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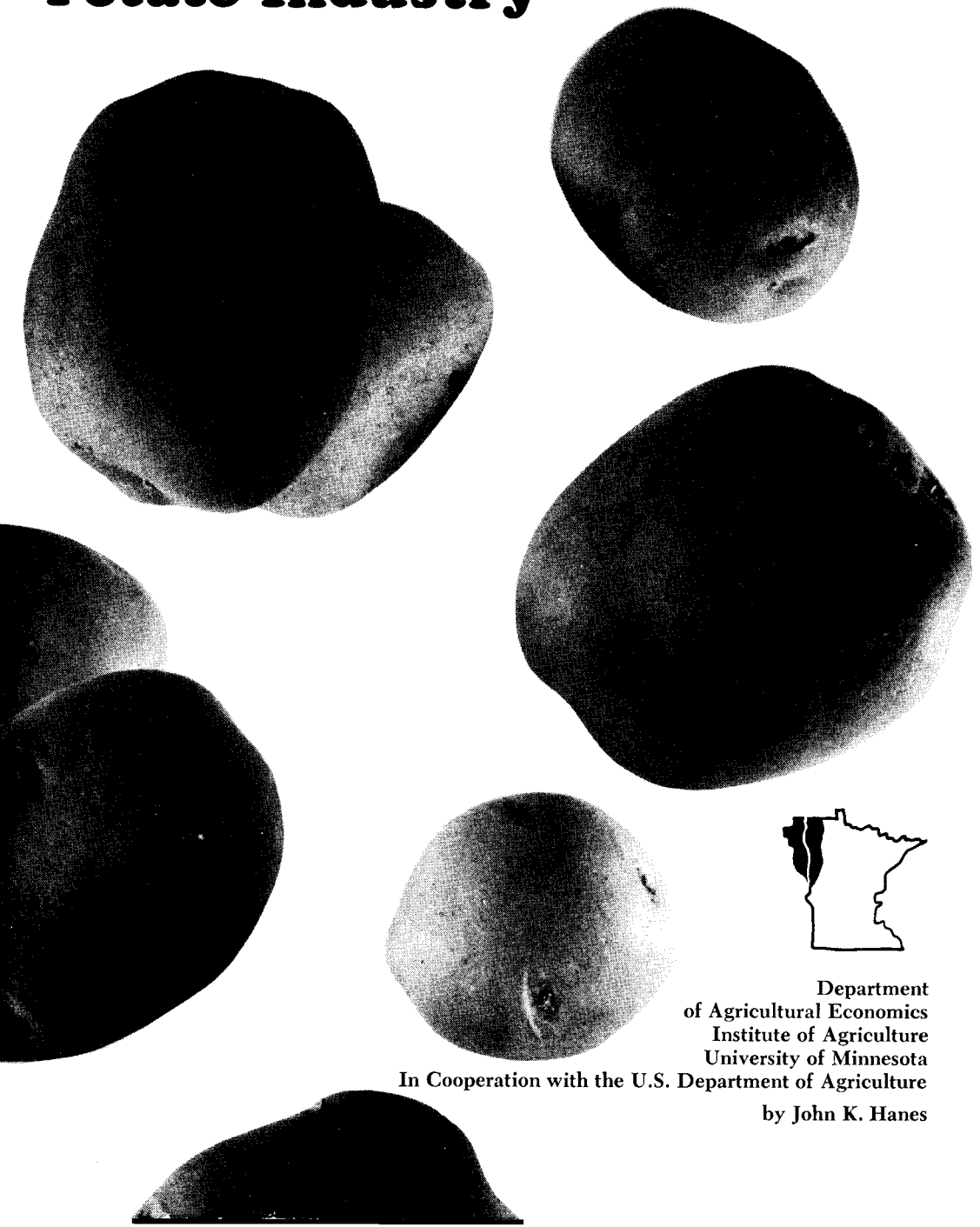
March 1969 Economic Study Report No. S68-3

Organization and Structure of the Red River Valley Potato Industry



Department
of Agricultural Economics
Institute of Agriculture
University of Minnesota
In Cooperation with the U.S. Department of Agriculture

by John K. Hanes

ECONOMIC STUDY

REPORT NO. S68-3 February 1969

ORGANIZATION AND STRUCTURE OF THE RED RIVER VALLEY POTATO INDUSTRY

by

John K. Hanes

Department of Agricultural Economics
Institute of Agriculture--University of Minnesota

In cooperation with the U.S. Department of Agriculture
St. Paul, Minnesota 55101

CONTENTS

	PAGE
Summary	i
Introduction	1
Purpose	3
Scope	3
Sources of data	4
Collection and analysis of survey data	5
Size of firm	6
Specialization of firms	7
Type of firm	8
Trends in Production	10
Late crop	15
Central region	15
Minnesota-North Dakota	17
Red River Valley	20
Minnesota crop reporting District No. 1	22
Trends in Consumption	23
Trends in Utilization	23
U.S. Potato Market	23
Red River Valley Potato Market	27
Production and Marketing Functions	34
Production	37
Harvesting	39
Storage	41
Storage decision	45
Packing	48
Integration	52
Vertical integration	52
Horizontal integration	54
Mixed integration	55
Ownership integration	55
Cooperatives and condominiums	56
Pooling tablestock potatoes	58
Contracting for processing potatoes	58
Stock ownership in other Valley firms	60
Relationship to firms in terminal markets	60
Marketing Channels	61
Intra-industry transactions	62
Acquisition of bulk potatoes	63
Acquisition of packed potatoes	65
Sales to final customers	65

PAGE

Concentration 68
Volume of inspections as a measure of firm size 68
Concentration ratio, 1962-63 season 69
Changes in number and size of firms 71
Changes in concentration 72

Product Differentiation 75
Real differences in tablestock potatoes 75
Real differences in processing potatoes 76
Real differences in seed potatoes 77
Product differences, 1962-63 season 78
Product trends, 1956 to 1963 crop years 79
Brands 81
Reputation 84
Goodwill 85
Services provided 86
Firm advertising 87
Industry promotion 88
Locational advantages 91

Conditions of Entry and Exit 91
Entry and exit 92
Conditions of entry 94
Entry at the grower level 95
Entry at the shipper level 96
Optimum size of firm 97
Capital requirements 100
Degree of displacement 103
Conclusions 104
Entry at the distributor level 104
Conditions of exit 105

LIST OF TABLES

TABLE NO.		PAGE
1.	Potatoes: acres harvested, yield per acre, and production, United States, 1920-56	12
2.	Measures of concentration, Red River Valley potato industry, 1962-63 season	70

LIST OF FIGURES

FIGURE NO.		
1.	Product specialization of Red River Valley potato firms, 1962-63	7
2.	Potatoes: trends in share of total production by season groups	13
3.	Potatoes: trends in share of total production by regional groups	14
4.	Late crop potatoes: trends in share of production, selected states	16
5.	Late crop potatoes: trends in share of production of Central Region, selected areas	18
6.	Late crop potatoes: location of major production, Minnesota-North Dakota	19
7.	Per capita consumption of potatoes in the United States	24
8.	Potatoes: utilization of sales, United States, 1956 to 1965	26
9.	Red River Valley potato sub-market overlaps	27
10.	Potatoes: utilization of sales, Red River Valley, 1956 to 1965	30
11.	Late crop potatoes: production and marketing functions	35
12.	Potatoes: monthly average prices received by farmers, Minnesota-North Dakota, 1954 to 1965	47

FIGURE NO. PAGE

13. Major marketing channels Red River Valley potato industry, 1962 crop year 67

14. Share of total inspections, by size groups of firms. . 73

APPENDIX TABLES

TABLE NO. PAGE

1. Potatoes: firm specialization by type of potatoes sold, Red River Valley, 1962-63 season 107

2. Potatoes: production by seasonal groups, United States, 1920-66 108

3. Late crop potatoes: trends in acreage and production, selected states, 1920-66 109

4. Late crop potatoes: production by regional groups, United States, 1920-66 110

5. Late crop potatoes: trends in acreage and production, selected areas, Central region, 1920-66 111

6. Potatoes: acres harvested, by counties, Red River Valley, census years 1924-66 112

7. Potatoes: number of farms harvesting, by counties, Red River Valley, census years 1924-64 113

8. Average acres harvested per farm, by counties, Red River Valley, census years 1924-64 114

9. Potatoes: number of farms, acreage, and production, Minnesota Crop Report District 1, 1954-66 115

10. Potatoes: per capita consumption (fresh-weight equivalent), United States, calendar year, 1950-65 . . 116

11. Potatoes, Irish: utilization of sales, United States, crop years 1956-65 117

12. Potatoes, Irish: utilization of sales, Red River Valley, crop years 1956-65 118

APPENDIX TABLES (continued)

TABLE NO.		PAGE
13.	Acres harvested of selected crops, 10 country area of Red River Valley, 1946-66	119
14.	Potatoes: number of marketing firms, by sizes of production units, Red River Valley, 1962-63 season . .	120
15.	Ownership and control of potato storage capacity, Red River Valley, 1962-63 season	121
16.	Location and utilization of storage capacity, Red River Valley, 1962-63 season	122
17.	Potatoes: montly average prices received by farmers, Minnesota-North Dakota, 1954-66 crop years	123
18.	Potatoes: production in 10 counties of the Red River Valley; in Minnesota-North Dakota and total stocks held by growers and local dealers on December 1, January 1, February 1, and March 1, states of Minnesota-North Dakota, 1954-66 crop years	124
19.	Vertical integration of functions within potato marketing firms, Red River Valley, 1962 crop year	125
20.	Potato marketing firms, by form of business organization and number of production units, Red River Valley, 1962 crop year	126
21.	Potatoes: intra-industry transactions, by method of acquisition, Red River Valley, 1962 crop year	127
22.	Volume of potatoes sold to final customers, by location of customers and intended use, Red River Valley, 1962 crop year	128
23.	Potatoes: volume inspected by size rank of firm, Red River Valley, 1955-63 crop years	129
24.	Potatoes: number and percent of potato marketing firms, by size groups based on volume inspected, Red River Valley, 1955-63 crop years	130
25.	Potatoes: volume inspected by size groups of potato marketing firms, Red River Valley, 1955-63 crop years.	131
26.	Potatoes: volume inspected by size rank of firms, and share of total inspections, Red River Valley, 1955-63 crop years	132

APPENDIX TABLES (continued)

TABLE NO.		PAGE
27.	Potatoes: the four, eight, and twenty largest firms, by number of years in specified size group and number of years in business, Red River Valley, 1955-63 crop years	133
28.	Potatoes: number of firms and volume packed by specified characteristics, Red River Valley, 1962-63 season	134
29.	Potatoes: volume of potatoes packed by size of package, Red River Valley, 1962-63 season	135
30.	Potatoes: shipments by utilization, type of potatoes, and volume washed, Red River Valley, 1956-64 crop years	136
31.	Potaotes: Shipments for tablestock and processing, washed and dry, by grade, Red River Valley, 1956-64 crop years	137
32.	Potatoes: shipments for tablestock and processing, by size of package, Red River Valley, 1956-64 crop years	138
33.	Potatoes: private brands, advertising, and brand recognition, Red River Valley, 1962-63 season	139
34.	Potatoes: entry and exit of firms paying inspections, Red River Valley, 1955-63 season	140
35.	Potatoes: average volume of inspections paid by firms entering and leaving, Red River Valley, 1955-63 season	141
36.	Estimated cost, potato storage and packing facilities, Red River Valley, 1963	142

APPENDIX FIGURES

FIGURE NO.		PAGE
1.	Functions performed, by type of firm	143
2.	Functions performed, by size of firm	144

APPENDIX EXHIBIT

EXHIBIT NO.		
1	States producing potatoes, by seasonal and regional groups	145

FOREWORD

This is the second of three reports examining various aspects of the Red River Valley potato market. The first report is entitled "The Red River Valley Potato Industry: Economics of Size in Storing and Packing Potatoes" Report No. 531, University of Minnesota, in cooperation with the U.S. Department of Agriculture, St. Paul, Minnesota, July 1967. A third report will analyze pricing and efficiency in the market and suggest changes in organization and structure needed to obtain improvements in market performance.

These studies review changing economic conditions and are designed to provide better information to the industry as a basis for adjustment decisions. The reports are a part of research project ME3-75, "Economic Analysis of the Structure and Performance of the Red River Valley Potato Market". This is a joint effort involving direct cooperation between the Minnesota Agricultural Experiment Station and the Economic Research Service, U.S. Department of Agriculture. In this phase of the overall project the Minnesota Station was represented by Professors Frank J. Smith and Darrell F. Fienup of the Department of Agricultural Economics. The Economic Research Service was represented by John K. Hanes, Agricultural Economist, Market Economics Division.

SUMMARY

The past half-century has been a period of major changes in the potato industry. This period has been marked by rapidly declining acreage, sharply increasing yields, and a slowly increasing production level. The early production areas have increased their share of total production at the expense of the intermediate (spring and early summer) production areas. The share of the late crop areas declined slightly between the 1920-24 and 1945-49 periods but then increased back to the earlier level by 1965-66. Although the share of the late crop has changed little, there have been major shifts between the Eastern, Central, and Western late crop regions. From the position as the most important of the three regions, producing one-half of the late crop in 1920-24, the Central Region declined to the least important of the three regions, producing less than one-fourth of the late crop in 1965-66.

The Red River Valley is the only area in the Central Region that has continued to expand potato production since the 1920's. Production in the Valley has more than doubled and the Valley's share of the Central Region increased from 11 percent in 1920-24 to 41 percent in 1960-64, but then declined to 39 percent in 1965-66. This recent decline is the result of expansion in Michigan and Wisconsin.

After declining over a 50-year period, the per capita consumption of potatoes stabilized during the 1950's. This change in trend resulted from the introduction and rapid increase in the consumption of processed potato products. Per capita consumption of processed products increased from 6.3 pounds in 1950 to 36.0 pounds in 1965.

The Red River Valley has not shared equally with other production areas in the expansion of the processing segment of the industry. Other production areas have expanded more rapidly in the production of frozen and dehydrated potato products, while the Valley industry has increased its share of the chipstock market. During the 1965 crop year, chipstock accounted for 12 percent of the total U.S. volume of potatoes sold, but represented 20 percent of the volume sold in the Valley. The production of frozen and dehydrated products in the Valley has lagged behind other areas. While 22 percent of the United States volume of potatoes sold were frozen and dehydrated in 1965, only 13 percent of the Valley volume was frozen and dehydrated.

The Red River Valley is not a specialized potato producing area in the sense that potatoes are produced to the exclusion of other crops. Although the Valley accounts for about 12 percent of the total United States late crop, potato acreage represents less than 5 percent of the Valley acreage devoted to major crops. Even for typical potato producers, the acreage devoted to potatoes represents only about one-fourth of the land farmed. Potato production units during the 1962-63 season averaged 848 acres per farm with 201 acres in potatoes.

In 1963, the total potato storage capacity available in the Valley was 26.1 million cwt. Trackside storage capacity totaled 19.7 million cwt. and farm storage accounted for another 6.4 million cwt. All of the 858 potato marketing firms in the Valley either owned or controlled some storage space; 710 firms actually owned storage space. The other 148 firms rented or leased space from those who owned it. Although all

858 firms owned or controlled storage space, only 704 of these firms packed any potatoes for shipment to final customers. The other 154 firms sold all of their potatoes in bulk to other firms who performed the packing function.

The pattern of functional integration in the Valley is one in which several independent firms combine horizontally at one level to jointly perform the next vertical function in the marketing sequence. There were 1,619 production units organized into 858 marketing firms during the 1962-63 season. Only 11 of these marketing firms operated as multi-plant operations with storage and packing facilities in two or more towns. About 462 of the marketing firms were vertically integrated to perform all of the functions from production through sales to "final customers", but only 295 firms made sales to customers "outside the Valley". The other 396 firms sold all of their potatoes to or through other firms in the Valley.

The number of marketing firms has been declining and the average size of firm has been increasing rapidly, but the share of the market controlled by any size group among the 100 largest firms has changed very little. The share of inspections paid by the 4, 8, 20, and 100 largest firms increased only 0.3, 0.4, 0.9, and 2.4 percent respectively over the 9-year period from 1955 to 1963. On the surface this would indicate a remarkable stability of market shares in the industry. However, the largest firms were not the same firms over the period. The four largest firms consisted of 11 different firms during the 9 years. Likewise the top 8 firms consisted of 19 different firms and the top 20 firms consisted of 53 different firms.

Traditionally, potatoes have been viewed as a homogeneous product with all market outlets potentially available to any producer with potatoes to sell. Changes in wholesale and retail procurement practices have had a major impact on the actions of sellers in the table-stock market. Increased washing, waxing, grading, sizing, and prepackaging accompanied by marketing firms efforts to differentiate their product by private brands, advertising, and increased services reflect these changing market conditions. During the 1962-63 season, 98 firms in the Valley washed potatoes, 72 waxed potatoes, and 81 prepackaged potatoes. Eighty-seven firms owned private brands and 51 of these firms spent an average of $546 per firm on advertising. Only 22 of the firms that advertised stated that they had been successful in gaining brand recognition in the market. Thirteen of these firms stated that they provided services to customers not provided by other firms in the Valley.

For purposes of examining the conditions of entry, it is assumed that entry can occur at the (1) grower level, (2) shipper level, or (3) distributor level. At the grower level, the entry of specialized potato producers does not appear likely, but, existing grain producers can introduce potatoes into the crop rotation system with relative ease. The large number of firms (ranging from 53 to 174 during the 1955 to 1963 period) that produced potatoes in only a single year reflects the ease with which existing producers can shift into and out of the production of potatoes.

At the shipper level, entry from outside of the industry appears to be a substantial barrier to entry at the shipper level. The large investment and operating capital and high degree of price uncertainty

results in a prohibitive risk level for any firm attempting to operate only as a shipper. On the other hand, there appear to be few barriers to entry from the grower level. The growers control production and storage and can obtain the capital needed to operate as a shipper. Also, there is very little that existing shippers can do to resist entry from the grower level. The major requirement for entry at the distributor level is a knowledge of markets and access to customers.

ORGANIZATION AND STRUCTURE OF THE RED RIVER VALLEY POTATO INDUSTRY

By John K. Hanes[1/]

Dynamic stability was the keynote of the U.S. potato industry during the first half of this century. That period was marked by an expanding population, declining per capita consumption of potatoes, rapidly declining acreage, sharply increasing yields, and major shifts among production areas. But despite these many internal changes, the total market remained remarkably stable. There was little tendency for growth or decline and little change in the product itself or in the manner in which it reached the consumer.

Between 1910 and 1950, the U.S. population increased about 60 percent. This demand-expanding force was almost offset by a 45 percent decline in per capita potato consumption. The volume of potatoes produced during 1950-54 was only 6 percent greater than that produced during 1910-14. Rapid and dramatic changes in the size and composition of the U.S. potato industry began in the early 1950's. Per capita consumption of all potato products began to stabilize, halting a long downward trend. The aggregate market for potatoes began to expand in step with population increases. Production for the most recent 5-year period, 1962-66, was 23 percent greater than in 1950-54. The reversal of the downtrend in consumption and the associated expansion of

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[1/] Agricultural Economist, Marketing Economics Division, Economic Research Service, USDA, stationed at the Institute of Agriculture, University of Minnesota, St. Paul, Minnesota.

production are attributed primarily to the introduction and rapid consumer acceptance of new processed potato products.

While the most striking recent development has been the advent and rapid growth of potato processing, changes in procurement practices of large, integrated, retail organizations also have had a major impact on the potato industry. As integrated retail organizations enlarge, they tend to bypass terminal markets and purchase directly at the shipping point. Because these large-scale buyers often have differing and specialized product requirements, they turn to a relatively few large sellers who can accept their specifications.

These changes have required major adjustments by potato producers and marketing firms. Production units and associated marketing firms are rapidly decreasing in number and increasing in size. Potato storage, handling, and marketing techniques are changing. Multi-product operations that combine both fresh and processed items are developing in some production areas. Increased washing, waxing, grading, sizing, and prepackaging, accompanied by marketing firms' efforts to differentiate their products by private brands, advertising, and increased services also reflect these changing market conditions.

A major problem, and the cause of considerable controversy in the Red River Valley, has been the alleged failure of the pricing mechanism to adequately reflect "real" differences between the products of various sellers in the market. Many shippers contend that the wide range in prices for the same grade of potatoes on a specific day does not truly reflect real product differences. Several suggestions have been offered as to the causes of this price variation. Most of the

discussion, however, centers around the small sellers who ship at irregular intervals. The large shippers feel that these small firms "undercut" the market and should be encouraged to work together to establish larger selling agencies.

Purpose

Individuals in industry and in public agencies need information as a basis for evaluating problems and for making decisions in adjusting to changing economic conditions. This reports describes and provides measures of the Red River Valley potato industry in organization and structure.

Scope

The Red River Valley potato industry is viewed as consisting of firms physically located in the Valley that produce, store, pack, or sell fresh potatoes to "outside" customers. These customers are either physically located outside of the Valley or else they convert fresh potatoes to processed products. For example, Valley distributors may not produce, store, or pack potatoes, but they perform the same selling functions as shippers and are therefore considered a part of the industry. Processors, however, are not considered to be a part of the industry even though several of these firms are physically located in the Valley. Valley processors are considered to be "final buyers" in the same sense that a terminal receiver or processor located in a distant city is considered to be a "final buyer" with respect to the industry.

The Red River Valley industry is viewed in two different contexts; both are useful in understanding the effects of changing conditions.

First, the industry is viewed as consisting of segments or units in a channel, through which potatoes flow from the producer to the "final buyer". Although this concept is rather limited for analytical purposes, it provides a picture of the sequential relationships of functions performed within and among firms in the industry. Second, the industry is viewed within the framework of market structure analysis.

Market structure analysis uses the concepts of price theory to analyze the effects of competitive processes in the market. Structural elements are important because they affect the industry's performance in terms of efficiency, progress, profits, etc. Elements of structure are assumed to exist independently of policy decisions of individual firms in the industry. If specific structural features in a market can be related to elements of poor performance, these features might be changed through public policy procedures.

A complete market structure analysis would encompass both the buying and selling sides of the market simultaneously. Although work currently in progress will provide a more complete analysis, this report only examines structural variables on the selling side of the market (i.e., the Red River Valley industry).[2/]

Sources of data

The data used in this study came from four major sources. First, the data on production, consumption, and utilization was obtained from

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2/For a discussion of changes on the buying side of the market the reader is referred to (1) W. F. Mueller and L. Garoian, Changes in the Market Structure of Grocery Retailing, The University of Wisconsin Press, Madison, 1961, and (2) A. C. Manchester, The Structure of Wholesale Produce Markets, MED, ERS, USDA, Agri. Econ. Rpt. 45, December 1963.

secondary sources, such as the Census of Agriculture, and publications and periodic reports of the U.S. Department of Agriculture, and the Minnesota and North Dakota Departments of Agriculture. Second, the Red River Valley Potato Growers Association made available tabulations of inspection data that had been obtained for administrative purposes, and provided access to records of inspection paid by individual firms for the years 1956 to 1963. Third, a personal interview survey of 103 firms located in the Valley was made during the summer of 1963 to obtain operating information for the 1962-63 shipping season. Fourth, the Transportation and Facilities Research Division, ARS, USDA, provided engineering and cost data obtained in existing potato storage and packing facilities in the Valley. These data, plus additional cost information have been incorporated in a study of economies of size in storing and packing potatoes.

