locus of the problem remains ill-defined. 115/ Intelligent forest regulation must begin with a good idea of the nature of the forest resources, the identity of their users, and the means of control appropriate to those users and their activities. In other words, there must be a forest policy based on knowledge of resources and needs, and there must be a pattern of regulation appropriate to the national context. Otherwise money, trained personnel, and legislative energy will be wasted on the wrong legislation while opportunities to enact the right legislation go unrealized.

105/ 7 U.S.C. § 1838 (Supp. IV 1969); 16 U. S.C. §§ 568-568e (1964).
106/ Farm Forestry Act 1962; Forestry Encouragement Grants Regulation, 13 April 1970; Forestry Encouragement Act 1962.
107/ Ley Forestal, 9 March 1959, art. 20.
108/ Forest Law, art. 63 (No. 6831 of 1956).
109/ Law No. 68-8, supra n.15, art. 48.
110/ Forest Act, supra n.4, art. 79.
111/ Act of 14 June 1960, supra n.98, art 23.
112/ Act No. 15 of 1962; cf. Malagasy Republic Décret No. 65-034, 27 Jan. 1965.
113/ Forestry, etc. Law, supra n.4, art. 41.
114/ Decreto No. 1.333, supra n.41, art. 59.
115/ François, supra n.101, at 142-45.

c. Grazing. - Grazing control is often distributed among several laws, in part reflecting the difference between forest and range grazing. Where pastoralism is the dominant economic activity, protection of grazing lands and development of more productive grazing patterns will go hand in hand. But where grazing is a part-time activity that results in destruction of forests, orchards, or water conserving ground cover, protection of those resources might appropriately be undertaken even at a loss of animal production. Where goat raising is a supplementary contribution to income, attempts to eliminate it are commonly seen. But where herding is the primary source of income, it cannot be eliminated in the absence of suitable alternative employment. This fundamental distinction must be borne in mind in framing grazing legislation.

The most important cause of grazing problems is the existence of free grazing. Where fodder is free, grazing is inordinately profitable to the grazier, although he might make a loss if he bore the cost of the damage his animals do to the public land. 116/ Where grazing causes damage to forests, or destroys the water holding potential of the soil, the loss to the grazier may be non-existent and it will certainly not be very visible to him, especially if he is also nomadic. Where free grazing exists, it also prevents controlled use of the range because of the competition among graziers, none of whom can prevent others from destroying what his forebearance might have saved. Therefore, legislation must deal with the twin problems that customary grazing is actually heavily subsidized and that graziers have a great disincentive to preserve range quality.

The basis of grazing legislation must be the establishment of a governmental interest in grazing lands. It is obviously difficult suddenly to appropriate the basis of livelihood of a large segment of the population, but the basis for regulation of usage can be laid. Where a recognition of ultimate national ownership exists grazing fees may be established. 117/ But it is more common to include grazing control among the same type of regulatory powers as other conservation laws. 118/ Grazing may be formally prohibited except by permission, 119/ or the power to regulate it may be delegated to the appropriate administrative authority. 120/ Sometimes fees are imposed at the same time. 121/ Collecting money fees from people with little cash income may be impossible, but in other circumstances, moderate fees might be seen as an acceptable replacement for the harassment caused in enforcing coercive regulations. After the establishment of the principle of public control over grazing, suitable systems of management must be introduced. 122/ Where grazing is a secondary activity, management might consist in nothing more than controls imposed from above. 123/ But where reduction in grazing activity will be strongly resisted, the graziers must be enlisted in a programme of range improvement. Here a combination of governmental guidance and cooperation of users could be useful. When demonstrations have shown that more can be realized from controlled, cooperative grazing than otherwise, the weight of local opinion could be used to ensure that even the doubters comply with a sound management plan. A grazing district would be

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116/ Food & Agric. Org. of the U.N. Goat-Raising Policies in the Mediterranean and Near East Regions 5 (1965).
117/ Cf. United States Taylor Grazing Act, 43 U.S.C. §§ 315 et seq. (1964).
118/ Cf., e.g., Zambia Conservation Act, supra n.15, § 23.
119/ Such prohibition seems limited to particular zones, usually forest, or to particular animals, usually goats. Cf. e.g., Turkey Forest Law art. 19 (No. 6831 of 1956); Cyprus Goats Law, supra n.26.
120/ Zambia Conservation Act, supra n.15, § 23.
121/ Cf. Cyprus Shepherds, Licensing Law, supra n.26, § 4(4). U.S. Taylor Grazing Act, supra n.117.
122/ Food & Agric. Org. of the U.N., Soil Conservation - An International Study 131-39 (Washington 1948); Richard C. Haw, The Conservation of Natural Resources 64-65 (London 1959).
123/ See FAO, Goats, supra n.116, at 3 (Yugoslavia).

appropriate, but they seem not to exist in developing countries. 124/

The advantages of controlled grazing are well demonstrated. But preventing encroachment on protected areas is sufficiently difficult that it is usually confined to protection of non-grazing resources. Forest laws are used to control or prohibit forest grazing where it is a problem. 125/ It is commonly defined as trespass to allow animals to enter forests without permission, and fines or imprisonment are the common penalties. 126/ Another penalty might be forfeiture of the beasts involved, since it is roughly scaled to the gravity of the offence, and it does not depend on establishing ownership. Animals are often owned by someone other than the herder, and he himself will not necessarily be in the vicinity of the herd. Where grazing is of such importance that the only significance of protected forests to local people is the fodder they offer, protection legislation inevitably fails. It may best succeed where the local people also have an interest in the protected land (especially so when orchards and goats are in competition). 127/ Then grazing is less likely to be a sole source of income, and a modicum of local cooperation in enforcement may be expected.

Controlling herd size is generally given as the competing approach to control of grazing areas, although there is no conflict between the two. Herd sizes are most often controlled in Mediterranean countries with goat problems. Free ranging goats may be banned altogether, as in certain areas of Cyprus 128/ and Yugoslavia. 129/ Cyprus has concurrently limited the size of goat herds. 130/ Again, herd size regulations seem most effective where grazing is a secondary activity of diminishing importance. Where it is economically essential, compensation merely for animals no longer used will be inadequate incentive to cease grazing because of the lack of alternative employment. Because the free grazing represents so much of the value in goat raising, compensation only for the goats cannot be expected to bring sufficient capital to enable the ex-grazier to create his own employment opportunities in another line. 131/

A third approach to grazing control is to accept that the activity cannot be eliminated and to rationalize it. Either through control of grazing permits, or through general stocking regulations, 132/ attempts are made to keep grazing within the limits of range capacity. Imposition of such limits is extremely difficult in the absence of a popular appreciation that controlled grazing with fewer animals will produce greater returns. 133/ Demonstrations have shown that untutored people can manage a system of

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124/ Morocco provides for pasture improvement districts, but specifically forbids grazing associations within the district. Dahir No. 1-69-171, 25 July 1969, art. 4. No other provision appears to allow herder participation in the operation of the districts.

125/ Cf., e.g., Lebanon Forest Law, 1 Jan. 1949, art. 23.

126/ Compare, e.g., Fiji Forest Ordinance, supra n.3, § 12(b)(i), with id. § 30(1).

127/ See T. François, Land Laws and Uses Control Measures, Licensing, etc., in FAO, Goats, supra n.116, Doc. 4, at 6-7.

128/ Goats Law, supra n.26

129/ FAO, Goats, supra n.116, at 3.

130/ Shepherds' Licensing Law, supra n.26.

131/ T. François, The Social and Economic Costs of Planned Goat-Grazing, in FAO, Goats, supra n.116, Doc. 2, at 2.

132/ See Morrocco Dahir No. 1-69-171, 25 July 1969, art. 6; Syria Legislative Decree No.65, 20 July 1966; Zambia Conservation Act, supra n.15, § 23.

