



The use and effectiveness of financial and physical reserves in Montana's dryland wheat area  
by Howard W Hjort

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:

The research problem was to test whether financial and physical reserves could be used by the dryland farmer to better adapt his farm organization and operations to the highly variable conditions encountered in dryland grain farming. When and if they could be so used, the problem was to determine the effectiveness of these reserves.

Reserves were defined as that part of the assets and/or earnings of a farm unit purposefully retained and managed in cash or in a less liquid form, as a provision for meeting current and future demands of the firm and household.

To test whether reserves could be used by the farmer, yield series of 14 to 24 years were constructed for 67 tracts of state-owned cropland located in the Judith Basin and Sheridan and Roosevelt counties.

An analysis of these yield series determined the liquid reserves that would be required to cover the non-deferrable expenses of the firm and household in both the short run and over time. These requirements ranged from \$472 to \$35,550 in the northeast area, from \$0 to \$41,061 in the other area. The average requirements in these respective areas were \$6,301 and \$7,060 when the four series with either extremely low average yields or high yield variability were excluded.

To determine the effectiveness of reserves, the amount of income above yearly non-deferrable expenses was isolated for three farm units in each study area. The farm unit in each area representing the low yield group was unable to accumulate the surplus net cash income necessary for long run survival. For the remaining four farm units the surplus income was used to replace depreciable items and invested to accumulate capital. The surplus that was invested demonstrated the effectiveness of reserves of a somewhat less liquid form.

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by  
HOWARD W. HJORT

A THESIS

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in  
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The responsibility for errors is my own.



## ABSTRACT

The research problem was to test whether financial and physical reserves could be used by the dryland farmer to better adapt his farm organization and operations to the highly variable conditions encountered in dryland grain farming. When and if they could be so used, the problem was to determine the effectiveness of these reserves.

Reserves were defined as that part of the assets and/or earnings of a farm unit purposefully retained and managed in cash or in a less liquid form, as a provision for meeting current and future demands of the firm and household.

To test whether reserves could be used by the farmer, yield series of 14 to 24 years were constructed for 67 tracts of state-owned cropland located in the Judith Basin and Sheridan and Roosevelt counties. An analysis of these yield series determined the liquid reserves that would be required to cover the non-deferrable expenses of the firm and household in both the short run and over time. These requirements ranged from \$472 to \$35,550 in the northeast area, from \$0 to \$41,061 in the other area. The average requirements in these respective areas were \$6,301 and \$7,060 when the four series with either extremely low average yields or high yield variability were excluded.

To determine the effectiveness of reserves, the amount of income above yearly non-deferrable expenses was isolated for three farm units in each study area. The farm unit in each area representing the low yield group was unable to accumulate the surplus net cash income necessary for long run survival. For the remaining four farm units the surplus income was used to replace depreciable items and invested to accumulate capital. The surplus that was invested demonstrated the effectiveness of reserves of a somewhat less liquid form.

## CHAPTER I

### INTRODUCTION

#### The Problem Situation

Variations in production caused by the weather, insects, and diseases, together with extreme price fluctuations, introduce elements of risks and uncertainties into the business of agriculture. Heady speaks of risk and uncertainty in the following manner:

Risk refers to variability or outcomes which are measurable in an empirical or quantitative manner. Uncertainty refers to future events where the parameters of the probability distribution cannot be determined empirically. Anticipations of the future can be formed but there is no way that the entrepreneur or administrator can assemble enough homogeneous observations to predict the relevant probability distribution. Risk is insurable in an actuarial sense; uncertainty is not. 1/

Therefore, action may be taken by the individual to shift risk while he must live with uncertainty.

#### The Agricultural Industry

There are two principal variables that cause risk and uncertainty in the agricultural industry. They are price and output.

The individual that depends upon the open market for the sale of his produce is forced to live with the price uncertainties that are characteristic of that industry. When price is free to fluctuate, the uncertainty associated with this variable is common to all producers operating within the industry, regardless of geographic location. When

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1/ Earl O. Heady, Economics of Agricultural Production and Resource Use, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1952, pp. 440, 443.

price is fixed for some specific time period price uncertainty is non-existent during that period of time.

Price as a variable may be considered as being internal to the industry but external to the firm. The individual has no control over price variability but at the industry level action can and has been taken to control prices. Legislative price supports are examples of this form of stabilizing action. When legislative action determines the product price no price risk or uncertainty is present for the individual or the industry, at least in the short run.