Collection and analysis of survey data

A stratified random sample using disproportionate sampling rates was used to select specific firms to be interviewed. Inspection data for all firms paying inspections during the 1961-62 shipping season were divided into three size categories on the basis of the volume of inspections paid. These size categories were: (1) 150 or more carlots, (2) 30-149 carlots, and (3) less than 30 carlots. Each of these three strata were sampled independently on a random basis. The sampling rates were: (1) 100 percent of the large size group, (2) 20 percent of the medium size group, and (3) 5 percent of the small size group. The final sample included 103 firms that were interviewed and consisted of 38 firms that paid inspections on 150 or more carlots, 34 firms that

paid inspections on 30-149 carlots, and 31 firms that paid inspections on less than 30 carlots.

When the survey was completed, the data for the various tables in the report were tabulated and expanded on the basis of each of three firm characteristics. These characteristics were: (1) size of firms, (2) product specialization of firm, and (3) functional type of firm.

Size of firm

The firms were classified into three general size groups based on the number of 400 cwt. carlot equivalents packed during the 1962-63 season.

Large firms--are firms that packed 150 or more carlots during the season. These are the firms that average one or more carlots per day. They are in the market on a regular basis and have sufficient volume to establish and maintain continuing relationships with buyers and other sellers in the market. The results of the survey show that there were 61 firms of this size operating in the Valley during the 1962-63 season.

Medium firms--are firms that packed 30 to 149 carlots during the season. These firms average one or more carlots per week, but less than one carlot per day. They have sufficient volume to supply a few customers on a continuing basis, but do not have sufficient volume to sell in the market on a day-to-day basis. The results of the survey show that there were 257 firms of this size operating in the Valley during the 1962-63 season.

Small firms--are firms that packed less than 30 carlots during the season. These firms average less than 1 carlot per week and do not have sufficient volume to establish and maintain stable relationships

in the market. The results of the survey show that there were 540 firms of this size operating in the Valley during the 1962-63 season.

Specialization of firms

There are three classes of potatoes produced in the Red River Valley: (1) tablestock, (2) processing, and (3) certified seed. Each class requires different production and handling techniques and are sold in different sub-markets. The firms were classified into three specialization groups on the basis of the class of potatoes that represented the largest proportion of total volume sold. For example, a firm classified as a tablestock firm sold more tablestock potatoes than processing or seed potatoes. Almost all of the firms sold more than 50 percent of one class or the other. Where firms sold all three classes, the classification is based on less than 50 percent of a specific class of potatoes sold. The results of the survey show that there were 534 firms who sold more tablestock, 90 firms who sold more processing, and 234 who sold more seed. The degree of specialization by firms is summarized in Appendix table 1.

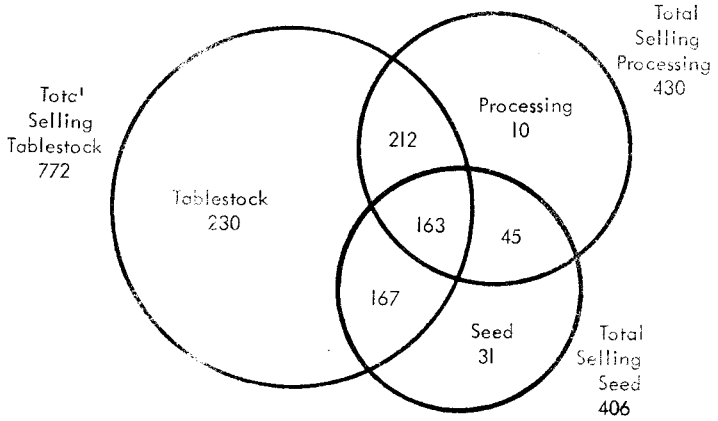

Figure 1

Figure 1.--Product Specialization of Red River Valley Potato Firms, 1962-63.

Of the 858 firms that sold potatoes during the 1962-63 season, 772 sold tablestock potatoes, 430 sold processing potatoes, and 406 sold seed potatoes. Only 271 specialized by selling only one class of potatoes, 424 sold two classes of potatoes, and 163 sold all three classes of potatoes.

Type of firm

The firms were divided into three broad categories, with two subdivisions in each, based on the primary functions performed by the firm.

(a) Two of these firm types are "market oriented", that is, their primary functions are "buying and for selling" potoatoes that have been produced and packed by other firms. Although these firms may produce and pack some potatoes, these operations are secondary to the buying and selling functions. These two firm types are distributors and agents.

Distributors--acquire more than 50 percent of their total volume from other firms after the potatoes are packed. They usually purchase and resell full carlots and trucklots but perform none of the physical handling functions. The results of the survey show that there were eight firms of this type operating in the Valley during the 1962-63 season.

Agents--acquire more than 50 percent of their total volume from other firms after the potatoes were packed. They represent a small group of growers as a seller, or a single firm as a buyer. They may receive a commission or salary, but in some cases take title on a purchase for resale at a predetermined price or on joint account with a

terminal distributor. The results of the survey show that there were four firms of this type operating in the Valley during the 1962-63 season.

(b) A second group of firms, consisting of two firm types, is also "market oriented" in that they handle their own sales but in addition operate storage and packing facilities and pack more than 50 percent of the total volume sold. These firm types are coop-packers.

Coop-packers--are true cooperative storage, packing, and selling operations; or corporations with salaried managers that store, pack, and sell for a group of growers who own the storage and packing facilities and pay the manager's salary. The production operations of the individual growers are independent of the operation of the firm. The results of the survey show that there were five firms of this type operating in the Valley during the 1962-63 season.

Packers--produce less than 50 percent of the volume sold, but pack 50 percent or more of the volume sold. They usually acquire bulk potatoes from growers at harvest for storage in their own warehouse. Several of these firms, however, are similar to coop-packers in that growers own storage facilities adjacent to the firm's warehouse. In some cases, the grower's facilities are connected by flumes to the firm's packing line. Although practically all of these growers sell to, or through, the connecting firm (that packs the potatoes), there is no formal requirement that they do so. The results of the survey show that there were 12 firms of this type operating in the Valley during the 1962-63 season.

(c) A third group of firms, consisting of two firm types, is primarily "production oriented". These firms produce, on their own production units, more than 50 percent of the total volume sold. These two firm types are grower-packers and growers.

Grower-packers--produce and pack more than 50 percent of the volume sold. Although they may purchase some potatoes from other firms, this volume is usually minor in comparison to the volume produced. The results of the survey show that there were 567 firms of this type operating in the Valley during the 1962-63 season.

Growers--produce more than 50 percent of the volume sold, but pack less than 50 percent of the volume sold. These firms usually sell most of their production in bulk to other firms in the Valley, either at harvest or out of storage later in the season. The results of the survey show that there were 262 firms of this type operating in the Valley during the 1962-63 season.

Trends in Production

Major changes in potato production during the past 40 years may best be described as revolutionary. It is not the purpose of this report, however, to analyze the numerous and complex forces that account for the present and emerging patterns of production. Instead, production trends are presented as a basis to better understand the present status of the Red River Valley in relation to other U.S. potato production areas.

The total U.S. acreage in potatoes has declined drastically from an average of 3.5 million acres in 1920-24 to only 1.4 million acres in

1965-66 (table 1). This 58 percent decline in acreage, however, was more than offset by yields that more than tripled. On balance, total production increased 32 percent during the 1920-24 to 1965-66 period.

These changes in total production accompanies, or resulted from, major shifts in the seasonal and regional patterns of production.[3/] The share of total production in the 29 late states, at 82 percent, almost exactly the same in 1965-66 as in the 1920-24 period (figure 2).[4/] There were important shifts, however, between the early and intermediate production areas. Production in the 13 original states more than tripled, and the original states' share of total production increased from 6 percent in 1920-24 to 14 percent in 1965-66. The intermediate share of total production declined from 11 percent to 4 percent during the same period.

In addition to shifts in seasonal production, there were also important shifts among the late crop producing areas. From 1920-24 to 1945-49, both the eastern and western regions increased their share of total production at the expense of the central region (figure 3). Since the 1945-49 period, the eastern and central regions' shares have declined while the western region's share has continued to increase. The sharp increase in the western region during the 1960's is not only the result of an expansion of acreage, but is also due to a shift in

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[3/] See Appendix Exhibit 1 for the breakdown of states by seasonal and regional groups.

[4/] Data for figure 2 is presented in Appendix table 2. Data for other figures throughout the publication is presented in an adjacent table or in the Appendix.

Table 1.--Potatoes: acres harvested, yield per acre, and production, United States, 1920-56

Period	Acres harvested	Yield per acre	Production
	1,000 acres	cwt.	million cwt.
1920-24	3,456.8	64.6	223.2
1925-29	3,066.3	68.4	209.8
1930-34	3,443.7	64.6	222.3
1935-39	3,033.3	70.3	213.3
1940-44	2,842.9	82.1	233.3
1945-49	2,185.6	117.9	257.7
1950-54	1,478.6	151.1	223.4
1955-59	1,380.0	178.1	245.7
1960-64	1,382.0	192.3	265.8
1965-66	1,440.9	205.0	295.4

1/ 2-year average.

Source: Compiled from Statistical Bulletins No. 122, 251, and 291, and annual summaries Statistical Reporting Service, USDA.

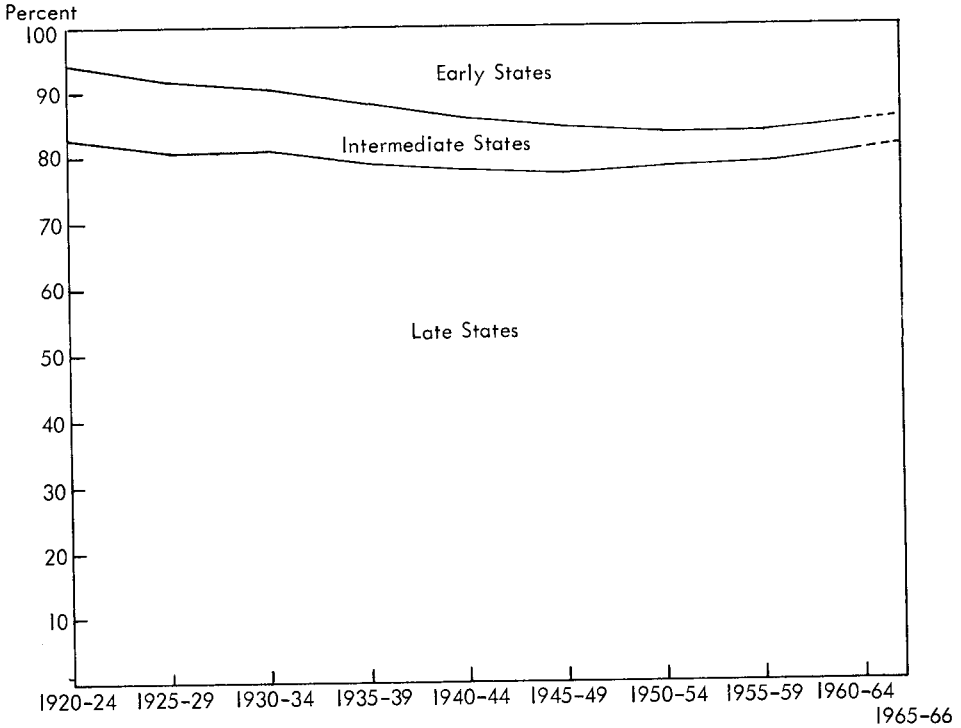

Figure 2.--Potatoes: trends in share of total production by season groups.

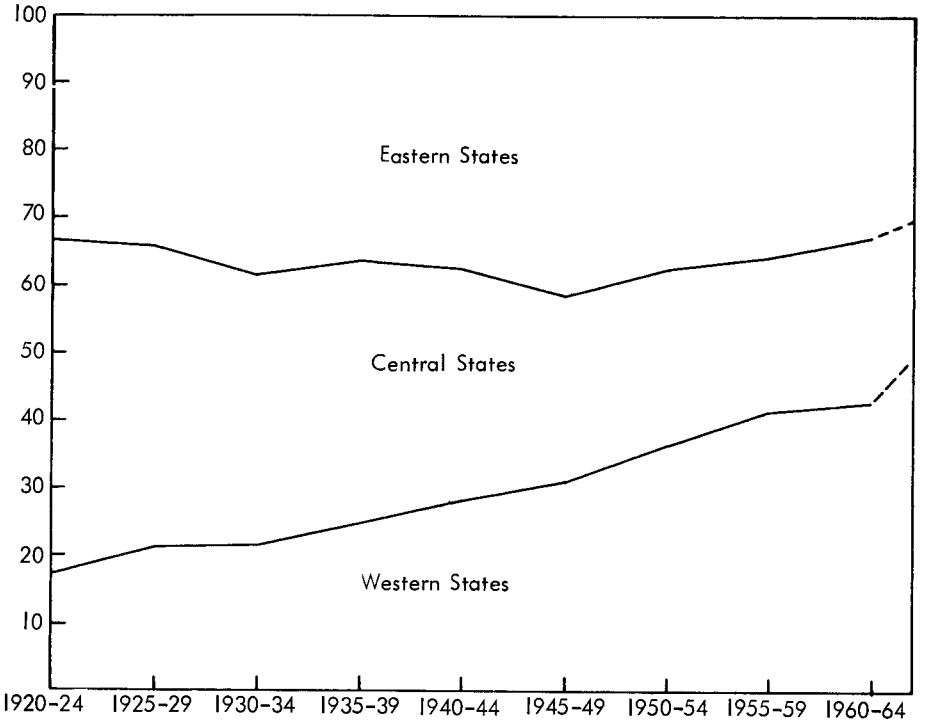

Figure 3.--Potatoes: trends in share of total production by regional groups.

production from unirrigated to irrigated land in Idaho, Oregon, and Washington.

Late Crop

The late crop (late summer and fall) is by far the largest of the three seasonal groupings. The acreage of late crop potatoes declined 59 percent, from 2.8 million acres in 1920-24 to 1.2 million acres in 1965-66. This decline in acreage, however, was more than offset by increasing yields, and production in the 29 late states increased from 185 million cwt. in 1920-24 to 243 million cwt. in 1965-66.

The five most important late states are Idaho, Maine, New York, and Minnesota-North Dakota.[5/] These five states together increased their share of the total late crop from 42 percent in 1920-24 to 60 percent in 1965-66 (figure 4 and Appendix table 3). Except for the State of Washington, each of the other 24 late states have much smaller production than either of the five states listed above. Production in most of those states declined steadily throughout the period. Production in Washington, however, almost doubled between 1964 and 1966, and actually exceeded that for New York in 1966. Whether or not that level of output will be sustained is a matter of conjecture at this point.

Central region

From the position as the most important of the three regions, producing one-half of the late crop in 1920-24, the central region declined to the least important of the three regions, producing less than

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5/Most of the production in Minnesota-North Dakota is now located in the Red River Valley. When discussing state totals, these two states are considered as a single unit.

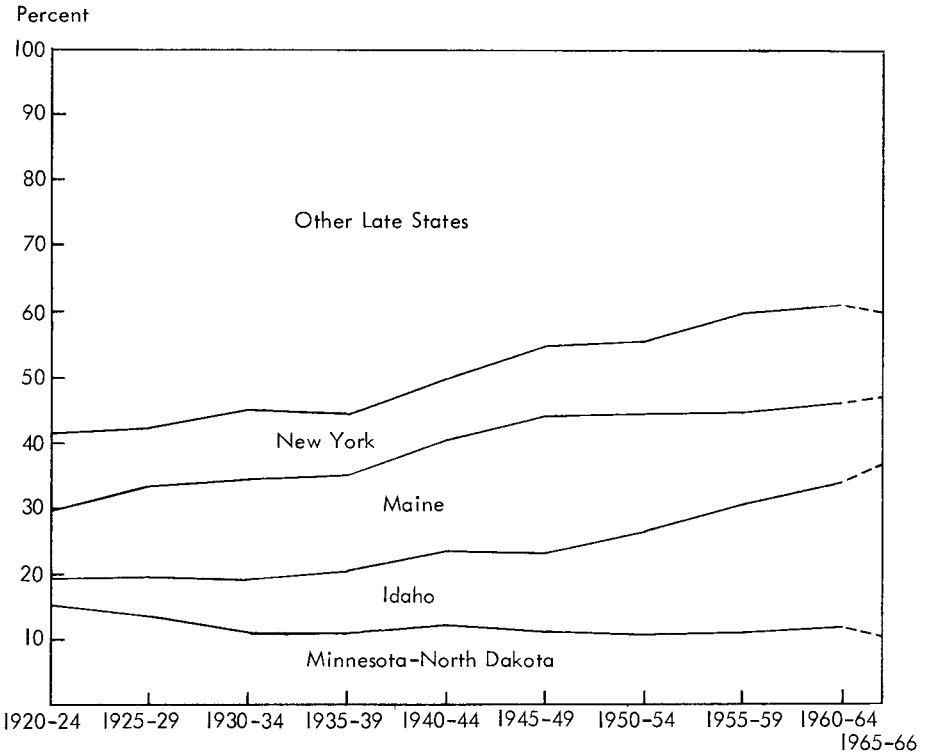

Figure 4.--Late crop potatoes: trends in share of production, selected states.

one-fourth of the late crop in 1965-66. While total late crop acreage declined 58 percent, acreage in the central region declined 78 percent.

Although yield increased considerably, this was not sufficient to offset steadily from 91 million cwt. in 1920-24 to 44 million cwt. in 1955-59. This long period of decline, however, was reversed and production increased to 56 million cwt. in 1965-66 (see Appendix table 4). This increase was due to an expansion of production in the Red River Valley, Michigan, and Wisconsin; all other producing areas in the central region continued to decline.

Production in the Red River Valley has more than doubled since the 1920's, and the Valley's share of central region production increased from 11 percent in 1920-24 to 41 percent in 1960-64, but then declined to 39 percent in 1965-66 (figure 5 and Appendix table 5). In addition to the major shifts among the states within the region, there has also been a major shift within the states of Minnesota and North Dakota. While the Valley accounted for only 34 percent of the two states' production in 1920-24, this share had increased to 81 percent in 1965-66.

Minnesota-North Dakota

Practically all of the commercial potato production in Minnesota-North Dakota is now concentrated in the Red River Valley (figure 6). Every census since 1924 has shown a larger share of the two states' acreage located in the 10 northern Valley counties[6/] (see Appendix

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[6/] Minnesota counties: Kittson, Marshall, Polk, Norman, Clay.
North Dakota counties: Pembina, Walsh, Grand Forks, Traill, Cass.

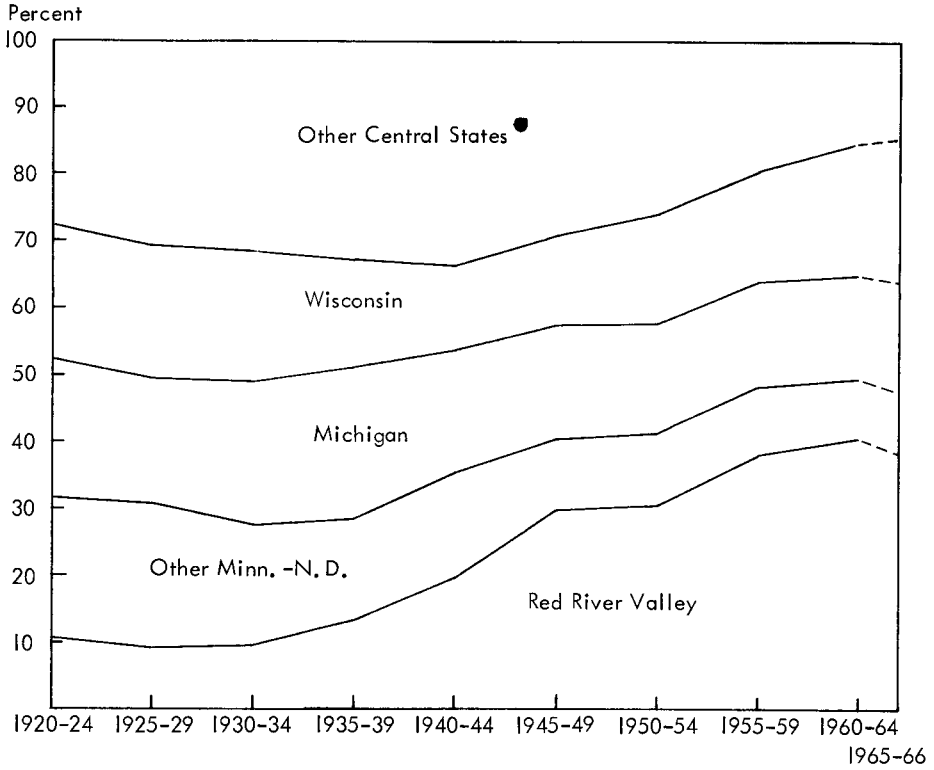


Figure 5.--Late crop potatoes: trends in share of production of Central region, selected areas.

* 5-year average.

● Ohio, Indiana, Illinois, Iowa, South Dakota, and Nebraska.

Figure 6.--Late crop potatoes: location of major production, Minnesota-North Dakota.