133/ See L. Schuyler Fonaroff, Conservation and Stock Reduction on the Navajo Tribal Range, Readings in Resource Management and Conservation 348 (I. Burton & R. Kates eds., Chicago 1965).

controlled grazing, 134/ but there is little to suggest that they will install it without evidence of profitability. This requires not just legislation, but also public management or at least direction. Such management, combined with the ultimate sanction of revocation of grazing rights, seems to offer the possibility of protecting range land and raising grazing productivity. 135/

3. Conclusion

Soil conservation legislation should vary in specifics, in order to fit different national situations. But in every country, it should be based upon legislative determination of fundamental policy, made in the context of a general resource policy. Cropping, forestry and grazing all use the soil, often competitively. Each has its particular requirements and economic importance. A country largely forested, with a shortage of food, requires a different policy from one with denuded hillsides and a surplus animal population. Shifting cultivation requires an approach different from intensive rice growing. It is important to identify the resources and their uses, and to establish priorities which will accomplish the greatest level of conservation within the financial and administrative capacity of the nation. Too many problems affect the land merely to prescribe soil conservation as the only goal. There are too many specifics from which to choose. Only if an objective is set - less goats, more trees, or the minimum erosion - will results follow.

134/ Food & Agric. Org. of the U.N., Soil Erosion by Water: Some Measures for its Control on Cultivated Lands 229-30 (Rome 1965); E.W. Russell, Recent Research and Development Work in Soil and Water Conservation in East Africa, Karachi Sympos., supra n.70, at 313, 321; A.T. Semple, Grassland Improvement 121 (London 1970).

135/ Cf. Marion Clawson & R. Burnell Held, The Federal Lands: Their Use and Management 57-60, 84-88 (Baltimore 1957).

INSTITUTIONS FOR SOIL CONSERVATION

One obstacle to a soil conservation programme lies not in designing appropriate legislation of primary conduct, but in designing appropriate institutions to effectuate the laws. At the field level, land users must be induced to follow desired practices. The legislature also requires some expert assistance in developing policy and an expert administration to translate it into action. Legislation that does not aim at fulfilling these functions might produce an impressive administrative structure, but it is unlikely to produce much soil conservation.

An ideal soil conservation programme would require a large institutional structure. Both adaptive and original soil and crop research should be undertaken. Dissemination of the information and persuasion of land-users involves intensive work over a considerable period. But most countries possess neither the researchers 1/ nor the staff 2/ for an ideal programme. So a description of the necessary activities of a soil conservation agency cannot be taken as a blueprint for universal adoption. Rather it will indicate the extent of the task and imply some sense of priority where it is impossible to do everything.

A. DECISION-MAKING

Successful conservation practice requires bodies with the ability and authority to make the underlying decisions. In practice the role will continue as long as the conservation programme. At the lowest level it may be performed by the same person who introduces conservation measures. But it bears emphasis that soil conservation requires important decisions to be made before it can wisely be put into practice.

1. National Resources Policy

The fundamental allocation of resources and finances within a nation must be determined at the highest level. It is basically a legislative function, but it also requires substantial expertise. A national resources planning body reporting either to the Cabinet or to a legislative committee is an appropriate solution. 3/ This entity would be responsible for indentifying national resources, for calculating the effects of resource uses, and for determining resource needs. It should consider all natural resources because of the competitiveand complementary qualities of different resources and uses. Financing is also competitive, and planning must take account of the difference in prospective returns from the possible investments in resource conservation and development. Where funds are scarce, it is hardly sound planning to leave national conservation policy to depend on the various ministers' skill at bureaucratic in-fighting. Nor is resource management a field which can reasonably wax and wane according to the annual moods of the budget director. It requires long-term, resource-oriented coordination.

1/ Cf. St. G.C. Cooper, Agricultural Research in Tropical Africa 130-38 (Nairobi 1970).

2/ Cf. C.W. Chang, The Present Status of Agricultural Extension Development in Asia and the Far East (Rome 1960).

3/ E.g., Zambia has a Natural Resources Advisory Board in charge of resource conservation, subject to the Minister of Lands and Natural Resources. It comprises the Director of Agriculture and the heads of forestry, fisheries, veterinary, and lands services among others. Natural Resources Conservation Act §§ 4, 9 (No. 53 of 1970).

2. The Soil Programme

The determination of priorities within the soil programme must be made by a technically competent body operating within the overall resource policy. To the extent that a comprehensive soil programme is not possible, certain of these decisions should have been made in defining the place of the soil programme in the nation. Colombia provides an example. There the soil conservation programme was initially limited to the coffee-growing areas, then made more comprehensive. 4/ In other countries, goat laws reflect a determination that goats represent a problem requiring particular emphasis. But even within the constraints of the legislative programme, the most promising lines of research and most practicable solutions for soil problems remain to be determined.

The organization that performs this function is the research section of the soil service. Its composition would therefore vary according to the problems presented. Where one type of soil occurs over a broad region, an international soil research station could contribute. But if a single tribe's attitude to land is unique, effort would have to be directed to the tribal area. Because soil, climate and people occur in so many combinations, there are many worthwhile approaches to soil conservation. Despite what has been said about the need for national resources coordination, programme execution decisions may often best be made by agencies concerned with a single use or problem. At the same time, one may and should have sections which deal with common problems. But the precise relationship should depend on national circumstances. Most importantly, where there are not facilities for studying all problems, it will be better to concentrate on one field, however narrow.

The basic unit of all these decisions is the individual land user. What is implied in national land policy is the behaviour of these individuals. And a national plan must be made, so must the situation of the individual farmer, grazier, or forest user be analysed. A trained field staff is needed to conduct local soil studies and make individual economic and managerial assessments. If the personnel for this activity does not exist, the entire programme must be oriented to those uses for which personnel suffices. This might mean a concentration on plantation farming and on commercial timber exploitation. But conservation activity can hardly be called policy if it neglects planning for the resource user.

B. PROGRAMME EXECUTION

Conducting soil conservation activity is not easily separable from some of the decision-making functions, especially at the user level. But the institutional requirements are not identical. For example, information on soils and practices may come from a variety of sources, some of them national and some of them not. But recommendation or compulsion of particular practices is very much a national prerogative. Within the country, deciding among resources should be done by a relatively detached but knowledgeable body, whereas effectuating particular programmes may require a certain evangelism. The degree to which these attributes can be combined in the same agency cannot be specified, but the possibility of conflict between essential functions should be considered in creating the institutions upon which an effective programme will depend.

4/ Compare Ley sobre Economia Forestal de la Nación y Conservación de Recursos Naturales Renovables (No. 2 of 1959) with Pan Am. Union Dep't of Econ. & Soc. Affaris, Report on Conservation of Renewable Resources in Latin America 13 (Washington 1950).

Variety among soil conservation organizations is appropriate because both conservation problems and administrative resources differ so much among nations. In countries without consequential erosion problems it seems unnecessary to establish the sort of agency that exists in the United States or New Zealand. Nor could such an agency function in the absence of a large pool of soil specialists. A small number of trained people might best be used to train others instead of being made administrators of programmes that do not function because there is no field staff.

A basic distinction lies between countries where a single agency is responsible for all conservation work, and those with special bodies responsible for particular uses, or even particular solutions. The United States has at least five agencies involved in conservation of soil, 5/ while Mali concentrates all soil conservation functions in the forest administration. 6/ The value of each approach depends upon the level at which the administration is differentiated, but certain conclusions seem generally applicable.

Where different uses affect the same land, a single agency should have responsibility. Almost every country applies this principle at least in part. In the United States, the National Forests are officially dedicated to "multiple usage," 7/ which means at least recreation, timber, grazing, wildlife, mining, and water conservation. Yet the Forest Service is responsible for all forest uses. In New Zealand, all uses in soil conservation reservations are subject to the Soil Conservation and Rivers Control Council. 8/ Forest services usually control forest grazing, and where shifting cultivation is important, they control agricultural activity also. 9/ The basis of such unitary control is that the resource is unitary. The same tree may be felled for timber, shifting cultivation, a mine, or a ski trail. It must be protected against all these threats if it is to be protected at all. Even where forests are not ubiquitous, shifting cultivation may be so important that a single agency is required to take account of all cropland and all forest resources. Otherwise, advocates of cropland conservation could promote a policy of less intensive land use at the same time that forestry policy was excluding shifting cultivators from the forest. Either both policies would end in defeat, or farmers would be driven from the land.

A complementary principle is that a single user should not be responsible to the control of competing agencies. Even where overt conflicts in policy are averted, it is confusing to receive advice from two experts, each of whom emphasizes his particular interest. 10/ From the standpoint of manpower utilization it is wasteful to set two agencies to the task of devising a farm management plan for the same farmer. And the goodwill gained through successful introduction of new production techniques would be useful in introducing soil conservation, and it should be so used. The exception to the single user-single agency principle is that regulatory functions should not be undertaken by agricultural development workers. They cannot inspire the necessary confidence in their recommendations if they are seen as a variety of rural policeman. 11/

5/ Soil Conservation Service, Agricultural Conservation Programme, Extension Service, Forest Service, Bureau of Land Management.

