



The effect of increasing farm size on land values
by John D Lawrence

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 concerned with farm land appraisals from the point of view of the prospective buyer who is already an established farm or ranch operator. The study is intended to furnish a method of answering the questions How much can a farmer or rancher afford to pay for land to be added to an existing unit? The underlying hypothesis of this study is that land purchased for incorporation with an existing unit is valued on the basis of the increment in net income that the additional land contributes to the income of the entire unit, rather than on the basis of -the net income that the added land might produce as a separate operating unit.

A general description of conventional land appraisal methods is presented, together with some analysis of the price influencing elements taken into account by the various methods. With the knowledge gained from a recent Montana survey and with the use of economic theory the inadequacies of price influencing elements contained in conventional appraisal methods and the inadequacy of accounting and measuring devices are explored. One of the major price influencing elements not usually accounted for in conventional methods is the "marginal demand price. The "marginal demand price" is defined as the difference between the price of additional land when appraised as a separate operating entity and the price of the same land when incorporated with an operating unit already in existence. Other elements that could influence price but were not accounted for by conventional -methods were; (1) current assets held by the prospective buyer, and (2) possible'savings to a prospective buyer, which could be considered earnings if alternative costs were considered.-, A land appraisal model that takes into account price influencing elements that aren't considered in the conventional land appraisal methods is presented. This model is a product of the knowledge gained from the survey and the analysis of the appraisal methods. This appraisal model adds the capitalized value of the existing unit to the capitalized value of the additional unit and subtracts the sum from the capitalized value of the combined unit which results in the obtaining of the marginal demand price. Adjustments are made for capitalized savings, terms of payment in view of the income tax structure, current assets held, and terms of finance. The adjustments listed plus other social and economic adjustments are added to the marginal demand-price and the capitalized value of the additional unit. This will be the total value of the additional unit.

The conclusions of this study are that one of the underlying causes of increased land values in a period of declining farm income and rising interest rates is the accounting of the marginal demand price. One important factor influencing the marginal demand price is the decreasing average operating costs per acre as the size of farm increases.

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by *30*

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TABLE OF CONTENTS

<u>Title</u>	<u>Page</u>
LIST OF ILLUSTRATIONS	ii
LIST OF TABLES	iii
ACKNOWLEDGMENT	iv
ABSTRACT	v
 PART I. INTRODUCTION	 1
The Problem Situation	1
The Research Problem and Limitations	5
The Research Problem	5
Limitations of the Problem	5
Objectives	6
Hypothesis	6
Procedure	7
 PART II. PRESENT LAND APPRAISING TECHNIQUES AND THEIR IMPORTANCE	 11
Formalized Land Appraising Techniques	11
The American Rural Appraisal System	13
Cost Per Animal Unit Method of Appraisal	17
Appraisal Methods Used by Land Buyers	24
Significance and Completeness of Current Appraisal Methods in View of Certain Aspects of Economic Theory . .	28
 PART III. AN IDEAL APPRAISAL SYSTEM	 38
An Ideal Appraisal Model For a Land Buyer Who Anticipates Adding Additional Land to Land He Currently Operates . . .	38
An Isolated Price Effect	48
 PART IV. SUMMARY AND CONCLUSIONS	 62
Summary	62
Conclusions	63
Further Research	64
 BIBLIOGRAPHY	 65

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LIST OF ILLUSTRATIONS

<u>Figures</u>		<u>Page</u>
1	Areas Where the Land Pricing Survey Was Conducted in the Summer of 1957	8
2	The American Rural Appraisal System	12
3	Short-run Average Cost Curve	30
4	Long-run Average Cost Curve	32
5	An Ideal Appraisal Model for a Land Buyer Who Anticipates Adding Land to Land That He Currently Owns	40

LIST OF TABLES

<u>Number</u>		<u>Page</u>
I	ALL FARM TRANSFERS: PERCENTAGE FOR FARM ENLARGEMENT, SELECTED MAJOR TYPES OF FARMING AREAS; 1949-1955	3
II	NUMBER OF TRANSFERS AND INTERVIEWS IN THE AREAS OF THE LAND PRICING SURVEY	9
III	BUDGET ANALYSIS DETERMINING THE VALUE OF REAL ESTATE CAPABLE OF SUPPORTING ONE ANIMAL UNIT PER YEAR	20
IV	TRANSLATION OF VALUES PER AU INTO CAPITAL VALUE AND LEASE VALUE PER GRAZING SEASON AND FEEDING SEASON	21
V	CAPITAL VALUE OR ANNUAL LEASE VALUE OF GRAZING LAND BY GRADE PER ACRE	21
VI	CONSIDERATIONS INFLUENCING THE PRICE BUYERS PAID FOR LAND IN MONTANA	27
VII	PRODUCTION COSTS OF A HYPOTHETICAL FIRM	30
VIII	INCOME AND EXPENSES FOR DIFFERENT SIZE FARMS IN AREA VI	52
IX	INCOME AND EXPENSES FOR DIFFERENT SIZE FARMS IN AREA III AND IV	53
X	PRODUCTION BUDGET FOR DIFFERENT AREAS RAISING WHEAT ONLY	55-56
XI	FIGURES NECESSARY FOR DETERMINING THE VALUE OF ADDI- TIONAL ACRES IN HYPOTHETICAL APPRAISAL USING THE IDEAL METHOD	59

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

ABSTRACT

This study is concerned with farm land appraisals from the point of view of the prospective buyer who is already an established farm or ranch operator. The study is intended to furnish a method of answering the question: How much can a farmer or rancher afford to pay for land to be added to an existing unit? The underlying hypothesis of this study is that land purchased for incorporation with an existing unit is valued on the basis of the increment in net income that the additional land contributes to the income of the entire unit, rather than on the basis of the net income that the added land might produce as a separate operating unit.

A general description of conventional land appraisal methods is presented, together with some analysis of the price influencing elements taken into account by the various methods. With the knowledge gained from a recent Montana survey and with the use of economic theory the inadequacies of price influencing elements contained in conventional appraisal methods and the inadequacy of accounting and measuring devices are explored. One of the major price influencing elements not usually accounted for in conventional methods is the "marginal demand price." The "marginal demand price" is defined as the difference between the price of additional land when appraised as a separate operating entity and the price of the same land when incorporated with an operating unit already in existence. Other elements that could influence price but were not accounted for by conventional methods were: (1) current assets held by the prospective buyer, and (2) possible savings to a prospective buyer, which could be considered earnings if alternative costs were considered.

A land appraisal model that takes into account price influencing elements that aren't considered in the conventional land appraisal methods is presented. This model is a product of the knowledge gained from the survey and the analysis of the appraisal methods. This appraisal model adds the capitalized value of the existing unit to the capitalized value of the additional unit and subtracts the sum from the capitalized value of the combined unit which results in the obtaining of the marginal demand price. Adjustments are made for capitalized savings, terms of payment in view of the income tax structure, current assets held, and terms of finance. The adjustments listed plus other social and economic adjustments are added to the marginal demand price and the capitalized value of the additional unit. This will be the total value of the additional unit.

The conclusions of this study are that one of the underlying causes of increased land values in a period of declining farm income and rising interest rates is the accounting of the marginal demand price. One important factor influencing the marginal demand price is the decreasing average operating costs per acre as the size of farm increases.

PART I

INTRODUCTION

The Problem Situation

The trend at the present time is toward larger farm units.^{1/} Larger farm units are generally accomplished in one of three ways. First, an operator may lease more land for increasing his unit size. Leasing can take several forms such as cash rent, crop share, or cow unit grazing permits. Secondly, the person that doesn't already operate land may simply purchase a unit of sufficient size to comply with the trend to larger farms, or make an aggregate of purchases where some purchases are of smaller than desired size. Precisely the same process of acquiring a larger farm unit applies to the person who has sold or relinquished his rights to a piece of land he previously operated. The third way to increase the size of a farm is by purchasing additional land.

Any land transfer that represents only a portion of land to be operated by the purchaser is of concern in this study. Apparently a somewhat different basis of valuation is followed for land to be added to an existing farm than for a complete farm unit. It appears that buyers often tend to value such land in terms of the additional net income possible from the entire farm if the additional land can be acquired.^{2/}

^{1/} John C. Bower, Maurice C. Taylor, and Mae F. True, Looking Ahead with Montana Farmers and Ranchers, Agricultural Experiment Station and Extension Service, Montana State College, Bozeman, Montana, Folder No. 47 Fall 1957, leaflet.

^{2/} United States Department of Agriculture, The Farm Real Estate Market, ARS, U. S. Government Printing Office, Washington, D. C., March 1955, p. 5.

A survey conducted in four counties of Montana covering the period January 1, 1956 to March 31, 1957 indicated that 90 percent of agricultural land transfers were consummated by purchasers who already operated farm or ranch lands. Dr. Layton S. Thompson in his bulletin Changing Aspects of the Farm Real Estate Situation stated that, "during the period 1940 to 1946, 85 percent of the tracts which changed ownership were purchased by people who already operated land."^{1/} This does not mean that all these transfers were for farm enlargements. Looking at the national scene and considering all types of farm lands used for many different purposes, the percentage of transfers for farm enlargement is somewhat smaller. Table I, indicates that in 1954, 32 percent of the land transfers that occurred were for farm enlargement.^{2/} This still suggests that a significant number of transfers are for farm enlargements.

How the buyers who were interviewed in the 1957 survey arrived at the prices they paid for the land they purchased was not always clear. However, several rational processes were indicated. Derivations and combinations of capitalization of income, comparisons and reproduction cost methods were noted. Various bargaining techniques were observed which would presumably reflect supply and demand relationships. But, seldom would an interviewee state that he had taken into account the

^{1/} Layton S. Thompson, Changing Aspects of the Farm Real Estate Situation in Montana, 1940 to 1946, Montana Agricultural Experiment Station, Bozeman, Montana, Bull. 440, January 1947, p. 19.

^{2/} United States Department of Agriculture, op.cit., July 1955, p 14.

TABLE 1. ALL FARM TRANSFERS: PERCENTAGE FOR FARM ENLARGEMENT, SELECTED MAJOR TYPE OF FARMING AREAS, 1949-1955.^{a/}

Type of farming area	Average 1949-1955	1952	1953	1954	1955
	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Eastern Dairy	12	15	16	16	15
General Farming	18	21	19	18	21
Eastern Corn Belt	25	30	33	33	40
Western Corn Belt	26	26	30	31	34
Wheat Areas (Eastern)	46	48	49	50	57
Burley Tobacco	11	20	20	19	29
Western Cotton	26	32	30	32	37
Western Range Livestock	29	32	32	36	37
United States	23	26	28	29	32

^{a/} Source: United States Department of Agriculture, op.cit., July 1955, p. 14. Of all the land transfers that occurred in the several areas the percent that represents farm enlargements is indicated.

increased value to the property he already owned by adding additional land, even when it was apparent to the purchaser and when it was the main reason he divulged that he was in the market for land to begin with. Perhaps the reason this effect is not taken into account (or, at any rate, not quantified by the purchaser) when figuring the purchase price is because the marginal value is very difficult to measure. People must be aware of an increase or decrease in value of land they own by adding additional land as it approaches or declines from an economic unit, but they do not know how to go about measuring the marginal effect. Nevertheless, present land values seem to indicate this effect is being taken into account.^{1/} Increasing land values in a period of declining farm income suggests some underlying forces, and one of these forces could be the accounting of a marginal effect.^{2/}

Some current appraisal methods tend to deal with a piece of land as if it were a complete unit by itself. Considering these appraisal methods from a seller's viewpoint they would be justifiable, especially if it is all the land that the seller operates. An appraisal of a piece of land that a prospective buyer has in mind should take into consideration all land that the buyer operates. In such a case it would lose its identity but would add or detract value to the land of the prospective buyer already operates, and similarly the other land would be effecting its value.

^{1/} The Equitable Society, Farm Loan News, 261 Madison Ave., New York 16, New York, October-November 1955, p. 7.

^{2/} United States Department of Agriculture, op.cit., March 1955, p. 6.

In essence, it appears that present agricultural land appraising techniques do not include a calculated effect caused by economies of scale or land relationships, i.e. the effect on value of a piece of land due to adding additional land. This effect must be taken into account if a land buyer is to determine accurately how much he can offer or pay for a piece of land he desires to purchase.

The Research Problem and Limitations

The Research Problem

This study is concerned with the economic implications involved when a prospective land buyer, who already operates agricultural land, determines the price he can pay for an additional piece of land.