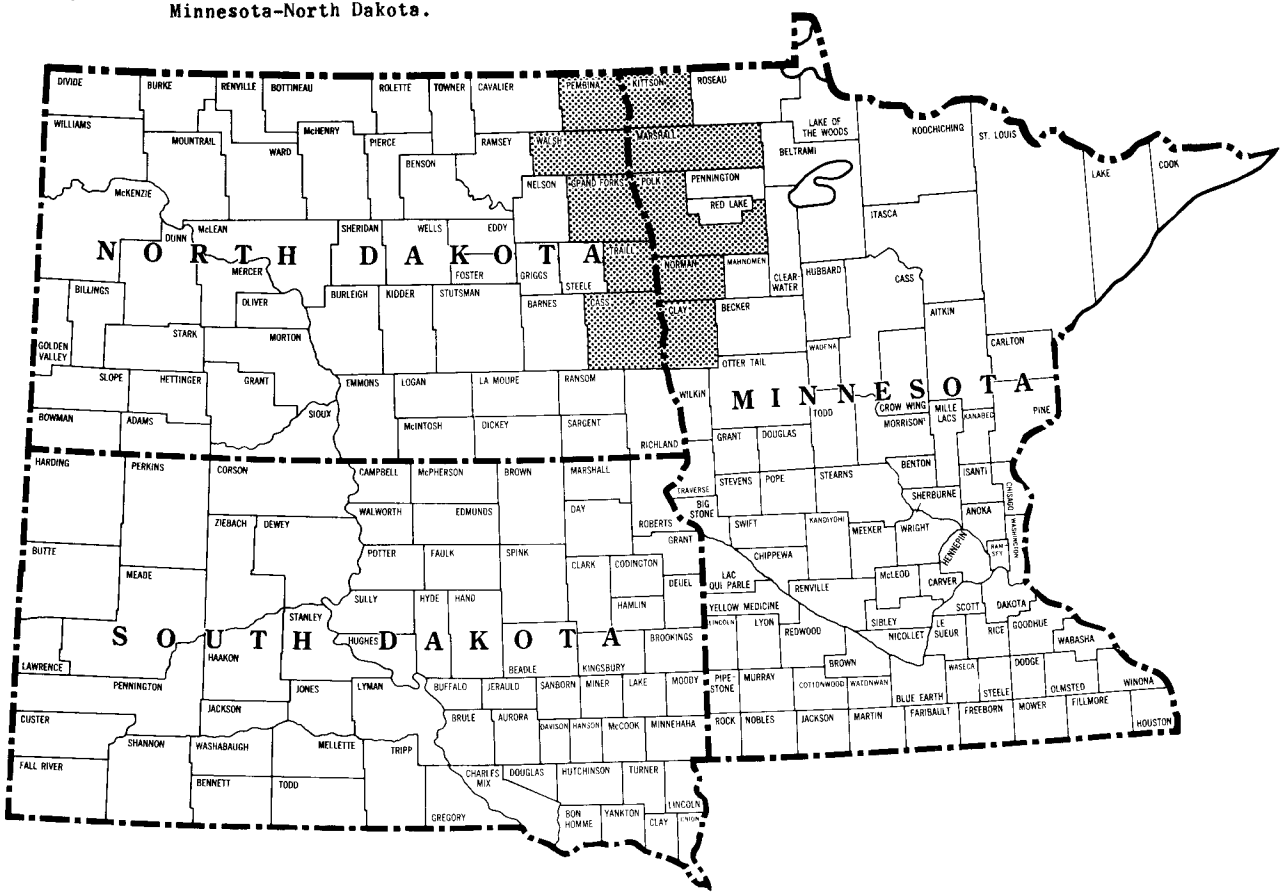


table 6). In 1964, these 10 counties accounted for 84 percent of the total acreage, as compared with only 36 percent in 1924, and the shift to the Valley is continuing.

Although most of the North Dakota acreage has always been located in the Red River Valley, this has not been the case for Minnesota. In 1964, the five Valley counties accounted for 94 percent of all potato acreage in North Dakota, which represented an increase from 57 percent in 1924. In the 1920's the important potato producing area of Minnesota lay along a line extending from the Wisconsin border near the Twin Cities to the Red River Valley. As recently as 1944, less than 50 percent of the Minnesota potato acreage was located in the five Valley counties. In 1964, however, 74 percent of the Minnesota acreage was located in these five counties.

Red River Valley

Not only has potato production shifted to the Red River Valley but there have also been substantial shifts within the Valley. There has been a continuing shift from the southern end of the Valley to the north and especially to the northwest. The three North Dakota counties of Pembina, Walsh, and Grand Forks have shown an increase in their share of Valley acreage from only 24 percent in 1924 to 53 percent in 1964. During the same period, the share of the four southernmost counties, two in each state, declined from 54 percent to 14 percent. The shift to the northern North Dakota counties is also reflected in a general shift in acreage from Minnesota to North Dakota. In 1924 the five North Dakota counties accounted for only 40 percent

of Valley acreage. This share had increased to 64 percent in 1944, but declined somewhat to 57 percent in 1964.

While acreage has been increasing during the most recent period, the number of farms producing potatoes has shown a decline in the 10 counties for every census since 1929 (see Appendix table 7). The number of farms producing potatoes has declined from a peak of 16.8 thousand in 1929 to only 1.3 thousand in 1964. Although the census data are not strictly comparable because of changes in the definition of a farm, there is no question but what there has been a very drastic reduction in the number of producers in the Valley.

The decline in the number of producers and the increase in total acreage is reflected in the increase in the average size of production units (see Appendix table 8). The average production unit increased slowly from 10 acres per farm in 1924 to 30 acres in 1954. Between 1954 and 1964, however, there was a very sharp increase to 122 acres per unit.

The average size of production units is not consistent throughout the Valley. In general, the largest production units are located in the counties showing the largest increases in total potato acreage. The production units in the three northern North Dakota counties of Pembina, Walsh, and Grand Forks increased from an average of 52 acres per unit in 1954 to 137 acres in 1964. On the other hand, the production units in the southern counties, Traill and Cass in North Dakota and Norman and Clay in Minnesota, increased from an average of 22 acres to 87 acres per unit during the same period.

Minnesota Crop Reporting District No. 1

The census data show that there has been a very sharp reduction in the number of farms and comparable increases in the size of potato production units. Information regarding the size distribution of production units is not available for the 10 Red River Valley counties, but it is published on an annual basis for Minnesota Crop Reporting District No. 1. This district includes the five counties on the Minnesota side of the Valley, plus six additional counties. These six additional counties, however, accounted for only 8.0 percent of District 1 potato acreage in 1954 and 4.5 percent in 1964. Although these data are not strictly comparable to the Valley census data discussed above, they give a good indication of the kinds of changes that have occurred in the Valley.

The total number of District 1 farms reporting 1 or more acres of potatoes has declined over 50 percent, from 1,269 in 1954 to 555 in 1966 (see Appendix table 9). Practically all of this decline has occurred among farms reporting less than 50 acres; the number of farms in the category declined from 943 in 1954 to only 190 in 1966. Farms reporting less than 10 acres have declined from 368 in 1954 to only 49 in 1966. On the other hand, farms reporting 50 or more acres of potatoes increased from 326 in 1954 to a peak of 539 in 1961 but then declined to 365 in 1966. This decline in large units is more apparent than real. The number of very large units is still increasing at a rapid rate. The apparent decline only reflects the fact that units larger than 50 acres, but still on the lower end of the distribution, are dropping out faster than the number of the largest units are increasing.

Trends in Consumption

Per capita consumption of potatoes declined almost 50 percent between 1910 and 1949. Since 1949, however, consumption of all potato products has stabilized, while consumption of fresh potatoes has continued to decline (figure 7 and Appendix table 10). This reversal of the downward trend has resulted from the introduction and rapid consumer acceptance of new process potato products.

Prior to World War II the only processed products of any significance were potato chips, canned potatoes, and potato flour. In 1940 the consumption of processed products was less than 2 pounds per person. Since World War II, and especially since 1950, the processing industry has expanded very rapidly. Per capita consumption of processed products has increased from 6.3 pounds (fresh weight basis) in 1950 to 36.0 pounds in 1965, almost a six-fold increase.

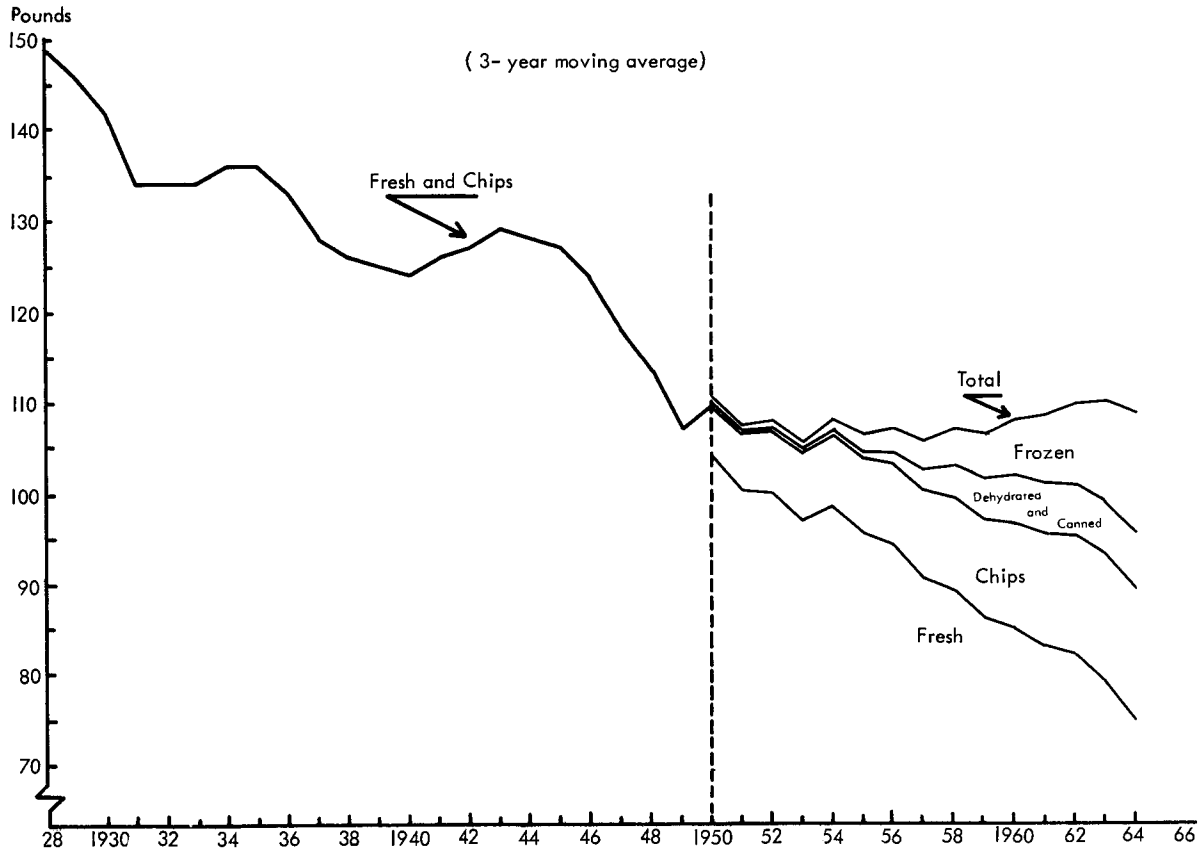
The downtrend in fresh consumption has existed since the beginning of this century, and there is no reason to believe that this trend will be reversed in the near future. During the period from 1950 to 1965, per capita consumption of fresh potatoes declined by almost one-third, from 100.0 pounds to 67.8 pounds.

Trends in Utilization

U.S. Potato market

Although per capita consumption of fresh potatoes has been declining, population expansion has been sufficient to prevent a major decline in the volume of potatoes sold for fresh market. During the 6 years from 1956 to 1961, the volume of tablestock sold increased slowly

Figure 7.--Per capita consumption of potatoes in the United States.



from 146.0 million cwt. to 153.3 million cwt. (see Appendix table 11). The years, 1962 to 1965 were years of contraction, and tablestock volume at 138.0 million cwt. for the 1965 crop year was less than that for 1956.

While the tablestock market has been standing still or contracting somewhat, the processing market has been expanding rapidly. This rapid expansion is a result of both increased per capita consumption and population expansion. For the 1965 crop year, 92.3 million cwt., or 35 percent of the total volume sold, was processed (figure 8). This compares with only 24.7 million cwt., or 12 percent of the total volume sold, processed in 1956.

For the first time in 1965 frozen products exceeded chips as the largest component of processed utilization; accounting for 40 percent of the volume processed. The volume of potatoes sold for freezing increased from only 4.7 million for the 1956 crop year to 37.3 million cwt. for 1965. This was an eight-fold increase, and this segment of the industry is continuing to expand at a rapid pace. Production of frozen potato products for the 1966 calendar year was a record 1.5 billion pounds (product weight basis), up a fifth from a year earlier.[7/]

Chips and shoestrings, in 1965 represented 34 percent of the total volume processed. The volume of potatoes sold for chips and shoestrings has increased at a relatively steady rate from 14.6 million cwt. for 1956 to 31.5 million cwt. for the 1965 crop. This was

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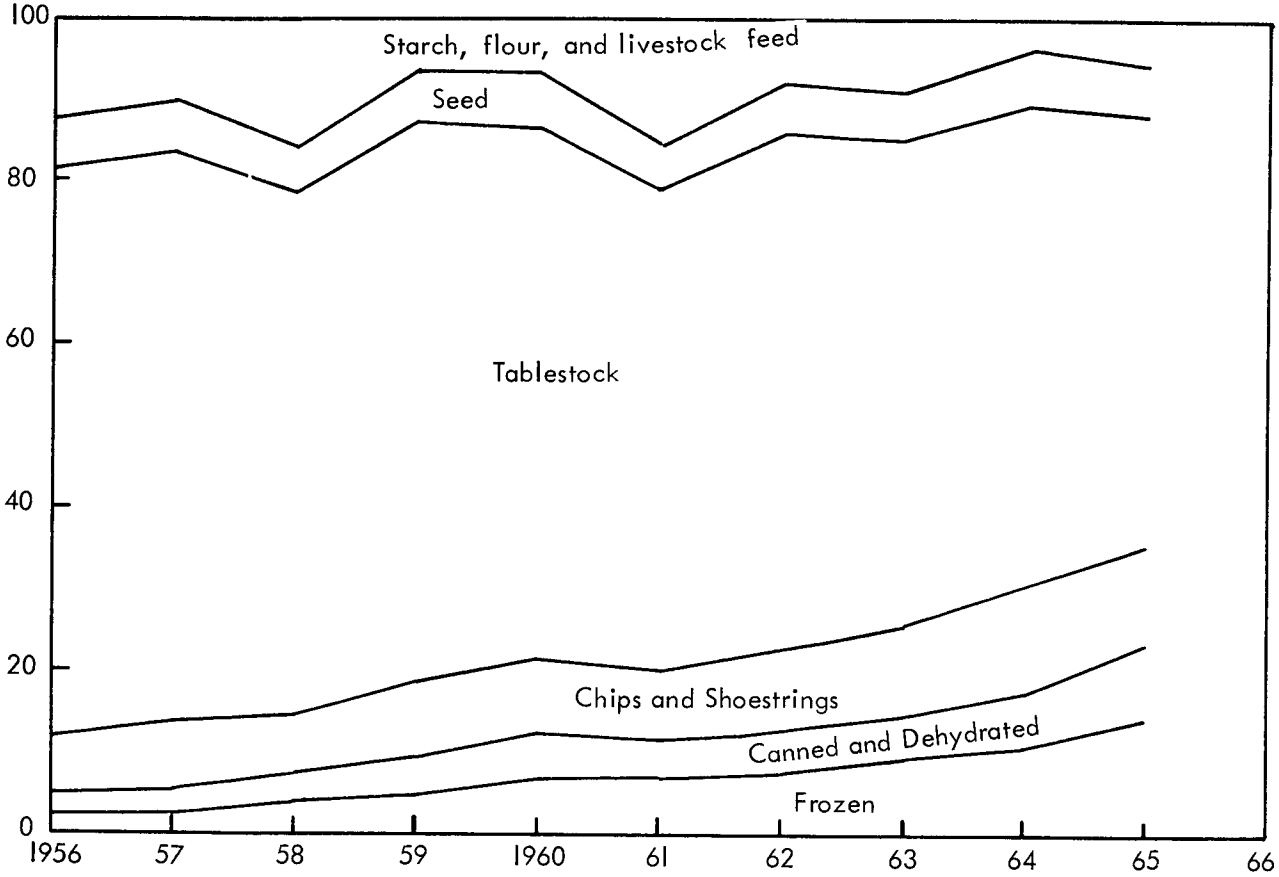
[7/] Vegetable Situation, TVS-164, ERS, USDA, April 1967, p. 18.

Figure 8.--Potatoes: utilization of sales, United States, 1956 to 1965.



a total increase of 116 percent, or an average rate of 9 percent per year.

The dehydration segment of the industry increased rapidly from 1956 to 1960, declined sharply in 1961, but was back up to the 1960 level in 1964. In 1965, however, the volume of potatoes dehydrated was almost double that for 1964. In 1956, 3.2 million cwt. of potatoes went for dehydrating. This volume had increased to 10.8 million cwt. for 1964 and almost doubled to 20.1 million cwt. for 1965.

The canning segment of the processing industry increased slowly but steadily from 2.3 million cwt. for 1956 to 3.3 million cwt. for 1965.

Red River Valley Potato Market

As in other major producing areas the Red River Valley potato market consists of three separate and distinct sub-markets: (1) the table-stock market, (2) the processing market, and (3) the certified seed market. On the buying side, there is a separate and distinct group of buyers in each of the sub-markets. On the selling side, however, the three sub-markets tend to overlap with most firms selling in two or all three sub-markets (figure 9). Of the 858 firms selling potatoes during the 1962-63 season only 32 percent sold potatoes in a single sub-market, 49 percent sold in two sub-markets, and 19 percent sold in all three sub-markets.

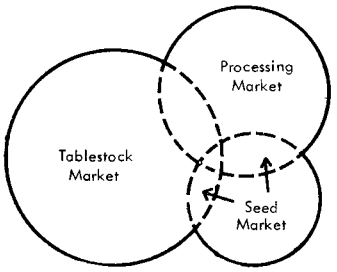


Figure 9

Figure 9. Red River Valley Potato Sub-market Overlaps.

The tablestock processing markets are separated primarily on the basis of the varieties of potatoes produced and practices followed in producing and storing the crop. Specific lots of potatoes are acceptable to varying degrees in either of the markets. The certified seed market, on the other hand, is separated on the basis of rules and regulations governing the production of certified seed. In general, there is weak two-way substitution between the tablestock and processing markets but only one-way substitution from the certified seed market to the fresh and processing markets.

Tablestock market--Although a small volume of white varieties such as the Irish Cobbler and Russet Burbank potatoes are sold fresh, the Valley tablestock market is primarily a red potato market. The buyers in the tablestock market are food retailers, or individuals who represent or sell to retailers. These buyers desire smooth, bright, red, medium-sized potatoes that give a good appearance in the retail store. The Red Pontiac is by far the most important potato produced in the Red River Valley. This variety is produced primarily for the tablestock and for seed, but some of the potatoes are used by Valley processors for the production of dehydrated products. Practically all of the potatoes that are stored for sale in the tablestock market during the winter and spring months consist of this variety. Two other red varieties produced for the tablestock market are the Norland and Red LaSoda. These are early varieties, and most of these potatoes are shipped to market during the harvest period in the fall.

The tablestock market has declined in relative importance as the processing market has grown, but it is still the most important outlet

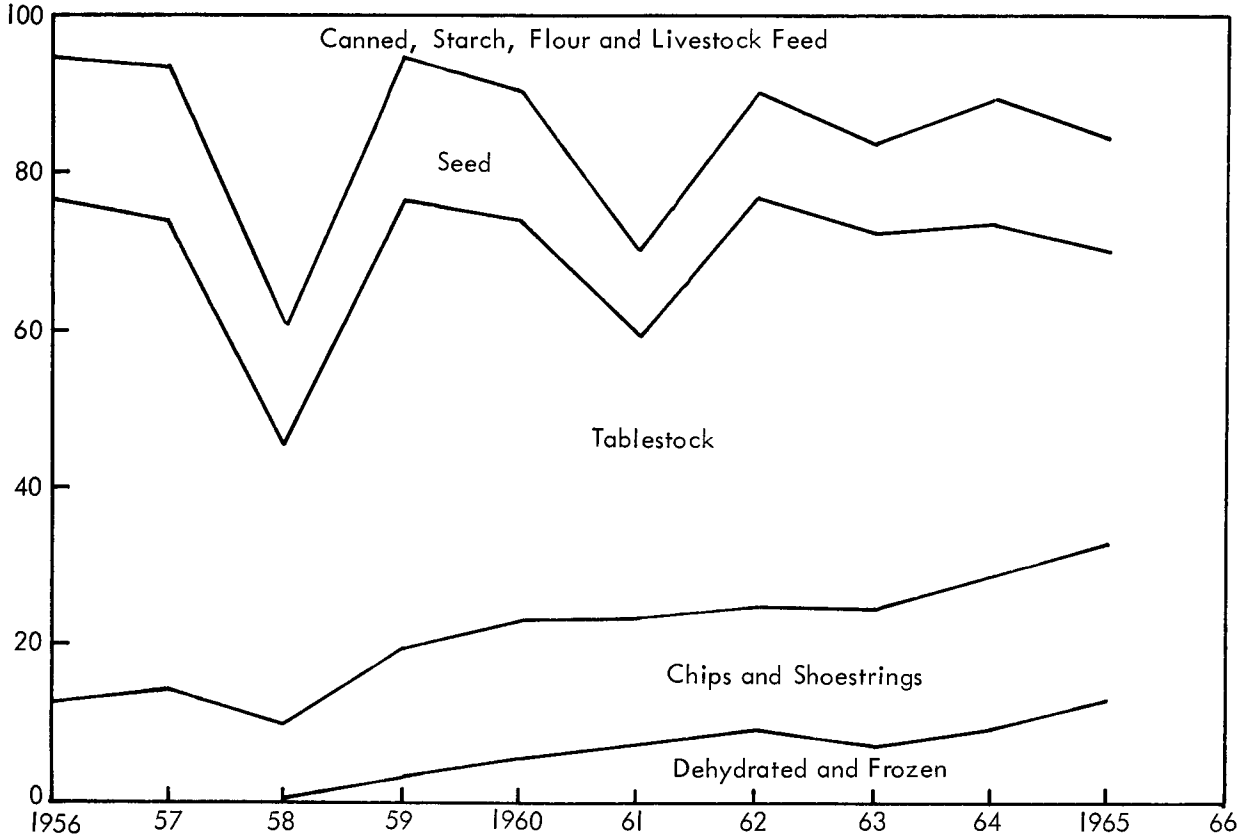
for Red River Valley producers. During the 1965 crop year 7.5 million cwt., or 37 percent of the volume sold, went to the tablestock market (figure 10). This compares with 8.8 million cwt., or 77 percent of total sales, that went for tablestock during the 1956 crop year. Although the volume of potatoes sold for tablestock was lower for 1965 than for 1956, the total U.S. tablestock market had also contracted somewhat and the Valley's share shows little change. The Valley's share of the U.S. market averaged 5.2 percent in 1964-65 which was almost exactly the same as the average for 1956-57.

Processing market--Buyers in the Valley processing market consist of freezers, dehydrators, and chip processors. The size, shape, and appearance of potatoes for processing is secondary to high specific gravity, low peeling loss, and the ability to produce a finished product of desirable color and texture. High dry matter content is directly proportional to the solids content of the potatoes. The yield of the finished product can vary as much as 50 percent between different lots of equal weight because of variations in dry matter.

Darkening of the finished product is a major problem in the processing industry. Many types of darkening result from high levels of "reducing sugars" in the tubers. But as in the case of solids, the variety of the potato is an important determinate of sugar content. Some varieties are inherently low in sugars at harvest, accumulate sugars slowly at usual storage temperatures, and lose their sugar content more readily upon reconditioning from storage.

Two white varieties, the Irish Cobbler and the Kennebec, are the most important Valley varieties produced for the processing market.

Figure 10.--Potatoes: utilization of sales, Red River Valley, 1956 to 1965.



Although the Irish Cobbler is an old variety with many years of acceptance in the tablestock markets of the East, there is little demand for this variety in the midwestern and southern tablestock markets supplied by Valley producers.