A basic assumption in this study is that price is a constant, thereby eliminating one of the two variables from further consideration. Indications are that legislative action will continue to control or support the price of food and feed grains. It is true that the price level may vary over time even with, or as the result of, legislative action. However, regardless of the level, the minimum base price will be determined each year prior to the time that management must determine the short run use of resources and price uncertainty is confined to relatively narrow limits. Even when prices are not fixed or supported, price uncertainty is common to all production areas, so the high risk and uncertainty peculiar to the Great Plains is attributable to uncertainty in output.

Therefore, output remains as the basic problem in this study. The amounts of land and labor available to the firm will be determined prior to analysis -- they will become fixed resources. The other two

resources, management and capital, will be variants -- management will vary with respect to capital and income. The operator will manage his fixed resources to utilize capital in a manner consistent with his goals -- those that are postulated as realistic goals of individual farmers.

Other inputs or factors that determine output can be classified as being internal or external to the firm. No claim to inclusiveness is made and some inputs will be both internal and external.

Internal inputs can be directly controlled by management. Examples of internal inputs are: (1) grain treating materials, (2) weed control materials, (3) fertilizers, (4) crop and building insurance, and (5) credit.

External inputs cannot be directly controlled by management. Examples are: (1) wind, (2) temperature, (3) moisture, (4) hail, (5) freeze, (6) flood, (7) insects, and (8) plant diseases.

External inputs are the major causes of the risks and uncertainties associated with output. Internal inputs can be utilized to reduce the effects of external inputs by management. Management of capital and income becomes a problem of managing the internal inputs, in an attempt to reduce the adverse effects of the external inputs. This is a problem of the individual and the industry that requires additional research.

Private and public institutions have been created to minimize the effects of external inputs. Crop insurance can be used by management to shift risk. Hail insurance can be purchased for any coverage level management desires. All-risk crop insurance provides coverage of the

cash expense associated with crop production. Nevertheless, to shift these risks or to assume them becomes a management decision.

### Dryland Agriculture in the Great Plains Region

The Great Plains Region has been recognized as an area where variations in production are highly erratic. 2/ Variable production produces extreme variation in the individual farmer's income. In the dryland agricultural areas of the Plains the external factors cause problems of greater concern than are found in other major dryland agricultural areas. In fact, variability characterizes dryland agriculture in the Plains Region. Consequent extreme variations in the fortune of the individual farmer is a typical expectation for the Plains agriculturalist.

The reputation of the region arises not from extreme variation from year-to-year alone but because variation occurs in an unpredictable manner. The individual is concerned with year-to-year variation in yield and with yield differences for the same year. 3/ Those concerned with these variations include as a sub-class of year-to-year variation years

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2/ E.g., see works of Carl F. Kraenzel, Rural Sociologist, Montana State College; Rainer Schickele, Agricultural Economist, formerly at North Dakota Agricultural College; E. Lloyd Barber, Agricultural Economist, formerly of the Bureau of Agricultural Economics, USDA; Phil Thair, Agricultural Economist, formerly of the Bureau of Agricultural Economics, USDA, stationed at the North Dakota Agricultural College; and Earl O. Heady, Agricultural Economist at Iowa State College.

3/ Yields will vary from year to year for the farm as a whole, but also yield differs from one part of the farm to the next in the same year.

of low, mean, or high yields that tend to group.<sup>4/</sup> There are indications of this in series of yields specific to individual tracts of land such as that shown in Figure 1. In this yield series, the mean yield is 14.5 bushels per seeded acre; the standard deviation is approximately 6.44 bushels. The coefficient of variation is 44.4 percent. This tract of land is located in Judith Basin county and is owned by the State of Montana.

