



An investigation of factors affecting the comparative general level of management for farm operators on the Jocko Valley Division of the Flathead Irrigation Project as measured by indexed alfalfa yields by John George Zurenko

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

This study is a continuation of a previous study which revealed that there were measurable differences in levels of management among and within cultural and tenure groups. The criterion for measuring management was indexed alfalfa yields, The inputs which make up yield, in addition to management, are soil and weather conditions. To ensure the validity of yield as a criterion for measuring management, the effects of soil and weather conditions had to be eliminated., The influence of weather was removed through sampling from a small geographic area. Variations in soil were removed through a soil indexing procedure.

The sample for the study was taken from the Jocko Valley Division of the Flathead Indian Reservation Irrigation Project. This irrigation division was chosen for several reasons: (1) the small geographic area covered by the division; (2) there is a recent soil survey available that is essential for the soil indexing method used; (3) there is a high percentage of cropland in alfalfa; and (4) the number of Indian and non-Indian operators in this area was large enough to permit the use of the statistics necessary to make the desired comparisons.

The sample was divided by thirds into three yield groups.

It was found that there were differences in indexed alfalfa yields among (1) Indian operators in the low, medium and high yield group's, (2) non-Indian owner-operators' in the low, medium and high yield groups, (3) non-Indian renters in the low, medium and high yield groups, (4) all non-Indian operators in the low, medium and high yield groups and (5) Indian and all non-Indian operators. There should be some identifiable factors which contribute to variation in indexed alfalfa yields. This study is an attempt to identify these factors and detect any differences in their utilization among the above designated groups.

Indexed alfalfa yields were found to vary directly with the amount of fertilizer applied per application, amount of fertilizer applied over the life of the stand and the number of years the tract has been farmed by the present operator. Indexed yields were found to vary inversely with percentage bloom at time of cutting. Broadcasting as opposed to drilling alfalfa seed, and the application of fertilizer resulted in higher indexed alfalfa yields. Tracts on which the stand was cut twice per season had higher indexed alfalfa yields than those with one cutting. The groups with significantly different levels of management differed in their utilization of one or more of these factors.

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

## TABLE OF CONTENTS

	<u>Page</u>
VITA. . . . .	i
ACKNOWLEDGMENTS . . . . .	ii
TABLE OF CONTENTS . . . . .	iii
LIST OF TABLES. . . . .	v
ABSTRACT. . . . .	ix
GLOSSARY OF TERMS . . . . .	x
CHAPTER I. INTRODUCTION. . . . .	1
The General Problem Setting. . . . .	1
The Problem Situation. . . . .	2
The Research Problem . . . . .	3
The Hypothesis. . . . .	4
CHAPTER II. SAMPLING PROCEDURE . . . . .	5
Type of Sample Unit Desired. . . . .	5
Size of Sample Unit. . . . .	6
Age of Stand. . . . .	7
Source of Data . . . . .	7
Indexed Yield of Tract . . . . .	8
Sample Size. . . . .	11
CHAPTER III. IDENTIFICATION OF FACTORS SIGNIFICANTLY INFLUENCING YIELDS. . . . .	14
Quantitative Continuous Data . . . . .	14
The Linear Regression Model . . . . .	14
Statistical Analysis. . . . .	16
Quantitative Discrete and Qualitative Data . . . . .	20
The Model for Analysis of Variance .. . . .	20
Statistical Analysis. . . . .	21
CHAPTER IV. STATISTICAL TESTS FOR DIFFERENCES IN FACTOR UTILIZATION AMONG MANAGEMENT LEVEL GROUPS. . . . .	28
Description of Tests Used for each Type of Data. . . . .	28
Quantitative Continuous Data. . . . .	28
Quantitative Discrete and Qualitative Data. . . . .	29
Tests for Differences in Factor Utilization Among Indian Operators in the Low, Medium & High Yield Groups. . . . .	30
Quantitative Continuous Data . . . . .	30
Quantitative Discrete and Qualitative Data. . . . .	32

TABLE OF CONTENTS  
(Cont.)