6/ Cf. Law No. 68-8, 17 Feb. 1968, 17 Food & Agric. Leg. No. 4 (1968).

7/ Multiple-Use Sustained-Yield Act 1960, 16 U.S.C. §§ 528 et seq. (1964).

8/ Soil Conservation and Rivers Control Act §§ 16(4), 20(2)-(3) (No. 12 of 1941). as amended.

9/ See, e.g., Philippines Administrative Code §§ 1816.

10/ Cf. Robert J. Morgan, Governing Soil Conservation: Thirty Years of the New Decentralization 88-170 (Baltimore, n.d. 1965; Unites States Comm'n on Org. of the Exec. Br. of the Gov't - Hoover - Comm'n), Dep't of Agric. 13-14 (Washington 1949).

11/ See Chang, supra n.2, at 3; J.M.A. Penders, The Role of Rural Extension in Developing Countries, Rural Extension at the Crossroads 54, 63 (Penders ed., Wageningen, Netherlands 1963).

Where different uses, technical skills, and social organizations are relevant to different land, and there is overall coordination of resource policy, different agencies may appropriately control parts of the soil conservation programme. For example, where there is a clear distinction between forest and cropland, there is good cause for agency specialization. The scientific knowledge, the educational mission, and the management possibilities of the forest ranger and the agricultural development worker differ. The organizational bias should differ, too. The forest ranger polices and manages a resource over which he has basic control. Agricultural development seeks to involve people in a new method of managing resources over which they have basic control. Essentially, only knowledge of soils is relevant to both. Here is an example of the divergence between the decision making and administrative requirements of soil conservation. The overall policy must be coordinated. And research on the same soil which might support trees in one place and corn in another is essentially one task. But policing the forests and educating the farmers are very different.

Whether soil conservation should exist independently from other agricultural organizations depends largely on the administrative resources available and on the relative importance of the conservation programme. If establishing a conservation agency requires depriving the rest of agriculture of scarce personnel, it could be a serious mistake. Soil conservation often depends on the sophistication and prosperity of the farm population. 12/ To detract from efforts to enhance these could deprive conservation of the necessary background. Instead, to educate the agriculture department - and especially field personnel - about conservation could accomplish as much immediately and considerably more over time. But there may still exist a basic conflict between maximum production presently and in the future. If one agency is responsible for both, a certain confusion of purpose might be inevitable.

1. Directorial Responsibility

Where it is possible, a conservation programme must be directed by a particular person or agency. There must be a figure to represent the conservation interest in the allocation of financial and administrative resources; and the lower levels of activity must be managed, especially if they are not performed by the soil conservation agency itself. No nation has infinite funds. Projects must be advocated or they do not receive necessary legislative support. Because conservation is frequently susceptible to varying definitions, there must be someone with a commitment to it who can explain the case for soil conservation. Similarly the people who eventually work with resource users must be made aware of the value of soil conservation. If they are general agricultural extension people it will be necessary to remind them that their job is not simply to increase production of export crops, but also to see that the soil is maintained for next year's and the next generation's crops. Public land managers must be prodded by someone with a specific interest in conservation to prevent over-use of resources at the instance of locally important concessionaires. Whatever the source, conflicts with a sound conservation policy must be countered by a powerful organizational influence in favour of conservation.

12/ See Melvin G. Blase & John F. Timmons, Soil Erosion Control - Problems and Progress, Readings in Resource Management and Conservation 338 (I. Burton & R. Kates eds., Chicago 1965); New Zealand Nat'l Wat. & Soil Conserv. Author., Rep. for the Year Ended 31 March 1970, at 8 (Wellington 1970); A.W. van den Ban, The Adoption Process, Rural Extension at the Crossroads, supra, at 104.

2. Field Staff

At lower levels, the organizational requirements depend on the use being regulated. Large, professionally managed estates require the smallest and simplest administration by thestate. Political difficulties may arise in enforcement, but the work of educating and supervising large numbers of independent operatives will not be necessary. This statement depends of course on the actuality of management. Large estates operated by sharecoppers are not usually managed in a way to obviate administrative difficulties. But where a single person or firm is in fact responsible for a large area, scarce manpower can be efficiently applied to induce conserving activities. Where particular rules exist, they can be enforced without putting anyone in fear of his livelihood. Where the activity would be personally beneficial, one man can be educated to the fact and thousands of acres, instead of five, can be conserved.

At the other extreme are small, traditional land users. There are many whose practices must be changed, and one finds great resistance to it. It is generally considered that a large, trained field staff is required to study individual situations, offer technical assistance, conduct educational programmes and supervise credit and subsidy arrangements. Opinions and conditions vary, but on a general estimate less than one extension agent to every 1200 farmers could generally be considered inadequate. 13/ Soil conservation workers would not have all the responsibilities of general extension agents, but it is doubtful that a nation with only a few extension agents would wish to create a separate agency solely for the promotion of soil conservation. Therefore, a nation without a sufficient number of trained staff may not be prepared to undertake a comprehensive soil conservation programme. This institutional limitation should be realized when framing soil conservation legislation. If there are not sufficient people to reach small farmers, reliance on individual persuasion is misplaced. Perhaps large users should be the target, or there might be a defined area where problems are the greatest and staff could be concentrated. Or other means may have to be devised for reaching the land user.

Cooperative farming offers one hope for introducing soil conservation in spite of fragmented holdings and a shortage of extension workers. 14/ Although each man continues to farm his own land, owners of adjoining plots can save labour by consolidating fields. An operation, like ploughing, can be shared and conducted along the contour instead of along old property lines. Where large enough areas are enclosed, it can become feasible to fence stock, allowing a pasture rotation. And a group accustomed to working together can be approached more efficiently by limited numbers of conservation workers. In some cases traditional local leaders can be persuaded to lend their prestige to soil conservation. Because of the importance farmers place upon adoption of new techniques

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13/ A.T. Mosher, Creating a Progressive Rural Structure 121 (New York 1969); cf. C.W. Chang, Comparative Extension Studies in Asia, Rural Extension at the Crossroads, supra n.11, at 39, 47 (One agent to 600 farms is adequate in Japan, "where farm people live in compact villages, with a high degree of literacy."); Richard Bradfield, The Role of Educated People in Agricultural Development, Agricultural Sciences for the Developing Nations 95, 101 (A. Moseman ed., Washington 1964).

14/ O. Schiller, Co-operative Farming and Individual Farming on Co-operative Lines, Rural Extension at the Crossroads, supra n.11, at 145; cf. P.C. Chambers, Planned Group-Farming in Nyanza Province, Kenya, 6 United Nations Sci. Conf. on the Conserv. and Utilization of Resources, Pro. 102 (New York 1951); United Nations, Progress in Land Reform - Fifth Report 46-48 (New York 1970).

by their neighbours, 15/ emphasis upon selecting and training appropriate local farmers should be far more effective than trying to convert an entire village at once. 16/ There are even regional leaders whose prestige can decisively influence the practices of the individual farmers. 17/ Contact is still important 18/ but much of its usefulness can be multiplied through proper use of existing influences.

Whether soil conservation is taught and advocated on every farm, or only in every village, an organization must exist to inform and direct the conservation workers. The organization can either be an independent service such as the Soil Conservation Service of the United States or it can work through the general agricultural extension service. Either form would still require specifically conservation-oriented direction.

The great advantage of a separate soil conservation agency at the user level lies in the single purpose such an agency would have. It could most effectively promote soil conservation because that would be its central - rather than periferal - task. Where the conservation agency is allowed to engage in programmes designed to raise immediate productivity there is some evidence it will do so, even while maintaining a basic commitment to conservation. 19/ Such dilution of purpose may be desirable for coordinating purposes, but where it is not wanted it should be guarded against.