Limitations to the Problem

There are a host of factors affecting value that enter into an appraisal method for a prospective buyer who already operates land. This study will be concerned with the possibility of just one value effect. In order to study just one value effect that has not been incorporated in formalized appraisal methods it becomes necessary to point out the following limitations: (1) insufficient primary data, (2) the numerous assumptions necessary to build up an ideal model for appraising land, (3) the restraints imposed by holding all variables constant except one in attempting to approximate actual market values and (4) inadequacies in secondary data.

Objectives

The main objective of this study is to show that there is an additional factor affecting value of land that must be taken into account by a prospective land buyer, who already operates land. To achieve the main objective, the following minor objectives will also have to be attained:

1. To describe the factors affecting land values that are considered in current approved appraisal methods and by free-lance buyers.^{1/}
2. To appraise the importance and completeness of the elements that compose the current methods of approved appraisers and free-lance buyers in view of certain implications of economic theory.
3. Construct an ideal model for appraising land from the buyers viewpoint.
4. Isolate the marginal demand price^{2/} effect caused by adding additional land.
5. Test the validity of the marginal demand price effect by using case studies.

Hypothesis

By incorporating a piece of land with other land a change in value will result because of changes in the scale of the unit which has an effect upon the net revenue. The change in value will be a positive relationship to economies of scale. A land buyer can benefit from estimates of marginal value as he attempts to determine the maximum price he

^{1/} Free-lance buyers refers to buyers who do not use the services of commercial appraisers.

^{2/} Marginal demand price is defined as the difference between the price of additional land when appraised as a separate operating entity and the price of the same land when incorporated with an operating unit already in existence.

can pay for additional units of land, and realize returns on investment comparable with other alternatives.

Procedure

In Part II a general description of land appraisal techniques will be presented to ascertain the value-influencing factors and elements that are currently considered in various land appraisal methods. This will entail the use of secondary as well as primary data.

The secondary material that will be used in this section will be utilized to present current appraisal methods that are employed. The following sources will be used: How Much Can a Cattleman Pay Per Animal Unit For a Cattle Ranch?, a paper presented by M. M. Kelso displaying a cost per animal unit method of land appraisal, and Rural Appraisals, by Crouse and Everett, presenting the American Rural Appraisal System.

The primary data were obtained from a land pricing survey in Montana covering the four counties indicated in Figure 1. This survey was conducted in the summer of 1957. All land transfers that reflected a reasonable market value during the period January 1, 1956 to March 31, 1957 were investigated. Buyers, sellers and bidders that still remained in the areas were interviewed. Table II shows the number of transfers consumated, the number of buyers interviewed and the number of sellers interviewed in each area. However, only the buyers' schedules will be used in this study. The sellers' schedules will be used only as a cross check for accuracy of information.

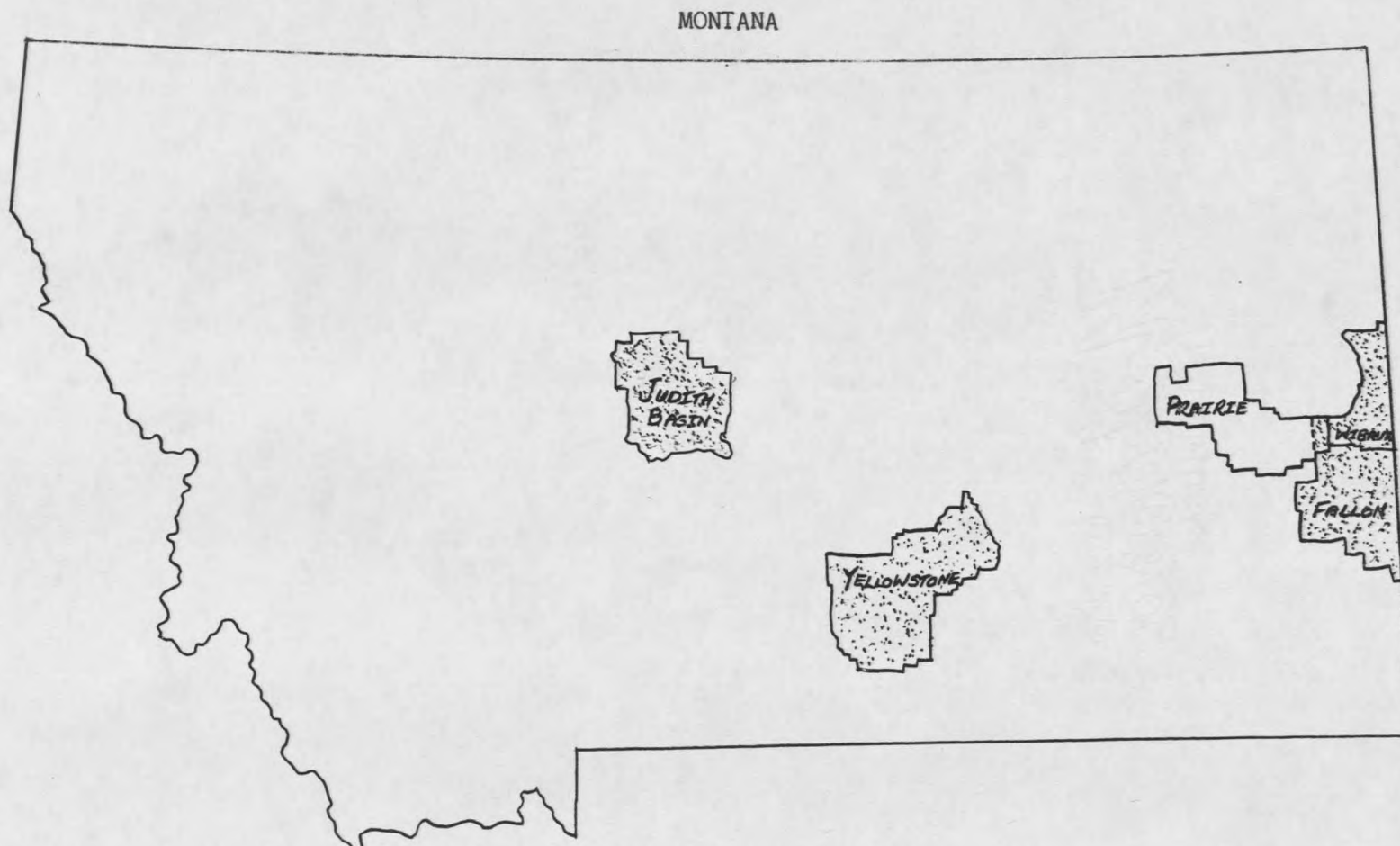


Figure 1. Areas Where the Land Pricing Survey Was Conducted in the Summer of 1957.

TABLE II. NUMBER OF TRANSFERS AND INTERVIEWS IN THE AREAS OF THE LAND PRICING SURVEY.

Item	Judith Basin County	Yellow- stone County	Eastern Prairie County	Wibaux County	Fallon County
Total number of transfers that reflected a reasonable value from January 1, 1956 to March 31, 1957	27	102	2	26	21
Number of buyers interviewed that remained in the area	16	55	1	17	13
Number of sellers interviewed that remained in the area	9	35	1	10	9

The completeness and importance of all price influencing factors will be appraised in view of certain aspects of economic theory. An analysis of the appraisal methods presented should bring out certain shortcomings in these methods.

Part III of the report will be the formulation of a model considered to be ideal for appraising land from the buyers viewpoint. After the formulation of the model it will become necessary to hold all the value influencing factors constant except the value effect factor caused by adding additional land. By allowing this factor to be the only variable the measure of its effect on value will be determined by appraising case studies in the following manner: (1) appraising the land for sale as a single unit, (2) appraising the land the prospective buyer currently operates by itself, (3) appraise both pieces of land as a combination, and (4) adding the two separate appraisals together and subtracting from

the combined appraisal to determine the difference. This difference will be the difference in value due to the land combination or the marginal demand price.

In the final section conclusions will be drawn concerning the validity of the tested value effect and the possibilities for further research in land appraisal.

PART II

PRESENT LAND APPRAISING TECHNIQUES AND THEIR IMPORTANCE

Formalized Land Appraising Techniques

There are a number of different methods of appraising land. Most of the appraisal methods over-lap and contain common elements. Some appraisal methods show only a slight resemblance to other methods; yet all appraisals are aimed at a value determination for some particular purpose. Regardless of the method of appraisal that a person chooses, it is imperative that he knows what kind of value it is that he is looking for.

The manner in which the American Rural Appraisal System looks upon the different kinds of value is shown in Figure 2.^{1/} Lands are appraised for investment value, tax value, condemnation value, loan value, normal agricultural value, liquidation value and fair market value. All of these stem from a basic value. Basic value is derived from earnings after certain adjustments.^{2/} Any factor that affects basic value should ultimately show up in the special values. It is for this reason that extreme care should be taken in determining basic value.

^{1/} Earl F. Crouse and Charles H. Everett, Rural Appraisals, Prentice Hall, Englewood Cliffs, New Jersey, January 1956, p. 263.

^{2/} Ibid., p. 263.

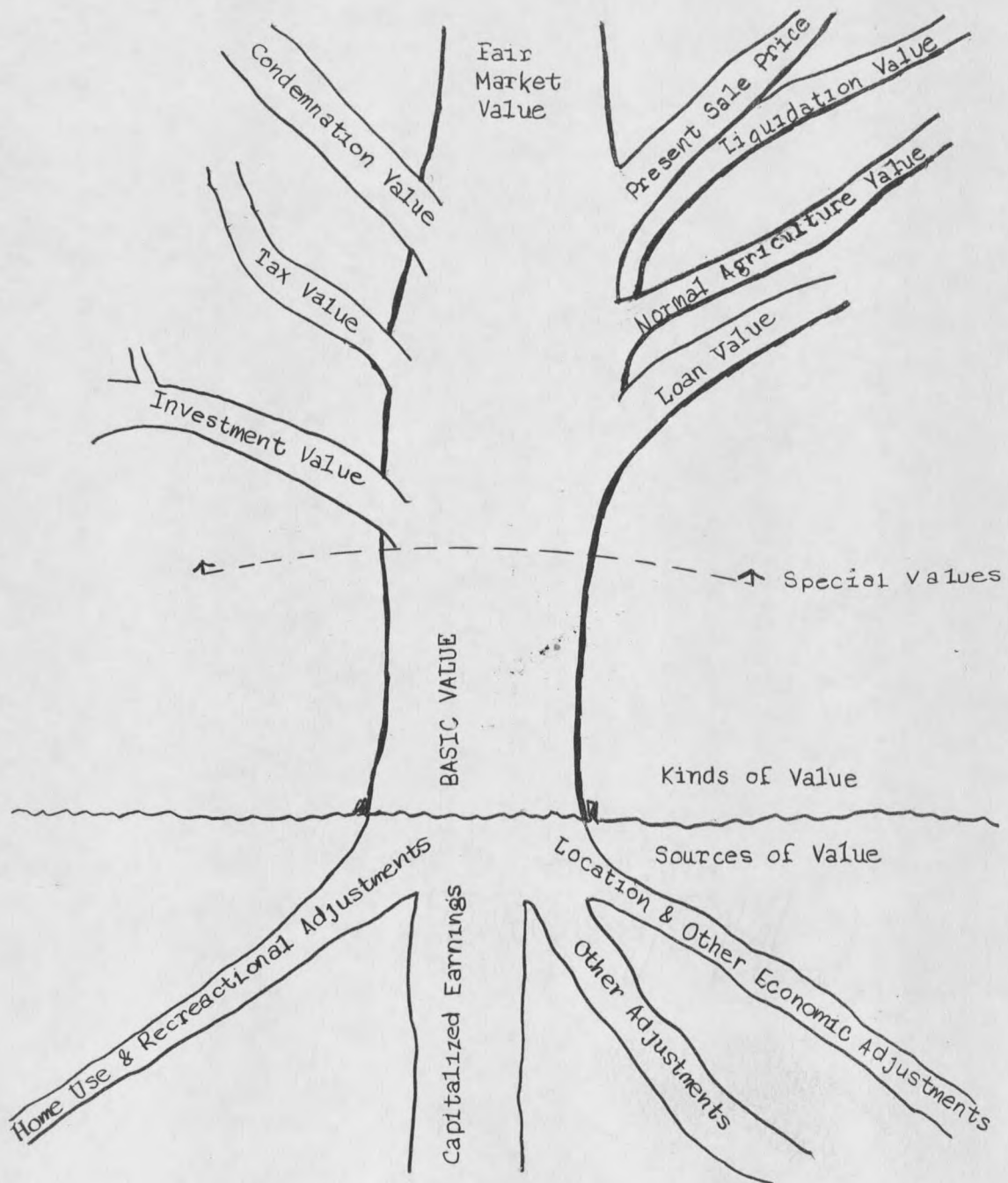


Figure 2. The American Rural Appraisal System. Basic Value is Derived from Earnings and Adjustments. Special Values Come Out of Basic Value.