	<u>Page</u>
Tests for Differences in Factor Utilization Among Non-Indian Owner-Operators in the Low, Medium and High Yield Groups. . . . .	32
Quantitative Continuous Data. . . . .	32
Quantitative Discrete and Qualitative Data. . . . .	32
Tests for Differences in Factor Utilization Among Non-Indian Renters in the Low, Medium and High Yield Groups. . . . .	36
Quantitative Continuous Data. . . . .	36
Quantitative Discrete and Qualitative Data. . . . .	37
Tests for Differences in Factor Utilization Among All Non-Indian Operators in the Low, Medium and High Yield Groups. . . . .	38
Quantitative Continuous Data. . . . .	38
Quantitative Discrete and Qualitative Data. . . . .	38
Tests for Differences in Factor Utilization Among All Non-Indian and Indian Operators. . . . .	38
Quantitative Continuous Data. . . . .	38
Quantitative Discrete and Qualitative Data. . . . .	41
CHAPTER V. SUMMARY AND CONCLUSIONS. . . . .	44
APPENDICES. . . . .	50
LITERATURE CITED. . . . .	69

## LIST OF TABLES

<u>Number</u>		<u>Page</u>
I	SOIL TYPES AND INDEXING OF THE SOILS IN THE JOCKO VALLEY DIVISION OF THE FLATHEAD IRRIGATION PROJECT. . . . .	9
II	OPERATOR CLASSIFICATION, ACTUAL YIELD, SOIL PRODUCTIVITY INDEX AND INDEXED YIELD OF EACH TRACT IN SAMPLE. . . . .	12
III	SAMPLE SIZE ARRANGED BY CULTURAL AND TENURE GROUP .	13
IV	QUANTITATIVE CONTINUOUS DATA. F TEST OF THE HYPOTHESIS THAT FACTOR VARIATION DOES NOT CONTRIBUTE TO VARIATION IN INDEXED ALFALFA YIELDS. . . . .	17
V	QUANTITATIVE DISCRETE AND QUALITATIVE DATA. F TEST OF THE HYPOTHESIS OF NO DIFFERENCES AMONG TREATMENT MEANS. . . . .	23
VI	QUANTITATIVE CONTINUOUS DATA. F TEST OF THE HYPOTHESIS OF NO DIFFERENCES IN THE MEAN LEVEL OF FACTOR UTILIZATION AMONG INDIAN OPERATORS IN THE LOW, MEDIUM AND HIGH YIELD GROUPS. . . . .	30
VII	DUNCAN'S TEST FOR LOCATION OF SIGNIFICANT DIFFERENCES IN MEAN LEVEL OF FACTOR UTILIZATION AMONG INDIAN OPERATORS IN THE LOW, MEDIUM AND HIGH YIELD GROUPS. . . . .	31
VIII	QUANTITATIVE DISCRETE AND QUALITATIVE DATA. TESTS OF THE HYPOTHESIS THAT THE RATIO OF NUMBERS OF OPERATORS IN EACH FACTOR CATEGORY IS THE SAME FOR INDIAN OPERATORS IN THE LOW, MEDIUM AND HIGH YIELD GROUPS. . . . .	33
IX	QUANTITATIVE CONTINUOUS DATA. F TEST OF THE HYPOTHESIS OF NO DIFFERENCES IN THE MEAN LEVEL OF FACTOR UTILIZATION AMONG NON-INDIAN OWNER-OPERATORS IN THE LOW, MEDIUM AND HIGH YIELD GROUPS. . . . .	34
X	DUNCAN'S TEST FOR LOCATION OF SIGNIFICANT DIFFERENCES IN MEAN LEVEL OF FACTOR UTILIZATION AMONG NON-INDIAN OWNER-OPERATORS IN THE LOW, MEDIUM AND HIGH YIELD GROUPS. . . . .	34

LIST OF TABLES  
(Cont.)