The Irish Cobbler is produced in the lower end of the Valley and matures earlier than the Kennebec. It produces good potato chips, and most of this crop is shipped early in the season. The Kennebec is a high yielding, late variety with excellent characteristics for the production of frozen french fries and potato chips. When full mature, this variety is high in solids and makes desirable light colored chips at harvest and after "reconditioning" from storage.

During the 1965 crop year, 6.8 million cwt., or 33 percent of the total volume of potatoes sold, were processed for food and an additional 1.6 million cwt. were processed for starch and flour (see Appendix table 12). Of the 6.8 million cwt. processed for food, 2.5 million cwt. were frozen, dehydrated, or chipped by firms located with the Valley, and 4.1 million cwt. were sold to chip processors located outside the Valley. All of the starch and flour was processed by firms located in the Valley.

The potato chip processors are the largest processing outlet for Valley growers. The Red River Valley has been a supplier of chipstock since World War II. This segment of the industry is not new, but until recent years it represented only a small part of the total market. Only two chip plants are located in the Valley and produce primarily for nearby distribution. The vast majority of potatoes for chipping are shipped fresh from the Valley to plants located in or near consuming centers.

The volume of potatoes shipped to chippers has more than doubled since the mid-1950's, increasing from 1.7 million cwt. for the 1956 crop to 4.1 million cwt. for 1965. While chipstock from the 1965 crop represented only 12 percent of the U.S. volume, it represented 20 percent of the Red River Valley volume of sales.

The freezing and dehydrating segments of the processing industry are located in the Valley. This part of the Valley industry got off to a late start and has developed at a much slower and more irregular pace than in other producing areas of the country. The freezing industry began to develop in other producing areas shortly after World War II, and the dehydrated flake process was developed in 1956. But plants were not built in the Valley until 1959.

During the 1962 crop year there were two plants producing frozen french fries and five plants producing dehydrated flakes and slices. One flake plant and a french fry plant did not operate in 1963 but were operated intermittently in 1965 and 1965. Another flake plant operated for part of 1963, but has not operated since then.

Starting from almost no processing prior to 1959 the volume of potatoes processed in the Valley increased to a peak of 1.7 million cwt. for 1962, declined to a low of 1.4 million cwt. for 1964, and then increased sharply to 2.7 million cwt. for the 1965 crop.

The rapid growth of freezing and dehydrating has been the most striking development in the national potato market during the past decade. While freezing and dehydrating operations have not attained a level of importance equal to that of some other producing areas the Valley industry has outstripped other areas in the production of

chipstock. On balance, when we consider all types of food processing the Valley has maintained its position in the national market. While food processing accounted for 35.4 percent of the 1965 U.S. crop, the comparable percentage of the Valley was 33.3 percent.

There are one starch plant and two flour plants located in the Valley. These firms provide a by-product or salvage market primarily for tablestock and seed producers. About 10 to 20 percent of the tubers in most lots of potatoes are unsuitable for sale in the primary market. These lower quality potatoes can be sold to starch and flour plants, or used for livestock feed. While the volume of potatoes going for starch and flour has more than tripled since the mid-1950's it is not likely that a "trend" exists. This is a residual outlet and the seller receives only 25 to 35 cents per cwt. for potatoes of this type.

Certified seed market--The buyers in the certified seed market are producers of potatoes or individuals who represent or sell to producers of potatoes. These buyers number several thousand and are located in practically every production area of the United States. The certified seed buyer desires stock that is free of seedborne diseases, varietal mixtures, and that will produce good yields exhibiting the proper "type" characteristics. An important characteristic of the market is that most of the buyers usually make only one purchase each year.

While considerably smaller than the tablestock or processing components, certified seed is an important part of the Valley potato market. The five most important varieties in terms of acres certified are Kennebec, Red Pontiac, Irish Cobbler, Norland, and Norgold Russet.

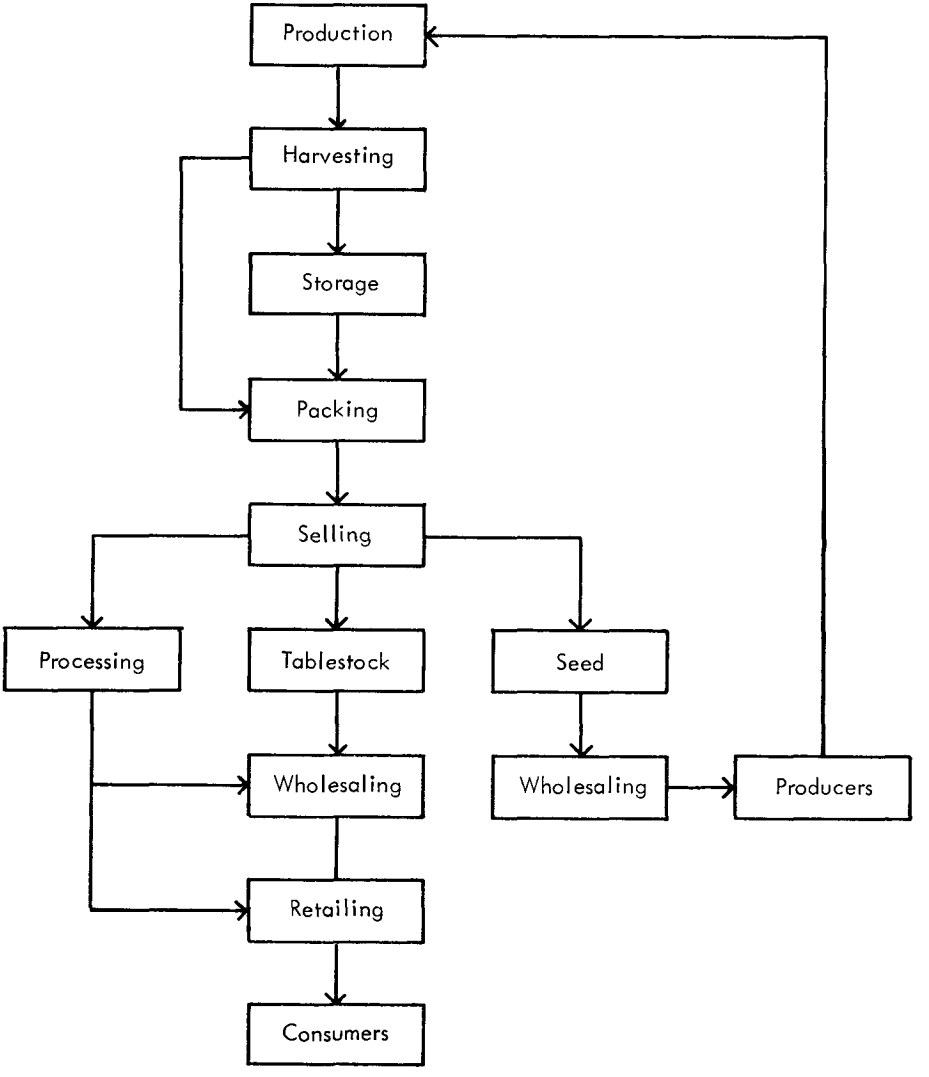
There were about 20 other varieties certified in 1965, but these five varieties accounted for 76 percent of the total acreage in Minnesota-North Dakota.

A much larger volume of potatoes is produced under certification in the Valley than is actually sold as certified seed. The remainder is sold as tablestock or to processors. Shipments of certified seed represented 14 percent of the Valley's total volume of shipments for 1965; this compares with only 6 percent for all areas of the United States. Some of the certified seed shipments go to processors, but the actual volume is not known and estimates within the industry vary considerably. Although there has been considerable year-to-year variation, the volume of seed shipments appears to be neither increasing nor decreasing. The 2.8 million cwt. of seed sold in 1965 was greater than the 2.4 million cwt. sold in 1956, but less than the 3.2 million cwt. sold in 1960.

Production and Marketing Functions

The functional process involved in marketing fall potatoes may be conceived of as an intermittent movement from the farms where the potatoes are produced to the hands of the ultimate consumer or user. In its simplest form, this process consists of the components illustrated in figure 11. Although these components are present for most of the potatoes produced in the Red River Valley, we do not always see the clear cut isolated segments as illustrated. For example, early in the season potatoes may be harvested and sold to a chainstore buyer. In this case, the storage function does not exist, and the producer performs

Figure 11.--Late crop potatoes: production and marketing functions.



the harvesting and preparation functions. There has been only one transaction, and the chainstore performs both the wholesaling and retailing functions. On the other hand, we may see a more complicated set of functions than those illustrated. The producer may harvest the potatoes and place them in a farm storage. Later in the season he may sell them to another firm that may leave them in the same storage or perhaps move them to a trackside storage. When the potatoes are packed, they may be sold to a local distributor, who in turn sells to or through a terminal broker. The broker may sell to a receiver, who sells to a truck-jobber who delivers the potatoes to a retail store. The marketing functions, however, are activities that must be performed. There are many possible variations, but the basic functions are those illustrated.

The functions performed by the firms in the Valley potato industry are production, storage, packing, and selling. We could discuss the industry in terms of production units, storage units, packing units, and selling units. However, none of the firms in the Valley were found to be strictly single function operations. In addition to single production units that perform two or more functions, many of the firms consist of several independent production units that combine to jointly perform storage, packing, and selling functions. The term "marketing firm" is used in the following sections to designate the broader economic entity of a single production unit performing two or more functions or two or more production units combined in storage, packing, or selling operations.*

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* Functions Performed by type of firm and size of firm are presented in Appendix figures 1 and 2.

Production

Unlike some of the other potato producing areas of the United States, the Red River Valley does not specialize in the production of potatoes to the exclusion of other crops. In 1966, the potato acreage harvested in the 10-county area was only 3.6 percent of the total acreage harvested for the 10 major crops (see Appendix table 13). Potato acreage was about one-seventh as large as that for wheat and barley, and was exceeded by oats, hay, flax, and soybeans. On the other hand, potato acreage exceeded that of corn, sugar beets, and rye.

The production units of potato "marketing firms" are more specialized than the area as a whole, but again they are not specialized potato producers. The production unit of the typical marketing firm averaged 848 total acres with 201 acres of potatoes in 1962 (see Appendix table 14). Thus, on the average potato acreage represented only 24 percent of the land farmed. However, the proportion of land devoted to potatoes was related to the size of the marketing unit. Potatoes represented 30 percent of the land farmed by large firms, but only 21 percent of the land farmed by small firms.

The largest producing units were operated by firms that specialize in the sale of seed potatoes. These firms averaged 1,107 acres per unit and harvested 265 acres of potaotes. This compares with an average of only 741 acres per unit and 163 acres of potatoes for firms that specialize in the sale of tablestock potatoes.

In addition to being an important cash crop, potatoes also have value in the rotation system as one means of improving soil tilth and controlling weeds in the grain crops. Thus, potatoes are an integral

part of the total farm operation, and production decisions regarding potatoes are not made in isolation from other crops. A recent study completed at North Dakota State University examined the production practices of potato producers in the Valley. This study, which included 82 farms with a range of potato acreage from 95 to 1,005 acres, found that: "Only slight differences were found in the crop rotation practices among the selected size groups. Sixty of the 82 growers interviewed planted their potatoes on old (nonfallow) ground, accounting for 83.0 percent of the total potato acres in the study. The most common rotation practice was to follow potatoes with 2 years of grain crops, entirely excluding fallow from the rotation. Several other growers used a rotation of potatoes with 3 years of grain crops. Half of the growers did not use any fallow in their crop rotations. In most cases, wheat was the usual crop following potatoes. Flax and barley, or oats, were common second and third year crops.

"Only 17.0 percent of all potatoes were planted on fallow. Twenty growers included fallow in the rotation but planted potatoes on old ground. The rotation pattern for this latter group was potatoes, small grains, fallow, sugar beets or small grains, followed by potatoes."[8/]

Although all of the farms included in this study were located on the North Dakota side of the Red River, there is no reason to believe that there would be important differences in the cropping pattern on the Minnesota side of the River.

8/M. G. Maier and L. D. Loftsgard, "Potato Production Costs and Practices in the Red River Valley," Bulletin No. 451, North Dakota State University, Fargo, September 1964, p. 8.

Harvesting

Potato harvesting in the Valley is most active from the first of September to the middle of October. About 10 to 15 percent of the crop is usually packed and sold during the harvest period, but the majority of potatoes go into storage to be marketed during the winter and spring months. Harvesting and storing the crop consists of four steps:

(1) vine killing preparatory to digging,

(2) digging the tubers and depositing them in bulk hopper body trucks, or in field sacks to be placed on flat bed trucks,

(3) transporting the potatoes to the storage facilities,

(4) unloading and depositing the potatoes in storage.

The vines are killed to make the harvesting job easier and to control the size of the tubers. The usual method of vine killing is by roto-beating or by chemical sprays followed by rotobeating. A rotobeater is a power driven mechanical devise used to remove the vines from the tubers. The North Dakota study found that 24.5 percent of the acreage was sprayed with chemical vine killer.[9/] All of the acreage in the study was rotobeaten at least once, but under certain conditions more than one rotobeating is necessary.

The two methods of harvest are "direct method" and "indirect method". The direct method consists of using a mechanical harvester to dig and elevate the potatoes into a bulk hopper body truck in a one-step operation. The indirect method consists of first plowing the potatoes out on top of the ground; the potatoes are then picked up in

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[9/] Ibid., p. 14.

bulk by machines, or they are picked, bagged, and loaded by hand. The North Dakota study found that 91.8 percent of the acreage was harvested by the direct method.[10/] Only 8 of the 82 growers used the indirect method on all or a portion of their acreage.

The mechanical harvesters owned by growers are nearly all of the 2 row pull type. The North Dakota study showed that of a total of 99 harvesters only five were self-propelled (used by the 82 growers).[11/] It is a common practice for two or more small growers to share the ownership of a harvester. Ten of the 19 machines owned by growers who produced less than 160 acres of potatoes were jointly owned. There is a dividing line at about 400 acres between the ownership of one or more harvesters. The 67 growers with less than 400 acres of potatoes owned 68 machines. The 15 growers with 400 to 1,005 acres owned 34 machines. Three was the largest number of harvesters owned by any grower included in the study.

The number of trucks needed per harvester depends on the distance the potatoes must be transported and the speed with which the trucks can be unloaded at the storage. However, a typical operation requires three trucks per harvester.[12/] The trucks are usually older models and in many instances are used only during the harvest period. In most cases they are equipped with specially constructed bulk hopper bodies with a capacity of 120 cwt. of potatoes. These bodies have a draper

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10/ *Ibid.*, p. 14.

11/ *Ibid.*, p. 15.

12/ *Ibid.*, p. 16.

chain conveyor in the bottom of the hopper which carries the potatoes out the rear of the truck automatically when unloading.

Storage

Storage is a very important function performed by potato marketing firms in the Valley. About 85 to 90 percent of the potatoes produced go into storage for some period of time after harvest. When the potatoes are harvested and placed in storage, they are usually held at a temperature of 50^0 to 60^0 F. and relatively high humidity for 10 to 14 days. Under these conditions cuts and bruises heal rapidly, and subsequent losses from shrinkage and decay are reduced. After the preliminary curing period, storage temperatures for tablestock potatoes are reduced to 38^0 to 40^0 F. Potatoes stored at 50^0 to 60^0 F. have better cooking and processing qualities because of the lower accumulation of reducing sugars in the tubers. However, at the higher temperatures sprouting occurs after 2 or 3 months, and shrinkage is much greater. Although a limited amount of sprouting does not affect the quality of tablestock potatoes, badly sprouted stock is "flabby" and difficult to market.

Potatoes stored at 40^0 F. are acceptable for most purposes other than processing. High reducing sugar content is one of the causes of the undesirable dark brown color in potato chips and frozen french fries and is to some extent responsible for discoloration in dehydrated potato products. If potatoes are to be processed within three months after harvest they are usually held at a storage temperature of 55^0 to 60^0 F., but if they are to be held for longer periods of storage this temperature is usually reduced to 50^0 to 55^0 F. Processing potatoes

from storage are usually "reconditioned". That is, the storage temperature is raised to 60^0 to 70^0 F. for 2 to 4 weeks prior to shipment. This "reconditioning" reverses the physiological process and reduces the sugar content of the tubers.

The type of storage and the ability to control temperature and humidity places limitations on the alternatives available to the marketing firm. As recently as the mid-1950's, much of the storage capacity consisted of small storage facilities located on individual farms. Many of these were earth covered underground type facilities. This is an economical type storage, but it is not suitable for packing large volumes of potatoes required by present-day buyers. In the small farm storages, the potatoes are forked out of the bins by hand and graded on small portable graders using a crew of only 5 or 6 people. Although well suited for utilization of family labor, these facilities usually lack washing equipment and the quality of potatoes packed is often relatively low. Also, control of temperature and humidity is difficult and potatoes from these storages are usually unsuitable for processing.

Potato storage design has changed in recent years to take advantage of modern bulk handling methods. A considerable number of large, modern, above-ground storage facilities have been constructed on rail sidings in the Valley. These storages are equipped with flume systems for moving potatoes from storage bins to high-capacity packing lines. In most cases these large storages are also equipped with automatic temperature and humidity control for individual storage bins. As the storages have increased in size, and processing has become more

important as a market outlet, automatic environment control has almost become a necessity for firms who sell to processors.

In 1963, the total storage capacity available in the Valley was about 26.1 million cwt. (see Appendix table 15). All of the 858 firms either owned or controlled storage space; 710 firms actually owned storage facilities. The other 148 firms rented or leased space from those who owned it. The 710 firms that reported ownership of facilities owned an aggregate of 24.1 million cwt. of capacity. In addition, about 2.0 million cwt. of capacity was owned by firms or individuals who were not active in the potato business. The 148 firms that rented storage but did not own any were primarily small tablestock growers. About 128 of these small growers accounted for 86 percent of the rent-only storage capacity.

The small potato storages located on individual farms have been, and are, becoming less important to the Red River Valley industry. Information regarding specific changes in location and types of storage in the Valley is not available. However, in discussing changes in five upper midwest states including Minnesota and North Dakota, Bakken, et al., stated that: "Until the 1930's, with the exception of Nebraska, most of the potato warehousing space was owned by local or multi-station dealers. The depression forced many of these dealers out of the industry. Commercial storage further declined in importance as production became concentrated in the hands of specialists. These producers prefer to store their own crops. In 1948, the government accentuated this change by requiring that producers provide their own storage for late-harvested (after September 30) potatoes in order to be eligible for

price supports. Both large and small growers then built their own facilities. By 1949, more than 99 percent of the storage used by Wisconsin growers was farmer-owned."[13]

During the 1962-63 season, only 6.4 million cwt. or 25 percent of the total Valley storage capacity was located on individual farms (see Appendix table 16). Trackside storage accounted for 19.7 million cwt. While many of the trackside storages are not modern, practically all of the new modern facilities have been constructed at trackside. As an indication of the rapid expansion of new facilities, a trade publication reported in 1960 that, "forty-two new and expanded potato storage warehouses, conditioning, and wash plants are being built in the Red River Valley."[14] It was estimated that this would represent about 1.7 million cwt. of new capacity.

The 1962 crop amounted to 22.4 million cwt. of potatoes that were sold from the farms, but 2.0 million cwt. represented cullage and sales during the harvest period. Thus, about 20.4 million cwt. of potatoes from the 1962 crop went into storage. The results of the survey indicate that 21.9 million cwt. of storage capacity was used to store this crop. The excess of storage capacity used over the volume of potatoes actually stored resulted from the fact that many bins were not filled to capacity. However, even though storage space was not used as

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[13] H. H. Bakken, A. L. Domike, and N. K. Sinha, "Changes in the Potato Market Structure in the North Central States," Research Bulletin 189, University of Wisconsin, Madison, December 1955, p. 21.

[14] Quoted in Chippers, Unnumbered bulletin, Red River Valley Potato Committee.

efficiently as possible, only 84 percent of total storage capacity was used for the 1962 crop.

The large and medium sized firms used their storage capacity more efficiently than did the small firms. The large firms used 91 percent and the medium firms used 94 percent of capacity, but the small firms used only 66 percent of capacity. Much of the unused capacity consisted of the small storages located on individual farms.

The largest proportion of the crop is stored by the firms that produce the potatoes. For example, the small firms who sell to or through other firms in the Valley produced 5.6 million cwt. of potatoes in 1962, but they used 5.2 million cwt. of storage space. Although one-third of the crop was sold on a bulk basis to other firms in the Valley who actually packed the potatoes, these transactions were not usually completed until the potatoes were packed. Only six of the 858 firms did not store any potatoes at all from the 1962 crop. These six firms were grower-packers who delivered all of their potatoes to processors during the harvest period. All six of these firms owned storage space, but only one rented his storage to another firm.

Storage decision

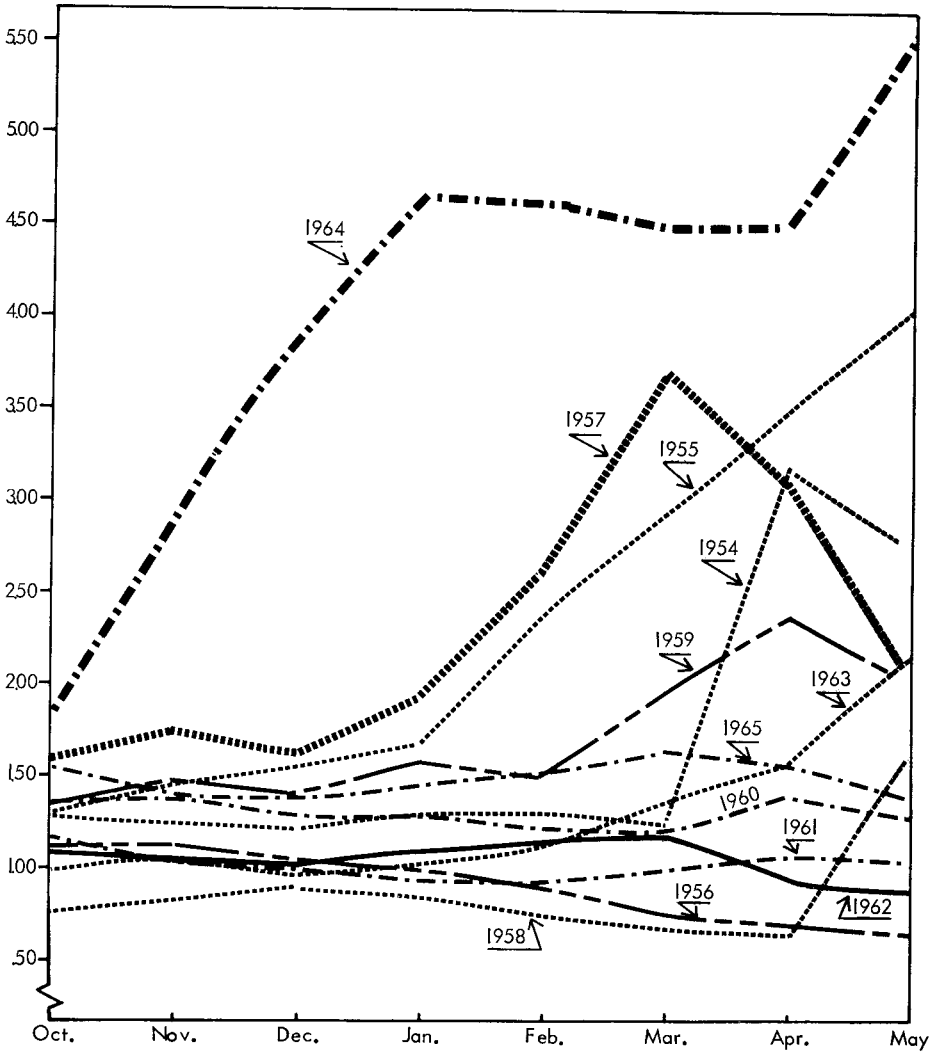
Each year the producer must make a decision as to whether he will sell his potatoes at harvest or undertake the additional costs of performing the storage function. If he owns storage facilities the capital investment and maintenance costs are more or less fixed, but he may have the alternative of leasing the facilities to other firms. In addition to the fixed costs of facilities, there are also the costs of shrinkage and quality deterioration and the risks of price change during the

storage period. If the supply of fall storage stocks and the costs of carrying them were the only factors affecting prices, the storage decision would be less difficult for the producer. However, production of potatoes in early producing areas, such as Florida and California, has a marketed effect on the price of late potatoes from storage. Thus, prices throughout the storage period are very unpredictable, even when the volume of potatoes in storage is known.