Source: Earl F. Crouse and Charles H. Everett, op.cit., p. 263.

To examine the procedures in appraising land for all the special values is beyond the scope of this study. Instead "fair market value,"^{1/} particularly from the buyers viewpoint, will be the facet to which this study will be restricted. The intentional restriction of all the value affecting factors other than capitalization of income in determining "fair market value" does not invalidate their importance. Their importance. Their importance is not questioned and they are accepted as worthy constituents of an appraisal system. However, "fair market value" with capitalization of income as the only price influencing factor will be the area of study.

The appraisal of the significance and completeness of various appraisal methods in a following section will be done in terms of the income earning potential of a piece of land from a prospective buyer's viewpoint. In setting out these appraisal methods this area, again, will be all that will be considered.

The American Rural Appraisal System

The first appraisal method under consideration will be that method entitled the American Rural Appraisal System. The American Rural Appraisal System is based upon appraisal principles set forth by the American Society of Farm Managers and Rural Appraisers. Under this system an appraisal value is determined by a combination of the income

^{1/} "Fair market value" is the price at which a rural property may be expected to change hands from a willing, able, and informed seller to a desirous, able, and informed buyer within a reasonable time and with a substantial cash payment.

capitalization, comparison and reproduction cost methods. Income capitalization is looked upon as a direct and primary approach while comparison is an indirect approach. The use of both the income and capitalization comparison approaches are used in every appraisal, and one is not emphasized to the minimization or exclusion of the other. Reproduction cost is used primarily for analyzing the value of improvements.

The appraisal procedure of the American Rural Appraisal System is divided into two phases. First, an inventory of the resources is taken. Secondly, the resources are then converted to dollar value. "Similarly, estimated farm earnings are derived from (1) the physical productivity of the farm based on the inventory of its resources and (2) the economic value of the product based on expected commodity prices less anticipated expenses."^{1/}

In estimating future income and expenses under the capitalized earnings approach reliance is placed primarily on historical data. However, reasonable care should be taken that a typical period of income and expense is represented.

To derive capitalized value from earnings entails the process of calculating net income and dividing by an appropriate rate of interest. Net income is found by subtracting all farm costs from gross farm income. There are five steps the American Rural Appraisal System makes so that full consideration is given to all aspects of income and expense. This is not meant to imply that the following five steps listed are necessary

^{1/} Ibid., p. 370.

in every case, nor that the steps have to be considered in the sequence stated. Rather, they are steps that facilitate the determination of income and expense. When measuring the earnings of rural property the following five steps or kinds of data are considered: (1) the share of income to land, (2) productivity estimates, (3) cash rentals, (4) expenses and (5) commodity prices.

The share of income to land for the farm being appraised is what is used in capitalization. The net return figure is obtained by finding that income attributable to land after all operating and maintenance costs have been deducted. However, some difficulty can arise due to lack of records necessary for the calculation of income and expense. An alternative method of deriving net income is to consider a crop share rental basis that is typical for the locality. Another approach is to use data which may be available on operators' income and expense for farms similar to the farm being appraised.

Productivity estimates help the appraiser determine how past use of the land has affected fertility and what can be expected of the land in the future. Important points to be considered are: (a) cropping system, (b) what yields can be expected under typical operation, (c) trends in kinds of crops and (d) effects of government agricultural programs.

Cash rents not otherwise shown as income, should be considered when the farm is located in an area in which cash renting is common practice. Again, the typical rental rates for the area should be used. This procedure facilitates the separation of production between ownership and operation.

Expenses that are to be deducted from gross income are computed on an annual basis. The six major expenses to consider are: (a) general real estate taxes, (b) special taxes, (c) insurance premiums, (d) maintenance, (e) management and (f) other expenses which include: all those expenses which must be borne by the landlord under typical operation in order to obtain that portion of the crop assigned to him.

Commodity prices are worthy of careful consideration because of the important effect they have on net income. Prices vary as to time, geographical area, and production. Therefore, the following points must be considered: (a) time element -- trends are more important in this case than averages, (b) area element -- storage facilities and distance to market, (c) quality element and (d) the source of data -- e.g., from the government crop reporting service.

After the foregoing five steps have been completed the annual net income from land is determined from the data and is capitalized at an appropriate interest rate. The capitalization or interest rate is sometimes difficult to determine. However, it should be consistent throughout an area. The four factors that influence the rate of capitalization for a particular area are as follows: (a) money market -- general and regional; (b) risk -- physical and economic; (c) marketability, indicated by liquidity of investment in farms of the region; and (d) competition with other forms of investment.^{1/}

^{1/} Ibid., p. 382.

In summary, what has been done to determine the income earning potential of a piece of rural land as set out by the American Rural Appraisal System is as follows: first, a typical operating plan was determined; second, yields were estimated; third, production between ownership and operation were divided; fourth, probable prices for products sold were selected; and fifth, expenses were deducted. The net annual income was then divided by the appropriate interest rate which gave the earnings value to a particular piece of land.

After capitalized earnings have been determined under the American Rural Appraisal System comparative adjustments are made. Using the comparison approach for making adjustments such as home use, location and recreation is definitely an important part of an appraisal method. So is the reproduction cost approach valid in determining values of buildings as set out by the American Rural Appraisal System. However, these approaches, regardless of their importance, do not affect the marginal demand price for land. The marginal demand price for land, would be reflected solely in the income earnings section of the American Rural Appraisal System. For this reason the income earnings section as set forth will conclude the presentation of the American Rural Appraisal System.

Cost Per Animal Unit Method of Appraisal

A method by which livestock ranches could be appraised has been presented by Dr. M. M. Kelso in his paper, How Much Can a Cattleman Pay Per

AU For a Cattle Ranch?^{1/} This method of appraisal rests upon these basic ideas as stated by Dr. Kelso:

"1. It's put on a per AU basis so as to be applicable to ranches of a wide range of sizes. Within rather wide limits, costs and returns in cattle ranching are almost directly proportional to numbers of AU run. The limits are roughly between 150 AU as a minimum and 600 AU as a maximum. Within these limits the operator with incidental hired help can do all the labor. Beyond 600 AU it rapidly becomes a management proposition for the operator with practically all labor hired. I'm not sure just how well my figures fit that sort of a set-up. But, about 90% of all ranches fall within the sizes I mentioned.

"2. It involves determining a net return per AU to pay real estate charges by figuring costs per AU that include cash operating costs exclusive of real estate taxes and interest on real estate mortgages and including a return for the operator's own and his family's labor (or you can call it a charge for the value of the operator's and his family's labor valued at hired labor rates) and including a charge for interest on non-real estate capital. These costs are subtracted from the gross income received per AU. The difference is the return per AU available to pay for real estate -- either in the form of rentals, real estate taxes, grazing fees, interest on mortgages, or interest return on the owner's equity in real estate, or any combination of these real estate charges.

"3. What one can afford to pay for real estate per AU is determined by taking out of the return per AU available for meeting real estate charges an amount for real estate taxes and then capitalizing the remainder at a rate representative of the interest return one should expect to secure on real estate investment (usually taken to be the rate commonly charged on real estate mortgages).

"4. The rental value or investment value per acre of different grades of ranch grazing and hay lands is then determined by determining the AU month carrying capacity of the ranch (or acres of grazing land required per AU for the grazing season and the hay

^{1/} M. M. Kelso, How Much Can a Cattleman Pay Per AU for a Cattle Ranch?, Unpublished mimeo, Montana State College, Bozeman, Montana, January 29, 1949. See also -- M. H. Saunderson, A Method for the Valuation of Livestock, Ranch Properties and Grazing Land, Montana State College, Agricultural Experiment Station, Bozeman, Montana, Circular 6, March 1, 1938.

lands relative to hay requirements per AU on the ranch) and translating these productivity figures into how much one can afford to pay per acre for them so as to keep his AU real estate charges within limits set by the preceding part of the analysis."^{1/}

An illustration of how this method of land appraisal based upon an animal unit cost works can be seen by referring to Tables III, IV and V. Tables III, IV and V are similar to those used by Dr. Kelso in illustrating his analysis. Dr. Kelso chose two different price levels to demonstrate his analysis where I have chosen one. But, the figures aren't so important as the idea of the method. The tables differ some from Dr. Kelso's, but the main idea is intact. I have chosen to deviate from Dr. Kelso's approach primarily for clarification.

Table III, line 3 gives gross income per AU. Line 4 through line 9 portrays operating cost. By subtracting line 10 from line 3 a margin of annual returns with which to pay annual real estate charges of all kinds is derived (shown by line 11). At this point real estate taxes can be deducted giving a net return figure which can be capitalized at a going rate of interest to give a capitalized value per animal unit (shown on line 14). The capitalized value per animal unit can be translated into capital value per grazing and feeding season, or lease value per grazing season.

Table IV shows how income available to pay real estate charges per animal unit can be broken down into an animal unit month (AUM) cost (lines 1 and 2 of Table IV). This figure can then be multiplied by the number of

^{1/} M. M. Kelso, op. cit., unpublished mimeo.

TABLE III. BUDGET ANALYSIS DETERMINING THE VALUE OF REAL ESTATE CAPABLE OF SUPPORTING ONE ANIMAL UNIT PER YEAR.^{a/}

1.	275# beef produced per AU @\$13.00 cwt.	\$36.00	
2.	Miscellaneous income per AU	<u>4.00</u>	
3.	Gross income per AU		\$ 40.00
4.	Labor (including value of operators and his family's labor valued at hired labor rates) . . .	\$17.50	
5.	Feed and salt	.50	
6.	Depreciation and repairs on equipment and improvements	6.50	
7.	Taxes -- cattle and equipment only	<u>.50</u>	
8.	General operating expenses	\$25.00	
9.	Interest on the investment in cattle, feed, and equipment @ 5% -- cattle valued at \$100.00 per AU and equipment and feed at \$20.00 per AU . . .	<u>6.00</u>	
10.	Total Expenses		\$ <u>31.00</u>
11.	Margin of annual returns with which to pay annual real estate charges of all kinds		9.00
12.	Real estate taxes if the real estate is owned one-third of the margin available to pay real estate charges		<u>3.00</u>
13.	Balance of annual income available to support real estate capital per AU per year		\$ <u><u>6.00</u></u>
14.	Capitalized at 4 1/2% equals real estate value per AU $\frac{(6.00)}{(.045)}$		\$135.00

^{a/} Source: M. M. Kelso, op.cit., leaflet. This table differs slightly, but is very similar to a table presented by M. M. Kelso.

TABLE IV. TRANSLATION OF VALUES PER AU INTO CAPITAL VALUE AND LEASE VALUE PER GRAZING SEASON AND FEEDING SEASON.^{a/}

1. Income available to pay real estate charges per AU (from line 11, Table III)	\$ 9.00
2. Amount available to pay real estate charges for one month is one-twelfth of this figure. <u>This is the amount available to pay all land charges per AUM</u> $\frac{(9.00)}{(12)}$	.75
3. Capital value supported per AUM is the value per AU divided by 12 $\frac{(135.00)}{(12)}$	11.25
4. Annual lease value (this assumes a 10 month grazing period). (.75 x 10)	7.50
5. Capital value (assuming a 10 month grazing period). (11.25 x 10)	112.50
6. Amount left for feeding hay the remaining two months if hay land is owned. (135.00 - 112.50)	22.50 ^{b/}

^{a/} Source: M. M. Kelso, op.cit., leaflet.

^{b/} If hay is worth \$45.00 per ton this would allow one-half ton of hay for the 60-day-feeding period.