Number		<u>Page</u>
XI	QUANTITATIVE DISCRETE AND QUALITATIVE DATA. TESTS OF THE HYPOTHESIS THAT THE RATIO OF NUMBERS OF OPERATORS IN EACH FACTOR CATEGORY IS THE SAME FOR NON-INDIAN OPERATORS IN THE LOW, MEDIUM AND HIGH YIELD GROUPS. . . . .	35
XII	QUANTITATIVE CONTINUOUS DATA. F TEST OF THE HYPOTHESIS OF NO DIFFERENCES IN THE MEAN LEVEL OF FACTOR UTILIZATION AMONG NON-INDIAN RENTERS IN THE LOW, MEDIUM AND HIGH YIELD GROUPS. . . . .	36
XIII	QUANTITATIVE DISCRETE AND QUALITATIVE DATA. TESTS OF THE HYPOTHESIS THAT THE RATIO OF NUMBERS OF OPERATORS IN EACH FACTOR CATEGORY IS THE SAME FOR NON-INDIAN RENTERS IN THE LOW, MEDIUM AND HIGH YIELD GROUPS . . . . .	37
XIV	QUANTITATIVE CONTINUOUS DATA. F TEST OF THE HYPOTHESIS OF NO DIFFERENCES IN THE MEAN LEVEL OF FACTOR UTILIZATION AMONG ALL NON-INDIAN OPERATORS IN THE LOW, MEDIUM AND HIGH YIELD GROUPS. . . . .	39
XV	DUNCAN'S TEST FOR LOCATION OF SIGNIFICANT DIFFERENCES IN MEAN LEVEL OF FACTOR UTILIZATION AMONG ALL NON-INDIAN OPERATORS IN THE LOW, MEDIUM AND HIGH YIELD GROUPS. . . . .	39
XVI	QUANTITATIVE DISCRETE AND QUALITATIVE DATA. TESTS OF THE HYPOTHESIS THAT THE RATIO OF NUMBERS OF OPERATORS IN EACH FACTOR CATEGORY IS THE SAME FOR ALL NON-INDIAN OPERATORS IN THE LOW, MEDIUM AND HIGH YIELD GROUPS. . . . .	40
XVII	QUANTITATIVE CONTINUOUS DATA. F TEST OF THE HYPOTHESIS OF NO DIFFERENCES IN THE MEAN LEVEL OF FACTOR UTILIZATION AMONG ALL NON-INDIAN AND INDIAN OPERATORS. . . . .	41
XVIII	QUANTITATIVE DISCRETE AND QUALITATIVE DATA. TESTS OF THE HYPOTHESIS THAT THE RATIO OF NUMBERS OF OPERATORS IN EACH FACTOR CATEGORY IS THE SAME FOR INDIAN AND ALL NON-INDIAN OPERATORS. . . . .	42

LIST OF TABLES  
(Cont.)

<u>Number</u>		<u>Page</u>
XIX	SUMMARY OF FACTORS SHOWING DIFFERENT RATES OF UTILIZATION AMONG THE MANAGEMENT LEVEL GROUPS. . . .	43



## ABSTRACT

This study is a continuation of a previous study which revealed that there were measurable differences in levels of management among and within cultural and tenure groups. The criterion for measuring management was indexed alfalfa yields. The inputs which make up yield, in addition to management, are soil and weather conditions. To ensure the validity of yield as a criterion for measuring management, the effects of soil and weather conditions had to be eliminated. The influence of weather was removed through sampling from a small geographic area. Variations in soil were removed through a soil indexing procedure.

The sample for the study was taken from the Jocko Valley Division of the Flathead Indian Reservation Irrigation Project. This irrigation division was chosen for several reasons: (1) the small geographic area covered by the division; (2) there is a recent soil survey available that is essential for the soil indexing method used; (3) there is a high percentage of cropland in alfalfa; and (4) the number of Indian and non-Indian operators in this area was large enough to permit the use of the statistics necessary to make the desired comparisons.

The sample was divided by thirds into three yield groups. It was found that there were differences in indexed alfalfa yields among (1) Indian operators in the low, medium and high yield groups, (2) non-Indian owner-operators in the low, medium and high yield groups, (3) non-Indian renters in the low, medium and high yield groups, (4) all non-Indian operators in the low, medium and high yield groups and (5) Indian and all non-Indian operators. There should be some identifiable factors which contribute to variation in indexed alfalfa yields. This study is an attempt to identify these factors and detect any differences in their utilization among the above designated groups.

Indexed alfalfa yields were found to vary directly with the amount of fertilizer applied per application, amount of fertilizer applied over the life of the stand and the number of years the tract has been farmed by the present operator. Indexed yields were found to vary inversely with percentage bloom at time of cutting. Broadcasting as opposed to drilling alfalfa seed, and the application of fertilizer resulted in higher indexed alfalfa yields. Tracts on which the stand was cut twice per season had higher indexed alfalfa yields than those with one cutting. The groups with significantly different levels of management differed in their utilization of one or more of these factors.