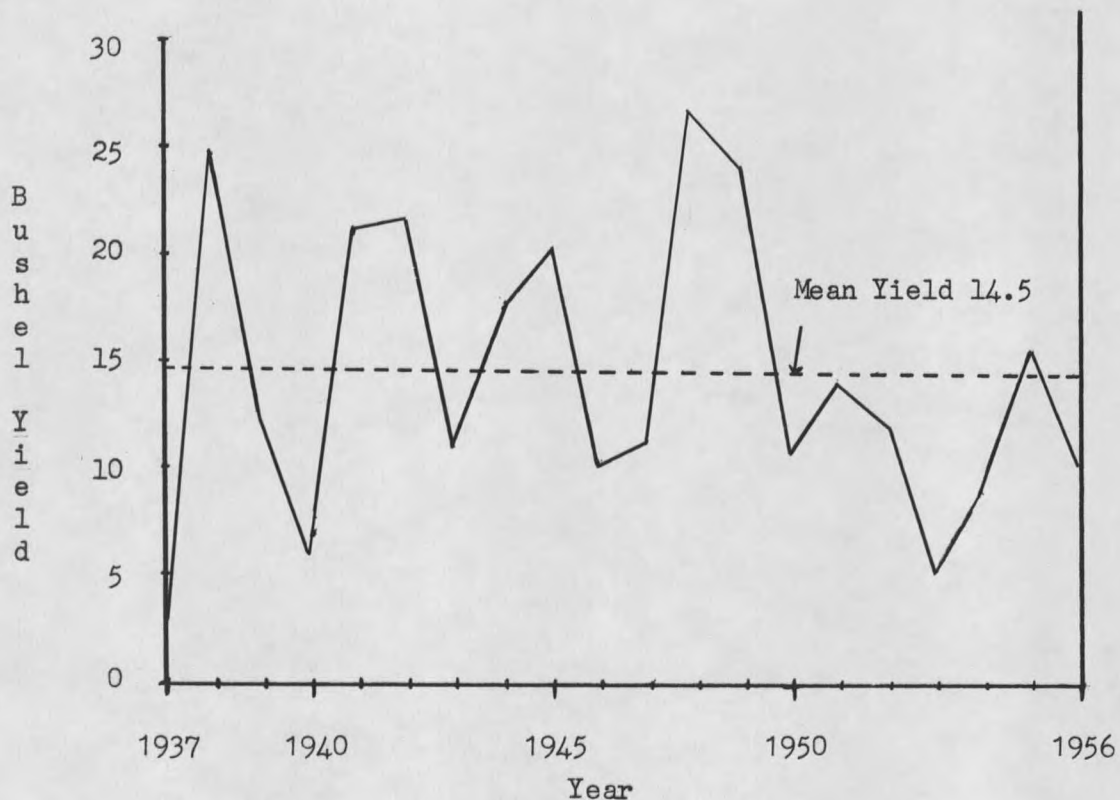


Figure 1. Twenty-year Yield Series on State-owned Cropland Located in Judith Basin County (R-12, T-17, S-34) Montana.

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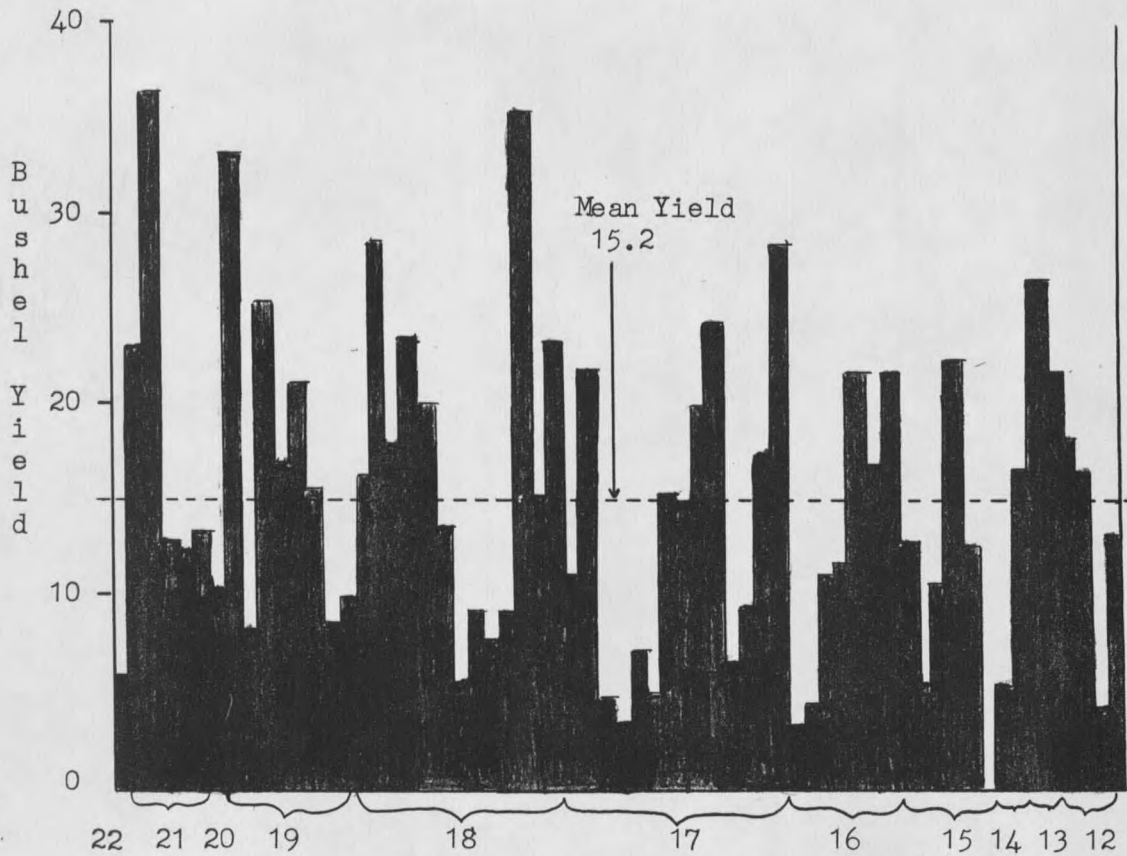
<sup>4/</sup> The statistical tools used to determine bunchiness do not confirm that this is so. This may be because (1) the lack of a suitable statistical device, (2) the lack of adequate time series data, or (3) bunchiness does not exist which is contrary to what we see in visual inspection of existing time series.

