A method of measuring the comparative general level of management for farm operators on the Jocko Valley Division of the Flathead Irrigation Project
by Carl Edmund Olson

A thesis submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of MASTER GF SCIENCE in Agricultural Economics
Montana State University

Abstract:
This study is an attempt to test the significance of differences in the level of management as this is represented by differences in crop yields.

Yield is made up of several inputs including management as defined here, soil and weather conditions. By subtracting out the effects of soil characteristics and weather conditions on yield, variations in the residuals can be attributed to variations in the management input.

The data used for analysis in this study were taken from records of the Jocko Valley Division of the Flathead Indian Reservation Irrigation Project. This irrigation division was used for several reasons? (1) there is a recent soil survey available that is essential for the soil indexing method used; (2) this division of the irrigation project covers a small geographic area, which is necessary to minimize differences in weather between tracts of land; (3) there is a large number of Indian operators as well as non-Indian operators, which also permits cross-cultural comparisons in testing the method statistically; and (4) a high percentage of the cropland is in alfalfa hay, giving a crop that is grown under all or most of the levels of management present in the area.

The method is based oh the removal of the weather influence through sampling, and removing the influence of variations in soil by use of the Storie Soil Index.

Each of the physical characteristics of the soil are given an index value on the basis of an "ideal" soil. These values are then used to obtain a productivity index value for the soil itself. From these soil productivity indexes a productivity index for each tract (alfalfa field) in the sample is obtained. The productivity index is then used to subtract out the soil influence on yield, with the remainder representing the influence of the management input.

Using the indexed yields, statistical tests are made to determine whether this method reveals significant differences in the management input among, as well as within, different groups of operators.

The results of these tests show that the method developed to determine an operator’s comparative level of management does, in fact, reveal significant differences within as well as between the groups studied.

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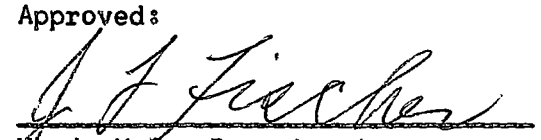

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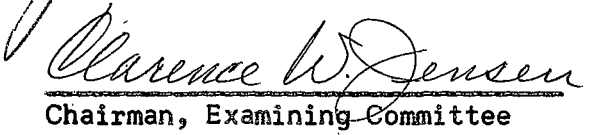

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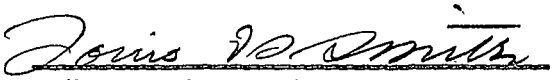

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Any errors or omissions in this study are the responsibility of the author.

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PART I

INTRODUCTION

Problem Situation

The level of managerial input of the individual farm operation is important in farm budget analysis. The budget tells the operator which of the enterprises considered are best suited for his particular operation and thus enables him to attain his goal more efficiently. Budgeting, as presently used, sets the level of management by specifying what practices are needed to attain a certain level of production. If the level of management input can be related to yields obtained with some degree of confidence, it will be possible to make better budget estimates for the individual farm operator.

Farm management, or management as used in farm budget analysis, may basically be defined as "the ways and means of organizing land, labor and capital and the application of technical knowledge and skills in order that the farm may yield the maximum net return" consistent with the goals of the family farm.[1/] In most farm management research the level of management is assumed constant. The assumption has been justified and explained in several ways. Johnson[2/] gives two cases in support of this assumption.

1/ C. W. Forster, Farm Organization and Management, New York, Prentice-Hall, Inc., 1946, p. 27.

2/ Glenn L. Johnson, "Problems in Studying Resource Productivity and Size of Business Arising From Managerial Process," Resource Productivity, Returns to Scale, and Farm Size, Edited by Earl O. Heady, Glenn L. Johnson and Lowell S. Hardin, Ames, Iowa, Iowa State College Press, 1956, pp. 16-23.