## A GLOSSARY OF TERMS

To establish a common frame of reference for the study, the following terms are defined:

1. A factor is defined to be one of the elements that either directly or indirectly contributes to variations in yields.
2. The codings I, nIoo, nIr, and all nI refer to Indian operators, non-Indian owner-operators, non-Indian renters and all non-Indian operators respectively.
3. The codings IL, IM, and IH refer to Indian operators in the low, medium and high yield groups respectively.
4. The codings nIooL, nIooM, and nIooH refer to non-Indian operators in the low, medium and high yield groups respectively.
5. The codings nIrL, nIrM, and nIrH refer to non-Indian renters in the low, medium and high yield groups respectively.
6. The codings all nIL, all nIM, and all nIH refer to all non-Indian operators in the low, medium and high yield groups respectively.
7. Quantitative continuous data are composed of observations which lend themselves to numerical measurement and for which all values are observable on a continuous scale.
8. Quantitative discrete data are composed of observations which lend themselves to numerical measurement and for which the possible values are not observable on a continuous scale.
9. Qualitative data are composed of observations belonging to one of several, non-numerical mutually exclusive categories.

## INTRODUCTION

### The General Problem Setting

Land, labor, capital, and management are generally recognized as the four factors of production. In farm budget analysis the usual practice is to treat land, labor and capital as variable factors and the level of management as a constant factor.

Not all would agree that the level of management should be treated as a constant. A recent Montana study was conducted to ascertain the existence or non-existence of measurable differences in levels of management between farm operators. 1/

That study defined management as,

"not only the ability to combine inputs, but also the ability to obtain and control inputs. The ability to obtain and control inputs reflects not only the wealth, income and credit position of the individual operator, but also the constraints which may be imposed on him by his education, his culture, and the area in which he lives." 2/

Thus, in accordance with the above definition, management may be influenced by both learning and institutions. Since management is influenced by both institutions and learning, there is reason to believe that variations in the general level of

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1/ Carl Edmund Olsen, "A Method of Measuring the Comparative General Level of Management for Farm Operators on the Jocko Valley Division of the Flathead Irrigation Project." Unpublished Master's Thesis, Department of Agricultural Economics and Rural Sociology, Montana State University, 1963, pp. 3-4.

2/ Ibid.

management may exist within as well as between various cultural and tenure groups.

Olsen's study was conducted under the assumption that significant differences in levels of management existed among and within cultural and tenure groups. The criterion for measuring the level of management was indexed alfalfa yields. Based on this criterion, he found that there were differences in levels of management within groups designated as Indian operators, non-Indian owner-operators, non-Indian renters and all non-Indian operators. It was also found that all non-Indian operators had a level of management higher than Indian operators.

#### The Problem Situation

If there are variations in indexed alfalfa yields among and within cultural and tenure groups, then there should be some identifiable factors contributing to these variations. Groups with different levels of management should have dissimilar utilization of some of these factors.

Since emphasis is on levels of management among and within cultural and tenure groups there is a need to have these factors identified in order to determine the responsibility of management. That is, if a factor is utilized in a particular manner by a group, could the operators in this group have

increased indexed yields by varying their use of this factor. Or were circumstances or the nature of the factor such that method and rate of utilization were beyond the control of the operator. If the latter is true, then significant differences in indexed yields among and within cultural and tenure groups may not be truly indicative of differences in levels of management among these groups.

#### The Research Problem

The purpose of this study is to identify those factors causing variations in indexed alfalfa yields relative to the role they play as indices of the general level of management of farm operators in the designated groups.

A factor which has a direct influence on yields should differ in its utilization among groups with significant differences in levels of management measured in these same yields. Thus the research problem resolves itself into two parts. The first is the identification of factors causing variations in indexed alfalfa yields. The second is a check to determine whether the management level groups, measured in indexed alfalfa yields, actually differed in their utilization of these factors.

### The Hypothesis

This study proceeds under two general hypothesis:

1. Factors having a significant influence on indexed alfalfa yields can be identified.
2. Those level of management groups differing in their utilization of these factors can be identified.

## CHAPTER II

### Sampling Procedure

This study is an extension of the previous study by Olsen. The operators composing that sample were interviewed in order to collect the data from which the factors suspected of causing variations in indexed yields could be examined. A condensation of the sampling procedure follows. A somewhat more detailed exposition may be found in the initial study. <sup>3/</sup> That study was the initial phase of the project. This study encompasses the second and final phase.