Figure 2 presents yields as reported in 1945 by operators of 63 different tracts of state-owned cropland in Judith Basin and Fergus counties. It is evident that within any one year pronounced differences in yields are the rule rather than the exception in this dryland crop area. For the 63 yield observations, the mean yield is 15.2 bushels per seeded acre, the standard deviation 8.28 bushels; therefore, the coefficient of variation is 54.5 percent. The yields on a seeded acre basis range from 0 to 36.6 bushels. Extreme variation in yield of either of these types cause the external factors to be classed as uncertainties rather than risks, as it becomes impossible for the individual farmer to pass them on to someone else.

Numerous economic studies have been made in various parts of the Great Plains to explore these risk and uncertainty aspects of dryland agriculture. 5/ Indications are that intelligent use of reserves will promote income stability for the individual and the industry. It seems that capital and income are recognized as factors that can be managed through the use of reserves. This recognition gives rise to the specific research problem to be studied.

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5/ Especially by Schickele, Barber, Thair, and Baldur Kristjanson, Agricultural Economists formerly of the North Dakota Agricultural College.



Yield Observations and Townships of Observations

Figure 2. Yields Per Seeded Acre as Reported for 63 State-owned Tracts of Cropland Located in Judith Basin and Fergus Counties, Montana, 1945.

The Research Problem

The problem of this research effort is to test whether financial and physical reserves can be used by the dryland farmer in the Great Plains Region, and if so, to measure how effective they, together with other management techniques, are in reducing the adverse effects of the external factors.



Reserves will be defined as that part of the assets and/or earnings of a farm purposefully retained and managed in cash or in a less liquid form, as a provision for meeting the current and future demands of the firm and the household. As such, reserves will be of two major categories: (1) financial and (2) physical.

Reserves will be looked upon as forms of capital. The quantity of reserves will fluctuate in use and will be controlled by annual variations in the income stream and the way it is managed as it enters the business. It is recognized that some farmers may have ample capital beyond that invested in the farm unit that, if retained in sufficiently liquid form, they could operate without other reserves. <sup>6/</sup> However, returns from such capital committed semi-permanently may be great enough to draw it off and justify use of a reserve program appropriate to a situation without surplus capital.

Financial reserves include: (1) cash bank accounts, (2) life insurance annuities, (3) federal, municipal, and corporate bonds, (4) common stocks, and (5) other forms of securities.

Examples of physical reserves are: (1) food or feed grain stored, (2) machinery and equipment, (3) farm land, and (4) off-farm real property.

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<sup>6/</sup> The farm unit consists of the producing and consuming portions of the farm, and is therefore considered a complete economic unit. This term will be used throughout this report and incorporates the firm and the household.