TABLE V. CAPITAL VALUE OR ANNUAL LEASE VALUE OF GRAZING LAND BY GRADE PER ACRE.^{a/}

Grades of grazing land	Annual lease value per acre	Capital value per acre
First grade--18 acres per AU for 10 mo.	$\frac{7.50}{18} = 43 \frac{3}{4}\phi$	$\frac{112.50}{18} = \$6.25$
Second grade--25 acres per AU for 10 mo.	$\frac{7.50}{25} = 30\phi$	$\frac{112.50}{25} = \$4.50$
Third grade--35 acres per AU for 10 mo.	$\frac{7.50}{35} = 21 \frac{1}{2}\phi$	$\frac{112.50}{35} = \$3.25$
Fourth grade--50 acres per AU for 10 mo.	$\frac{7.50}{50} = 15\phi$	$\frac{112.50}{50} = \$2.50$
Fifth grade--80 acres per AU for 10 mo.	$\frac{7.50}{80} = 9 \frac{1}{3}\phi$	$\frac{112.50}{80} = \$1.50$

^{a/} Source: M. M. Kelso, op.cit., leaflet.

months in a grazing season to determine the lease value per AU per grazing season (line 4). If, however, capital value per AU per grazing season is desired the capitalized value from line 14, Table III is divided by 12 and multiplied by the number of months in the grazing season (line 3 and line 5, Table IV). This is the amount a person can pay for grazing land per AU, assuming the appropriate number of grazing months.

An amount is left over from the capitalized value derived by the budget analysis in Table III. This is so because the entire cost of obtaining 275 pounds of beef from an animal unit for an entire year was calculated. This residual value (the difference between \$135.00 per AU and \$112.50 per AU equals \$22.50) will be the amount necessary to carry an animal through the feeding period. The residual amount can be used either to purchase feed if it can't be produced on the ranch or else it can be used as a basis for capitalizing the value of lands used for producing winter feed.

To find out how much per acre a person can afford to pay, either to own or to lease grazing land, Table V is presented. Table V shows five different grades of grazing lands with different carrying capacities. The annual lease value per acre is determined by dividing the annual lease value per grazing season by the number of acres it takes to support one animal unit. The capitalized value per acre or the amount a person can pay per acre to own the grazing land, is determined in exactly the same manner. In other words the capitalized value per animal unit per grazing season is divided by the number of acres that it takes to support an animal on that particular grade of land.

The capitalized value of hay land can be determined by calculating what it will produce annually in relation to an animal unit requirement for the feeding period. For example, assume that it takes one-half ton of hay produced on this land to support an animal unit for the two-month feeding period. We have \$22.50 which we can afford to pay for this one-half ton of hay (the difference between the capitalized value per AU which is \$135.00 and the capitalized value per grazing season which is \$112.50). Now suppose this land produces one ton of hay per acre. This means that the capitalized value of the hay land will then be \$45.00 per acre.

To appraise a stock ranch by the method presented entails the foregoing method of determining value of deeded grazing land, leased grazing land (if applicable) and deeded land used for producing feed. All that is left to do then is to get the sum of these figures to determine the overall value of the ranch.^{1/}

A similar method of land appraisal has been presented by M. H. Saunderson.^{2/} The cost per animal unit method of appraisal presented by Mr. Saunderson rests basically upon the same assumptions as that method of appraisal presented by Dr. Kelso. However, Mr. Saunderson does show more concern about variability of the individual ranch and how to make adjustments in his appraisal for these variabilities. These adjustments, however, do not alter the basic method of appraisal nor influence a marginal demand price within an individual ranch appraisal.

^{1/} M. M. Kelso, op.cit., unpublished mimeo.

^{2/} M. H. Saunderson, op.cit.

Appraisal Methods Used by Land Buyers

Two formalized methods of land appraisal have been presented to ascertain various aspects that influence price when making a land appraisal. Now let us take a look at how land buyers determine price when they are in the market for land.

A survey was conducted in Montana during the summer of 1957 in which 102 land buyers were interviewed. All these interviews represented buyers who had purchased tracts of land between January 1, 1956 and March 31, 1957. In all cases these sales represented willing buyers and willing sellers that "dealt at arm's length." Only agricultural land was included in the survey. For areas of survey and number of schedules taken in each area see Figure 1 and Table II, pages 8 and 9.

Before reviewing the various considerations influencing the price buyers paid for land let us take a look at why they were in the market for land to begin with. Approximately 58 percent stated they were in the land market to enlarge their operation. Another 15 percent stated they purchased particular pieces of land because of its strategic value. Reasons given for strategic value were such things as "water holes," "middle of place buyer operated," "bordered place buyer operated," and "within reasonable distance from buyer's place to use as a winter headquarters." Eight percent were in the market to move from tenant to owner. Another 8 percent were in the market for investment purposes, while 11 percent purchased agricultural land to use as a rural residence with anticipation that a relative or another person would farm it. The

remaining 9 percent gave miscellaneous reasons such as "qualification for the capital gains tax," "just wanted to own a piece of land," and "didn't really know why they were in the market for land."

Forty-nine buyers out of the 58 that purchased land for farm enlargement used a method of capitalizing to determine the value of that piece of land. This suggests that approximately 85 percent of those buyers that enlarged their farms projected their present operational experience into the future operation of an enlarged unit. The need for a method of computing a marginal demand price becomes apparent at this point. The awareness of this need is especially apparent when one considers that approximately 49 percent of the respondents in the survey were involved with a marginal demand price. There were 13 out of the 16 that purchased land for strategic reasons that appraised their purchased land in the same manner. The figure now rises from 49 percent to 62 percent that were involved with a marginal demand price calculation.

It is true that in some cases the purchaser did not use a well defined method of valuation. This is due partially to insufficient past records as well as trying to attempt to incorporate other price influencing considerations such as bartering techniques and terms of payment. Terms of payment will sometimes alter a rationally derived value. A fairly accurate idea of income and expense is necessary in using the capitalization method. While "common sense" can be substituted for insufficient records of income and expense, a combination of both "common sense" and good records is desirable. The number of cases in which this combination prevailed was in the minority.

In many cases buyers were influenced by more than one consideration in determining price (see Table VI). The most predominate consideration was the way they expected to use the land (77 percent out of the total 102 purchases). This involved all shades of capitalizing value from the very strict methodological approach to a very loose approximation.

Bargaining was very popular, with approximately 45 percent engaging in such. Thirty-nine percent of the entire group were effective in their bargaining techniques by bidding less than asking price and succeeding in paying less than the asking price. Six percent of those that tried to bargain failed to gain any advantage. Terms of purchase influenced 40 percent of those interviewed in their decision to purchase land. It was interpreted from the schedules that perhaps a higher price was paid by the buyer in order to secure more lenient terms of finance.

The comparison method was used by 18 percent of the buyers. However, in all but one case the comparison method was used in conjunction with other price determining considerations. Buyers placed their judgement on commercial appraisals 14 percent of the time, while 21 percent sought outside help other than commercial appraisers in determining price. Complete judgement was not placed on outside advice in all cases. Eighteen percent of those interviewed stated that other factors such as grazing permits and mineral rights influenced the price they paid for the land they purchased.

TABLE VI. CONSIDERATIONS INFLUENCING THE PRICE BUYERS PAID FOR LAND IN MONTANA.^{a/}

Price determining factors	Percent ^{b/}
1. Buyer placed judgment on commercial appraisal	14
2. Buyer sought outside help on appraising	21
3. Buyer knew of recent sales and based judgment on such sales	20
4. Buyer estimated what land was worth based on the way he expected to use it (a capitalization method).	77
5. Terms of purchase influenced consummation of sale	40
6. Other things that influenced price and sale (such as mineral rights, grazing permits and wheat acreage allotments)	18
7. Buyer bargained on price	45
a. Buyer bid lower than asking price and paid less	39
b. Buyer bid lower than asking price, but paid asking price	6

^{a/} Source: Land pricing survey conducted in Montana in summer of 1957. See Figure 1 and Table II.

^{b/} The percentage figures in this column is the percent of 102 interviewees that responded affirmatively to the questions regarding price determining considerations. Because some buyers were influenced by more than one consideration in determining the price they paid for the land they purchased, the total of the percent column will exceed 100 percent.

Significance and Completeness of Current Appraisal
Methods in View of Certain Aspects
of Economic Theory

In the first three sections of Part II, current appraisal methods and price determining elements considered by land buyers were presented without comments as to their significance and completeness. This was done so that the reader could get an idea of how land values are determined. The author does not believe the appraisal methods are adequate if analyzed with the following criteria in mind.

First, it is assumed that the appraisal is to be used to show how much a land buyer can afford to pay for a piece of land he wishes to purchase. It is further assumed that these appraisal methods will meet the need of a buyer who is purchasing land to add to a unit he currently operates. To analyze the appraisal methods in view of these assumptions may appear to do the appraisal methods injustice. This would be so if these appraisal methods were not used for buyers adding land to existing operations. How well these appraisal methods meet the needs of land buyers in view of the foregoing assumptions will be discussed, bringing in certain aspects of economic theory, and other contingent factors affecting price in the land market.

The first aspect of economic theory to be presented is concerned with the long-run average cost curve and economies to scale. In Table VII, the concept of average cost is presented. The figures used in Table VII are not intended to picture an actual situation; they are for illustrative purposes only. The concept of changing average cost is

based upon the idea that total costs can be divided into fixed costs and variable costs, and that as the size of an operation increases only variable costs will change. This is so in an intermediate situation. In a sufficiently short-run situation, all costs would be fixed; whereas, in a sufficiently long-run situation all costs would be variable. However, looking upon a general type of farming operation where the farmer intends to stay in the business, certain fixed costs will prevail over a rather long period. Examples of such fixed costs are depreciation of machinery and expenses of the family labor. These fixed costs will prevail, once a farmer has committed himself, whether he farms 50 acres or 400 acres. Variable costs will change as size of operation changes. Examples of variable costs are taxes, seed, gasoline and interest, just to name a few. A person can expect variable costs to be rather proportionate to acres operated up to a certain point. At this point variable costs will probably increase more than proportionally, due primarily to managerial difficulties. Total costs are the sum of fixed costs plus variable costs. In Table VII, average cost per acre is derived by dividing total cost by number of acres operated. From Table VII, we can see that the average cost per acre declines as we increase the number of acres of land operated up to a point and then it starts upward again. The lowest average cost per acre is \$266.70, and is achieved when operating 300 acres.

Figure 3 portrays, graphically, how a short-run average cost curve would appear by using the data from Table VII. Here we can see that the

Cost of
Operation

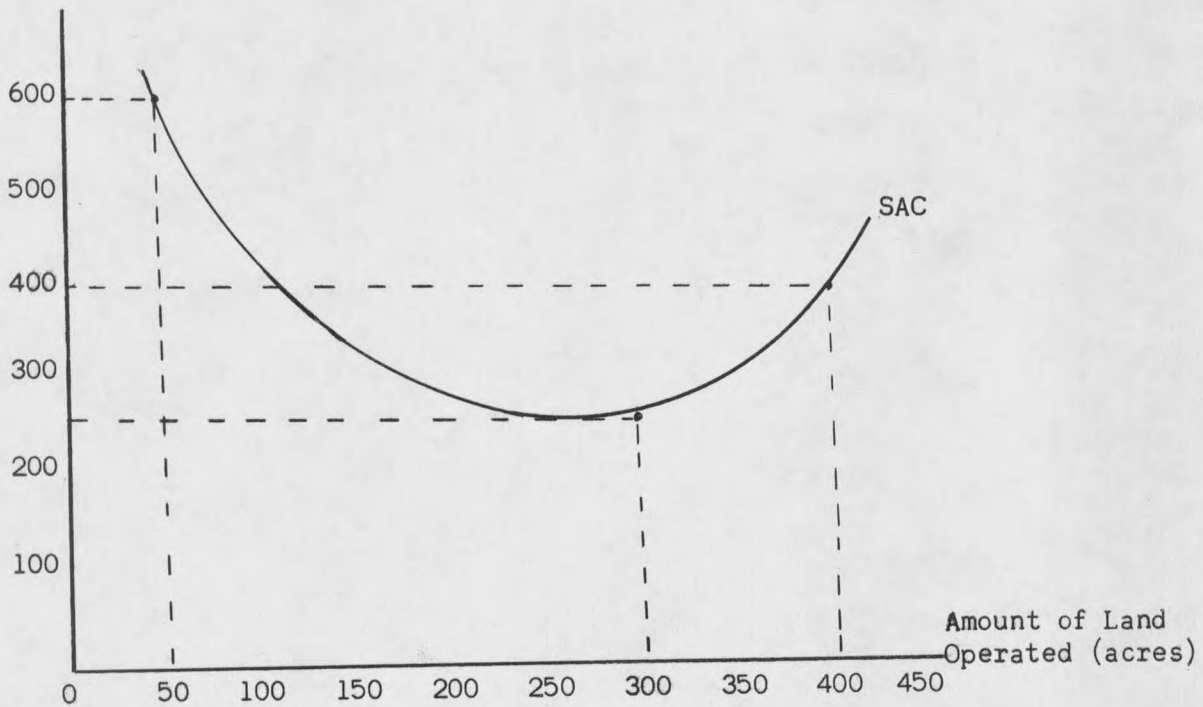


Figure 3. Short-run Average Cost Curve.