If a separate soil conservation service exists, it is necessary to coordinate its activities with the extension service. At the very least the two agencies cannot be allowed to offer conflicting advice to the farmer. By design they would each emphasize different aspects of farming, but they should still operate within a coherent national policy. If such a policy does not exist, organizational competition may help to form one. Indeed, in some instances, if the competition depended primarily upon farmer acceptance, possibly the soil conservation service may deviate from its conservation purpose rather than the extension agency alter its emphasis upon maximum current production. 20/

A separate soil conservation service operating within a sound national policy might possibly face the difficulty of persuading farmers to adopt its practices. It is commonly accepted that farmers adopt new practices piecemeal if possible. If the first stage works, the agency which has promoted it has earned a reserve of goodwill which can be used to induce the adoption of something further, perhaps something more difficult or offering less immediate profit. But the return from some soil conservation may be rather distant in time, and, if so, it may be difficult to persuade farmers of the advantages. When the conservation programme cannot offer immediately attractive assistance, how then can it get started? Subsidies are of course important, and they are used. 22/ But it seems equally reasonable and ultimately cheaper to introduce conservation techniques into the sequence of general agricultural development. The goodwill established by the man who introduces hybrid corn should be as useful in promoting contour ploughing as in persuading people to use fertilizer. 23/

15/ R. Burnell Held & Marion Clawson, Soil Conservation in Perspective 255 (Baltimore 1965).
16/ Cf. René L. Ambroise, Rapport au Gouvernement du Mali sur la Conservation du Sol 15, passim (Rome 1969).
17/ See Arthur F. Raper, Rural Development in Action - The Comprehensive Experience at Comilla, East Pakistan (Ithaca, New York 1970).
18/ Frederick C. Fliegal, et al., Agricultural Innovations in Indian Villages 38 (Hyderabad 1968).
19/ Cf. Held & Clawson, supra n.15, at 69-75; W. Robert Parks, Soil Conservation Districts in Action 144 (Ames, Iowa 1952).
20/ See Held & Clawson, supra n.15, at 69-75.
21/ Henry F. Lionberger, Adoption of New Ideas and Practices 105 (Ames, Iowa 1960).
22/ See, e.g., Tunisia Decret No. 64-81, 12 March 1964.
23/ See Held & Clawson, supra n.15, at 86, tab.4.

The need to gain farmer confidence and to assure that he is advised according to a single policy implies that only one agency should undertake to promote the whole range of desired agricultural practices. But the implication is not absolute. Although administratively neater, and theoretically more efficient, if the existing agricultural service agency is hostile or indifferent to soil conservation, it will not produce an effective programme. An extension agent transmits not just technical information, but often his own faith in it. At the same time he must make quite subjective determinations of what should be done on a particular farm. The scope for transmutation of policy through agent bias is broad. Before a particular form of organization can be prescribed, this bias and its strength must be ascertained. Strong hostility to conservation might indicate that a completely separate soil conservation agency should be established. Lack of understanding or indifference could be dealt with in an intermediate way, perhaps with regional soil conservation officers who would advise and prompt the generalists who worked directly with farmers. And where an enthusiasm for soil conservation already exists, it can be strengthened through enhanced technical support.

In most developing countries the possibility of creating a comprehensive soil conservation field service seems remote because of the shortage of trained staff; and this predicament may force the choice of a single all-purpose agency. But a shortage of staff suggests that agency bias against soil conservation will not be severe problems, because a small, growing organization will be altered merely by the addition of new personnel. The national direction of soil conservation must have a role in the agricultural training programme and it must have a definite call upon the field staff. There must be someone with conservation responsibilities who can observe and influence field staff. Then where the extension service is still in the process of coming into being, it should be possible to instill a bias in favour of soil conservation, greatly alleviating the administrative difficulties of a joint organization. Forest and grazing services already exhibit successful hybridization of this sort, but agricultural soil conservation agencies do not appear to be formally connected with other rural development. 24/

Where many users compete for the same resource, as in range grazing and uncontrolled forest exploitation, the state should consider participating in the management of the land. Unless all users help to conserve, those who do will not fully benefit from their conservation. Active forest management is quite common, 25/ although lack of personnel often limits the role of the forester. Where the staff exists, foresters are very successful at sorting out loggers, hunters, graziers, and recreational users; 26/ this despite the fact that some forest users pay directly for their use and others do not. But public control over public lands only extends as far as the ranger's eye. Beyond that, overgrazed range and forest and ruined watersheds are the rule. 27/

24/ See, e.g., Malagasy Republic Arrêté No. 1320, 20 March 1968. The soil conservation service (art. 5) is directed to coordinate soil conservation activities with other agricultural agencies, but there is no formal authority to engage non-SCS personnel in conservation work. Art. 12. But see Tunisia Loi No. 63-17, 27 May 1963, arts. 2-5, 8 (state assistance to associations formed both for soil conservation and general farm management).

25/ Approximately three-fourths of the world forests are publicly owned. United Nations, Land Reform, supra n.14, at 144.

26/ See Cyprus, Min. Agric. & Nat. Resources, Forest Dep't, Jt. Sub-Comm'n on Mediterranean Forestry Problems, 10 Sess., Country Rep. - Republic of Cyprus, pt. 2, tr. at 5 (1968); Herbert Kaufman, The Forest Ranger - A Study in Administrative Behaviour 47-64, 203-41 (Baltimore 1960).

27/ Cf. Ghaus Muhammad Khattak, Range Land Problems in West Pakistan, in Sympos. on Soil Erosion & Its Control in the Arid & Semi-Arid Zones, Pro. 189 (Karachi 1957).

3. Conservation Districts

Districts for soil conservation are a common feature of legislation. 28/ Some were originally advocated because of an intention to have comprehensive soil conservation programmes embracing entire watersheds; 29/ and plans devised for an entire watershed and adhered to by all land-users have proved tenable. However, if all soil conservation schemes had to await the cooperation (voluntary or otherwise) of everyone their number would be reduced, 30/ so conservation agencies have generally had to allow for this factor when planning their programmes. 31/

There are sound reasons for conservation work on a watershed or similar basis. Soil detached by erosion can cause considerable damage to the land it finally settles on. Soil-bearing water generally carries its load to the foot of the scope or to local flood plain. 32/ Deposited silt may maintain the fertility of bottom lands, 33/ but it can also cover growing crops, plug soil pores (retarding drainage), and silt up water control structures. 34/ Erodible soil conditions also enhance flooding danger. 35/ Wind-blown soil causes significant damage on neighbouring land, especially when it is deposited on growing crops. 36/ But these external effects do not compel the choice of comprehensive action or nothing. Most of the damage caused by erosion occurs to the land from which the soil is taken. That damage can be controlled through individual efforts. Where intense runoff or landslides from uphill land occur, cooperation is necessary. But lesser externalities should not divert the programme from piecemeal efforts that farmers will accept.

Districts seem most appropriate in controlling competitive exploitation where universal cooperation is in fact necessary. They have proved effective in range management where the incursion of non-members could be controlled. 37/

28/ See, e.g., Cyprus Soil Conservation Laws § 7, Laws of Cyprus c.94 (1959); Zambia Conservation Law, supra n.3, § 17.

29/ Morgan, supra n.10, at 37-44.

30/ Cf. Held & Clawson, supra n.15, at 277; New Zealand Nat'l Wat. & Soil Conserv. Author., supra n.12, at 8-9. But cf. Parks, supra n.19, at 147-59 (compulsory land-use regulations adopted by local vote in some wind erosion areas).

31/ See Morgan, supra n.10, at 156-58; cf. id. 359-62. Part of the problem in the United States has been diversion of SCS efforts to the practices of the Agricultural Conservation Programme, which SCS does not control. By 1969 the SCS had made basic conservation plans for 38% of United States farms. A Better Environment for All People, 35 Soil Conserv. 135, 136 (1970).

32/ Food & Agric. Org. of the U.N., Soil Erosion by Water: Some Measures for its Control on Cultivated Lands 29 (Rome 1965).

33/ Id. 34-36.

34/ Id. 31-34; Helmut Kohnke & Anson R. Bertrand, Soil Conservation 239-40. (New York 1959).

35/ See Kohnke & Bertrand, supra, at 236-38.

36/ Food & Agric. Org. of the U.N., Soil Eorsion by Wind and Measures for its Control on Agricultural Lands 5-6 (Rome 1960).