During the 12-year period from 1954 to 1965, there were only 6 years when the price rise throughout the storage period was more than sufficient to cover the additional costs of sotrage (figure 12 and Appendix table 17). However, in each of these 6 years the price rise was substantial and the individuals with potatoes in storage made large financial gains. In 2 of these years there was no increase in prices during the first part, but a substantial increase later in the season, in one case beginning in January and in the other beginning in March. In 5 years there was variation throughout the season, but on balance little change from the price level at harvest; in only 1 year did prices decline throughout the storage period.

With the wide variation in returns to storage, it might be expected that the proportion of the crop stored would vary sharply from one year to the next. While individual producers may have the option of selling at harvest or storing the crop, all marketing firms, as a group, have little choice between selling or storing the potatoes. The demand for potatoes is very inelastic and the quantity that can be sold at harvest changes little from year-to-year. So, firms sell for immediate use at harvest and store the remainder of the crop that cannot be shipped at acceptable prices.

Figure 12.--Potatoes: monthly average prices received by farmers, Minnesota-North Dakota, 1954 to 1965.



In 12 of the 13 years from 1954 to 1966, December 1 stocks on hand varied only from 67 to 76 percent of the total fall crop (see Appendix table 18). The one exception was 1957 when only 62 percent of the fall crop was on hand December 1. This was the crop following the year of heavy financial losses resulting from a general price decline throughout the storage period. In addition, production in 1957 was reduced by floods during the harvest period and prices early in the season were higher than normal.

Packing

The market in which the potaotes are to be sold determines whether the potatoes are washed, the grade packed, and the size and type of container used. Most of the tablestock potatoes are packed in relatively large flume equipped, fixed-line, packing plants. The potatoes are washed out of the bins by water pressure and conveyed to the fixed packing line via a flume system. Most of the field dirt is washed away in the flume, but upon reaching the packing line the potatoes are passed through a high pressure water spray which completes the washing operation. After coming out of the washer, the potatoes are usually passed through a dryer. Here, hot air blowers and absorbent rollers combine to remove surface moisture. After washing and drying, the potatoes go through the sizer, which separates the very small and very large sizes (usually less than 1-7/8 inches and over 3-1/2 inches in diameter) from the potatoes to be packed for tablestock market.

The small or B size potatoes are usually sold to canners and other buyers who process the market whole precooked potatoes. The large or jumbo size potatoes are sold to starch or flour processors or to

institutional users such as hospitals, schools, or restaurants that prefer the large sizes because of the low peeling loss involved in preparation.

After washing and sizing, the potatoes are conveyed across a roller type grading-table where trained personnel remove potatoes that fail to meet the requirements of the grade being packed. There are several grade classifications in the U.S. Standards for potatoes -- U.S. Fancy, U.S. No. 1, U.S. Commercial, and U.S. No.2. However, only three of these grades are usually packed in the Red River Valley. These are U.S. No. 1, U.S. Commercial, and U.S. No. 2. Culls are not defined in the Standards, but these consist of defective potatoes that fail to meet the minimum quality standards for U.S. No. 2 grade.

The U.S. Standards specify both quality and size requirements. A specific grade includes several different size designations. For example, a U.S. No. 1 grade may be U.S. No. 1 - Size A, U.S. No. 1 - Size B, U.S. No. 1 - 2-1/4 inch minimum, or any one of many other specific size designations. There are allowable variations, or tolerances, within the designated grade and size classifications. Some lots of potatoes may be well within these tolerances, while others barely meet the minimum requirements. Thus, there may be considerable variations in quality and size between lots of potatoes of the same grade.

The size and operating speed of the grading-table usually controls the packing capacity of the plant. There are three sizes of fixed-line grading-tables in general use in the Valley. These are tables of 24 inches, 36 inches, and 48 inches in width. Although the speed of grading operation depends on the quality of potatoes packed and the number

and skill of the workers on the grading-table, a common rule-of-thumb is 100 cwt. per hour for the 24-inch table, 200 cwt. per hour for the 36-inch table, and 300 cwt. for the 48-inch table.

After grading, red potatoes may be waxed, or they may be marketed unwaxed. Waxing involves the application of a red vegetable dye to enhance the color of the potatoes. Although the desirability of waxing potatoes has often been questioned by some, most of the red potatoes are waxed.

From the waxer the potatoes are conveyed to the packaging units. Most of the plants do not pack small size packages, but in the larger plants there are two sets of packaging equipment. One set is for filling 50-to 100-pound bags and another set for filling 25-pound and smaller "consumer" packages. The 50- and 100-pound bags are filled, weighed, and closed by hand, but the consumer packaging is usually done on semi-automatic "merry-go-round" type filling and weighing units. These "merry-go-round" units fill and weigh small packages in a continuous cycle. The potatoes are fed into empty bags suspended from scale heads that automatically fill the packages to a pre-set weight.

After packaging, the potatoes are conveyed to waiting rail-cars and trucks for shipment to consuming centers. Because of the extreme cold during the winter shipping season, the rail-car or truck is usually pre-heated for several hours before loading is started. There is also provision for heater service to maintain moderate temperature while the load is in transit. Prior to the 1963 shipping season, rail-cars were loaded to about 400 cwt. per shipment. However, rate reductions for more heavily loaded rail-cars has increased the average load

to about 500 cwt. per shipment. Truck shipments are more variable in size, but most truck shipments are comparable to those in rail-cars.

About one-fourth of the tablestock potatoes are shipped "dry" (i.e., unwashed) in 100-pound burlap bags. Most of the dry potatoes are packed by small firms which usually are not equipped to wash and prepackage potatoes. In many cases, these potatoes are sold to "prepackers" and other firms in the terminal markets who wash and prepackage the potatoes in their own plants before they are sold to retail stores.

Potatoes packed for the processing or seed markets are not washed and are usually packed in 100-pound burlap bags. The packing equipment required is rather simple, usually consisting of a portable sizer-grader combination that can be operated right in the storage bin.

Potatoes for processing are most often graded to the requirements of the U.S. Commercial grade. Decayed and seriously damaged potatoes are removed, but potatoes with minor damage that fail to meet the requirements of the U.S. No. 1 grade are allowed to remain. These minor defects are removed when the potatoes are washed and peeled in the processing plant.

Seed potatoes are not washed because washing would not improve the quality of the seed and the wash water might spread any disease organisms that happen to be present. Seed potatoes sold outside of the Valley are usually Blue Tag. That is, in addition to meeting the requirements of field and storage inspections necessary for certification, they have also been graded to U.S. No. 1 grade specifications.

Integration

Integration is a term which refers to the manner in which firms are organized to perform the necessary production marketing functions. Integration is usually viewed as consisting of two dimensions; vertical and horizontal.

Vertical integration

Vertical integration refers to the linking together of two or more functions in the production and marketing sequence. A completely vertically integrated firm would perform all of the functions from the production of potatoes to the sale to final consumers. A chain-store that operated farms, storage, and packing facilities would be one example of a completely vertically integrated firm. In the Red River Valley, however, there are no firms that are completely integrated. Except in the case of contracts between producers and processors, there is a clear break in the functional process at the point where potatoes are packed and are ready for sale to customers outside of the Valley.

At each stage in the functional process, the firm is confronted with the decision of selling on the one hand or undertaking the next successive stage in the process. At harvest, the producer must decide whether he will sell or undertake the storage function. Later in the season, the firm with potatoes in storage must decide whether it will sell from storage in bulk or undertake the packing function. If it packs potatoes it must decide whether to seek outside customers or sell to, or through, other firms in the Valley. Although none of the firms operate completely as single function firms, it would be possible and

several firms come very close. Some of these are producers who sell all or most of their potatoes in bulk at harvest. There are also a few cases where several producers jointly own a storage facility that is operated independently from their production activities, and all of these potatoes are sold in bulk to packers. In addition, there are distributors whose major activity is the purchase and resale of packed potatoes.

In the vast majority of Valley firms, however, the functions performed are not an "all or nothing" decision. Some potatoes are stored at harvest and the remainder are sold in bulk. Some of the stored potatoes are packed and some are sold from storage in bulk. Some of the packed potatoes are sold to outside customers and others are sold to, or through, other firms in the Valley. Thus, in practically all cases some combination of production and marketing functions are vertically integrated.

Of the 858 marketing firms operating during the 1962-63 season, 462 performed all of the functions from production through sales to "final customers", for at least part of their volume produced (see Appendix table 19). Another seven firms were integrated from storage through sales to "final customers", but did not produce any potatoes. About one-fourth of the firms in the Valley, or 229 firms, performed all of the functions from production through packing but did not sell to "final customers". These firms sold all of their potatoes to, or through, other Valley firms that acquired packed potatoes and sold to "final customers". A smaller group of 154 firms produced and stored potatoes but did not pack to sell to "final customers". These firms

sold potatoes in bulk to other firms who packed and handled the sales. Only 6 firms sold all of their potatoes at harvest; although they packed and handled their own sales, they did not store any potatoes.

Horizontal integration

Horizontal integration refers to the case where two or more establishments performing the same function, or functions, at the same level in the marketing sequence, are combined under a single management. The simplest form of horizontal integration is where the same firm owns and operates facilities at two or more locations. In 1963 there were 11 firms that operated storage and packing facilities in more than one town.[15/] Nine of these firms operated plants at three locations. All of the plants operated by 10 of the firms were located in the Valley. One of the three-plant firms, however, had two plants in the Valley and one plant in southern Minnesota. Although the potatoes were stored and packed at more than one location, the selling operation was centralized at one location for each of the 11 firms.

Ten of the 11 multi-plant firms were vertically integrated through the selling function. That is, the principals in the firm produced potatoes and the firm conducted storage, packing, and selling operations. One of the firms did not produce any potatoes, but it conducted storage, packing, and selling operations.

Although the multi-plant firms were large, they were not necessarily the largest firms in the Valley. Based on volume of potatoes packed,

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15/ Firms with two or more storage buildings in the same town, or storage buildings both on the farm and at trackside, were not considered multi-plant firms in this report.

only five of the 11 firms were among the 20 largest firms, and only one was among the four largest for the 1962 crop year.

Mixed integration

The pattern of integration in the Valley is generally some combination of both vertical and horizontal integration. That is, several firms combining horizontally at one level in order to jointly perform the next vertical function in the marketing sequence. Thus, we see independent producers forming partnerships and corporations to own and operate storage and packing facilities. We also see producers who have formed cooperatives and condominiums to perform these marketing functions.

The 1959 Census of Agriculture shows that 2,143 farms harvested potatoes in the 10 county area of the Red River Valley. Yet only 1,008 firms paid inspections under the Federal-state marketing orders in 1959. Although some farmers sold all of their potatoes at or prior to harvest, the major part of this difference was due to the combination of independent production units into joint marketing firms. The results of the survey indicate that there were 1,619 production units organized in 858 marketing firms for the 1962 crop year (see Appendix table 20).

Ownership integration

The largest group of marketing firms, by legal form or organization, were proprietorships which accounted for 565 firms. In addition there were 25 corporations and 266 partnerships. Although some of the principals in the family corporations did not own independent production units, the majority of principals operated production units separate

from the marketing firm. In the case of partnerships, practically all of these applied only to the storage, packing, and selling operation, and each partner operated his own independent production unit.

Cooperatives and condominiums

In 1963 there were only two cooperatives in the Valley, but there were three condominiums whose mode of operation is very similar to that of a cooperative organization. The condominium form of organization is a rather recent development in the Valley, with the first firms of this type being organized in 1959.

In the case of cooperatives, storage buildings and packing facilities are owned by the cooperative and storage space is rented to the members. The producer retains control of his potatoes until he is ready to sell. The potatoes are packed by the cooperative and the producer receives the current price, but in addition also shares in patronage dividends at the end of the accounting period.

The condominiums are organized within a corporate structure. The packing facilities and equipment are owned by the corporation, but the storage bins are individually owned by the producers. Ownership of one storage bin gives the producer one share of stock in the corporation. The corporation, in turn, employs a professional manager who supervises housekeeping, packing, and selling operations. Ownership of the storage bins is restricted only to the extent that the sale of a bin must be approved by the other owners. The producer has complete control over his own potatoes, including the right to remove them for packing at a different location if he wishes. In practice, however, this right is seldom exercised. Practically all of the potatoes are packed

in the corporation's facilities using a full-time crew employed and supervised by the manager. The manager also handles all sales of potatoes packed in the facility.

Both the cooperative and condominium forms of organization enable a large group of relatively small producers to obtain economies of large scale storage and packing operations through the process of horizontal and vertical integration. Although it requires a much larger initial investment on the part of the producer, the condominium has the additional advantage that the storage bins can be rented or sold if the producers decide not to use them.

The two cooperatives and three condominiums had a total of 360 active members or stockholders during the 1962 crop year. This does not mean, however, that all of these producers necessarily marketed all of their potatoes through these firms. In most cases this was only one of several marketing alternatives available to the producer.

In addition to the condominiums that were vertically integrated from storage through the selling operation, there were at least five other condominiums that were organized only for the purpose of storage. The storage warehouse, in each case, was located immediately adjacent to the storage facility of an independent packer and had a flume connection to the packing line. There was no formal requirement that the individual producers had to sell to, or through, the adjoining packer, but in practice practically all of the potatoes from these storages were marketed through the connecting firm.

Pooling tablestock potatoes

Pooling is a method used by several producers to spread the risks of price change over time and among themselves. At the beginning of the time period, during which the pool will operate, each producer commits a certain volume of potatoes to the pool. The manager of the pool packs and sells the potatoes without relation to the ownership of the specific lots packed. At the end of the pool period, each participant receives the average price per unit for all potatoes that have been sold in the pool.

Eleven of the large- and medium-sized firms operated pools which included potatoes from 108 different producers during the 1962 crop year. Most of the volume pooled was handled by three of the coop-packers who accounted for 78 percent of the volume pooled. In the case of the coop-packers, the pools were operated separately from other activities of the firm. The members or stockholders are free to enter a pool or to continue to sell through the firm by the usual methods.

In addition to the pools operated by the coop-packers, eight of the proprietary firms also operated pools. These firms rented storage space to other producers and all of the potatoes in storage, including those owned by the pool operator, were sold in a common pool. The eight pools included potatoes from 71 different producers.

Contracting for processing potatoes

The processing market requires certain varieties of potatoes stored under special conditions and usually reconditioned before use. While the tablestock or seed shipper can make the decision to sell,

pack the potatoes, and ship them the same day, the producer of processing potatoes usually needs 2 to 4 weeks to recondition the potatoes after the decision has been made to sell. The variability of potato prices and the inflexible and time-consuming nature of the preparation function provides the conditions that make contracting attractive for both the processor and the producer. Within limits, the processor is assured of the right kind and amount of raw product. He is thus able to concentrate on production and sale of processed products without the need to speculate in the potato market. On the other hand, the producer is assured of an outlet for his production at a predetermined price.

The term "contract" is used here in the broad context of an agreement between buyer and seller. In most cases, it represents a formal written contract, but in some cases it is only a verbal agreement by the buyer to purchase potatoes at a specified price if they are "chipping quality". Several buyers and many sellers have operated on this informal basis for several years and when questioned stated that they have a "contract".

Practically all of the contracting during the 1962-63 season was done by three agents who represented chip processors and nine large packers and grower-packers who specialize in selling to chip processors. The agents only carry out instructions and sign formal contracts for the processors they represent. In two of the three cases, the firm received a fee of 5 cents per cwt. for supervising the contracts and arranging for shipments. In the third case, the processor was a major stockholder in the firm and the manager, who was also a stockholder, was employed on a salary.

In the case of the packers and grower-packers, however, the relationship to the processor was not so clear-cut. Four of the packers and grower-packers have formal ties to terminal distributors who contract in their own name with individual processors. These ties involve either joint-account sales or a silent partner arrangement. The five other packers and grower-packers have commitments to specific processors, but these are little more than verbal agreements to accept the potatoes if they are of "processing quality".

Stock ownership in other Valley firms

Eighty-four of the principals in the Valley shipping firms owned stock in other Valley shipping firms. Seventy-eight of these principals owned stock in only one other firm, but six owned stock in two other firms.

When several of the Valley processing firms were organized in the late 1950's, much of the capital was raised through the sale of stock to principals in shipping firms. Also, several of these principals in shipping firms were active in the organization of the processing firms. Three of the principals in shipping firms were also principals in a processing firm in 1963. In addition, seventy-three principals in shipping firms owned stock in Valley processing firms, but did not take an active part in the management of these firms.

Relationship to firms in terminal markets

The one firm that operated a plant in Southern Minnesota and the various relationships that existed between firms in the processing market have been discussed above. In addition to those firms, there was no formal integration of Valley firms with firms located in terminal

market firms. Both of these individuals stated, however, that although they had a financial interest that they did not take an active part in the management of these firms. In fact, they make fewer sales to these firms than to some of their other customers.

A few of the chain stores maintain buying offices in the Valley during the shipping season, but these are staffed by salaried employees. And although the chains purchase from a relatively small number of the largest firms, they do not appear to maintain a formal relationship with specific firms. Also, several terminal distributors employ fieldmen in the Valley. In some cases these are salaried employees, but others work on a commission basis.

Marketing Channels

In the following sections "final sales" is used as an expository term to indicate potatoes that have left the control of any firm in the Valley industry. In point of fact, however, most of these sales are not final, in the sense of a sale to the ultimate consumer. These sales are divided into two broad groups: (1) sales to final customers in the Valley, and (2) sales to customers located outside of the Valley. The final users in the Valley consist of two subgroups: (1) Valley processors, and (2) producers who purchase stockfeed and certified seed for their own use. Sales outside the Valley were subdivided on the basis of intended final use: (1) tablestock, (2) processing, and (3) seed. Sales to retail stores, restaurants, truckers, etc. were classified as outside sales even though the customer may have been located in the Valley. This type of sale, however, represented a very small part of the total volume sold.

Intra-industry transactions

The total volume of potatoes sold to "final customers" during the 1962-63 season was 18.9 million cwt., but the total volume sold by individual firms amounted to 29.9 million cwt. Thus, 11.0 million cwt., or 58 percent of the volume sold to "final customers" was acquired from other firms in the Valley. These intra-industry transactions consisted of 6.3 million cwt. of potatoes acquired in bulk, and 4.7 million cwt. acquired after they had been packed by other firms.

Of the 858 firms in the Valley industry, only 88 firms acquired potatoes from other firms (see Appendix table 21). An additional 207 firms made some sales outside the Valley, but the remaining 563 firms sold all of their potatoes to, or through, these 88 firms or to "final customers" located in the Valley. All of the distributors, agents, coop-packers, and packers acquired potatoes, but only 38 of the 567 grower-packers and none of the 262 growers acquired potatoes from other firms. It is of interest that 20 of the grower-packers were in the large size category (packed 150 or more carlots) on the basis of their own production only, and did not acquire potatoes from other firms.

A striking feature of the Valley industry is the small number of traditional "assemblers" who purchased bulk potatoes from producers and performed all of the shipping-point marketing functions. Only seven of the 88 firms that made acquisitions did not produce any potatoes. Five of these seven firms were coop-packers and only two were proprietary firms. There were 10 other firms whose bulk acquisitions represented more than 75 percent of their "final sales", and 10 firms whose bulk acquisitions represented 51 to 75 percent of their "final sales".

Thus, in addition to the five coop-packers, there were only 22 firms whose major functions included the assembly of bulk potatoes produced by other firms.

On the other hand, eight of the 88 firms that acquired potatoes from other firms were distributors. That is, more than one-half of their "final sales" were potatoes that had been packed and prepared for shipment by other firms. Thus, for 53 of the 88 firms, their most important functions were neither assembly nor distribution. These firms produced a major part of their "final sales", they acquired some potatoes in bulk and acquired some that were already packed.

Acquisitions of bulk potatoes

The three major methods used to acquire bulk potatoes were "contract" purchases, pooling by a group of producers, and various forms of cash purchase. In general, most of the volume acquired under "contract" was purchased by agents who represent chip processors, most of the pooled volume was handled by coop-packers who sell in the tablestock market, and most of the cash purchase volume was acquired by coop-packers who also sell in the tablestock market.

The chip processors have more specialized product requirements than other types of "final customers". Therefore, contracting is an important method of purchase used to assure the required supply of potatoes with desirable processing characteristics. About 1.3 million cwt., or 7.2 percent of the volume sold to "final customers" was purchased under contract by 12 Valley firms. Eleven of these firms were large firms and 8 of them specialized in the sale of processing potatoes. The 8 firms that specialized in sales to processors accounted for 92

percent of the "contract" volume. These firms included the three agents, who had formal ties with processors and accounted for 61 percent of the "contract" volume.

About 1.0 million cwt., or 5.2 percent of the volume sold to "final customers" was acquired on a pooled basis by 11 Valley firms. Practically all of the pooled potatoes were destined to the tablestock market, and five firms that specialized in the sale of tablestock potatoes accounted for 93 percent of this volume. Three of these firms were coop-packers who accounted for about three-fourths of the pooled volume.

The most important method of acquiring bulk potatoes was by outright purchase. Almost 4.0 million cwt., or 21.0 percent of the total volume sold to "final customers" was purchased in bulk by 43 Valley firms. As to location, these potatoes were purchased (1) unharvested in the field, (2) on a grade-out basis at the end of the purchaser's packing line, and (3) field-run at the producer's or purchaser's storage. The most important point of purchase, however, was at the end of the packing line.