TABLE VII. PRODUCTION COSTS OF A HYPOTHETICAL FIRM.

Acres of land operated	Fixed Costs	Variable Costs	Total Costs	Average cost per acre
50	\$2,000	\$ 1,000	\$ 3,000	\$600.00
100	2,000	2,000	4,000	400.00
150	2,000	3,000	5,000	333.33
200	2,000	4,000	6,000	300.00
250	2,000	5,000	7,000	280.00
300	2,000	6,000	8,000	266.67
350	2,000	9,000	11,000	300.00
400	2,000	14,000	16,000	400.00

lowest point of the short-run average cost curve would be when 300 acres are operated. If we assumed constant output per acre, 300 acres would be the most efficient size of operation. If this is true, then it would be desirable to increase the size of operation until 300 acres is reached, if less than 300 acres were operated, and to cut down on size of operation if more than 300 acres were farmed. However, if a farmer operated 50 acres at an average cost of \$600.00 per acre and in a short-run situation increased his operation to 300 acres his average cost would be that shown by SAC_1 in Figure IV or \$266.70. However, in a longer run situation he probably would acquire more machinery for efficiency of operation and go to SAC_2 which now puts his average cost to \$225.00. If this process is continued he will finally reach a minimum of average cost per acre as shown by SAC_3 at 600 acres which will be the lowest possible average cost obtainable. This point will also be the lowest point on the long-run average cost curve, and the most efficient point obtainable. If a series of SAC are taken and a curve drawn tangent to this series of SAC a long-run average cost curve can be derived. The same process applies moving along the long-run average cost curve as that presented for the short-run average cost curve. This process will be defined as economies to scale.

In the strict sense the analysis of the long-run average cost curve and economies to scale is left somewhat lacking. However, if we assume output per acre to remain constant and prices to remain the same the analysis will be valid.

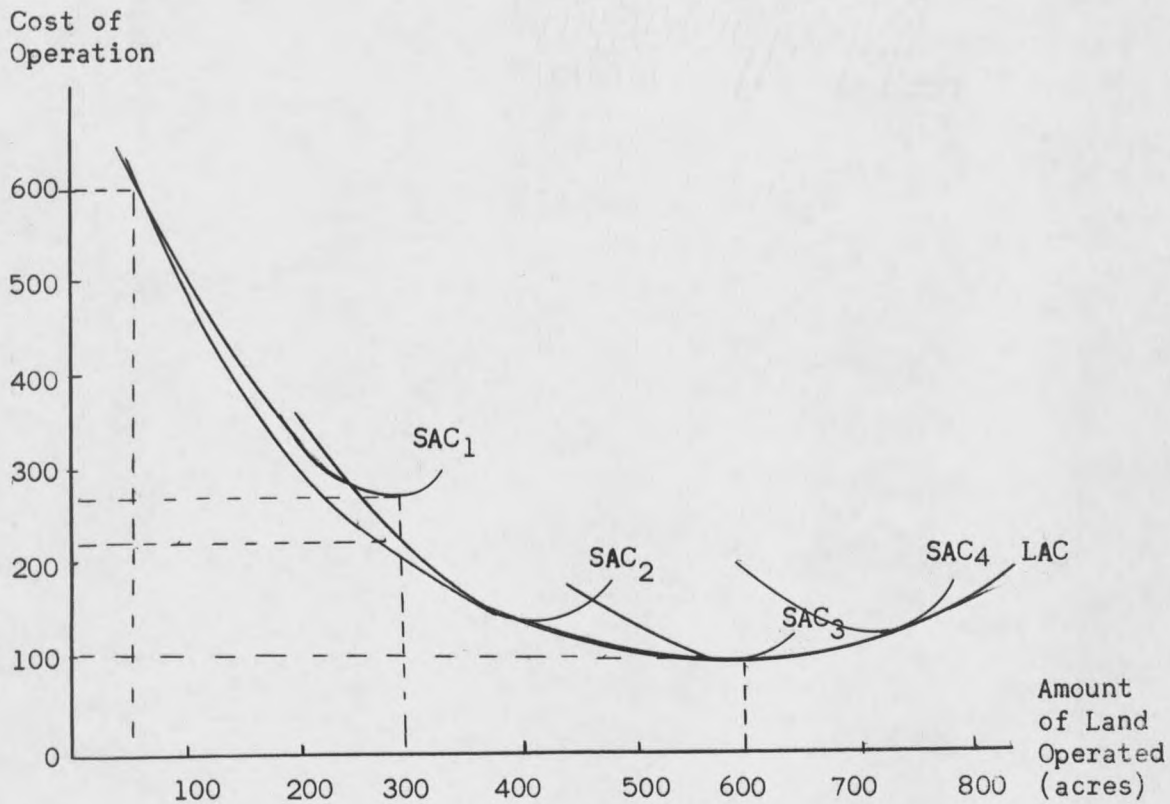


Figure 4. Long-run Average Cost Curve.

In trying to incorporate the concept of long-run average costs and economies to scale into an appraisal method we see that the appraisal would have to be done in view of what the prospective buyer already operated. If this is done we can also see that if we wish to capitalize the value of a piece of land to be purchased the net return per acre will be affected by a changing average cost per acre. In view of this it becomes apparent that an accurate appraisal for one buyer will not necessarily be accurate for any other.

Before we analyze the adequacy of the appraisal methods presented there are a few other factors worthy of mention. Commodity prices and farm expenses are constantly changing. Not only are they changing themselves, but also with respect to one another. These two factors definitely have a bearing upon real estate value. However, only good judgment can take these into account wisely, and only time will tell whether they have been accurately calculated. For this reason they shall be assumed constant. Another factor to consider is the effect of current land market values upon appraisal methods. It can be logically concluded that an accurate appraisal tells a buyer how much he is able to pay for land and not how much he will have to pay. An appraised value that is lower than what the highest able and will bidder will pay for the land tells the prospective buyer that he can't afford the purchase. However, an appraised value above what the next highest bidder offers merely states he can afford to pay that price, but he need not if all it takes is just to outbid the next highest bidder.

The last factor to be mentioned is the purchasing of land as an investment. The soundness of an investment depends upon its income earning potential. Income earning potential depends upon the level of expected receipts and expected costs. True, some purchases are not based on income earning potential. Purchases of this type will not be considered at this time. However, there are cases where the income earning potential of the investment is practically nil, but in which substantial savings may occur. An example of this may be the qualification for the capital gains tax.

Now, let us take a look at the American Rural Appraisal System. Just how complete is this system in view of the criteria set forth? It appears, that even with its fine methodological approach, it lacks essential factors to determine value accurately for a buyer who already operates farm land. The American Rural Appraisal System fails to take into account current assets held by the prospective buyer as well as history of income that may save the purchaser money if he qualifies for the capital gains tax and has recently disposed of agricultural land.

The American Rural Appraisal System is quite thorough and contains elements for a cross-check on value for any particular purpose except those previously mentioned. The factors that are used to determine value under the American Rural Appraisal System are considered significant. It is the incompleteness of the appraisal that draws criticism.

The following are criticisms of the American Rural Appraisal System: (1) it fails to take into account a marginal demand price, (2) it does not take into account current assets of the prospective buyer, (3) it fails to take into account the possibility of savings to a prospective buyer, which could be considered earnings if alternative costs are considered, and (4) one appraisal for a particular purpose is presumed to stand valid for all persons.

By failing to take into account a marginal demand price the American Rural Appraisal System will display an erroneous value to a prospective buyer who already operates land. This is so because the prospective buyer who already operates land and adds land to his unit will experience

a change in average costs per acre. This change in average cost per acre will affect the average net return per acre, which in turn will affect value when net return is capitalized. Any prospective buyer who is on the declining portion of his long-run average cost curve can afford to pay more for land than the value of comparable land he currently operates. By adding land to that which he currently owns he will increase the value of the original land.

Now, suppose the American Rural Appraisal System did take into account the effect of marginal demand price. The implications are that it still may be somewhat lacking if the current assets of the prospective buyer are not considered. The capitalized value of a piece of land with the marginal demand price effect incorporated still does not take into account the effect of income variability. A buyer that adds land to an existing unit, but lacks sufficient capital for operating in an area of high income variability could possibly find himself losing everything. Some of this effect, however, may be accounted for in the terms of sale.

A person that has just sold a farm or ranch and is in the market for another unit can use the adjusted base of the farm or ranch sold in calculating the adjusted base of the newly acquired unit. This could represent a savings of a capital gains tax. However, he has a limited time in which to do this. If he does not acquire another agricultural unit he may find himself paying a tax which negates this possible savings. The statements, "a penny saved is a penny earned," is quite

correct when considering alternative costs. A savings, if it occurs and is capitalized into value will give a higher figure. It must be remembered that an appraisal tells a buyer what he can pay and not what he will have to pay. In this particular case any price below the appraised value, including the savings in appraised value, could be supporting evidence in purchasing that land. The American Rural Appraisal System fails to take this into account.

Lastly, it is unlikely that two or more prospective buyers experiencing the same changing average costs are identical in the size of their operation, current assets held, and the like. For this reason an appraisal needs to be tailored to fit an individual buyer and not to fit a particular piece of land. It is possible that one or two of these factors would not be relevant in a particular case. However, the likelihood of the two prospective buyers operating the same size unit and experiencing the same changing average costs is rather remote. For this reason, an appraisal for one person is good for that person and possibly for no one else, unless adjustments for differing factors are taken into account. These particular adjustments are not apparent in the American Rural Appraisal System.

The same faults that were mentioned about the American Rural Appraisal System seem to prevail in the Cost Per Animal Unit Method of appraisal, even though the manner in which Dr. Kelso has presented this method makes it possible to take these adjustments into account. This could be done by using the average cost of the old unit plus the additional unit in the budget analysis for determining capitalized value.

This would be a step in the right direction in calculating the effect of a marginal demand price. But, the change in value to the existing unit caused by adding an additional unit would not be accounted for. Dr. Kelso, avoids this issue by assuming constant returns to scale. This assumption is questionable, and rather unlikely in view of increased farm sizes and improved technology. The Cost Per Animal Unit Method of appraisal also breaks down when it is used for the value of land used for raising feed. The idea of taking two-twelfths of the capitalized cost per animal unit and assuming this as a basis for capitalizing land used for raising feed according to productivity is a hasty finish to an appraisal. It is rather unlikely that the grazing period is of the same proportional value to that of the feeding period. This is actually what the Cost Per Animal Unit Method of appraisal suggests.

The methods used in determining price by free-lance-buyers is open to much criticism. However, rather than criticize the methods of appraisal used by free-lance-buyers it would be more helpful to take their particular needs and circumstances into account. First, more accurate records of income and expense data would be helpful. This would help buyers to determine average costs more accurately. This knowledge, in addition to an understanding of the capitalization process, and the awareness of the effects of the marginal demand price, would facilitate a more accurate valuation of a particular piece of land. The remaining factors that these buyers need to take into consideration include the effect variability of income will have on their financial structure and the possibility of capitalizing a tax savings.

Some of the buyers interviewed in the survey conducted in Montana did not stress the needs mentioned above. It was apparent that the majority of the buyers used incomplete appraisal methods. This is not to imply that buyers paid too much for the land they purchased. On the contrary, some buyers probably could have paid more for the land than they actually paid. However, if the trend of increasing land prices continue, the need for more accurate appraisals will become more apparent.

PART III

AN IDEAL APPRAISAL SYSTEM

An Ideal Appraisal Model for a Land Buyer Who Anticipates Adding Additional Land to Land He Currently Operates

In Part II formalized land appraising methods and techniques of free-lance-buyers were presented. These methods and techniques were then appraised as to their completeness and significance. In view of this knowledge a model, which is considered ideal, for appraising land for a land buyer who anticipates adding land to his operating unit is presented. The model presented in Figure 5 contains approximately 26 steps, the explanation of the 26 steps in Figure 5 is as follows:

A. Appraisal of the farm the buyer currently owns.

Step 1. Determine average annual gross income per acre from an analysis of past records. Gross income should include the average cash value of all products produced on the farm with the exclusion of perquisites. This figure should then be divided by the number of acres operated. If gross income is received from a diversified operation, it will then be desirable to break down the average gross income into classes of land such as grazing land, wheat land, hay land and the like.