The Individual Farmer and His Goals

The farmer's planning and action are governed by the set of resources at his command, by known techniques, by his knowledge and appraisal of weather and other hazards, and price expectations. His decisions are made within the established set of institutions, both public and private, with which he does business and carries on many of the activities of his daily living.

The institutional framework and individual institutions may or may not be adapted to the environment of the Great Plains. In fact, they may be in conflict with the goals of the farm unit. A comprehensive economic analysis of resource use requires transcending institutional boundaries in an attempt to locate and define the conditions necessary to help the farm unit achieve its goals.

It is assumed that the goals of the farm unit are survival over time and capital accumulation over time. The household must survive; this is a prerequisite to the firm's survival. The management problem is to organize and manage the household and firm, and to conduct the business affairs in a manner that will attain these goals. The extent to which these goals are realized is a measure of economic success.

As the farm unit attempts to establish itself as a business, the first goal is survival. At some further stage of development the major goal becomes capital accumulation. The goals change when the manager decides that survival is assured. The changing of goals is expected to

influence the way reserves are used and almost by definition the quantity and forms of reserves that are available.

The optimum use of reserves by any farm unit may require financial reserves alone, physical reserves alone, or some combination of both. Optimum use of reserves will occur when the farm unit uses the reserves available in the manner most consistent with the limited resources under its command and by this use they will be consistent with the objectives or goals. The form of tenure, the fixed resources of land and labor, and the institutional framework within which the manager makes his decisions will have an effect on the optimum use of resources. This optimum will be guided by the goals as previously postulated.

#### The Present Situation

Present knowledge of the use and effects of reserves, as defined, is not adequate to reject or substantiate existing beliefs of farmers, researchers, and other individuals concerned. An economic analysis of this problem will result in information of value to the individual farmer, the Extension Service, Agriculture Experiment Stations, Department and other Federal Officials and others concerned with Northern Great Plains agriculture and rural welfare.

#### Objectives

The major objective is to develop economic information concerning reserves and their use that will help the farm operator in Montana and in similar areas, to better adapt his farm organization and operations to the highly variable conditions encountered in dryland grain farming.

Specific objectives are to:

1. Measure the effect of reserves on dryland farm organization, management, and overall economic success.
2. Demonstrate the effectiveness of organizational and management adjustments the farm unit can make by using reserves.

#### Hypotheses

Within the uncertain income situations characteristic of farming in the Northern Great Plains Region, the farm unit can use financial and physical reserves to alleviate the problems of management, capital, and income in the efforts to attain the objectives.

Specific hypotheses are:

1. The individual who intelligently manages reserves will attain economic success before the individual who does not utilize reserves.
2. For each organizational and operational farm business there will be a reserve use pattern that is optimum. Of the different organizational and operational plans available to the individual one will show an absolute advantage over the others.

#### Procedure and Assumptions

This research is a phase of a major research project currently being conducted by the Farm Economics Research Division. 7/ The basic data accumulated for the major project will provide much of the basic information needed.

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7/ Study in progress, Effects of Weather on Economy of Dryland Farms, conducted by Don M. Bostwick, Agricultural Economist, Farm Economics Research Division, Agricultural Research Service, United States Department of Agriculture.

### Study Area

The geographic study area is, in general, the dryland winter and spring wheat areas of Montana's portion of the Great Plains. It is hoped that the results of this study will be applicable to similar dryland areas of the Northern Great Plains.

Specifically, portions of Fergus, Judith Basin, Sheridan, and Roosevelt counties were selected for study. The underlying assumption in this selection is that these counties are representative of the two major wheat producing areas in Montana. The first two represent the winter wheat area, the latter two the spring wheat area. These study areas are shown on the following map presented as Figure 3.

### The Specific Farm Unit

It is a necessary requirement that the farm unit be of adequate size to return, at a level of management commonly practiced in the area, income sufficient to meet its goals. There must be sufficient income over time to provide a level of living the family will accept, cover cash expenses, and meet overhead costs -- these are characteristics of a farm unit that will survive. Also over time, there must be some surplus for reinvestment, for capital accumulation as the second goal is expressed above. In the short run, capital must be adequate to meet minimum and non-deferrable living costs and cash operating costs. If these costs are not covered, reserves cannot be utilized effectively, if at all.



















































































































































































