About 87 percent of the potatoes purchased in bulk were purchased by 30 firms that specialized in the sale of tablestock potatoes. Only two firm types, coop-packers and packers, which included 16 firms, accounted for 82 percent of the bulk purchases. Although purchases were made at a quoted price, for both types of firms, it is clear that the terms of purchase by the coop-packers were somewhat different from those of packers. In addition to expectation of sharing in dividends at the end of the marketing period, the member of the coop-packer has

some financial interest in the firm and often a vote in certain policy issues affecting the operation of the firm.

Acquisition of packed potatoes

The handling of packed potatoes on a brokerage basis is not an important method of acquisition by Valley firms. Although several of the distributors located in the Valley are often referred to as "brokers", only two of the eight distributors handled brokerage sales and the brokerage volume represented less than 5 percent of the total volume acquired by the distributors.

Fifteen Valley firms acquired 0.4 million cwt., or 2.2 percent of the total volume sold to "final customers", on a brokerage basis. Most of the brokerage potatoes were handled by firms that specialized in the sale of tablestock potatoes, and the group of six grower-packers was second only to distributors in brokerage volume handled.

In contrast with bulk potatoes that were acquired primarily for the tablestock and processing markets, most of the packed potatoes were purchased by distributors for the seed market. Sixty Valley firms purchased 4.3 million cwt., or 22.7 percent of the total volume sold to "final customers", after the potatoes had been packed by other Valley firms. About two-thirds of this volume was purchased by eight distributors who specialized in the purchase and resale of seed potatoes.

Sales to final customers

Of the 18.9 million cwt. sold to final customers during the 1962-63 season, 3.3 million cwt. was sold to final customers in the Valley and 15.6 million cwt. was sold to customers outside the Valley. Of the 3.3 million cwt. sold to customers in the Valley, 2.2 million cwt. went to

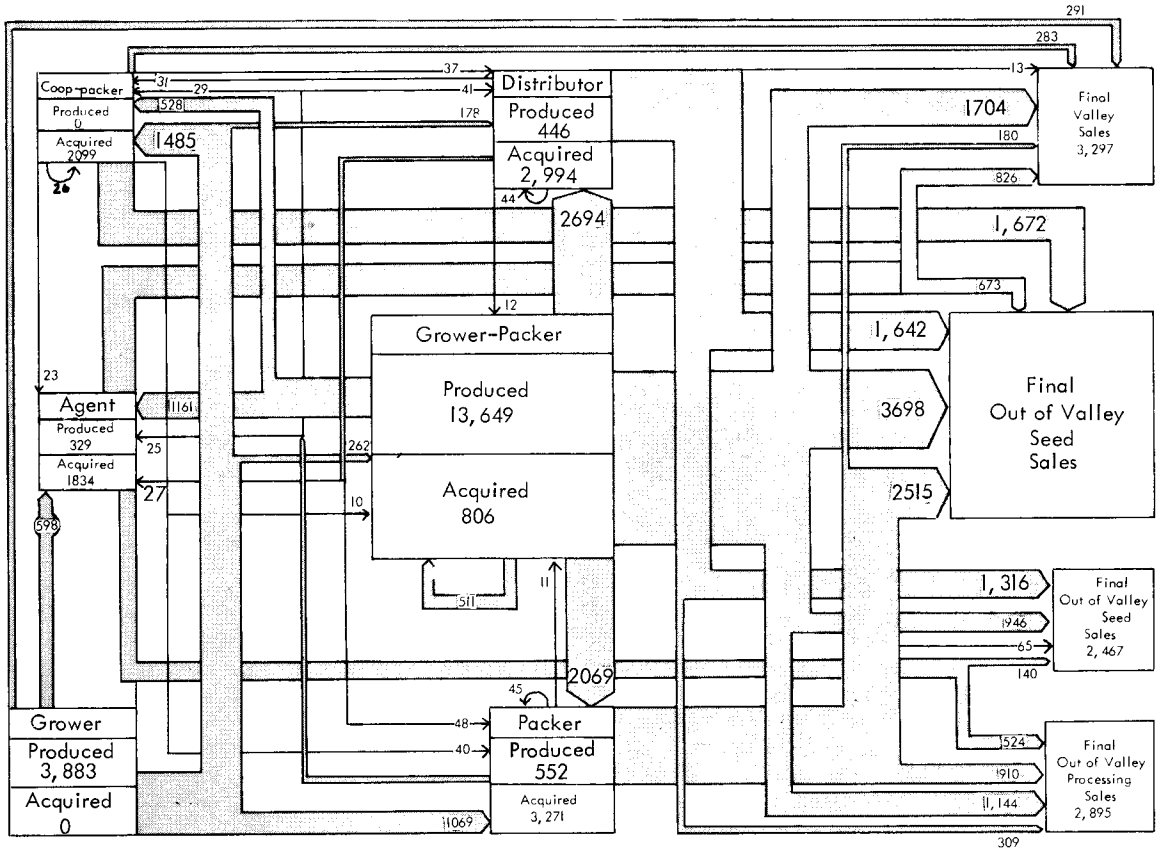
processors located in the Valley and 1.1 million cwt. went to producers as stockfeed and certified seed. Of the 15.6 million cwt. sold to customers outside the Valley, 10.2 million cwt. went for tablestock, 2.9 million cwt. went to processors, and 2.5 million cwt. went for seed.

A total of 475 firms sold potatoes to final customers (see Appendix table 22). However, 180 of these sold only to final customers in the Valley, and only 295 firms also had sales to customers outside the Valley. Of the 295 firms that had outside sales, 207 sold only their own production and 88 also acquired potatoes from other firms. In addition to the 11.0 million cwt. acquired from other firms, these 88 firms produced 3.7 million cwt., or 19.6 percent of the volume sold to final customers. Thus, the 88 firms that acquired potatoes from other firms controlled 77.8 percent of final sales, while the 387 firms that marketed only their own production controlled only 22.2 percent of final sales.

The firm specialization categories were based on total volume sold by type of potatoes handled, irrespective of whether the sales were made to final customers or to other firms in the Valley. There were 534 firms that sold more tablestock than either processing or seed, yet only 260 firms sold tablestock potatoes to outside customers. Likewise, 90 firms specialized in processing potatoes to outside customers. And finally, 234 firms specialized in seed potatoes, but only 48 firms sold seed to outside customers.

Intra-industry transactions and sales to final users are summarized in figure 13 to show the channels and final disposition of the 1962 Red River Valley potato crop.

Figure 13.--Major marketing channels, Red River Valley potato industry, 1962 crop year. (thousand cwt.)



Concentration

Certain aspects of structure and organization are thought to bear significantly on price and income determination and to affect conduct of firms within an industry and thus the performance of the industry. Economic theory suggests that industries with high seller concentration are likely to restrict output, charge higher prices, and earn higher profits than industries of low concentration. The degree of concentration of an industry refers to the amount of total output controlled by a specified number of firms. The most commonly used measure of concentration is the proportion of total industry output controlled by the four, eight and 20 largest firms.

Volume of inspections as a measure of firm size

Under the Marketing Agreements and Orders that were in effect from 1952 to 1965, there were certain grade and size restrictions on potatoes sold outside the Valley. In order to enforce these requirements, the industry operated under a compulsory inspection regulation which required federal-state inspection for all shipments from the Valley. Although this regulation applied to "dealers and handlers", there was no requirement as to who actually paid the inspection fee. In some cases the producer paid the fee, in others the shipper paid the fee, and in some instances the shipper paid the fee but deducted it from the payment to the producer. Thus, while the volume of potatoes inspected is an excellent measure of shipments from the Valley, it is a less accurate measure of shipments by individual firms.

An analysis of data from the 103 firms included in the survey showed a high correlation between volume inspected and volume packed by individual firms during the 1962-63 season. Also, of the 95 firms in the sample who actually packed potatoes, only four did not pay any inspections and three of these packed less than 10 carlots.

In general, the volume of potatoes inspected was found to be a better measure of size for large firms than for small firms. Only three of the 20 largest based on volume of potatoes packed were different from those based on volume of inspections. Volume of potatoes inspected is an imperfect measure of the size of individual firms within a season, but, to the extent that the pattern of inspection payments between firms remains unchanged from one season to the next, volume of inspections can be used as an indicator of changes in the number and size of firms over time.

Concentration ratios, 1962-63 season

There are several different measures of size that could be used to determine the importance of a firm in the industry. The measure chosen, however, has an effect on the concentration ratios that are determined. Table 2 summarizes four different measures, obtained from the survey of firms that could be used. Reading down the left side of the table are the measures by which the firms were ranked, and reading across are the proportions of totals based on these rankings. For example, the four largest firms, based on inspection paid, accounted for 13.9 percent of inspections, controlled 6.6 percent of the storage space available, packed 12.5 percent of the volume packed, and made 8.6 percent of the final sales. Likewise, the four largest firms, based on storage space

Table 2.--Measures of concentration, Red River Valley potato industry, 1962-63 season

Basis for ranking firms	Proportion of volume, based on rankings			
	Inspections paid	Storage controlled	Volume packed	Final sales
	(percent)			
Four largest firms				
Inspections paid	13.9	6.6	12.5	8.6
Storage controlled	9.9	9.5	10.5	9.8
Volume packed	13.9	6.6	12.5	8.6
Final sales	11.0	8.4	10.2	11.2
Eight largest firms				
Inspections paid	20.7	10.3	18.6	12.6
Storage controlled	15.7	14.6	15.3	14.1
Volume packed	19.2	12.7	19.5	15.9
Final sales	16.9	11.3	17.5	16.9
Twenty largest firms				
Inspections paid	33.6	20.1	30.2	23.3
Storage controlled	28.0	24.9	27.4	24.0
Volume packed	31.6	20.8	32.8	24.9
Final sales	31.9	21.9	30.5	28.5

controlled, paid 9.9 percent of the inspections, controlled 9.5 percent of the total storage space, packed 10.5 percent of the volume packed, and made 9.8 percent of the final sales.

The ratios for volume inspected and volume packed were very close to one another. For the four largest firms the ranking based on inspections was the same as that based on volume packed. Also, seven of the eight largest firms, and 17 of the 20 largest firms fell into the same ranking groups for both inspections paid and volume packed. Although inspections as such have little or no economic meaning, it does appear that inspections are a good indicator of volume packed, which is in turn an indicator of the firm's potential influence in the market.

The indicated degree of concentration varied somewhat among each of the measures used, but is relatively low for all four measures. Thus, there does not appear to be any one firm, or group of firms, large enough to exert a significant influence in the market as a result of size alone.

Changes in number and size of firms

The average size of all firms, based on inspections, has more than doubled, from 19.7 carlots per firm in 1955 to 53.0 carlots in 1963 (see Appendix table 23). This increase in average size reflects both an increase in the total volume of potatoes shipped and a decrease in the number of firms paying inspections. The total volume of potatoes inspected increased from 21.1 thousand carlots in 1955 to 39.7 thousand carlots in 1963. During this period the number of firms paying inspections declined from 1,075 firms in 1955 to 750 firms in 1963. Although the growth of the 100 largest firms was somewhat less than the average

for all firms, the increase in size was very consistent among each of the groupings made of the 100 largest firms. While the average size of all firms more than doubled; the four largest doubled in size; the five to eight largest doubled in size, etc.

The number of firms paying inspections on fewer than 30 carlots each season declined by almost one-half, from 930 in 1955 to only 481 in 1963 (see Appendix table 29). This decline in the number of small firms resulted both from firms dropping out of the industry and from the growth of firms into large size groups.[16/] While the number of firms paying inspections on less than 30 carlots declined, the number of firms in each of the larger size groups increased. The proportion of firms paying inspections on less than 30 carlots declined from 87 percent of all firms in 1955 to 64 percent in 1963.

The change in the number of firms in each size category was accompanied by rather large changes in the volume of inspections paid by the smallest and largest groups of firms (see Appendix table 25). The proportion of inspections paid by firms of less than 30 carlots decreased from 29 percent in 1955 to only 12 percent in 1963. During this same period, the proportion of inspections paid by firms of 450 carlots or more increased from 12 percent to 23 percent.

Changes in concentration

While the firms in the industry have been growing at a rapid rate, the proportion of inspections paid by any group among the 100 largest firms has changed very little as illustrated in figure 14 and Appendix table 26. The share of the four largest firms increased only 0.3, and

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16/See Appendix table 21.

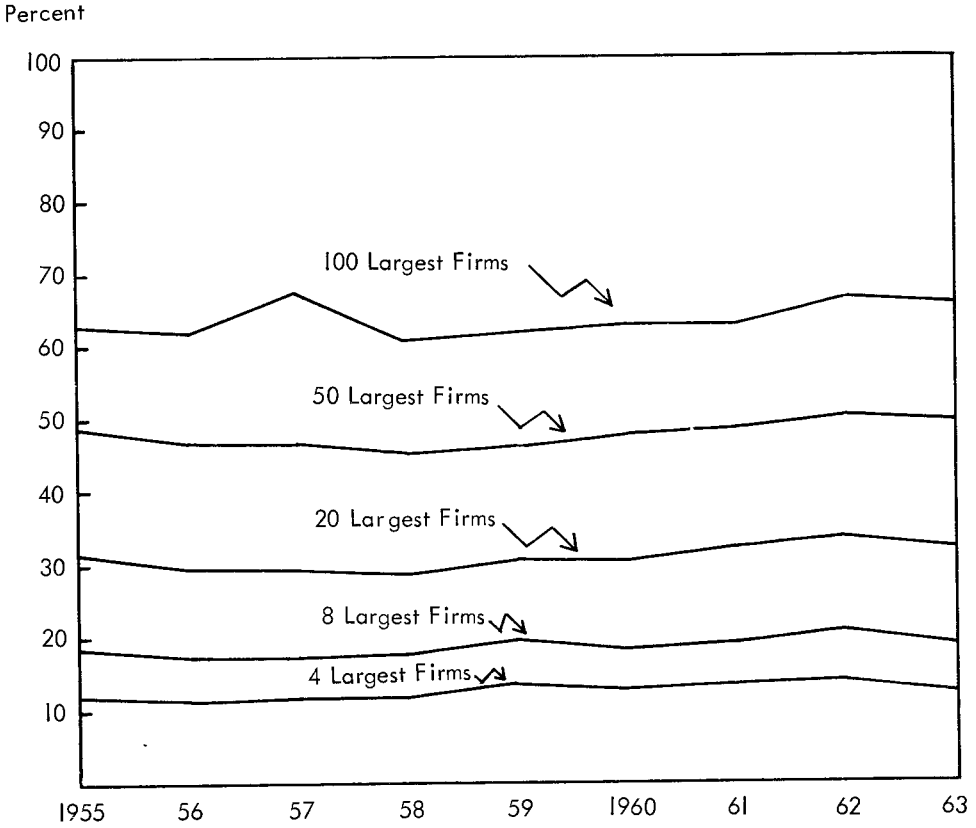

Figure 14.--Share of total inspections, by size groups of firms.

* See Appendix table 19 for additional details.

the four largest firms increased only 0.3, and the share of the 100 largest firms increased only 2.4 percent over the 9-year period from 1955 to 1963. A 1-year comparison shows that shipments increased by one-half between 1958 and 1959, yet the share of inspections paid by the four largest firms increased less than 2 percent, and no other group among the 100 largest firms changed that much. In two other years, the year-to-year change in total shipments was more than 20 percent, yet there were only two cases where the share of inspections paid by any group of firms changed more than 2.1 percent.

On the surface this would indicate a remarkable stability in the industry. Also, when considered along with the aggregate firm growth pattern mentioned above, it would appear to support a hypothesis of equal proportionate growth among all firm sizes in the industry. However, a closer examination shows that the largest firms were <u>not the same</u> firms over the period (see Appendix table 27). The four largest firms consisted of 11 different firms over the 9-year period. Only six of these 11 firms were in business for all of the 9 years, and only two of these six were in the top four for all 9 years. Likewise, the top eight firms consisted of 19 <u>different</u> firms and the top 20 firms consisted of 53 different firms.

Although most of the facilities of entrants appearing among the largest firms are newly constructed, the principals of these firms are not new to the industry. In most cases the large new firms have resulted from integration of the production of several smaller firms. For example, the organization of condominiums in the recent years has merged the production of many small producers into a few very large firms.

Additional analysis would be needed to specify the exact growth pattern, but it is very clear that the largest firms are not a stable group of the same firms that have maintained a constant share of industry volume over a period of years. Instead of a very stable industry as indicated by the concentration ratios, it is a dynamic industry in the process of rapid change.

Product Differentiation

Product differentiation may be defined as that condition under which firms receive different prices or buyers differentiate or distinguish among the products of different firms, because of special attributes of the products or associated services. Kohls has suggested five factors which create product differentiation:[17/]

(1) real physical differences in the product

(2) assumed differences in product, such as brand name, established reputation, good will, etc.

(3) special services offered with the product

(4) habits and customs

(5) locational advantages.

Real differences in tablestock potatoes

The major real product differences recognized by tablestock buyers are grade, size, condition, appearance, and size of package. Grade refers to the product characteristics specified in the U.S. Standards for Potatoes. In addition to grade characteristics, the standards also

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17/Richard L. Kohls, Marketing Agricultural Products, New York: The Macmillan Company, second edition, 1961, p. 140.

include "condition factors and the more extreme appearance factors at the time of shipment. However, the trade also recognizes "condition" factors of a progressive nature, that is, factors that change between the time of shipment and the time the potatoes are received by the purchasers. Likewise, ordinary field dirt may affect appearance but it is not usually sufficient to prevent the packing of the U.S. No. 1 grade. But potatoes that are badly skinned because of premature harvest or badly smeared with a mixture of dirt and decay from other potatoes in storage would fail to meet the U.S. No. 1 grade because of appearance.

Except for internal defects, the tablestock shipper has considerable control over the quality of potatoes he packs. He cannot change damged, decayed, or misshapen potatoes, but he can remove these from the potatoes to be marketed. He also has considerable control over appearance through the process of washing and waxing and by the selection of attractive packages. Thus, real product differences in tablestock potatoes are largely under the control of the shipper and are used by some firms as a basis for differentiating their product in the market.

Real differences in processing potatoes

The quality of processing potatoes is determined by the whole series of production and storage techniques that affect size, specific gravity, mineral content, and sugar content of the tubers. The condition and appearance of potatoes has little or no effect on processing quality, and if the shipper has not followed the appropriate production and storage methods there is little that can be done to affect processing quality at the time the potatoes are packed. Also, processing quality is

measured by laboratory type analysis of specific gravity and various "cooking tests". This analysis is objective and much more precise than the "inspection" of tablestock potatoes. If a specific lot of potatoes fails to meet the requirements for processing, the buyer has little interest in the firm's past reputation for producing high quality processing potatoes. Under these conditions, there is little that firms selling to processors can do to differentiate their product in the market.

Real differences in seed potatoes

In some respects the seed firm is faced with quality factors similar to those of the processing firm. The quality of seed is determined by the proper selection of foundation stock and by the whole series of production and storage techniques designed to eliminate seed borne diseases and prevent varietal mixture. On the other hand, there are no objective tests that can be applied beforehand to determine the performance of a specific lot of seed planted on a specific farm. The state "certifies" that rigorous production and storage techniques have been followed, but the crucial test of quality is for the farmer to use the seed to produce a crop. There is no generally applicable objective test of quality, and very little that the firm can do to affect quality at the time of packing. Therefore, the buyer must depend on the firm's past reputation for producing quality seed. Thus, the seed firm's product can be differentiated on the basis of performance. The responses of individual seed firms indicate that it takes several years to build a quality image in the seed business, but only 1 year of bad seed production to destroy that image.

Product differences, 1962-63 season

Information was obtained on the characteristics of potatoes packed by the individual firms during the 1962-63 season. While 704 firms packed potatoes, only 98 washed potatoes, 72 waxed potatoes, and 81 prepackaged potatoes (see Appendix table 28). Washed potatoes represented 37 percent of the total volume of potatoes packed. Twenty-two percent of the potatoes were waxed, but only 10 percent were packed in "consumer packages" of 25 pounds or less. Most of the washing, waxing, and prepackaging was done by the large firms. Only 33 large firms accounted for 87 percent of the washed potatoes and 87 percent of waxed potatoes. Twenty-two of these 33 firms also accounted for 87 percent of the prepackaged potatoes.

All of the washed, waxed, and prepackaged potatoes are sold in the tablestock market, and practically all of the washing, waxing, and prepackaging was done by firms that specialize in tablestock potatoes. Only one processing firm washed, waxed, and prepackaged potatoes. While 14 seed firms washed potatoes, only nine waxed potatoes, and only one prepackaged potatoes. Although the firms that specialized in processing or seed potatoes accounted for 32 percent of all potatoes sold for tablestock, they only accounted for 4 percent of the washed, 2 percent of the waxed, and 1 percent of the prepackaged potatoes.

Only one of the seed firms and none of the processing firms had specialized prepacking equipment. Most of the volume prepackaged by the processing and seed firms was packed in 25 pound bags which do not necessarily require the use of specialized prepackaging equipment (see Appendix table 29).

Product trends, 1956 to 1963 crop years

The Red River Valley Potato Growers Association tabulates data on the characteristics of potatoes shipped from the Valley each season (see Appendix table 30 for summary of shipments by characteristics for the period from 1956 to 1964).[18/] Although by no means a perfect measure, a useful rule-of-thumb is that dry white potatoes are destined for processors, and washed whites, all red, and all russets are destined for the tablestock market. For purposes of discussion in this section only, dry whites are designated as "processing" and washed whites, all reds, and all russets are designated as "tablestock". The proportion of washed potatoes going for "tablestock" has increased considerably over the 9-year period. At the same time the proportion of potatoes shipped dry for "processing" also increased. On balance, the proportion between washed and dry shipments changed very little during the period.

(Appendix table 31 summarizes shipments by grade for tablestock and processing shipments.)[19/] Many of the shipments of dry red potatoes are destined to prepackers located in terminal markets. These prepackers wash, grade, and prepackage the potatoes before they are sold to retailers. Also, in most cases shippers only remove seriously damaged potatoes from shipments destined to processors. Therefore, the dry

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18/It should be noted that tables 30 and 31 are from a different source and have a different base than tables 32, 33, and 34. The first two tables summarize information obtained from the survey of firms and are based on the volume of potatoes packed during the 1962-63 season, irrespective of destination. The following three tables summarize data tabulated by the Association from inspection certificates and only include shipments outside of the Valley.

19/Does not include seed.

packed potatoes contain a higher proportion of the lower quality U.S. Commercial and U.S. No. 2 grades than the washed potatoes. The trends in grade are not as clear as in the case of washing. Although the proportion of "tablestock" potatoes shipped as U.S. No. 1 grade appears to have increased over the period, there has been considerable variation from one year to the next. The proprotion of U.S. No. 1 grade at 65 percent of total "tablestock" shipments for 1964 compares favorably with the 47 percent for 1956, but was well below the 87 percent for 1958.

The growing importance of chip processing as a market outlet is reflected in the increasing proportion of potatoes shipped dry in 100-pound burlap bags (see Appendix table 32). While dry shipments in 100-pound bags represented only about 20 percent of total shipments for 1959 through 1961, this proportion had increased to 47 percent for 1963 and 1964.