37/ See Cyprus, Country Rep., supra n.26, pt. 2, at 2; Omar Draz, The "Hema" System of Range Reserves in the Arabian Peninsula (FAO Doc. PL:PFC/13, Rome 1969). FAO, Water, supra n.32, at 229-30; T. François, Land Laws and Uses Control Measures, Licensing, etc., in Food & Agric. Org. of the U.N., Goat-Raising Policies in the Mediterranean and Near East Regions, Doc. 4, at 6 (1965); E.W. Russell, Recent Research and Development Work in Soil and Water Conservation in East Africa, Karachi Sympos., supra n.27, at 313, 321; A.T. Semple, Grassland Improvement 121 (London 1970).

Whether the group of graziers are denominated a district or not, they must all participate in any stock reduction or grazing control scheme. Merely constituting a district does not eliminate the necessity of educating and guiding the stock-owners, but a formalization of the group provides a good means of persuading laggards to allow an improvement scheme to go forward: avoiding government restrictions on what seems free land may be easier than resisting an overwhelming vote of one's neighbours.

Where universal cooperation is not essential, districts composed of local land-users can still serve as an educational arm of the soil conservation service. People in formal association with a programme are more likely to act to implement the programme goals. But local participation does not assure programme success. Districts still depend both for technical help and for motivation upon conservation workers. 38/ One study of district officers indicates that they do not always fulfill the local advocacy function they should. 39/ The same study indicates uneven success in the use of districts as local administrative units. 40/ One may conclude that they help conservation workers, but that they should not be considered as substitutes in the primary task of educating and persuading farmers. There is no evidence that conservation districts can replace a large, trained conservation field staff.

Some sort of local representative body is extremely useful in allocating the costs of projects requiring substantial works, such as flood-control structures. There is no single formula for assessing the individual benefit from a project that necessarily benefits many. 41/ A formula that seems fair to those concerned can best be chosen by themselves. General legal limits on rates of taxation and methods of assessment should protect against gross unfairness. The use of a local body, at least to approve of this class of project, is also desirable in order to assure that those who must pay the bill will in fact do so. The energy expended in explaining a project and securing local approval through visibly fair means may save greater difficulties as the project is executed. And if people will adopt a project as - collectively - their own, it spares what may be scarce administrative talent for other things.

C. CONCLUSION

Soil conservation institutions should produce the maximum conservation possible with the money and staff available. Limitations of both mean that priorities must be established for the agency. Unless its mandate is limited it may over-extend itself; and such over-extension is inappropriate for a programme in which intensive effort is necessary to produce results. Explicit legislative recognition of the importance of priorities is a necessary incentive for proper agency response.

The focus of soil conservation activity must be the user of the soil. Districts, field staff, and traditional leaders are useful or not according to their ability to induce individuals to adhere to the practices of the soil conservation programme. And in general, the role of trained personnel is essential in this regard. This is another reason

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38/ See Harold Fallding, The Group as a Medium of Agricultural Extension - A Study of the Agricultural Bureau of New South Wales 32-33 (Sydney 1962); Morgan, supra n.10, at 275-80.

39/ Morgan, supra n.10, at 279.

40/ Id. 224-30, 263-85; see Parks, supra n.19.

41/ See H. Stewart Jessee, Financing an Oklahoma Conservancy District, 17 J. Soil & Wat. Conserv. 13 (1962).

for confining the agency to the tasks within its competence. A proliferation of activities sometimes implies an equal proliferation of administrators. But to achieve the maximum soil conservation requires the simplest administration in order to free existing personnel for field work.

Within these general constraints, national organization must accord with national conditions. Programme objectives and institutional characteristics should influence each other to create a realistic policy and an administrative structure that will faithfully reflect that policy. A successful organization must be developed; it cannot be copied from patterns that have succeeded in dissimilar settings.

SUMMARY AND CONCLUSIONS

Soil conservation legislation should reflect a policy based upon a comprehensive knowledge of a country's natural resources. No nation can afford to waste resources that it will soon need, nor can it conserve one at the expense of destroying other, more valuable resources. Soil occupies a comfortable position in a conservation policy because it does not compete on a large scale with other natural resources. But soil uses do compete, and much of soil conservation consists in applying the appropriate use to a piece of land. Appropriateness is not purely a biological concept. The land must serve the nation, and if the need is for food, or the shortage is of investment capital, the soil programme must respond. So must soil legislation.

A. A NATIONAL SOIL POLICY

A national soil conservation policy must determine the proper use of the soil for both present and future production. National needs and methods of agriculture will change over the foreseeable planning period, so policy makers must weigh competing demands for which no common measure may exist. Uncertainty is inherent in such a process but estimates can indicate the general path a country should follow.

The first step in evolving policy is to inventory the existing land uses and estimate what they are doing to the soil. On a large scale, the soil erosion survey of Latin America 1/ provides such information for that region. Then desired land uses must be worked out in terms of needed products and the soil damage cost of producing them.

The result should indicate in general whether land clearance or forest protection is to be emphasized (the policy would probably differ from region to region); whether grazing is to be encouraged and improved, or phased out; whether eroding land should be shifted to pasture or left in high value crops. It should also suggest the areas of greatest importance, where soil damage is greatest or soil qualities are most important.

Soil conservation policy must also account for the means of implementing overall decisions. Unlimited finances and staffing will not exist, so priorities have to be established for the use of what is there. Where municipal drinking water, for example, is threatened by watershed deforestation, it would be part of the policy to halt the process, even at the expense of other conservation work. But where poor land could easily be placed under optimal management, that effort might receive higher priority than the conservation of richer land farmed by rigid traditionalists. The considerations will differ in each country, but the need to establish priorities will not.

1/ Conserv. Fdn. & Food & Agric. Org. of the U.N., Soil Erosion Survey of Latin America (3 parts), 9 J. Soil & Wat. Conserv. 158, 214, 275 (1954).

B. LEGISLATION

Soil conservation laws do not appear to be based upon an explicit policy as much as they should be. A general authority to "conserve" is frequently delegated without any statement of particular goals. Such authority gives the conservation agency the flexibility to respond to new information and changing situations, but it also allows it to follow a course of action which may be incompatible with broader national interests. Annual appropriations can be designed to ensure administrative adherence to legislative intentions, but such a procedure is no substitute for coordinated underlying legislation.

Legislation does not respond to policy merely by restating it. Such a statement may have salutary effect, as in a forest law where it is easy to say that national policy is for maximum timber production or for protection of existing stands. But often legislation must encourage or discourage specific actions. A scale of subsidies can be established for certain practices on land planted in a particular crop. Or land titles can be given either for clearing or reforestation, whichever is locally appropriate. But legislated rules of agricultural practices are likely to be ineffective in the absence of appropriate incentives and technical assistance. They are also unwise where local variations demand individual treatment. The degree of specificity should depend upon legislative ability to evaluate and control an activity and the efficiency of more general statements in securing appropriate administrative response.

Organization of conservation legislation into one or several statutes should be a planned response to programme needs. If a variety of agencies administer a plethora of conservation, the exercise of consolidation will both clarify administrative responsibility and force the legislature to consider the inter-relationships of the programmes. But if it is only possible to make a small start on soil conservation, specific legislation directed to particular lands and uses can serve to focus administrative attention and legislative appropriations on the activities of highest priority. Legislation should not be so fragmented that integrated planning of related programmes is impossible. But it should not encompass a broader area than the national capacity for action.

A fledgling soil conservation programme cannot be uncritically based on a large and well-established one. The importance of soil and its exploitation are likely to differ among countries. The men and money available for a conservation programme are not the same from place to place. And the people who work the land have their unique characteristics in every country. A well-designed programme will address itself to these factors, and the solutions it embodies will be unique to them.

C. INSTITUTIONS

A soil conservation programme requires national resources planning at a level of detail appropriate to the degree of national control to be exercised. Within the context of national policy there must be a director of soil conservation who will represent the conservation interest in national councils and direct conservation research, education and implementation. At the field level, most countries may find it effective initially to place responsibility for soil conservation in an established agricultural service, advised by soil conservation specialists. Forestry may remain the separate department it usually is, guided, of course, by national resource policy. Where shifting cultivation is an important forest use, the forestry service should be in charge of that also; otherwise it should be with the soil conservation service. But whatever form the organization takes, it must be directed toward getting necessary information, assistance, and inspiration to those who use the soil.