Step 2. Average cost per acre can also be determined with the use of the operator's past records. Average cost per acre will include total average annual operational expenses (but will not include a figure for management) divided by the number of acres operated. Total operational expenditures includes average annual interest other than on land

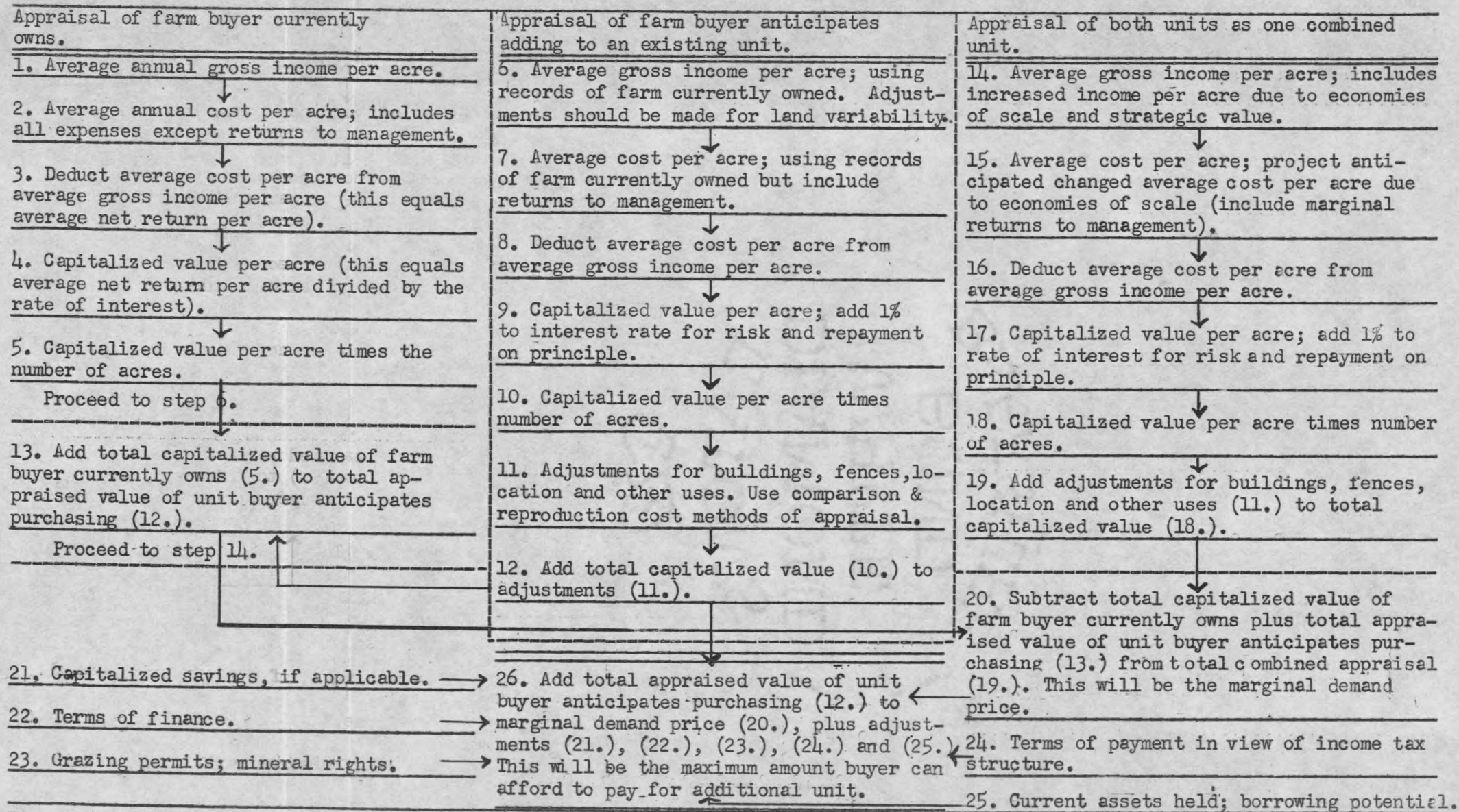


Figure 5. An Ideal Appraisal Model for a Land Buyer who Anticipates Adding Land to Land That He Currently Owns.

investment, interest, taxes (personal and real estate), a figure for operator and family's labor, insurance connected with farm operation, depreciation, and expenses reasonable and necessary for the production of a crop. Returns for management are not considered as an expense, because the owner's managerial ability should not be used to decrease the capitalized value of the land he currently owns. For if we include returns to management as an expense in this appraisal it will also have to be done in the combined appraisal and thus they will negate each other. Again, if this is a diversified operation it will be necessary to prorate these expenses to the various classes of land.

Step 3. Average net return per acre is derived by subtracting average cost per acre from average income per acre. If average income and costs were catagorized as to classes of land the average net return will be catagorized into various classes.

Step 4. Capitalized value per acre will be calculated by dividing average net return per acre by an appropriate interest rate. An appropriate interest rate may be difficult to determine. However, a good rule is to use the interest rate charged for long-term real estate.

Step 5. Total capitalized value is the average capitalized value per acre times the number of acres owned. If different classes of land have been included, the number of acres in each class will have to be multiplied by the appropriate capitalized value per acre of that class. The total of these various classes will constitute total capitalized value.

B. Appraisal of land the buyer anticipates adding to the existing unit.

Step 6. Average gross income per acre; in this case average gross income will be calculated by the use of records buyers has from his own operation, using the appropriate classes of land and dividing by the number of acres in each class or the total number of acres in this unit. Because of variability in land fertility and topography, adjustments may have to be made. These adjustments can be made by using past records of productivity of that unit and soil samples in conjunction with buyers' own records.

Step 7. Average cost per acre can be determined by the same process as that used in appraising the land buyer currently owns. The use of the buyer's own records will be helpful. But, again, adjustments may have to be made because past management practices may have affected soil conditions which may require additional or decreased cost to correspond with the practices of the prospective buyer. A cost for management is included in this case, because the operators managerial ability should yield him a return in view of alternative costs. By including management as a cost, a decrease in capitalized value will result, which in turn will decrease the marginal demand price. This is justifiable if a person believes an increase in responsibility deserves a return which should be separated and not capitalized into the value of the land.

Step 8. Average net return per acre is derived by subtracting average costs from average gross returns. Again if separation into classes of land is applicable it should be done.

Step 9. Capitalized value per acre is found by the same process as before, but 1 percent is added to the interest rate to take care of risk.

Step 10. Total capitalized value is determined in precisely the same manner as was done previously in step 5.

Step 11. Adjustment; because this property may have buildings, fences, unique locational features and other uses, adjustment may have to be made. These adjustments can be made by employing the comparison and reproduction cost approaches. In some cases the buildings and fences may be superfluous. If this is the case they may add nothing to value or possibly detract from value. The possibility of a higher use of the land may be foreseeable, such as subdivision, highways, or irrigation. Appropriate adjustment in view of probability of accrual and increase in value will have to be taken into account. The possibility also exists that due to its location (either undesirable or desirable aspects) certain adjustments in the appraisal will have to be made.

Step 12. Total value is total capitalized value plus adjustments.

Step 13. Total separate value is the total capitalized value of the farm the buyer currently owns plus the total value of the unit the buyer anticipates adding to his unit.

C. Appraisal of both units as an integrated unit.

Step 14. Average gross income per acre will include the anticipated gross income of the entire operation in view of buyers' records and other sources of information indicated in Step 6. An additional adjustment may have to be made in view of strategic value and extra large wheat acreage

allotments, if they occur. By strategic value it is meant that an increase in income will result by the relationships of the two units. As an example of strategic value, one unit may be utilized more extensively by the use of the other (grazing land without summer water in one unit, and water without much grazing land in the other unit). Again, if the land is of different classes the appropriate income from each class will have to be divided by the number of acres in each respective class.

Step 15. Average cost per acre will be different in this case than the other two appraisals. This will be so because anticipated changed average cost per acre will be used. The same procedure and categories of costs will be included in figuring this average cost as was used in Steps 2 and 7. Return for management will, also, be included for the marginal amount used for the additional unit (see Step 7).

Step 16. Average net return per acre is found by subtracting average cost from average gross income. Again, it may be desirable to categorize into different classes of land.

Step 17. Capitalized value per acre will be determined in the same manner as in Step 9, including the additional 1 percent interest rate for risk.

Step 18. Total capitalized value is the capitalized value per acre times number of acres in each class and totaled.

Step 19. Total value includes the adjustments made in Step 11 plus total capitalized value derived in Step 18.

Step 20. Marginal demand price is the difference between the price of additional land when appraised as a separate operating entity and the price of the same land when incorporated with an operating unit already in existence. This is determined by subtracting the total capitalized value of the existing unit plus total appraised value of additional unit buyer anticipates purchasing (Step 13) from the total value of the combined appraisal (Step 19).

Step 26. Total appraised value of the unit the buyer anticipates purchasing is the total value of the unit the buyer anticipates purchasing plus the marginal demand price in view of the necessary adjustments (Steps 21-25).

D. Adjustments.

Step 21. Capitalized savings is the case where a capital gains tax savings may occur if the land is purchased within a specified period of time after the sale of another unit. If this is applicable, the amount of the savings can be considered as an earning and added to total value.

Step 22. Terms of finance can have a bearing on possibility of repayment. It becomes obvious that if the terms of finance can't be secured which will provide fairly realistic payments in the future total appraisal would have to be adjusted. In this case terms of finance may become the limiting factor.

Step 23. Grazing permits and mineral rights are relevant factors in some purchases. If there is mineral activity in the area or mineral leases present on the unit it may become necessary to capitalize the value of the lease into total value, or make an appropriate adjustment for

speculation. If this is not desirable, the land may be purchased without the mineral rights. Sometimes grazing permits are worth more than the land purchased. In some cases these privileges can be capitalized into total value. However, one should take care not to over-value these privileges, because regardless of how long these privileges run they are not purchased land and changes in policy may result in a purchaser paying twice for these privileges.

Step 24. Terms of payment in view of the income tax structure can be a limiting factor to total value even with considerable lenient terms. This is primarily true of purchases involving large sums of money with a small down payment and a short time for the balance. For example, assume that the total value of a unit to be purchased is \$250,000.00, and the seller offers terms of \$50,000.00 down with 4 percent interest on the balance to be paid in 10 equal payments annually for 10 years. The unit has a history of an average annual net income of \$28,000.00 before income taxes. The balance of the principle to be paid is \$200,000.00 plus approximately \$40,000.00 interest for the 10 years. This would make the annual payments be approximately \$24,000.00. Now this \$24,000.00 would have to be paid after income taxes, so the purchaser would have to net approximately \$31,000.00 before income taxes (assuming income taxes to be \$7,000.00). Not considering income taxes the purchaser would have a \$4,000.00 margin on the average, but when considering income taxes an average annual deficit of \$3,000.00 would occur. Therefore, different terms would have to be secured or else total value adjusted.

Step 25. Current assets held and borrowing potential will have to be considered in view of operating expenses and payment on mortgages in areas of high income variability. If the unit to be purchased is in an area of high income variability and sufficient reserve assets aren't held or emergency credit available the purchaser may find himself losing everything. Adjustments will have to be made to take care of this, either in total value or terms of finance.

The ideal model for appraising agricultural land for a land buyer who currently owns agricultural land has been presented. However, there are a few additional comments to be made. The model may appear to be somewhat complicated and its use requires good records as well as good judgment. The criticism that the model is more "idealistic" than "realistic" may ensue. At the present time there is not much defense against this criticism. However, if all factors and principles of the model are relevant, then as land prices become more competitive and continue to rise, these factors will have to be accounted for. Those that don't account for the factors and principles set forth in the model will run the risk of either paying more than they can afford for additional land, or else not getting land they want to add to their unit and can afford. This means agricultural land operators will have to start keeping records if they don't do so now, use good judgment, and consider the factors included in the ideal appraisal if they are to continue operating agricultural land and be competitors in the future land market.