The proportion of total shipments in 100-pound bags ranged from 84 to 90 percent during the period from 1956 to 1963, but then increased to 92 for 1964. On the other hand, the proportion of shipments in 50-pound bags declined steadily from 10 percent for 1956 to 1 percent for 1964. This decline in the proportion of 50-pound bags was accompanied by a comparable increase in the proportion of 25-pound and smaller "consumer packages", which increased from 5 percent for 1956 to 13 percent for 1962 but then declined to 7 percent for 1964.

Only a small proportion of "consumer packages" are packed with unwashed potatoes. During the 6-year period from 1959 to 1964, 1960 was the only year when dry packed potatoes in consumer packages exceeded

1 percent of the total dry pack volume. Therefore, the package-size composition of washed potatoes is more meaningful in evaluating what is occurring in the tablestock market. The proportion of washed potatoes packed in "consumer packages" increased from 18 percent for 1959 to 23 percent for 1962, but then declined to only 13 percent for 1964.

Brands

In the general context of "brands", there are four types of containers used by firms in the Valley. These are: (1) private brands, (2) stock brands, (3) new unbranded burlap bags, and (4) used burlap bags. The private brands consist of a distinctive printed design on the bag with the name and address of the owner clearly identified. These private brands are usually registered with a state and/or federal agency and cannot be used by other shippers except with the expressed permission of the owner.

There are also many so called "stock brands" available to the firms in the Valley. These are brands designed by the bag manufacturers, not registered, and available to anyone who wishes to use them. Local material suppliers usually keep some stock brand bags on hand that do not have any name or address printed on the bag. For larger orders, however, a shipper can obtain stock brands with his own name and address printed on the bag at no additional charge.

New unbranded burlap bags are also available but are seldom used. Inverted used bags are much cheaper and serve the same purpose as unbranded bags. The inverted used bags are used primarily for shipping potatoes to processors.

Eighty-seven firms in the Valley owned at least one private brand during the 1962-63 season (see Appendix table 33). In most cases, however, firms owning a private brand usually owned more than one brand. The 87 firms owned 167 brands or an average of 1.9 brands per firm. In general, the private brands were owned by the larger firms in the Valley. Of the 167 private brands, 122 were owned by large firms, 45 were owned by medium firms, and none was owned by small firms.

The use of private brands by larger firms appears to be related to two factors. First, a firm must have a substantial volume in order to obtain any advantage from brand identification. Second, on large orders private brand bags can be purchased at the same price as stock brands, but on small orders there is an additional charge for private brand bags. Thus, the small firm would have to purchase a larger supply of bags than was needed, or pay the higher price to obtain private brand bags.

Tablestock brands. In the case of tablestock firms, the number of private brands owned was related to the number of "regular customers" and the quality of potatoes sold in a specific terminal market. As a matter of business practice, the private brand tablestock firms do not sell the same brand to more than one customer in each city. Also, one private brand is reserved for U.S. No. 1 and better quality potatoes for each "regular customer" in a city, and a different private or stock brand is used for lower quality potatoes. The 33 tablestock firms owning brands owned 103 brands or an average of 3.1 brands per firm.

Processing brands. Brand identification is of little or no importance in the processing market. None of the Valley firms owned private

brands that were used for processing potatoes, but a few firms sometimes used nationally-known private brands that are owned by terminal distributors. Practically all of the processing potatoes from the Valley are sold on the basis of "processing quality tests", and most shipments are made in inverted used bags. Although two of the firms that specialized in processing potatoes owned private brands, these were used for seed potatoes in one case and for tablestock potatoes in the other.

Seed brands. The seed firms consider their brand, and reputation, to be very important to the success of their operation. To a large extent this is a reflection of the unique character of the seed business. While the tablestock firm tends to make many sales to a few customers each season, the seed firm usually makes one sale to each of many different customers. The tablestock firm often has regular contact with their customers and if an undesirable lot of potatoes is shipped, this is soon apparent and an adjustment can be made. The seed firm, however, has much less contact with their customers and if some disease is present in a shipment of seed, this may not be apparent until the next crop is produced. If the disease is one that is transmitted by the soil the purchasers may bear an additional production cost for many years in the future. While several of the tablestock firms provide their own private brand bags to other firms who sell to or through them, the better known seed firms are very reluctant to allow any other firm to use their private brand bags.

The importance of the brands to seed firms is reflected in the proportion of firms owning private brands. While only 8 percent of the tablestock firms that packed potatoes owned at least one private brand,

22 percent of the seed firms owned a private brand. Also, the seed firms owned fewer brands per firm. In general, the seed firms used only one brand for "Blue Tag" or the best quality seed. Lower quality seed was usually sold under stock brands or in unbranded bags. The 52 seed firms owned 60 private brands, or an average of only 1.2 brands per firm.

Reputation

When discussing factors emphasized to customers when selling potatoes, over two-thirds of the firms interviewed stated that there was nothing to emphasize, that they were just selling potatoes. Thirty-one of the large and medium firms said that they emphasized the quality and consistency of their pack, and 17 of these firms stated that they had a reputation for dependability in putting up a good pack.

The term reputation reflects the more specific attributes of quality, consistency, and dependability. Some firms made a specific effort to maintain a reputation for quality. That is, all of the potatoes packed in their private brand bags were better than the minimum grade requirements. Most of these firms felt that by maintaining a quality image they were able to obtain higher prices than other firms. Other large firms stated that consistency was more important than quality; they did not attempt to pack the highest quality possible, but instead tried to maintain the same level of quality at all times. Irrespective of the quality image of the firm, most managers emphasized that dependability was very important. The manager maintains an attitude of forthright honesty. He ships the kind and quality of potatoes at exactly the agreed upon time. He is careful not to make commitments he cannot

fulfill, and if for some reason he is unable to meet a commitment he notifies the buyer immediately.

Goodwill

The firms included in the survey were asked to estimate the current market value of the firm. When this estimate was obtained, the respondent was then asked to idivide the estimate between the value of plant and equipment and the value of goodwill. Although 29 of the large firms estimated the market value of the firm, only six of these said that goodwill was included in the estimate. For five of these six firms the estimates of goodwill ranged from $10,000 to $25,000 and averaged $15,400 per firm. The sixth firm estimated "goodwill" and stated that the price was actually under negotiation, but that it was conditional upon the original owner remaining in the firm at least 3 years to slowly transfer his accounts to the new principals. There was also the requirement that the original owner not start a new business within a designated area. Thus, this estimate included the equivalent of 3 years' salary and several other elements not usually considered as goodwill. While the estimated value of all 29 firms averaged $155,000 per firm, the estimated value of the five firms that included goodwill only averaged $114,000. The estimates of goodwill ranged from 11 to 20 percent and averaged 14 percent of the estimated value of the five firms.

Twenty-two of the medium firms estimated the market value of the firm, but only one of these included an estimate of goodwill. The estimated market value of the 22 medium firms averaged $34,000. Only eight of the small firms estimated a market value of the firm and none of these included an estimate of goodwill.

Although only seven firms attempted to place a value on goodwill, there was a general consensus among the other firms that a well-known brand and a good reputation are valuable assets to the firm and necessary for successful operation, but that reputation resides with the owner or manager and was not transferable or saleable. Most of the respondents felt that the market transactions were based on personal relationships between individual buyers and sellers and not on impersonal relationships between firms as buyers and sellers.

Services provided

Only 12 large tablestock firms and one medium seed firm stated that they provided services not provided by other firms. Seven of the large firms said that they provided a "complete product line". They would load "mixed loads" and provide any kind of quality of potatoes desired by the consumer. All seven of these firms had washing and waxing facilities and prepackaging equipment needed for packing any size of package. Each of these firms was large enough to provide practically any customer requirements from their own supplies. But if necessary other supplies would be obtained from other firms at ano additional charge to the customer. It was felt that the opportunity to purchase all his needs (varieties, grades, size of potatoes, and size of package) from only one seller without having to shop around was a "real" product difference to the buyer.

Five of the seven firms, plus two other large firms said that they provide "fast service" in orders. They would make rail shipments within a matter of hours or when a truck arrived would begin loading

immediately. When necessary to meet a commitment for "fast service" the packing plant would be operated nights, Sundays, and holidays.

One firm stated that it guaranteed "condition" on f.o.b. shipments, and two firms said that they would book orders at current prices for future delivery. Two firms, including the one seed firm, said that they allowed regular customers credit terms which were more liberal than the usual 10 days.

Firm advertising

While 87 firms owned private brands, only 51 of these firms did any advertising during the 1962-63 season. These firms spent a total of $27,844, or an average of $546 per firm (see Appendix table 32). Most of the advertising expenditure was made by the large firms. Thirty-three large firms spent an average of $724 per firm and accounted for 86 percent of the total advertising expenditure. The 18 medium firms spent an average of only $220 per firm and none of the small firms spent anything on advertising. Almost as many of the seed firms advertised as did the tablestock firms, but while the seed firms spent an average of only $372 per firm the tablestock firms averaged $700 per firm. The single processing firm that advertised did not advertise processing potatoes but advertised seed which he also sold.

Only 22 of the firms that advertised felt that they had gained brand recognition. That is, customers requested specific brands, or discussed purchases in terms of specific brands. The large firms were more successful in gaining brand recognition than the medium firms. While over one-half of the large firms had gained brand recognition, less than one-third of the medium firms were successul in gaining brand

recognition. This appears to be related to the difference in average advertising expenditure by the two size groups. On the other hand, the 27 tablestock firms spent almost twice as much per firm on advertising as the 23 seed firms, yet only one-third of the tablestock firms gained brand recognition while over one-half of the seed firms were successful in gaining brand recognition. This again appears to reflect the unique nature of the seed business and the importance of a firm's reputation for quality seed.

All 51 of the firms advertised in trade journals and publications likely to be subscribed to by potential customers. In addition, nine of the large firms also made direct mailings to potential customers. None of the advertising was of a general type directed to the consumer.

Several of the large firms also follow a policy of "keeping in touch" with potential customers. They make regular telephone calls to these individuals, discuss the weather, market conditions, or subjects of mutual interest, even though there may be little or no chance of making a sale on a specific call. Although this is definitely a promotional effort, which in some cases may exceed in the expenditure for direct advertising, it would be impossible to separate the cost of this type of activity from the usual selling costs.

Industry promotion

In 1951 the "Potato Improvement, Marketing, and Advertising Act", sponsored by the Red River Valley Potato Growers Association was passed by both the Minnesota and North Dakota legislatures. Among other provisions, this statute provided for the formation of a Potato Development Commission authorized to conduct hearings and issue orders,

subject to approval by two-thirds of the growers voting in referendum and empowered to collect and distribute funds under the Act. The provisions of this act were activated in 1952 with the start of an organized sales promotion program for potatoes produced in the Red River Valley. This program was administered by the Red River Valley Potato Committee and financed by a handler assessment of one-half cent per cwt. for potatoes shipped from the Valley. This assessment was raised to 1 cent per cwt. in 1954, and the promotion program was continued until the Act was declared unconstitutional by the North Dakota Supreme Court in 1965.

Based on the volume of potatoes shipped during the period from 1956 to 1963, assessments collected by the Red River Valley Potato Committees ranged from about $96,000 for 1958 to $161,000 for 1960. Part of these collections are used to pay administrative expenses of the program, and the committee contributed to programs not associated with "promotion", such as the operation of the Research Farm and separate research facilities for both fresh and processed potatoes. On the other hand, much of the collections went directly into promotion.

During the last years the Act was in effect, the Committee employed three "market representatives" who covered various terminal markets throughout the Midwest and South calling on wholesalers, retailers, and processors. These representatives encouraged the purchase of Valley potatoes and reported market conditions, problems, and complaints to shippers in the Valley. They also prepared displays and exhibits and generally promoted Valley potatoes at state fairs and

conventions such as the Retail Grocers Convention, Potato Chip Institute Conference, Fresh Fruit and Vegetable Association Convention, UPS (restaurant, hotel, and other institutional food representatives) Convention, etc.

The Committee also promoted Valley potatoes through newspaper and trade publication advertising. In 1962, for example, advertisements ran for a 7-week period in 34 newspapers in 32 important terminal markets. And in 1963, a similar advertising campaign was conducted in 29 terminal markets. Full page advertisements also appeared regularly in several trade publications.

Newspaper and store bulletin mats and art were supplied to retailers and produce departments for tie-in advertising. Point-of-sale signs and display aids were provided free for use in retail stores. During the 1964-65 season, for example, 40,000 point-of-sale kits (eight pieces each) were distributed to retailers.

Since 1961 the Committee had sponsored an annual "Chippers' Day" in which individuals from the processing industry are invited to the Valley for "a good look at the tremendous productiveness of the area, to see harvesting operations, storage facilities, and the best chipping potatoes in the world".[20/] These activities include "two full days of tours, hospitality, and prizes. . . for the 'Chippers'".[21/]

[20/] "The Valley Potato Grower", East Grand Forks, Minnesota, Vol. XV, No. 17, September 1961, p. 6.

[21/] Ibid., Vol. XVI, No. 17, September 1962, p. 1.

Locational advantages

Practically all of the important terminal markets for Red River Valley potatoes are southeast and south of the Valley. Thus, potatoes from the northwestern part of the Valley must traverse the length of the Valley on the way to terminal markets. This is a distance of about 210 miles from Walhalla, North Dakota in the northwest to Barnesville, Minnesota in the southeast. The rail freight differences between Walhalla and Barnesville in 1963 were 12½ cents per cwt. to Chicago, Illinois, 9½ cents per cwt. to Minneapolis, Minnesota, 9 cents per cwt. to Kansas City, Missouri, and 8 cents per cwt. to Dallas, Texas. Truck rate differences are comparable, but there is also a turn around time difference of up to 10 hours for trucks picking up loads at the northern end of the Valley. In most cases trucks in the Valley are seeking a "back haul", and even with the rate difference it is sometimes difficult to obtain trucks for shipments from the northern end of the Valley.

Conditions of Entry and Exit

The ease of entry and exit of firms in an industry is a measure of competitive pressure on existing firms and an indication of the ability of the industry to make adjustments to changing economic conditions. The ease of entry and exit is also thought to affect progressiveness in development and improvement of products, and the development and adoption of new technologies.

Entry and exit

In order to examine the patterns of entry and exit in the industry, the inspection data for individual firms were divided into four general groups for the 9-year period from 1955 to 1963 (see Appendix tables 34 and 35). First, there were 211 firms that paid inspections in all 9 years. Although there were variations from year-to-year, these firms demonstrated a pattern of considerable growth, increasing from an average of 18.3 thousand cwt. per firm in 1955 to 32.4 thousand cwt. in 1963.

Second, there were firms that paid inspections for the first 2 years of the period but then dropped out and did not reappear by 1963. There were 309 of these firms that dropped out at an average rate of 44 firms per year. In general, these firms were relatively small, averaging only 7.7 thousand cwt. per firm in 1955. Also, this group of firms showed little tendency for growth, averaging to 8.0 thousand cwt. per firm for the last year that they paid inspections.

Third, there was a group of firms that did not pay inspections in 1955 but came in and paid inspections for each of the remaining years of the period. There were 154 of these firms that came in at an average rate of 22 firms per year. These new firms were more than twice as large as the firms that dropped out, averaging 18.6 thousand cwt. for the first year that they paid inspections. The firms that came in also demonstrated strong growth tendencies, increasing to an average of 31.5 thousand cwt. per firm in 1963. The average size of these 154 new firms in 1963 was almost the same as the 211 firms who had been in for the whole 9-year period.

The fourth, and by far the largest, group consisted of firms who were in some years and out in other years. At one extreme were firms that paid inspections in only 1 of the 9 years. At the other extreme were firms that paid inspection in 8 of the 9 years but were out for one of the middle years. Ignoring the first and last year,[22] the number of firms that were in only 1 year during the period ranged from 54 to 143 and averaged 89 firms each year. These firms were very small; the average inspections paid ranged from only 1.8 to 4.4 thousand cwt. per firm for each of the years taken individually. The number of firms that were in 8 years, and only out 1 year during the period, ranged from 56 to 83 and averaged 72 firms for the 9-year period. These firms were much larger than the firms that were in only 1 year but considerably smaller than the firms that were in on a continuous basis; the average size ranged from 9.6 to 16.0 thousand cwt. per firm each year.

In summary, the 750 firms that paid inspections in 1963 consisted of 211 firms that had been in business continuously for at least 9 years, plus 154 firms that had come in on a continuing basis during the period. These two groups, totaling 365 firms, averaged 32.6 thousand cwt. per firm in 1963. In addition, there were 385 firms who were in some years but out in other years. Ignoring the firms that came in for the first time in 1963, the firms that were in on a discontinuous basis ranging from 2 to 8 years during the period, averaged 10.6 thousand cwt. per firm, or about one-third as much as the firms that were in on a continuous basis.

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[22] The first year of the period includes firms that were in the year before, and the last year includes firms that stayed in the following year.

Conditions of entry

The conditions of entry as a structural characteristic of an industry refers to the advantages which sellers already established in the industry possess over potential additional sellers who wish to enter it. Papandreou and Wheeler have suggested that restrictions on entrance may be classified into five categories:[23]

(1) terms on which technological data and technologies are made available

(2) terms on which factors of production are made available

(3) terms on which outlets for the product are made available

(4) consumer allegiances

(5) outright legal restriction.

In practice, most of the marketing functions are merged in various combinations in most of the firms in the Valley. For purposes of discussing conditions of entry, however, we will assume that entry can occur at only three possible levels: (1) grower level, (2) shipper level, and (3) distributor level. Growers are defined as firms that produce, store, and often pack potatoes, but they are only concerned with their own production; they do not acquire potatoes from other firms. Shippers are defined as firms that store, pack and sell potatoes that have been acquired from producers. Distributors are defined as firms that purchase packed potatoes for resale but do not perform any of the physical functions of production, storage, or packing.

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[23] A. G. Papandreou, and J. T. Wheeler, Competition and Its Regulation, Prentice-Hall, Inc., Englewood, N. J., 1954, p. 179.

Entry at the grower level

The present organization of production in the Valley does not encourage specialization in the production of potatoes. Potato production is an integral part of a crop rotation system. But even if there were no other reason, price uncertainty would tend to discourage specialized potato production. On the other hand, most of the grain producers in the Valley are potential potato producers. The grain producers who do not produce potatoes use summer fallow, sugar beets, soybeans or some other row crop to serve the same purpose in the rotation system. Under different economic conditions grain producers could introduce potatoes into the rotation system with relative ease. There are no legal restrictions, and production methods are widely known and freely available to newcomers. Obtaining customers outside the Valley could be a problem for the new firm, but sales can be made to or through other firms with relative ease. The usual charge for selling potatoes that have already been packed and loaded is only 10 cents per cwt.

Although some specialized equipment is used in potato production, most of the equipment is the same as that used in the production of other crops. Potato harvesters which cost $10,000 to $12,000 are the most expensive item of specialized equipment. Maier and Loftsgard found that, on the average, harvesters accounted for 25.5 percent of the total investment in machinery used in potato production.[24/] This does not mean, however, that all producers must own harvesters. Many small growers

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[24/] M. G. Maier and L. D. Loftsgard, op. cit., p. 19.

share harvester ownership with other growers, and custom harvesting is also available.

The very low barriers to entry at the grower level are reflected in the large number of new firms that pay inspections each year, and the large number of firms that are in and out from one year to the next on a discontinuous basis.

Entry at the shipper level

Important technological differences do not appear at the shipper level of the industry. The techniques of storing and packing potatoes are similar for all firms in the Valley, and would be equally available to any newcomer. Knowledge and experience, or "know-how" is a factor that may provide some advantage to existing firms. However, many experienced foremen and some experienced managers are available for employment, and "know-how" could be obtained with relative ease. The terms on which technology is made available would not be important barriers to entry.

The terms on which the factors of production are made available could be an important barrier for some types of entrants. These terms are affected by (1) optimum size of firm and (2) the degree of displacement that would result from the entry of a new firm.[25/] The optimum size of a firm gives an indication of the amount of resources (investment and operating capital) that a new entrant would need to control in order to compete on an equal cost basis with existing firms. The degree of displacement is a measure of the output reduction that existing

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[25/] A. G. Papandreou, and J. F. Wheeler, op. cit., p. 178.

firms would suffer as the result of the entry of a new firm. The higher the degree of displacement, the more likely that existing firms will take steps to resist the entry of new firms.

Optimum size of firm

The firms included in the survey were asked what they considered to be the "most desirable size packing and selling operation". The term "desirable" rather than "efficient" or "optimum" was chosen in order to elicit responses in terms of any factor considered to be important to the respondent. Of the 37 large firms, 17 stated that the most desirable size was larger than their current operation. Although the volume packed by these firms ranged from 60,000 to 1 million cwt., they were fairly consistent in estimating the most desirable size at about twice the size of the current operation. The most desirable size averaged 515,000 cwt. as compared with 251,000 cwt. packed during the 1962-63 season. They stated that the major advantages of a larger operation would be (1) the ability to better service customer needs with a wider range of products and (2) to attain more efficient utilization of facilities and personnel.

Fifteen of the large firms stated that the size of their current operation was satisfactory. The most common reason given was that their packing and selling operation was primarily geared to the size of their production unit. These 15 large firms packed an average of 154,000 cwt. during the 1962-63 season.

Only four of the large firms thought that a smaller operation would be more desirable. In three cases the principals were approaching retirement age and planned to spend less time in the business. The

fourth respondent stated that he planned to reduce the size of the packing and selling unit to coincide with the size of his production unit.

Eleven of the 33 medium firms stated that the most desirable size of packing and selling unit was larger than their current operation. These firms, however, were less consistent than the large firms in relating the most desirable size of their current operation. Estimates of the most desirable size ranged from only one-third larger to 15 times as large as the current operation. The average for the 11 firms was three times as large, or 108,000 cwt. as compared with 36,000 cwt. packed during the 1962-63 season. The 12 medium firms that thought the size of their current operation was satisfactory also packed an average of 36,000 cwt. In each of these cases the size of the packing and selling unit coincided with the size of the production unit. Only one medium firm felt that its packing and selling operation was too large.

The small firms, as a group, viewed themselves primarily as producers with only a secondary interest in packing and selling. Only five of the 33 small firms interviewed expressed an opinion as to the most desirable size. Three of these firms stated that a larger operation would be more desirable, and two felt that the current operation was satisfactory.

Although 17 of the large firms stated that a larger operation would be more desirable, only six of these firms said that they planned to expand the size of their current operation. Of these six firms, only one packed more than 250,000 cwt. in 1962-63 season, while the other five all packed less than 125,000 cwt. On the other hand, eight of the 17

firms stated that they did not plan to expand the size of their present packing and selling unit. All of these eight firms packed 250,000 or more cwt. during the 1962-63 season. All of the 11 medium firms that stated that a larger size would be more desirable packed less than 60,000 cwt., yet only three of these firms had plans for expanding the size of their current operation.