APPENDIX

SELECTED NATIONAL SOIL CONSERVATION LEGISLATION

I. CYPRUS

Cyprus has a comprehensive body of laws governing grazing, forestry, and cropland soil conservation. The Forest Law of 1967 1/ grants complete authority to the Council of Ministers to constitute forests, and to include private land by compulsory purchase. 2/ Only the Council can alienate forest land. 3/ The Director of the Department of Forests is authorized to control the manner and extent of private use. 4/ The Forest Regulations of 1967 5/ authorize the Director to control cutting and transportation of timber. It is significant that watershed protection is not one of the factors the Director is instructed to consider in determining cutting. Grazing is authorized, but only upon declaration of the Council of Ministers. Communal or Municipal Forests may be turned over to local authorities for management, but subject to regulation by the Director.

Cyprus has three laws which are directed at control of grazing. The Tree Planting (Village Areas) Law 6/ allows a local Commissioner, upon a two-thirds vote of a village, to declare a Tree Planting Area. There is no obligation to plant trees, but it becomes an offence to maintain an animal in a tree planting area (which cannot be within 400 yards of the village). Camels, horses, cattle, asses and mules may be kept on one's own land, but only if they present no danger to trees in the Commissioner's opinion. In a tree planting area, therefore, goats are effectively excluded. A more direct approach to goats lies in the Goats Law, 7/ which allows a village to vote to ban free-ranging goats, and as a separate issue, to limit other goats to five per family. Finally, the Sheep and Goats (Shepherds' Licensing and Control) Law 8/ provides for the licensing of shepherds, requires them to control their animals, and establishes penalties including loss of license for violations.

The Soil Conservation Law 9/ defines a soil measure as any measure for the prevention or repair of erosion or sand drift; "the protection, conservation or improvement of the land, the vegetation, the surface of the land and the soil;" protection of water resources; or the "betterment" of watercourses. 10/ This is not a very limited definition, and could lead to some confusion of purpose. The administration of the law is largely in the hands of local Soil District Boards, normally comprising one village. 11/

1/ No. 14, 17 Food & Agric. Leg. No. 3 (1968).
2/ Id. §§ 3, 5.
3/ Id. § 7.
4/ Id. §§ 9, 12-14.
5/ (28 July) 17 Food & Agric. Leg. No. 3 (1968).
6/ Laws of Cyprus c.100 (1959).
7/ Laws of Cyprus c.66 (1959).
8/ Laws of Cyprus c.91 (1959), as amended (1965), Cyprus Min. Agric. & Nat. Resources, Forest Dep't, Jt. Sub-Comm'n on Mediterranean Forestry Problems, 10th Sess., Country Rep. - Republic of Cyprus, pt. 2, at 2 (1968) (summary).
9/ Laws of Cyprus c.94 (1959).
10/ Id. § 2.
11/ Id. §§ 3-10, 12-16.

The Board is elected, and the local conservation plan is approved by vote (subject to the final approval of the Governor). The Board is empowered to make regulations governing grazing, tillage practices, rotations and other land practices, 12/ and to apportion costs of work according to benefit and to collect the assessments made. 13/ The Board can also hire and fire, acquire property by compulsory purchase and dispose of it (the latter two acts require the Governor's approval). 14/ In sum, the Board is extremely powerful. Its actions are appealable and often subject to prior approval, but it is primarily responsible for operating the soil conservation scheme. It would require close supervision indeed to prevent the local Board from operating any variant it preferred within the broad definition of "soil conservation measure."

The significant limitation which does exist is that no provision for state subsidies is made beyond the preparation of conservation plans. Projects must be financed by levies on the land benefitted. (Borrowing is authorized, but there is no provision for repayment except improvement assessments.) 15/ These may apparently be paid to landowners to do work from which they do not fully benefit, 16/ but otherwise both the village and each inhabitant are on their own. Where major works are to be constructed, the value of state advice could be all that is needed to induce the village to carry out the project. But where conservation practices, such as rotations or strip cropping, are concerned, it is difficult to see how the mechanism of the Board and its plan will induce voluntary conservation. Yet the requirement of local votes (which must be carried by a property-based majority of two thirds) means that significant motivation must be voluntary.

12/ Id. § 12.
13/ Id. §§ 12(1), 22(2)-(3).
14/ Id. §§ 13-16.
15/ Id. § 13(1).
16/ Id. § 29.

II. MALI

Mali has a single act which regulates land use generally. 1/ Mali's soil problems can be divided into two categories: over-intensive shifting cultivation in the south, 2/ and nomadic herding in the desert and sub-desert north. 3/ Two provisions are applicable to the north. One forbids burning north of a line which roughly divides the pre-desert steppe from the woodland and savanna area. 4/ The second forbids grazing in the desert except in managed grazing areas. 5/ Since three-fourths of the country's animals are owned by nomads, 6/ this provision seems difficult to enforce.

The main body of the law applies to the forested areas of the south. It establishes control over all forest exploitation, on state or private lands. A permit is required to log, and other documentation is required for the transport and sale of forest products. 7/ Certain species of trees are protected, saving specific authorization. 8/

Clearance for cultivation is also thoroughly regulated. No fresh land clearance is permitted without written permission. 9/ It is forbidden on erodible slopes, on slopes steeper than thirty-five degrees, where certain protected species exist (exceptions can be made), and in areas of water catchment and flow. 10/ Burning is not allowed for the purpose of killing trees or bush, although this provision may be waived. 11/

Use rights are dealt with comprehensively. The right to use soil is specifically abrogated with respect to areas where clearance is forbidden, and all use rights are subject to regulation by the Waters and Forests Administration. 12/ A distinction is drawn between commercial and non-commercial exploitation of forest products.

There is a close regulation of all agricultural activity in Mali. However the manpower to supervise clearing, issue permits to each individual who wishes to do it, and enforce the use regulations is rather limited. 13/ Possibly more profitable would have been to set the task of cataloguing existing use practices and demarcating the actual forested area. 14/ As the law stands, the Waters and Forests Administration has little guidance for allowing the exceptions it is authorized to make. If it should really prohibit clearing as strictly as it is empowered to, it could make the erosion problem worse by preventing the timely return to forest of already cleared land. To avoid such pitfalls requires a good knowledge of the extent of forest and uses. Diversion of technical manpower to issue permits detracts from the task of gathering such knowledge.

1/ Law No. 68-8, 17 Feb. 1968, 17 Food & Agric. Leg. No. 4 (1968).
2/ See Rene L. Ambroise, Rapport au Gouvernement du Mali sur la Conservation du Sol (Rome 1969).
3/ See German Federal Republic, Statistisches Bundesamt, Länderberichte Mali 25 (Allgemeine Statistik des Auslands, Wiesbaden 1966).
4/ Compare Law No. 68-8, supra n.1, with Oxford Regional Economic Atlas: Africa 52 (Oxford 1965).
5/ Law No. 68-8, supra n.1, art. 33; cf. id. art. 39.
6/ German Federal Republic, supra n.3.
7/ Law No. 68-8, supra n.1, arts. 40-47.
8/ Id. arts. 36-38.
9/ Id. art. 5.
10/ Id. arts. 11, 14, 16.
11/ Id. arts. 8-9; see art. 26.
12/ Id. arts. 28, 30, 32.
13/ See Ambroise, supra n.2, at 10.
14/ See T. François, What Should a Basic Forest Law Contain? 15 Unasylva 140, 143-46 (1961). Uses will be gradually enumerated as land in Mali is classified, but the project is not given individual priority. Cf. Law No. 68-8, supra n.1, art. 20.