First, the sample used in the study may be drawn in such a manner that only one level of management is present. In the second case the sample is drawn in such a manner that the managerial input is normally and randomly distributed and the input will "average out" to some uniform level.[3] This "average" level of management is then used to represent all management used in the study. In both cases it is recognized that the management input varies, but great care is taken to hold it constant.

Tramel and Hildreth[4] have a different reason for assuming the level of management to be approximately the same for different farm operators. This is attributed to better education of farm operators. Also, more effective dissemination of agricultural information has increased the extent to which new farming practices are adopted. They argue that this has helped reduce variation in management.[5]

In the case presented by Tramel and Hildreth for assuming management constant, it would appear that the managerial ability of an individual would greatly influence the rate at which he will adopt new technologies. Higher managerial ability should result in higher output (or yield). If this is the case, then there would appear to be a direct relationship between yield and management input.

3/ Ibid., pp. 20-21.

4/ Thomas E. Tramel and R. J. Hildreth, "Relative Role of Survey and Experiment in Farm Management," Journal of Farm Economics, Vol. XXXIX, No. 5, December, 1957, pp. 1445-1451.

5/ Ibid., p. 1451.

In these systems of dealing with the management input, this input is held constant and not included as a variable. If management is not a variable in the production process, why then are there variations in yield on adjoining farms with similar soil, weather and climatic conditions?

Production theory tells us that management is one of the four factors of production. These four factors are land, labor, capital and management. In the actual budgeting process land, labor and capital are used as variables for the enterprises considered. This is reasonable as these factors can be shifted from one enterprise to another without too much difficulty. Management is handled differently. In actual budgeting the management input is assumed constant between enterprises as well as between farm operations. This does not seem reasonable. The idea that there is no managerial difference between farmers is wrong;[6/] there are differences. If one can determine the degree to which managerial ability does vary, he will be better able to estimate the general level of management of a particular operator and its effect on yield.

Research Problem

If management is to be included as an input in the production process, how much does it contribute to the level of yield attained?

Management, as it will be used in this study, is defined not only as the ability to combine inputs, but also the ability to obtain and control

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6/ Don Kanel, "Discussion: Relative Roles of Survey and Experiment in Farm Management Research," Journal of Farm Economics, Vol. XXXIX, No. 5, December, 1957, pp. 1451-1454.

inputs. The ability to obtain and control inputs reflects not only the wealth, income and credit position of an individual operator, but also the constraints which may be imposed on him by his education, his culture, and the area in which he lives.

Since management is constrained by both institutions and learning, it is suspected that there may be variations in the general level of management within as well as between different cultural groups. This study is to determine whether there are measurable differences and whether the adapted methods are sufficient to reveal these differences in a meaningful way.

Yield is influenced by three main inputs: management, soil characteristics and weather conditions. By "netting out" the effects of soil and weather on yield, the residual yield can be attributed to the management input. Included in the management input are such things as type of seed used, rate of seeding, use of fertilizers, use of proper machines in the proper manner and timeliness of the operation.

Hypotheses

This study will be conducted under two general hypotheses relating to the measurability of management. They are, (1) there are measurable differences in the levels of management between individuals in a cultural or tenure group, and (2) there are measurable differences in the level of management between cultural and tenure groups as a whole. Thus, if the levels of management are significantly different, these hypotheses will not be rejected by the statistical tests to be used.

Objectives

There are two objectives of this study. First, an attempt will be made to develop a method for measuring comparatively the general level of management of different groups (both cultural and tenure) of farm operators in a given area. Second, this will be an attempt to determine whether such a method can produce estimates that will be of use in establishing levels of yields for different operators in farm budgeting.

PART II

DEVELOPMENT OF THE METHOD

Sampling

For this study an area is needed in which there are different cultural groups of farmers, such as Indian and non-Indian farmers, and different tenure positions of the operators. The area to be considered should have a crop which is grown on most farms. Also, a reasonably accurate soil survey is needed of the area.

