

ECONOMICS OF WESTERN RANGE RESOURCE USE¹

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The central economic problem relative to range resource use is the allocation of all scarce resources

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available to the Western Range Area so as to obtain a maximum of the goods and services desired by all individuals and groups concerned. The resources considered were: (1) all land resources west of the eastern boundary (placed near the 100th meridian), including climate as well as physiographic features; (2) all labor resources available to the area, including the skills, productivity and mobility of the workers; and (3) all capital and management resources available to the area.

The primary purpose of this study was to develop a logical framework for economic analysis of western range resource use. The basic deductive theorems of the framework were taken from general equilibrium theory and welfare economics adapted to dynamics.

The marginal conditions underlying the theoretical models were enumerated, their limitations to specific situations were pointed out, and the policy and research implications of the maximizing solutions were discussed.

In general, the economic problems of range resource use fall under four main types of theoretical solutions: (1) optimum factor combination and use; (2) optimum scale of firms; (3) optimum product combination; and (4) the pricing of factors and products. The latter set of problems arises out of the environment in which some of the factors and products are rationed and their respective prices are administered.

The marginal conditions governing the optimum combination of factors of production specify that factors be so allocated that the ratio of the discounted expected marginal value of product to the discounted expected price of the factor be equal for every resource. This ratio should also be equal for every possible alternative use for each factor. (In absolute equilibrium this ratio would be 1.00.) The physical input-output relationships

needed for making maximizing solutions come from the science of range management. However, the logic of the maximizing principles is not a part of the theories and principles of range management as currently defined, but comes from the science of economics.

Optimum scale of firms occur when it is impossible to increase or decrease the size of firms and thus obtain a lower cost of production for the same products or increase the amount of products from the same resources. There is strong evidence that substantial scale maladjustment occurs with the smaller firms. The extent of conflict between resource efficiency and income distribution criteria for determining optimum scale adjustment depends on the real nature of the economies of scale. There are conflicts in the kind of recommendations one makes based on each criteria.

An important assumption underlying the necessary marginal conditions for maximum welfare is that the factors and products are priced so that the market is cleared of all factors and products that are offered at that price and that no demand at that price goes unsatisfied. This assumption was found to be invalid for several instances of federally owned forage resulting in pressures tending toward malallocation. A general procedure was presented for evaluating the forage in terms of: (1) the quantity and quality of forage and the production coefficient rate at which grass was transformed into animal product; (2) the price of livestock products; and (3) the cost of resources other than forage associated with range-livestock production.

The marginal conditions specifying an optimum combination of enterprises (products) were explored for three different types of allocation problems. The first was that of determining the type of agricultural production for areas that are marginal between range-

livestock production and dryland cropping. A part of this problem for some regions is the integration of irrigation into range and dryland farming operations. The existing economic criteria for determining the feasibility of irrigation development was appraised.

The second type of product combination to which the marginal conditions were applied was that of determining the optimum rate of of product (resource) use over time. This is the general problem of conservation.

A theoretical model for determining optimum intensity of grazing over time was developed and adapted to conditions of weather uncertainty.

The third type of product combination pertained to the optimum combination of the products of multiple-use resources, *viz.*, livestock, wildlife, timber, recreation and hydrological products. The general solution to this problem was approached through a series of partial solutions.

In each case the solution was a function of the physical marginal rates of product substitution between the two alternatives in question for a specific range site and the relative preferences of society for the products being considered. The general nature of several physical transformation functions was suggested, and procedures for estimating others were outlined.

The relative preferences of society for alternative products are usually expressed in terms of market prices. Not all products are allocated through the market mechanism, however. In some cases individuals express their preferences for alternatives by voting. Many of the allocation decisions pertaining to range resource use have been delegated to elected and/or appointed representatives. The complex and interrelated allocation decisions that are made by the several different

elected and appointed representatives (Congress, the President and the bureaucracy) can be improved by the use of: (1) a central planning and coordinating board; and (2) a professional sampling staff to esti-

mate the preferences of individuals relative to alternatives by means of statistical sampling.

Where the information needed for a decision is known, the theoretical models lead directly to the maxi-

mizing solution. Where the information is not known, the models direct the search for the needed facts. In the meantime they furnish the only logical basis for decision making in the absence of information.

New Publications of Interest

An Introduction to Climate. By Glenn T. Trewartha. *McGraw-Hill Co., N. Y.* 402 pages. 1954. \$7.00.

Commerce of the Prairies. By Josiah Gregg, edited by Max L. Moorhead. *University of Oklahoma Press, Norman.* 480 pages. 1954. \$7.50.

Methods of Crop Forecasting. By Fred H. Sanderson. *Harvard University Press, Cambridge, Mass.* 254 pages. 1954. \$5.00.

Our American Weather. By George

H. T. Kimble. *McGraw-Hill Co., N. Y.* 320 pages. 1954. \$4.50.

Raising Livestock. By George P. Deyoe, W. A. Ross and W. H. Peters. *McGraw-Hill Co., N. Y.* 540 pages. 1954. \$5.75.

Readings on Agricultural Marketing. By Frederick V. Waugh (editor). *American Farm Economic Association.* 456 pages. 1954. \$5.00.

Reclamation in the United States. By Alfred R. Golze. *McGraw-Hill Co., N. Y.* 451 pages. 1952. \$8.50.

Sampling Theory of Surveys with Applications. By P. V. Sukhatme. *Food and Agricultural Organization, Rome, Italy.* 491 pages. 1954. \$6.00.

Statistics and Mathematics in Biology. By Oscar Kempthorne *et al.* *Iowa State College Press, Ames.* 640 pages. 1954. \$6.75.

The Schooling of the Western Horse. By John Richard Young. *University of Oklahoma Press, Norman.* 376 pages. 1954. \$4.95.

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