III. NEW ZEALAND

New Zealand possesses a combination of a separate law for almost every situation and a broad soil conservation and water law. Besides standard enactments covering forestry, water, and particular land uses, there is also a specific statute controlling the use of agricultural chemicals. 1/ But the New Zealand legislation most important for soil conservation is the Soil Conservation and Rivers Control Act. 2/

The main effect of the soil conservation law is to establish official bodies and to grant them authority to promote soil conservation on a broad front. A National Water and Soil Conservation Authority is responsible for national soil and water policy. 3/ It is given all the powers of previously established subsidiary bodies, but they retain primary responsibility for their statutory functions. 4/ In general charge of soil conservation is a Soil Conservation and Rivers Control Council, consisting of delegates from the national works, lands, agriculture, forests, and treasury offices, plus nominees of the municipal, countries, drainage and river boards, farmers and catchment authorities associations. The council is directed to undertake surveys, investigations, demonstrations and publicity related to soil conservation and flood control. It should work with landholders, supervise subsidiary conservation bodies, and coordinate other government activities relevant to soil conservation and flood control. Both directly and through subsidiary bodies the Council may make loans and grants with landowners in exchange for agreements to perform conservation works. It may also directly construct works and levy the cost on benefitted parties. To conduct these activities the Council is given broad authority to engage experts. 5/

Under the general supervision of the Council and the Minister of Works, most soil conservation work is designed to be undertaken by local districts, established by the Governor-General on the recommendation of the Council. 6/ Each district is governed by a Catchment Board consisting of a majority of members elected by the local populace, with voting weighted by sub-districts according to local circumstances. 7/ The board is a corporate body with all appropriate legal capacities. 8/ It is specifically authorized to appoint salaried officials, levy limited rates for administration, construct works (with the approval of the Minister of Works and the Council), acquire land by compulsory purchase, assess the costs of works, and with the approval of the Council enact regulations for land use. 9/

1/ Agricultural Chemicals Act (No. 5 of 1959); see Agricultural Chemicals (Insecticides) Regulations, 27 Jan. 1969; Agricultural Chemicals (Orchards) Regulations, 7 Nov. 1962; cf. Health Act 1956 (permits regulation of the use of pesticides on food crops); Pesticides Regulations, 8 July 1959 (establishing standards under the Health Act).

2/ No. 12 of 1941, as amended.

3/ D.G. McGill, Legislation for Water Resources Development, Soil & Wat., March 1968, at 9, 10.

4/ Water and Soil Conservation Act § 14 (No. 135 of 1967).

5/ Soil Conservation Act, supra n.2, §§ 3, 10-11.

6/ Id. § 34; cf. §§ 35, 37.

7/ Id. §§ 40-41.

8/ Id. § 40.

9/ Id. SS 80, 84-88, 107, 110, 126, 128, 135, 138, 150-51, 152A.

Outside of soil conservation districts, all of New Zealand is declared Catchment Territory. Here the Council possesses power to do all that Catchment Boards may do in districts. 10/ The Council may establish Catchment Areas in the Catchment Territory to be managed by Catchment Commissions, 11/ to which the Council may delegate the essential functions of a Catchment Board. 12/ The primary difference between Boards and Commissions is that a majority of a Commission is appointed by the Council from nominees of existing local authorities. 13/ With such control over the Commission membership and powers, the Council may be expected to control policy in the non-district part of the country much more closely than in the districts.

A third classification of territory is the soil conservation reserve. It is public land, either existing or acquired for the purpose on recommendation of the Council. 14/ Specific permission of the Council is required for any exploitation of reserve land. Animal trespass, mining, and destruction of vegetation are specifically mentioned as activities to be controlled. 15/

The New Zealand statute is not specific in its division of responsibilities, since both delegation and revocation of powers are so broadly allowed. But however authority is exercised in a particular district, ample powers exist for inducing, aiding, compelling, controlling, and financing soil conservation activities. Among the district administrative functions, planning is specified so that development of conservation plans may be accomplished without special approval of the Council of Ministers. 16/ Both Council and Catchment Boards may employ experts, so the possibilities of developing really competent advice for land users are fully allowed. The power to make grants and loans is confined to the Council, which should restrict the possibilities of abuse of untrammelled discretion to award such funds. Grant and loan funds are also required to come from annual appropriations rather than from other income, such as loan repayments, that the Council may have. 17/ Thus the law combines the necessary flexibility to assure activity under varying conditions with high level control of expenditure.

10/ Id. §§ 11(1)(m), 14(4).
11/ Id. § 13.
12/ Id. § 23A. It requires unanimous consent of the local governments in the Area to delegate all Board powers as such. Id. § 23AA.
13/ Id. § 13.
14/ Id. § 16.
15/ Id. §§ 17, 20.
16/ See id. § 84.
17/ Id. §§ 30-31.

IV. UNITED STATES 1/

The soil and water conservation programme in the United States has evolved from many legislative acts.

In 1928 the first educational attempt was made on erosion prevention. The USDA published a bulletin, "Soil Erosion - A National Menace" and Congress provided funds under the Agricultural Appropriations Bill to: (1) set up ten regional experiment stations for measuring the rate of soil and water losses; (2) survey the extent of erosion damage and locate the worst areas; (3) work out methods of control and prevention.

The National Industrial Recovery Act established the Soil Erosion Service in the Department of Interior in 1933 to utilize Civilian Conservation Corps help in establishing soil conservation demonstrations on farmlands.

Public Law (PL) 74-46 in 1935 created the Soil Conservation Service and utilized the organization of the then existing Soil Erosion Service of the Department of the Interior.

The purpose of the Law was "to provide permanently for the control and prevention of soil erosion and thereby to preserve natural resources, control floods, prevent impairment of reservoirs and maintain navigability of rivers and harbours, protect public health, public lands and relieve unemployment, and the Secretary of Agriculture, from now on, shall co-ordinate and direct all activities with relation to soil erosion."

Thus, the basic purpose of the S.C.S. programme has been to aid in bringing about physical adjustments in land use and treatment that will conserve natural resources, establish a permanent and balanced agriculture, and reduce the hazards of floods and sedimentation.

The Flood Control Act of 1936 was the first attempt to treat upstream watersheds as a flood prevention measure. Although 200 plans were partially completed, interest declined and the projects were dropped during the Second World War.

Also in 1936 a standard Soil Conservation District Law was drawn up to initiate the concept of local, self-help programmes rather than Government action programmes. The Agricultural Conservation Programme was established the same year and is now administered by the Agricultural Stabilization and Conservation Service. It provides funds for cost sharing in the establishment of conservation and environmental enhancement practice with private landowners. This agency also administered the Cropland Conservation Programme and the Cropland Adjustment Programme which were intended to encourage the withdrawal of marginal and generally erodible cropland from intensive cultivation and convert these lands to long term grass, forage or tree production.

The Case-Wheeler Act of 1937 included a water utilization programme in the western states to help farmers and ranchers build up water supplies. In addition, there was a provision for irrigation and drainage surveys. The same year also saw the organization of the first Soil Conservation District in the United States.

During 1946 the Farmers Home Administration was established in the US Department of Agriculture. This Administration provides loans for the establishment of soil and water conservation practices on individual farms and makes loans to the local sponsoring organizations in PL-566 small watershed projects.

1/ Prepared by Dale R. Smelcer, Land and Water Development Division, FAO, Rome.

1952 saw the transfer of all Federal soil survey activities to the Soil Conservation Service; and in 1953 the Pilot Watershed Programme was started to demonstrate the benefits of proper watershed treatment. There were originally 63 watersheds selected by the Forest Service.

The following actions were initiated in 1954: PL 83-591 (Section 175, Internal Revenue Code of 1954) permitted farmers to deduct up to 25% of their gross income for operating costs incurred in applying conservation measures. PL 83-597 amended the Water Facilities Act of 1937 to include the remaining states not authorized in the original act. PL 83-566 The Watershed Protection and Flood Prevention Act authorized the Secretary of Agriculture to co-operate with states and local agencies in planning and carrying out works of improvement for soil conservation and other purposes in watersheds not to exceed 250,000 acres in size. Water storage capacity of a single structure was not to exceed 25,000 ac. ft. The act was amended in August 1956 to provide for: (1) flood prevention; (2) agricultural water management; (3) other purposes such as: municipal and industrial water supplies. It also provided for loans or advancements to local organizations for their share of project costs. The purpose of this act was to provide for reduction of erosion, flood and water and sediment damages, and development, utilization and disposal of water for the preservation of the nation's land and water resources on small watersheds. Specific duties of the Soil Conservation Service under this programme are:

1. Prepare detailed work plans for each part of the watershed.
2. Install works of improvement to reduce flood, erosion, and sediment damage on a cost share basis with local people.
3. Accelerate the work of soil conservation measures on the lands in the watershed.

The SCS was also assigned responsibilities for the River Basins Surveys which were authorized under PL 566 as follows:

1. Provide the chairman for each Field Advisory Committee.
2. Make physical appraisals of agricultural and rural water problems and residential development needs.
3. Determine development potentials of upstream areas and feasibility of watershed projects.
4. Evaluate physical and economical effects of upstream projects and co-ordinate with other agency proposals.
5. Determine treatment needs for non-federal open lands in the basin.