An Isolated Price Effect

The ideal appraisal method just presented contains a number of price influencing factors. Regardless of the appraisal method used in determining the value of land to be added to an existing unit, several price influencing factors will enter into the picture. The foregoing appraisal method not only contains a number of price influencing factors, but also a procedure that is vitally important. We can look upon this appraisal method as a functional relationship where the total value of the additional unit (dependent variable) is a function of all the price influencing factors (independent variables). In equation form it could be expressed as: $Y = f(X_1, X_2, X_3, \dots, X_n)$.

However, as correct as this equation may be, it tells us nothing about procedure, so a more elaborate formula will become necessary to take this into account.

A more detailed equation which takes into account the procedure as well as the independent variables is as follows:

$$Y = \left(\left(\frac{\sum_{i=1}^n a_i X_3 - Y_3}{r + .01} \right) A + B \right) - \left\{ \left(\frac{\sum_{i=1}^n a_i X_1 - Y_1}{r} \right) A + \left[\left(\frac{\sum_{i=1}^n a_i X_2 - Y_2}{r + .01} \right) A + B \right] + \left(\frac{\sum_{i=1}^n a_i X_2 - Y_2}{r + .01} \right) A + B + C + D + E + F + G \right\}$$

Where:

- Y = Value of an additional unit of land to be added to existing unit of land.
- a = Commodity price level.
- b = Technology and production cost price level.
- r = Interest rate.
- $\sum_{i=1}^n$ = The sum of different types of land.
- X_1 = Average gross income per acre for existing unit.
- X_2 = Average gross income per acre for additional unit.
- X_3 = Average gross income per acre for combined unit.

- Y_1 = Average cost per acre for existing unit.
- Y_2 = Average cost per acre for additional unit.
- Y_3 = Average cost per acre for combined unit.
- A = Number of acres in each type of land.
- B = Social and other economic adjustments of additional land.
- C = Capitalized savings.
- D = Terms of finance.
- E = Grazing permits and mineral rights.
- F = Terms of payment in view of income tax structure.
- G = Current assets held and borrowing potential.

It can be argued that this equation is still, somewhat, incomplete as there can be other variables in the X 's and Y 's and B that aren't explained by the equation. However, the equation stated will be sufficient for our purpose, yet explain the ideal appraisal method as set forth. A further argument can arise against the equation because it is not reduced to the simplest form. The reason why this is not done is because of the desire to show the effect of the marginal demand price.

The marginal demand price is shown by the following portion of the equation:

$$\left\{ \left[\left(\frac{X_3^a - Y_3^b}{r + .01} \right) A \right] + B - \left(\frac{X_1^a - Y_1^b}{r} \right) A + \left(\frac{X_2^a - Y_2^b}{r + .01} \right) A + B \right\}$$

Because the scope of this study has been restricted to the marginal demand price, it will become necessary at this point to hold the rest of the variables in the equation constant. All the variables in the equation were included in order to make the ideal appraisal method for land buyers who are adding additional land to an existing unit complete. To test the validity of the ideal appraisal method as explained by the

equation would be quite cumbersome in view of all the independent variables. So, we will assume all variables not included in the marginal demand price to be constant.

In addition to the above assumption, it will be assumed further that a and b are constant, and that we are dealing with just one type of land. For simplicity we can also drop B from the equation as it will cancel out and still not affect the marginal demand price. In view of the above assumptions the equation which explains the value of an additional unit of land to be added to an existing unit can be expressed as follows:

$$Y = \left\{ \left(\frac{X_3 - Y_3}{r + .01} \right) A - \left[\left(\frac{X_1 - Y_1}{r} \right) A + \left(\frac{X_2 - Y_2}{r + .01} \right) A \right] \right\} - \left(\frac{X_2 - Y_2}{r + .01} \right) A$$

The marginal demand price is now expressed as:

$$\left\{ \left(\frac{X_3 - Y_3}{r + .01} \right) A - \left[\left(\frac{X_1 - Y_1}{r} \right) A + \left(\frac{X_2 - Y_2}{r + .01} \right) A \right] \right\}$$

We have now reduced the equation to a point where we can test the validity of the marginal demand price, and meet the objectives of the study.

Sufficient case studies with all the necessary information to test the marginal demand price were not obtained in the survey conducted in Montana. However, D. C. Myrick has worked out a budget analysis showing the economics effect of shifting farm production and increasing farm

sizes.^{1/} This information will be adequate for demonstrating and testing the validity of the marginal demand price.

Tables VIII and IX are tables that were used by Myrick in drawing up his analysis. Three different areas were chosen. Area VI represents an area of fairly high production per acre and consequently higher land values (shown by Table VIII) and Area III and IV, representing moderate land values with corresponding production (shown by Table IX). Area III and IV were grouped into one. Three different farm sizes were picked by each area. From data obtained for each area, a typical budget analysis for each area was worked out for the different farm sizes for different patterns of production.

Operators cash income was determined for the different types of production patterns for each size of farm; expenses were calculated and broken down into cash expense, depreciation, interest on investment attributable to land and interest on investment other than land. By subtracting all expenses from income a residual figure was obtained for family labor and management.

Land values in Table VIII were assumed to be \$75.00 per acre, while the value of land in Table IX was assumed to be \$50.00. The rate of interest charged in both cases on land investment was 4.5 percent.

Data in Tables VIII and IX indicate an association between returns to labor and management and size of farm. Some of this increase is due to

^{1/} D. C. Myrick, Shifting Wheatland to Grass in Montana, Farm Economics Research Division, ARS, USDA, Bozeman, Montana, February 3, 1958, leaflet.

TABLE VIII. INCOME AND EXPENSES FOR DIFFERENT SIZE FARMS IN AREA VI.^{a/b/}

Acresage allotment seeded to:	Wheat	Wheat	Wheat	Wheat	Wheat
Diverted acres produce:	Wheat	Barley Hogs	Sheep	Idle	Cattle
Small Farm -- 384 crop acres					
Operators cash income	\$5,806	\$6,548	\$5,285	\$4,053	\$4,541
Cash expense ^{c/}	1,735	2,524	2,098	1,473	1,753
Depreciation	1,297	1,397	1,467	1,297	1,448
Interest on investment (land) ^{d/}	1,296	1,296	1,296	1,296	1,296
Interest other than land	573	649	701	573	705
Labor and management income	905	682	-277	-586	-661
Medium Farm -- 800 crop acres					
Operators cash income	12,094	13,439	10,921	8,466	9,525
Cash expense ^{c/}	2,863	4,169	3,417	2,363	2,813
Depreciation	1,944	2,145	2,132	1,944	2,095
Interest on investment (land) ^{d/}	2,700	2,700	2,700	2,700	2,700
Interest other than land	983	1,137	1,146	983	1,165
Labor and management income	3,604	3,288	1,526	476	752
Large Farm -- 1,640 crop acres					
Operators cash income	24,793	25,105	22,427	17,357	19,692
Cash expense ^{c/}	4,927	6,255	6,120	3,959	4,796
Depreciation	3,221	3,428	3,450	3,221	3,372
Interest on investment (land) ^{d/}	5,535	5,535	5,535	5,535	5,535
Interest other than land	1,658	1,812	1,908	1,658	1,945
Labor and management income	9,452	8,075	5,414	2,984	4,044

^{a/} Source: Information for this table obtained from work sheets used by D. C. Myrick in preparing, Shifting Wheatland to Grass in Montana, op.cit.

^{b/} Area VI is Cascade, Chouteau, Fergus, Glacier, Hill, Judith Basin, Liberty, Pondera, Teton and Tool counties in Montana.

^{c/} As farm sizes increased additional hired labor was figured into cash expenses.

^{d/} Obtained by assuming a price of \$75.00 per acre at 4 1/2 percent interest.

TABLE IX. INCOME AND EXPENSES FOR DIFFERENT SIZE FARMS IN AREA III AND IV. a/b/

Acreage allotment seeded to:	Wheat	Wheat	Wheat	Wheat	Wheat
Diverted acres produce:	Wheat	Barley Hogs	Sheep	Idle	Cattle
Small Farm -- 384 crop acres					
Operators cash income	\$4,279	\$4,999	\$4,218	\$2,987	\$3,475
Cash expense <u>c/</u>	1,826	2,523	2,226	1,556	1,872
Depreciation	1,006	1,105	1,107	1,006	1,157
Interest on investment (land) <u>d/</u>	864	864	864	864	864
Interest other than land	406	477	534	406	538
Labor and management income	177	30	-513	-845	-956
Medium Farm -- 800 crop acres					
Operators cash income	8,915	10,271	8,673	6,240	7,299
Cash expense <u>c/</u>	2,871	4,044	3,473	2,379	2,864
Depreciation	1,455	1,652	1,643	1,455	1,606
Interest on investment (land) <u>d/</u>	1,800	1,800	1,800	1,800	1,800
Interest other than land	763	904	927	763	946
Labor and management income	2,026	1,871	830	-157	83
Large Farm -- 1,640 crop acres					
Operators cash income	18,276	19,475	17,813	12,793	15,128
Cash expense <u>c/</u>	4,893	6,348	6,191	3,929	4,839
Depreciation	2,664	2,871	2,891	2,664	2,815
Interest on investment (land) <u>d/</u>	3,690	3,690	3,690	3,690	3,690
Interest other than land	1,389	1,542	1,635	1,389	1,675
Labor and management income	5,640	5,024	3,406	1,121	2,109

a/ Source: Information for this table obtained from work sheets used by D. C. Myrick in preparing, Shifting Wheatland to Grass in Montana, op.cit.

b/ Area III and IV Dawson, Fallon, McCone, Prairie, Richland, Wibaux, Daniels, Roosevelt, Sheridan and Valley counties in Montana.

c/ As farm sizes increased additional hired labor was figured into cash expenses.

d/ Obtained by assuming a price of \$75.00 per acre at 4 1/2 percent interest.

increased labor and management, but some of it is also due to decreasing average cost per acre.

With the information from Tables VIII and IX, Table X is developed. One production alternative for each area was selected for Table X. A close look at Tables VIII and IX indicates that all production patterns have the same tendency toward increasing returns to scale. The first production pattern was chosen.

Cash income in Table X is taken from Myrick's budget analysis for the existing unit and for the combined units. The average income per acre of the existing unit times the number of acres in an additional unit was used to determine cash income for the additional units. This procedure is based on the assumption that the productivity (fertility) of the added land is equal to that for the existing unit.

"All expenses" is the sum of cash expenses, depreciation, and interest on investment other than land from the budget analysis, plus a cost for family labor. For the existing unit the return the family labor had been receiving for its labor is used as the cost for family labor. In the combined unit calculations a ratio of acres operated in the combined unit to acres operated in the existing unit was used to determine the cost of family labor. In the additional units the average cost of the existing unit times the number of acres in the additional unit was used to derive all expenses. Because family labor was included in the average cost per acre in the existing unit no addition for family labor will be necessary for the additional unit.

TABLE X. PRODUCTION BUDGETS FOR DIFFERENT SIZE FARMS IN DIFFERENT AREAS RAISING WHEAT ONLY.

	Area VI	
	Total	Per Acre
Small Farm -- 384 crop acres (existing unit)		
Cash income	\$ 5,806.00	\$ 15.11
All expenses ^{a/}	4,510.00	11.74
Net annual income from land	1,296.00	3.37
Capitalized value at 4 1/2%	28,800.00	75.00
Medium Farm -- 800 crop acres (combined unit)		
Cash income	\$ 12,094.00	\$ 15.11
All expenses ^{b/}	7,690.00	9.61
Return to management ^{c/}	400.00	.50
Net annual income from land	4,004.00	5.00
Capitalized value at 5 1/2% (4 1/2% + 1%)	72,800.00	90.90
		<u>91.00</u>
416 crop acres (additional unit)		
Cash income (using existing unit's records)	\$ 6,285.76	\$ 15.11
All expenses (using existing unit's records)	4,883.84	11.74
Return to management ^{c/}	400.00	.96
Net annual income from land	1,001.92	2.41
Capitalized value at 5 1/2% (4 1/2% + 1%)	18,216.72	43.81
		<u>43.79</u>
Large Farm -- 1,640 crop acres (combined unit)		
Cash income	\$ 24,793.00	\$ 15.11
All expenses ^{d/}	13,670.00	8.33
Return to management ^{c/}	1,200.00	.73
Net annual income from land	9,923.00	6.08
Capitalized value at 5 1/2% (4 1/2% + 1%)	180,418.18	110.54
		<u>110.01</u>
1,256 crop acres (additional unit)		
Cash income (using existing unit's records)	\$ 18,978.16	\$ 15.11
All expenses (using existing unit's records)	14,745.44	11.74
Return to management ^{c/}	1,200.00	.96
Net annual income from land	3,032.72	2.41
Capitalized value at 5 1/2% (4 1/2% + 1%)	55,140.36	43.81
		<u>43.90</u>

^{a/} Includes cash expenses, depreciation, interest on investment other than land and \$905.00 for family labor.