#### Type of Sample Unit Desired

In order for alfalfa yields to function as instruments for measuring levels of management, an area meeting certain specific conditions had to be chosen. The area chosen was the Jocko Valley Division of the Flathead Indian Reservation Project. The conditions which are found in the Jocko Valley and which meet the requirements of the study are outlined as follows:

1. The cultural and tenure groups studied (Indian owner-operators, non-Indian owner-operators and non-Indian renters) are actively engaged in farming in numbers sufficient to allow sampling for statistical purposes.

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<sup>3/</sup> Olsen, Ibid., pp. 6-18.

2. To ensure that only the influence of the management input was being measured, it was necessary that the following be removed:
  - (a) Soil variations. This was done by indexing yields. To index yields a soil indexing method is needed, which in turn requires a soil survey. The United States Department of Agriculture had performed a soil survey in the Jocko Valley in 1929 and revised it in the late 1950's.
  - (b) Weather variations. It was assumed that by confining the study to a small area the effect of weather variations on yields would be held to a minimum. The Jocko Valley encompasses a small geographic area.
3. Since management levels were measured by comparing indexed yields, a crop of major importance was required. In the Jocko Valley alfalfa accounts for 35 percent of all major cropland. It was assumed that indexed alfalfa yields would demonstrate the range of management levels present.
4. To calculate indexed yields it is necessary to have complete crop reports. These were available in the Jocko Valley Division.

#### Size of Sample Unit

A size limitation was imposed on both the maximum and minimum acreage of irrigated land that an operator could farm to be included in the sample. Size may be a function of management. But the level of management may also be a function of size, that is, a large unit may force the operator to reduce the intensity and variety of management practices. Olsen assumed that an operator could not handle over 320 irrigated acres and still do an adequate job of farming. It was also



felt that an operator with an irrigated acreage that is too small may tend to overlook the full potential of this resource and not devote to it the management effort warranted, particularly if this tract is only a part of the total operation. Consequently 60 irrigated acres were set for the minimum acreage an operator must farm in order to be included in the sample.

#### Age of Stand

The sample is composed of alfalfa stands with two or more years of maturity. There are two reasons for eliminating stands with less than two years of maturity. Some stands are seeded with a nurse crop. If the hay crop is harvested the yield will be reduced due to the nutrients removed from the soil by the nurse crop. Secondly, a first year alfalfa crop seeded without a nurse crop usually yields less than succeeding crops.

No restrictions were placed on the maximum age a stand could attain. Although it is recognized that the yield of an alfalfa stand will generally decrease after a period of years, this is a reflection of management level.

#### Source of Data

The data for this study, exclusive of that used in indexing yields, came from two sources. Raw yield data were obtained from the 1963 crop reports of the Flathead Irrigation Project

on the Flathead Indian Reservation. Data to be used in determining which factors caused variations in indexed alfalfa yields were obtained from interviews with the individual operators. A reproduction of the questionnaire used is shown in Appendix A.

### Indexed Yield of Tract

The derivation of indexed yields occurs in a three step process. These steps are outlined as follows:

1. Index Value of Soil. The first item required in order to index yields is an indexed value of a particular soil type. In the early 1940's the Agronomy Department, Montana Agricultural Experiment Station in cooperation with the Soil Survey Division of the Bureau of Plant Industry indexed the Jocko Valley Division of the Flathead Indian Reservation Irrigation Project using a technique developed by R. E. Storie, <sup>4/</sup> of California. The data for the study were obtained from the Plant and Soil Science Department of Montana State University. <sup>5/</sup> The soil types and soil indexing of the soils in the Jocko Valley Division of the Flathead Indian Reservation Irrigation Project are shown in Table I. In determining the index value of a particular soil, six factors are considered. The first three are referred to in Table I as factors A, B, and C. "Factor A" refers to the character of the physical profile, "Factor B" the surface texture, and

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<sup>4/</sup> R. Earl Storie, Revision of the Soil-Rating Chart, California Agricultural Experiment Station, Berkeley, California, December, 1959.

<sup>5/</sup> Taken from unpublished soil report, Department of Plant and Soil Science, Montana State University, Bozeman, Montana.









































































































