The Food and Agriculture Act of 1962 (Section 102) authorizes the Secretary of Agriculture to assist in developing and carrying out plans for a programme of land conservation and utilization. The attempt is to provide for a complete conservation programme on complete hydrologic units. Costs share funds are available for community works of improvement which involve soil and water conservation practices or their enhancement. Section 401 authorizes the SCS to provide technical assistance in planning recreational developments on rural, non-federal lands.

In 1965 the SCS was assigned leadership in preparing a "Conservation Needs Inventory". The objective was to determine the number and location of project size watersheds and evaluate their conservation problems and needs and their potential. This job was completed in 1967.

Soil Conservation Districts

Soil Conservation Districts are created under laws passed in each of the states. None of them are exactly alike, but all of them are patterned after a standard Soil Conservation District law developed in 1936 by the Department of Agriculture and several state representatives.

A District is a legal sub-division of the state in all but two states where it is an administrative arm of the state. Each state has a Soil Conservation Committee, Board or Commission. Each District is governed by local farmers or ranchers called supervisors of which there are usually five.

The broad general scope of the Districts is the control and prevention of erosion and the conservation of soil and water resources.

A District may be formed on petition of at least 25 landowners in any designated area. This petition is made to the State Soil Conservation Commission, Committee or Board.

A Memorandum of Understanding between a District and the USDA provides for USDA agencies to make technical assistance available to the District. Each District has its own programme for which the Soil Conservation Service has no responsibility. Neither can the SCS approve or disapprove the District's programme.

The first SCD was Brown Creek SCD formed in Anson Country, North Carolina in August 1937. Today there are over 2,700 Soil Conservation Districts or Soil and Water Conservation Districts covering 600 million hectares and over 90 percent of all farms.

The Soil Conservation Service works only with private landowners in Soil Conservation Districts. The Bureau of Land Management and the Bureau of Indian Affairs, two agencies of the Department of Interior, have responsibility for conservation practices on public range lands and Indian reservations respectively. Conservation practices in the National forests are the responsibility of the US Forest Service of the US Department of Agriculture.

Research in conservation is the responsibility of the Agricultural Research Service of the USDA; also the Extension Service (which is administered through the Land Grant Colleges and Universities) assists in this area.

Other Federal agencies which have responsibilities for conservation are the Bureau of Reclamation and the US Army Corp of Engineers. These agencies are generally involved in large scale projects of water conservation through storage and river and flood control works.

V. VENEZUELA

Venezuela has a unitary conservation act. 1/ Approval of the Ministry of Agriculture is required for lumbering, clearing, sheep and goat raising, and the transportation of timber. 2/ Agriculture is restricted in water supply areas, and is everywhere subject to Ministry of Agriculture conservation regulations. In addition, grazing may be controlled. 3/ Technical and financial assistance is authorized for both soil conservation and reforestation. 4/ Regulations supplement the law. 5/

The land clearance regulations carry the law to its extreme. A written petition to clear, burn, or destroy vegetation must state in full what is to be destroyed and for what purpose. 6/ Clearances larger than 100 hectares require a technical report from a recognized professional. 7/ Permission to clear forested or forestable land may be granted only if previous surveys demonstrate the feasibility of permanent cultivation. 8/ Permits to destroy medium and high vegetation can be granted only to those without land or who occupy unsuitable waste land, and then the permission is limited to five hectares. 9/ Lumbering requires written application including a technical report for any size operation. Those covering more than 5,000 hectares must also have a plan of management which is subject to Ministry approval and must be followed. 10/ The distinction between lumbering and clearing for cultivation seems reasonable, but the basic requirement of a written petition for clearing permission seems unlikely to be fulfilled by people practising shifting cultivation in the highlands. 11/ Grazing control is placed on a more tentative basis pending studies. 12/

The cropland conservation regulations are extremely detailed. The Ministry can establish variations based on technical factors, 13/ but otherwise specific practices are prescribed. Land is categorized both by use and by conservation practices, but in effect the conservation practices control. Cultivation perpendicular to the contour is absolutely forbidden. 14/ Up to a slope of fifteen percent, there are no other restrictions. Between fifteen and thirty-five percent either terraces or contour strips must be employed. The strips are to be uncultivated cover, ranging up to 3.5 meters wide and at intervals of ten meters on slopes above twenty-five percent. Above thirty-five percent only special crops such as coffee and fruit may be grown, and terraces and other measures are required. Pasturing is also permitted under practices to be established. Similarly, the Ministry may establish practices for uses of land steeper than fifty percent. 15/

1/ Forestry, Soils, and Water Law 1965, 15 Food & Agric. Leg. No. 3 (1966).
2/ Id. arts. 7, 38, 79-81.
3/ Id. arts. 17-21, 37, 82-84, 86.
4/ Id. arts. 41, 86.
5/ Reglamento de la Ley Forestal de Suelos y de Aguas, Decreto No. 1.333, 11 Feb. 1969.
6/ Id. art. 63.
7/ Id. art. 64.
8/ Id. art. 66.
9/ Id. art. 69.
10/ Id. arts. 108, 114, 122, 123, 128, 130.
11/ See generally Conserv. Fdn. & Food & Agric. Org. of the U.N., Soil Erosion Survey of Latin America (Part 2), 9 J. Soil & Wat. Conserv. 158, 214, at 215 (1954).
12/ Decreto No. 1.333, supra n.5, arts. 76-78.
13/ Id. art. 186.
14/ Id. art. 187.
15/ Id. arts. 180-88.

VI. ZAMBIA

Zambia has enacted a single statute under which all natural resources may be governed. 1/ A Natural Resources Advisory Board is established for general coordination and advice, but the Minister of Lands and Natural Resources is given actual authority in most matters. 2/ The Minister may order a land occupier to do what seems necessary for the conservation of natural resources, defined as soil, water, flora, fauna and other resources as the Minister may determine. 3/ The conservation orders may relate to land use, the construction and maintenance of works, methods of cultivation or stock-tending, a variety of water protection measures, care and exploitation of trees, and fire. 4/ In addition, specific provisions give the Minister authority to order stock reductions (but only with the consent of the President), 5/ and, on the request of half the occupiers of a district, to establish Fire Authorities which directly control burning. 6/ Presumably the specifications of power, with their limitations, limit the general grant of authority.

The apparent heart of the soil conservation scheme in Zambia is the Conservation Plan. Upon application of half the occupiers of an area, or upon the recommendation of the Natural Resources Advisory Board, the Minister may designate a "conservation planning area." 7/ In such an area the Minister has dominant responsibility for devising a conservation plan, permissibly of broad scope, which becomes binding on all land in the area. 8/ The Minister is directed to consult as far as possible with affected land users in devising the plan. 9/ There is provision for appeal to the Board, which may modify the plan, but the Minister retains the power of final approval. 10/ The Minister may cancel all or part of a plan on his own authority, but other modifications require exposure to the appeals procedure as with original plans. 11/ The Conservation Plan may govern land use, land consolidation, soil erosion, prevention works, stock limitation, control of burning and, "the organization, systemization and control of indigenous shifting cultivation." 12/

There is no provision in the Zambian statute for technical assistance, but the Minister does have authority to perform works himself and bear the cost to the extent that he determines the public benefits from the works. Another apportionment provision directs the Minister to assess costs for publicly constructed works if it would be "just." 13/ Where a gap exists between public benefit and justice, no formula is given. One solution lies in the Minister's authority to apportion costs between the land occupier and others having interest in the land. 14/ But that may not encompass the situation where one or a few neighbours benefitted from work on a plot. If, for example, land normally flooded is protected by an upstream dam which benefits no other area the public benefit as well as the value to the upstream landowner, may be rather limited. How such a problem will be solved remains to be seen in the administration of the law.

1/ Natural Resources Conservation Act (No. 53 of 1970).
2/ Cf. Id. §§ 4, 9.
3/ Id. §§ 2, 13(1).
4/ Id. § 13(3).
5/ Id. § 23.
6/ Id. §§ 26-30.
7/ Id. § 41.
8/ Id. §§ 42, 48.
9/ Id. § 45.
10/ Id. §§ 46-47.1
11/ Id. §§ 51-52.
12/ Id. § 42 (schedule).
13/ Compare id. § 15 with id. §§ 13(6)-(7).
14/ Id. §§ 13(13), 13(17).

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