The first condition suggests going to an Indian reservation where Indians are actively engaged in farming. Records and past experience indicate that the Indian farmer is not as good a manager as the non-Indian operator in the same area, in keeping with the definition of management used in this study, or he is using less productive land or a combination of the two. In reviewing data from the various Indian reservation projects in Montana, it was found that there are very few Indians actively farming on these projects. Of the divisions of the Flathead Indian Reservation Irrigation Project, the Jocko Valley Division has the greatest number of Indian operators.

The preliminary survey of the 1961 crop reports shows 43 tracts with irrigated alfalfa farmed by Indians in the Jocko Valley Division. This compares with 23 in the Mission Valley Division and only a handful in the Camas Division. The Jocko Valley Division crop report shows 125 tracts of irrigated alfalfa farmed by non-Indian operators. Of the 125 tracts,

32 are farmed by renters and 93 are farmed by owner operators. This Division appears to be the most acceptable in terms of relative size of the sample available from each of the cultural and tenure groups. Having sufficient samples from the different cultural groups, among which there are suspected differences in management input, it is necessary to see whether the method to be used is sufficient to reveal these differences.

In keeping with the objective of measuring management by using relative yields, the yield of only one crop should be used. This crop should be one that is of major importance and reflects in its yield the management input. For these reasons alfalfa hay was selected to be the crop used in this study. Approximately 35 percent of all the irrigated crop land in the Jocko Valley Division is in alfalfa (Table I), indicating that it is a major crop and that it should demonstrate the range of management levels present. Other divisions of the Flathead Indian Reservation Irrigation Project have approximately the same percentage of irrigated alfalfa, but there are not sufficient Indian operators to make the necessary statistical tests.

The method to be developed requires a soil indexing method to eliminate soil variation. Most of the Indian reservations have had soil surveys made by the United States Department of Agriculture or the Bureau of Indian Affairs or, in some cases, both organizations. The Jocko Valley Division has such a survey. The original survey was made in 1929 by the United States Department of Agriculture and a revision or second survey was made in the late 1950's by the Bureau of Indian Affairs.

TABLE I. USE OF CROPLAND IN FLATHEAD IRRIGATION PROJECT DIVISIONS, 1960*

Item	Jocko Valley		Camas		Mission Valley		Total Project	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Forage								
Alfalfa	3636.1	35.41	3734.8	35.59	22168.6	25.99	29539.5	27.85
Grass Hay	1355.4	13.20			5484.1	6.43	6839.5	6.45
Annual Pasture	3889.0	37.87	3115.1	29.69	31874.9	37.37	38879.0	36.66
Silage	25.0	0.24	5.0	0.05	358.9	0.43	388.9	0.37
Other Forage	152.8	1.49	2868.5	27.34	8498.8	9.96	11520.1	10.86
Total	9058.3	88.21	9723.4	92.67	68385.3	80.18	87167.0	82.19
Grains								
Barley	359.0	3.50	368.4	3.51	5296.0	6.21	6023.4	5.68
Oats	296.0	2.88	175.4	1.67	4286.6	5.03	4758.0	4.48
Wheat	71.5	0.70	152.5	1.45	5176.7	6.07	5400.7	5.09
Other					46.0	0.05	46.0	0.04
Total	726.5	7.08	696.3	6.63	14805.3	17.36	16228.1	15.29
Other Uses								
Fruits	5.7	0.06			110.4	0.13	116.1	0.11
Garden	41.9	0.41	1.2	0.01	138.0	0.16	181.1	0.17
Potatoes					794.4	0.93	794.4	0.75
Sugar Beets	32.5	0.32			491.8	0.58	524.3	0.49
Seed Crops								
Soil Bank	282.3	2.75	65.2	0.62	411.1	0.47	758.6	0.72
Misc.								
Irrigated, not cropped	120.4	1.17	7.0	0.07	166.5	0.19	293.9	0.28
Total	482.8	4.71	77.4	0.70	2112.2	2.46	2668.4	2.52
Total	10267.6	100.00	10493.1	100.00	85302.8	100.00	106063.8	100.00

*From Agency Crop Report