^{b/} Includes all the above expenses, but family labor is now valued at 800/384 of existing unit's family labor or \$1,900.00.

^{c/} Returns to management are figured on the marginal basis; therefore, when \$400.00 is included for the management return for 416 additional acres, the per acre cost for 800 acres is less than for 416 acres. The same applies for the larger unit.

^{d/} Includes all the above expenses, but family labor is now valued at 1,640/384 of existing unit's family labor or \$3,864.00.

TABLE X. (Continued). PRODUCTION BUDGETS FOR DIFFERENT SIZE FARMS IN DIFFERENT AREAS RAISING WHEAT ONLY.

	Area III & IV	
	Total	Per Acre
Small Farm -- 384 crop acres (existing unit)		
Cash income	\$ 4,279.00	\$ 11.14
All expenses ^{a/}	3,415.00	8.89
Net annual income from land	864.00	2.25
Capitalized value at 4 1/2%	19,200.00	50.00
Medium Farm -- 800 crop acres (combined unit)		
Cash income	\$ 8,915.00	\$ 11.14
All expenses ^{b/}	5,457.00	6.82
Return to management ^{c/}	400.00	.50
Net annual income from land	3,058.00	3.82
Capitalized value at 5 1/2% (4 1/2% + 1%)	55,600.00	69.45
		<u>69.50</u>
416 crop acres (additional unit)		
Cash income (using existing unit's records)	\$ 4,634.24	\$ 11.14
All expenses (using existing unit's records)	3,698.24	8.89
Return to management ^{c/}	400.00	.96
Net annual income from land	536.00	1.29
Capitalized value at 5 1/2% (4 1/2% + 1%)	9,745.45	23.45
		<u>23.43</u>
Large Farm -- 1,640 crop acres (combined unit)		
Cash income	\$ 18,276.00	\$ 11.14
All expenses ^{d/}	9,701.00	5.91
Return to management ^{c/}	1,200.00	.73
Net annual income from land	7,375.00	4.50
Capitalized value at 5 1/2% (4 1/2% + 1%)	134,090.90	81.81
		<u>81.76</u>
1,256 crop acres (additional unit)		
Cash income (using existing unit's records)	\$ 13,991.84	\$ 11.14
All expenses (using existing unit's records)	11,165.84	8.89
Return to management ^{c/}	1,200.00	.96
Net annual income from land	1,636.00	1.29
Capitalized value at 5 1/2% (4 1/2% + 1%)	29,745.45	23.45
		<u>23.68</u>

^{a/} Includes cash expenses, depreciation, interest on investment other than land and \$177.00 for family labor.

^{b/} Includes all the above expenses, but family labor is now valued at 800/384 of existing unit's family labor or \$368.00.

^{c/} Returns to management are figured on the marginal basis; therefore, when \$400.00 is included for the management return for 416 additional acres, the per acre cost for 800 acres is less than for 416 acres. The same applies for the larger units.

^{d/} Includes all the above expenses, but family labor is now valued at 1,640/384 of existing unit's family labor or \$755.00.

A return for management was subtracted from cash income in accordance with the ideal appraisal method. The figures \$400.00 for the 416 acre addition and \$1,200.00 for the 1,256 acre addition was deemed most realistic in view of the situations. The tremendous importance that the evaluation of return to management has upon the capitalized values and the marginal demand price should be emphasized. Extreme care should be taken when evaluating returns for management.

Net annual income from the land was determined by merely subtracting all expenses and the return to management from cash income. Net annual income from land was then capitalized by the appropriate rate of interest. In the budget analysis 4.5 percent was the rate charged for interest on land investment. The interest rate of 4.5 percent was used, because of this, in capitalizing net return for the existing unit. In capitalizing net return for the additional units and the combined units 1 percent was added to the 4.5 percent to take care of risk. This made the capitalization rate for the combined units and additional units 5.5 percent.

Averages per acre were determined by dividing the total figures by the number of acres in the units, with the exceptions of net annual income from land and capitalized value. Net annual income from land per acre and capitalized value per acre can be derived two ways. Net annual income from land per acre can be derived by subtracting average expenses per acre plus average return to management per acre from average cash income per acre, or by dividing total net annual income from land by the number of acres in the unit. Capitalized value per acre can, also, be

obtained either by capitalizing average net annual income per acre, or by dividing total capitalized value by the number of acres in the unit.

A difference in capitalized value per acre can occur if average net annual income per acre is not carried out to several decimal places. In most cases it will amount to just a few cents, depending on the degree of rounding error. Figures derived both ways are given for capitalized value per acre. The bottom figure is for the total capitalized value divided by the number of acres in the unit, and the top figure is by capitalizing average net annual income. If a person were dealing with a large unit these few cents could amount to a considerable sum. Caution in rounding of decimals must be emphasized when capitalizing average net income per acre. It is for this reason that both figures are given.

With the revised budget analysis in Table X and the capitalized values of the various units, it is now possible to determine the marginal demand price and total value for the additional units. The steps, 1 through 10, in Table XI will depict total marginal demand price, marginal demand price per acre, capitalized value per acre and two methods of deriving total value for the additional units. Table XI is compiled from Table X by the use of the following process. The capitalized values of the three units for the two different size additions in each area are shown.

The formula for deriving the total value of additional land is:

$$Y = \left\{ \left(\frac{X_3 - Y_3}{r + .01} \right) A - \left[\left(\frac{X_1 - Y_1}{r} \right) A + \left(\frac{X_2 - Y_2}{r + .01} \right) A \right] \right\} + \left(\frac{X_2 - Y_2}{r + .01} \right) A$$

TABLE XI. FIGURES NECESSARY FOR DETERMINING THE VALUE OF ADDITIONAL ACRES IN A HYPOTHETICAL APPRAISAL USING THE IDEAL APPRAISAL METHOD.

(Different Size Additional Units in Different Areas)

Item	Area VI		Areas III & IV	
	Add 416 Acres to 384 Acres	Add 1,256 Acres to 384 Acres	Add 416 Acres to 384 Acres	Add 1,256 Acres to 384 Acres
1. Total capitalized value of existing unit	\$28,800.00	\$ 28,800.00	\$19,200.00	\$ 19,200.00
2. Total capitalized value of additional unit	18,216.72	55,140.36	9,745.45	29,745.45
3. Total capitalized value of existing unit plus additional unit	47,016.72	83,940.00	28,945.45	48,945.45
4. Total capitalized value of combined unit	72,800.00	180,418.18	55,600.00	134,090.90
5. Total marginal demand price (4 - 3) .	25,783.28	96,477.82	26,654.55	85,145.45
6. Marginal demand price per acre (5 divided by number of additional acres) .	61.98	76.81	64.07	67.79
7. Total capitalized value per acre of additional unit	43.80	43.80	23.45	23.45
8. Total value of additional land per acre (6 + 7)	105.78	120.61	87.52	91.24
9. Total value of additional land (8 times number of additional acres) . . .	44,004.48	151,486.16	36,408.32	114,597.44
10. Total value of additional land, optional method (2 + 5)	44,000.00	151,618.18	36,400.00	114,890.90

Where:

$$\left(\frac{X_1 - Y_1}{r} \right) A = \text{Total capitalized value of existing unit.}$$

$$\left(\frac{X_2 - Y_2}{r + .01} \right) A = \text{Total capitalized value of additional unit.}$$

$$\left(\frac{X_3 - Y_3}{r + .01} \right) A = \text{Total capitalized value of combined unit.}$$

The marginal demand price is:

$$\left\{ \left(\frac{X_3 - Y_3}{r + .01} \right) A - \left[\left(\frac{X_1 - Y_1}{r} \right) A + \left(\frac{X_2 - Y_2}{r + .01} \right) A \right] \right\}$$

Now, if we add the total capitalized value of the existing unit and the additional unit and subtract the total capitalized value of the combined unit from this sum we will have the total marginal demand price. When we divide the total marginal demand price by the number of acres in the additional unit it becomes the marginal demand price per acre.

The results in Table XI are not meant to be indicative of an actual situation. However, the ideal method of appraisal does show the effect of the marginal demand price as indicated in Table XI. In Area VI where land had been valued at \$75.00 per acre we see that by adding land to an existing unit \$105.78 or \$120.61 can be paid per acre by buying 416 acres or 1,256 acres respectively. The same applies to Area III and IV where land had been valued at \$50.00 per acre. One of the underlying

factors for increased land values in a period of declining farm income and higher interest rates is a partial accounting of the marginal demand price.

Table XI shows the maximum amount a buyer can pay per acre for additional land and not what he should offer. Anytime a buyer can get the land cheaper than this appraised value he should.

Before departing from the analysis in Table XI a few comments are in order. The difference in the total value of additional land derived two ways is the result of rounding errors. Another comment is: while the marginal demand price appears to be much higher than the capitalized value for the additional unit it is because in real situations a partial marginal demand price has been accounted for. In this analysis the entire marginal demand price has been separated from the total value. Even though the marginal demand price appears to be quite high, the total value is probably not too far out of line for the situations assumed.

PART IV

SUMMARY AND CONCLUSIONS

Summary

A general description of conventional land appraisal methods was presented, together with some analysis of the price influencing elements taken into account by the various methods. The inadequacies of price influencing elements contained in conventional appraisal methods and the inadequacies of accounting and measuring devices were pointed out.

One of the major price influencing elements not usually accounted for is marginal demand price. The appraisal methods analyzed were also incomplete on the following points: accounting for possible savings, accounting for prospective buyers, current assets and emergency credit and accounting for terms of payment in view of the income tax structure.

The implication that one appraisal for a particular purpose was to be valid for all people was deemed inappropriate. For this implication to be correct all buyers would have to be in an identical situation. This is highly unlikely.

In spelling out what was actually happening in the land market by an analysis of current land sales, certain price influencing elements considered by land buyers were discussed. The inability of some land buyers to (and the need for them to) take into account other price influencing elements was pointed out. It appeared that the land buyers were faced with rising land prices without the knowledge to account for all the price influencing factors in appraising the additional land they purchased.

In view of the knowledge gained by analyzing current appraisal methods and the analysis of current land sales an appraisal method, considered ideal, for land buyers adding additional land to an existing unit was developed. All price influencing factors considered relevant were included in this model.

In testing the validity of the ideal appraisal model all price influencing factors were held constant except the marginal demand price factor. A budget analysis of operating costs and cash income for different sized units and different classes of land was presented. With computations from the budget analysis the effect of the marginal demand price was shown to be a relevant factor in influencing the value of land.

Conclusions

The conclusions of this study are in accord with the hypothesis presented in the beginning of this report.

Land values increase as additional units of land are added to an existing farm unit. One of the reason why land values increase is because of economies of scale. As more land is farmed average costs per acre decline. This has the effect of increasing net income per acre, and when net income is capitalized a higher value per acre results.

Economy of scale is one of the major factors influencing marginal demand price. A land buyer can benefit by taking into account the marginal demand price as he attempts to determine the maximum price he can pay for additional units of land.

One of the underlying causes of increased land values in a period of declining farm income and rising interest rates could be the accounting of a marginal demand price. Current appraisal methods do not take into account the marginal demand price, yet land buyers are faced with that price influencing factor driving land prices up in the land market. Therefore, if land buyers are going to get the land they want and can afford, or avoid over-payment for land, it will be to their advantage to take into account the marginal demand price.

Further Research

It appears that with the validity of the marginal demand price established further research would be justified. The premises of the marginal demand price rest upon the need for adequate records of the land buyers, knowledge of various classes of land and an appropriate interest rate. These requirements, at present, are limiting factors in calculating the marginal demand price. Because of the delicate nature of arriving at the marginal demand price by using a capitalization rate and the other requirements, further research for refining, and possibly, the deriving of another method for measuring the marginal demand price is needed.

There is room for research in determining the effect terms of payment have upon price in view of the income tax structure.

As a last comment, in view of rising land prices, and the effect the price a land buyer pays for a piece of land has on the possibility of his making his agricultural enterprise a success, more research in the field of agricultural land appraisal would be justified.

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