The responses of the individual firms suggest that below some minimum size the firms are production oriented and are concerned primarily with the size of the production unit. Many of the firms in the medium size range, however, recognized the existence of size economies and expressed the desirability of larger packing and selling units. The large firms also recognized the desirability of larger packing and selling units, but there was less pressure for expansion at the upper end of the size range.

These responses do not conflict with the results of a cost of production study made at the University of North Dakota and a study of economics of a size in storage and packing operations made at the University of Minnesota. These studies indicate that substantial economies of size exist both in production and in storage and packing operations. However, most of the economies of size in production are attained at 400 acres (66,000 cwt.), but equivalent economies in storage and packing are not attained until storage capacity reaches 240,000 cwt. Although there are indications of physical economies beyond these sizes, they do not appear to be very large.

Maier and Loftsgard found that the cost of production declined rather rapidly from 89 to 74 cents per cwt. as the size of the production unit

increased from 80 to 200 acres (10,000 to 28,000 cwt.) and declined less rapidly from 74 to 68 cents per cwt. as the production unit increased from 200 to 400 acres (28,000 to 66,000 cwt.).[26/] Although this analysis only included production units of 400 acres or less, there are indications that production costs may continue to decline (or at least do not increase) over a large range of sizes. This is supported by the fact that seven firms in the Valley harvested 1,000 or more acres of potatoes in 1962. The production of these seven firms ranged from 141,000 to over 200,000 cwt. each.

A study of economies of size made at the University of Minnesota indicates that the cost of storing and packing potatoes in 100-pound burlap sacks declined from 51 to 37 cents per cwt. as the size of the storage and packing unit increased from 42,000 to 240,000 cwt.[27/] As capacity increased from 240,000 to 386,000 cwt., cost declined only 1 cent--from 37 to 36 cents. That there are few economies beyond the 240,000 cwt. size is further supported by the fact that only 13 firms packed more than 240,000 cwt. in 1962-63. An only five of these firms exceeded 350,000 cwt. in a single facility.

Capital requirements

The investment costs shown in table 31 are synthesized costs of efficient storage and packing facilities in the Valley.[28/]

[26/] M. G. Maier and L. D. Loftsgard, op. cit., p. 29.

[27/] J. C. Chai, J. K. Hanes, F. J. Smith, "The Red River Valley Potato Industry: Economies of Size in Storing and Packing Potatoes," Report No. 531, University of Minnesota, St. Paul, July 1967, p. 20.

[28/] Ibid.

These costs are based on engineering observations in existing plants and actual costs of construction for recent years adjusted to 1963 prices. Equipment costs are also based on 1963 prices. These data show that the initial investment in building and equipment will range from $73,000 for a plant of 42,000 cwt. storage capacity to $326,000 for a plant of 386,000 cwt. storage capacity.

While these costs are thought to be good estimates for smaller plants, they tend to under-estimate typical investments in larger plants. This is due to the fact that there is no provision for prepackaging operations in the larger plants. In order to examine economies of size, the product mix was held constant. That is, it was assumed that all sizes of plants packed potatoes only in 100-pound burlap sacks. In actual practice, however, the larger plants usually have separate prepackaging equipment for containers of 25 pounds and less. To the extent that firms acquire prepackaging equipment and make additional space provision for prepackaging, the required initial investment will be increased over the costs (see Appendix table 36).

The survey responses of firms in the industry and the results of the analysis of costs indicate that a new entrant with a plant of 240,000 cwt. storage capacity would be able to compete on an equal cost basis with the more efficient firms currently operating in the Valley. The cost data show that a new entrant constructing a 240,000 cwt. plant would need at least $205,000 in investment capital at 1963 prices.

The pattern of entry at the shipper level during recent years has been that of several growers forming partnerships or corporations, and

larger groups of growers forming condominiums to construct new facilities and perform the storage, packing, and selling functions. There is no reason to believe that the amount of investment would be any different from an entrant outside the industry than for an entrant from the grower level. There is reason to believe, however, that the terms on which capital could be obtained would be different for these two types of entrants.

The actual interest rate on loans consists of a "risk premium" as well as the "true" interest rate. There is less risk to a financial institution on several smaller loans than for one large loan. Thus, other things being equal, 10 growers would be able to borrow $20,500 each at a lower rate of interest than a single outside entrant could borrow $205,000. In addition, several growers would likely be better risks because of their knowledge of the industry and a past history of successful operation in the specific area.

In addition to investment capital, an outside entrant would also be confronted with the problems of access to the supply of potatoes. He would need to purchase field-run potatoes at harvest or induce producers to rent storage space and sell potatoes to him as the marketing season progressed. Under the present organization this could be a major barrier to an outside entrant. Although producers usually retain ownership of potatoes in storage, practically all of them either already own storage or have standing storage arrangements with existing firms. If an outside entrant found it necessary to purchase field-run potatoes to fill the storage this would require an additional $200,000 to $300,000 in operating capital to fill a 240,000 cwt. storage. This type of

purchase would also involve a considerable amount of price uncertainty. As mentioned earlier, there were 5 years during the 11-year period from 1954 to 1964 when the price rise throughout the season was not sufficient to cover the additional cost of holding potatoes in storage. Several producers, each with a much smaller volume, production costs that have already been sunk, and alternatives as to when to sell, are in a much better position to "gamble" on a price rise than an outside entrant who must make an all-or-nothing investment decision during the relatively short harvest period.

Degree of displacement

In terms of the whole Valley, a new 240,000 cwt. firm would represent little more than 1 percent of the potatoes that went into storage for the 1962-63 season. The production area, however, is 20 to 40 miles wide and about 210 miles long. At any location in the Valley a new 240,000 cwt. storage would represent a substantial share of local storage capacity and in many locations would be greater than existing capacity. Here again an outside entrant would be at a considerable disadvantage in comparison to entry by a group of local producers. In order to enter a local area the new entrant would have to completely displace or substantially reduce the volume of existing shippers. Given the traditional organization and any degree of producer allegiances, the existing shippers could likely resist outside entry. On the other hand, a group of producers could enter the shipper level with relative ease. They control the production and with the employment of a well-known and experienced manager would have little trouble obtaining the

necessary capital. Also, there is very little that existing shippers can do to resist entry from the producer level.

Conclusions

Most of the evidence supports the conclusion that there are few barriers to growers entering the shipper level, but entry from outside the industry is difficult. This conclusion is further supported by the fact that there were only 22 firms at the shipper level in 1962-63 that acquired more than 50 percent of their bulk potatoes from other firms; and practically all of this volume was not acquired until the potatoes were prepared for shipment. There were no firms that were only in the business of purchasing bulk potatoes at harvest, storing, and then packing and shipping potatoes throughout the season. While there has been little or no outside entry at the shipper level in recent years, there has been considerable entry from the grower level to the shipper level.

Entry at the distributor level

The only requirement for entry at the distributor level of the industry is a knowledge of markets and access to customers. Distributors in the Valley perform the function of bringing buyers and sellers together in the same manner as a broker, except that they usually take title to the potatoes. Since the larger firms handle their own transactions, the distributor usually deals with the smaller buyers and sellers. The distributor does not physically handle the product and the only facilities needed are telephone and record-keeping system. In most cases the margin is only 10 cents per cwt. but there is little or no risk involved. Although the distributors take nominal title to

the potatoes, they usually have a confirmed sale before they confirm the purchase. The small margin means that a successful distributor must handle a large volume of sales. Even though product differentiation is relatively weak, the distributor must develop a reputation for integrity and dependability and maintain contact with many customers.

Conditions of exit

The ease of exit depends on the alternative uses for the facilities and equipment. Firms that cannot liquidate their assets at a reasonable price or cannot use them for other purposes are likely to continue operations as long as variable costs are covered. The firms covered in the survey were asked if they decided to go out of the potato business would there be a market for the firm as a going concern or would they have to sell the buildings and equipment piece-meal. Twenty-five of the large firms stated that the firm could be sold as a going concern. Three of the large firms felt that they would have to sell the plant and equipment piece-meal, and nine firms stated that they did not know whether there was a market for the firm.

Nineteen of the medium firms stated that there was a market for their firm. Three of the medium firms thought they would have to sell the plant and equipment piece-meal, and 11 firms said that they did not know.

Only two of the small firms felt that the firm could be sold as a going concern; four firms said they would have to sell piece-meal, and 27 said they did not know. None of the firms that had only farm storage facilities thought that the firm could be sold as a going concern.

Many of the small firms that are dropping out of the industry, or grouping together in larger firms, consist of firms with farm storage facilities. There are few alternative uses for farm storages. However, the fact that only 25 percent of the total storage available was located on farms in 1962-63 would indicate that the advantages of trackside storages are sufficient to cause the abandonment of farm storages. Although the volume of shipments has been increasing in recent years, the small firms as separate entities have been leaving the industry in rather large numbers.

Appendix table 1.--Potatoes: Firm specialization by type of potatoes sold, Red River Valley, 1962-63 season

Firm classification	Tablestock potatoes only	Processing potatoes only	Seed potatoes only	Tablestock and processing	Tablestock and seed	Processing and seed	Tablestock processing and seed	Total
				(number)				
All firms								
Large	2	5	5	14	10	3	22	61
Medium	17	-	-	44	111	-	85	257
Small	211	5	26	154	46	42	56	540
TOTAL	230	10	31	212	167	45	163	858
All firms								
Tablestock	230	-	-	190	61	-	53	534
Processing	--	10	-	22	--	24	34	90
Seed	--	-	31	--	106	21	76	234
TOTAL	230	10	31	212	167	45	163	858
All firms								
Distributor	--	-	-	--	6	-	2	8
Agent	1	-	-	2	-	1	1	4
Coop-packer	--	-	-	2	2	-	1	5
Packer	--	2	-	2	1	1	6	12
Grower-packer	147	3	31	93	138	22	133	567
Grower	82	5	-	114	20	21	20	262
TOTAL	230	10	31	212	167	45	163	858

Appendix table 2.-- Potatoes: Production by seasonal groups, United States, 1920-66

Period	13 Early states	7 intermediate states	29 late states	Total
		(million cwt.)		
1920-24	12.8	25.4	165.0	223.2
1925-29	17.1	23.1	169.6	209.8
1930-34	21.7	20.4	180.3	222.3
1935-39	25.4	19.3	168.6	213.3
1940-44	32.7	18.3	182.4	233.3
1945-49	39.7	18.2	199.8	257.7
1950-54	36.3	11.7	175.4	223.4
1955-59	39.2	11.7	194.8	245.7
1960-64	38.7	11.8	215.2	265.8
1965-66 1/	42.1	10.5	242.8	295.4
		(percent)		
1920-24	15.8	11.4	62.9	100.0
1925-29	8.2	11.0	80.8	100.0
1930-34	9.7	9.2	81.1	100.0
1935-39	11.9	9.1	79.0	100.0
1940-44	14.0	7.8	78.2	100.0
1945-49	15.4	7.1	77.5	100.0
1950-54	16.2	5.2	78.5	100.0
1955-59	16.0	4.8	79.3	100.0
1960-64	14.6	4.5	81.0	100.0
1965-66 1/	14.3	3.6	82.2	100.0

Source: Compiled from Statistical Bulletin No. 122, 251, and 291 and annual summaries, Statistical Reporting Service, USDA.

1/ 2-year average.

Appendix table 3.-- Late crop potatoes: Trends in acreage and production, selected states, 1920-66

Period	Idaho	Maine	Minn. N. Dak.	New York	Sub-total 5 late states	Other late states	Total late states
				Acres harvested (thousand acres)			
1920-24	65.2	133.2	531.2	384.3	1,034.4	1,737.4	2,771.8
1925-29	89.0	150.0	419.8	237.2	896.0	1,484.4	2,380.4
1930-34	115.0	171.2	499.0	237.8	1,023.0	1,661.8	2,684.8
1935-39	118.6	156.8	382.4	213.2	876.0	1,421.2	2,297.2
1940-44	148.0	173.2	366.4	196.4	884,0	1,171.7	2,055.7
1945-49	162.4	192.4	265.6	154.2	774.6	807.7	1,582.3
1950-54	150.7	132.2	175.2	106.8	564.9	503.5	1,068.2
1955-59	191.9	142.6	179.2	92.5	606.2	426.8	1,033.0
1960-64 1/	249.8	145.8	220.2	84.0	699.8	401.9	1,101.7
1965-66 1/	296.5	153.0	201.0	78.8	729.3	421.6	1,150.9
				Production (million cwt.)			
1920-24	7.2	19.1	28.9	21.7	76.9	108.1	185.0
1925-29	10.6	22.9	23.3	15.1	71.9	97.7	169.6
1930-34	14.6	27.7	20.0	18.8	81.1	99.2	180.3
1935-39	15.7	24.6	18.8	16.1	75.2	93.4	168.6
1940-44	20.9	30.6	22.2	17.5	91.2	91.2	182.4
1945-49	24.4	41.2	22.5	21.6	109.7	90.1	199.8
1950-54	27.6	32.2	19.2	18.8	97.8	77.7	175.4
1955-59	38.8	37.1	21.6	19.5	117.0	77.9	194.8
1960-64 1/	48.0	37.4	26.1	20.1	131.6	83.6	215.2
1965-66 1/	63.7	37.0	26.7	19.1	146.4	96.4	242.8
				Production as a percent of late crop (percent)			
1920-24	3.9	10.3	15.6	11.7	41.6	58.4	100.0
1925-29	6.2	19.5	13.7	8.9	42.4	57.6	100.0
1930-34	8.1	15.4	11.1	10.4	45.0	55.0	100.0
1935-39	9.3	14.6	11.2	9.5	44.6	55.4	100.0
1940-44	11.5	16.8	12.2	9.6	50.0	50.0	100.0
1945-49	12.2	20.6	11.3	10.8	54.9	45.1	100.0
1950-54	15.7	18.3	10.9	10.7	55.7	44.3	100.0
1955-59	19.9	19.0	11.1	10.0	60.0	40.0	100.0
1960-64 1/	22.3	19.4	12.1	9.3	61.1	38.9	100.0
1965-66 1/	26.2	15.2	11.0	7.9	60.3	39.7	100.0

Source: Compiled from Statistical Bulletins No. 122, 251, and 291, and annual summaries, Statistical Reporting Service, USDA.

1/2-year average.

Appendix table 4.-- Late crop potatoes: Production by regional groups, United States, 1920-66

Period	Eastern states	Central states	Western states	Total
		(million cwt.)		
1920-24	61.5	90.9	32.5	185.0
1925-29	58.0	75.6	35.9	169.6
1930-34	69.0	72.3	39.0	180.3
1935-39	60.8	65.9	41.8	168.6
1940-44	68.2	62.4	51.8	182.4
1945-49	82.7	55.2	61.9	199.8
1950-54	65.8	46.1	63.6	175.4
1955-59	69.7	44.5	80.6	194.8
1960-64	70.5	52.5	92.2	215.2
1965-66 1/	68.0	55.6	119.1	242.8
		(percent)		
1920-24	83.3	49.2	17.6	100.0
1925-29	34.2	44.6	21.2	100.0
1930-34	38.3	40.1	21.6	100.0
1935-39	36.1	39.1	24.8	100.0
1940-44	37.4	34.2	28.4	100.0
1945-49	41.4	27.6	31.0	100.0
1950-54	37.5	26.3	36.2	100.0
1955-59	35.8	22.8	41.4	100.0
1960-64	32.8	24.4	42.8	100.0
1965-66 1/	28.0	22.9	49.1	100.0

Source: From Statistical Bulletins No. 122, 251, and 291, and annual summaries, Statistical Reporting Service, USDA.

1/ 2-year average.

Appendix table 5.-- Late crop potatoes: Trends in acreage and production, selected areas, Central region, 1920-1966

Period	Red River Valley	Other Minnesota	Other N. Dakota	Total Minnesota N. Dakota	Michigan	Wisconsin	Other Central states	Total Central region
				(per thousand acres harvested)				
1920-24	179.7	285.8	65.7	531.2	303.2	208.6	506.4	1,629.4
1925-29	146.1	232.8	40.9	419.8	238.8	236.6	432.8	1,328.0
1930-34	183.5	268.2	47.3	499.0	284.8	274.8	489.4	1,548.0
1935-39	165.9	181.2	35.3	382.4	257.0	234.4	394.4	1,258.2
1940-44	197.9	127.8	40.7	366.4	190.4	163.0	318.2	1,038.0
1945-49	173.8	64.1	27.7	265.6	120.2	95.0	174.7	655.5
1950-54	120.0	38.1	17.1	175.2	66.8	56.4	96.7	395.1
1955-59	137.0	30.0	12.2	179.2	50.5	50.0	62.7	342.4
1960-64 1/	181.5	27.7	11.0	220.2	46.7	53.8	47.0	367.7
1965-66 1/	164.0	25.8	11.2	201.0	50.5	59.2	43.6	354.4
				(Production - million cwt.)				
1920-24	9.8	15.9	3.2	28.9	18.9	17.8	25.2	90.9
1925-29	6.9	14.5	1.9	23.3	14.2	14.8	23.4	75.6
1930-34	6.9	11.7	1.4	20.1	15.5	14.2	22.6	65.9
1935-39	8.8	8.6	1.4	18.8	14.9	10.7	21.6	65.9
1940-44	12.4	6.7	3.1	22.2	11.4	7.9	20.7	62.4
1945-49	16.5	4.2	1.8	22.6	9.2	7.5	16.0	55.2
1950-54	14.1	3.8	1.3	19.2	7.5	7.5	11.9	46.1
1955-59	17.0	3.6	1.0	21.6	7.0	7.3	8.6	44.5
1960-64 1/	21.4	3.8	.9	26.1	8.2	10.4	7.9	52.5
1965-66 1/	21.6	3.9	1.2	26.7	9.2	11.8	7.9	55.6
				(Production as a percent of region - percent)				
1920-24	10.8	17.5	3.5	31.8	20.8	19.6	27.8	100.0
1925-29	9.1	19.2	2.5	30.8	18.7	19.6	30.9	100.0
1930-34	9.5	16.2	1.9	27.7	21.4	19.6	31.3	100.0
1935-39	13.4	13.0	2.1	28.5	22.6	16.2	32.7	100.0
1940-44	19.9	10.7	5.0	35.7	18.3	12.8	33.2	100.0
1945-49	29.9	7.6	3.3	40.9	16.7	13.5	28.9	100.0
1950-54	30.6	8.2	2.8	41.6	16.2	16.4	25.8	100.0
1955-59	38.2	8.1	2.2	48.6	15.8	16.4	19.2	100.0
1960-64 1/	40.8	7.3	1.7	49.7	15.6	19.8	15.0	100.0
1965-66 1/	38.8	7.0	2.2	48.0	16.5	21.2	14.2	100.0

Source: State-Federal Crop and Livestock Reporting Service, Minnesota and North Dakota, in cooperation with Statistical Reporting Service, USDA.

1/ 2-year average.

Appendix table 6.-- Potatoes: Acres harvested, by counties, Red River Valley, census years 1924-64

State and country	1924	1929	1934	1939	1944	1949	1954	1959	1964
					(Acres)				
Minnesota									
Kittson	6,407	5,209	9,916	10,173	10,160	3,660	4,596	5,767	5,855
Marshall	3,147	2,889	4,530	5,403	10,285	5,876	8,288	11,082	14,626
Polk	24,128	22,781	24,998	22,856	33,571	20,797	19,457	29,179	33,020
Norman	16,872	18,601	17,529	11,495	5,941	3,857	4,022	3,768	3,155
Clay	42,756	45,577	39,823	29,636	15,184	14,285	15,646	14,450	12,814
Subtotal	93 310	95,057	96,796	79,563	75,141	48,475	52,009	64,246	69,470
North Dakota									
Pembina	12,232	14,510	21,168	26,988	33,906	22,048	21,164	29,578	22,280
Walsh	13,686	19,711	34,241	47,714	53,760	32,944	37,064	34,667	37,583
Grand Forks	11,353	14,441	22,370	19,124	37,183	22,764	21,217	22,804	24,973
Traill	9,457	10,194	9,409	6,706	8,015	5,421	4,158	5,459	5,613
Cass	14,965	15,188	10,456	6,470	2,311	1,198	926	851	240
Subtotal	61,693	74,044	97,644	107,002	133,175	85,175	84,529	93,359	90,689
Red River Valley	155,003	169,101	194,440	186,565	208,316	133,650	136,538	157,605	160,159

Source: Consensus of Agriculture, U.S. Bureau of the Census.

Appendix table 7.-- Potatoes: Number of farms harvesting, by counties, Red River Valley, census years 1924-64

State and country	1924	1929	1934	1939	1944	1949	1954	1959	1964
					(Number)				
Minnesota									
Kittson	921	984	929	899	571	247	229	156	53
Marshall	1,681	1,771	1,713	1,548	1,243	550	818	257	147
Polk	2,667	3,089	3,029	2,617	2,263	879	868	408	240
Norman	1,613	1,544	1,615	1,349	753	293	240	106	45
Clay	1,737	1,777	1,901	1,701	990	452	458	252	134
Subtotal	8,619	9,167	9,187	8,114	5,820	2,421	2,613	1,179	619
North Dakota									
Pembina	1,161	1,267	1,225	1,104	684	384	372	257	191
Walsh	1,710	2,065	1,984	1,873	1,442	686	752	343	273
Grand Forks	1,180	1,530	1,433	1,317	870	411	397	228	157
Traill	901	1,054	888	776	476	191	194	91	58
Cass	1,584	1,745	1,583	1,167	797	186	232	45	15
Subtotal	6,536	7,661	7,113	6,237	4,267	1,858	1,947	964	694
Red River Valley	15,155	16,828	16,300	14,351	10,089	4,279	4,560	2,143	1,313

Source: Censuses of Agriculture, U.S. Bureau of Census.

Appendix table 8.-- Average acres harvested per farm, by counties, Red River Valley, census years 1924-64

State and country	1924	1929	1934	1939	1944	1949	1954	1959	1964
				(Acres)					
Minnesota									
Kittson	7.0	5.3	10.7	11.3	17.8	14.8	20.1	37.0	110.5
Marshall	1.9	1.6	2.6	3.5	8.3	10.7	10.1	43.1	99.5
Polk	9.0	7.4	8.3	8.7	14.8	23.6	22.4	71.5	137.6
Norman	10.5	12.0	10.8	8.5	7.9	13.2	16.8	35.5	70.1
Clay	24.6	25.6	20.9	17.4	15.3	31.6	34.2	57.3	95.6
Subtotal	10.8	10.4	10.5	9.8	12.9	20.0	19.9	54.5	112.2
North Dakota									
Pembina	10.5	11.4	17.3	24.4	49.6	59.5	56.9	115.1	116.6
Walsh	8.0	9.5	17.2	25.5	35.9	48.0	49.3	101.1	137.7
Grand Forks	9.6	9.4	15.6	14.5	42.7	55.4	53.4	100.0	159.1
Traill	10.5	9.7	10.6	8.6	16.8	28.4	21.4	60.0	96.8
Cass	9.4	8.7	6.6	5.5	2.9	6.4	4.0	18.9	16.0
Subtotal	9.4	9.7	13.7	17.2	31.2	45.8	43.4	96.8	130.7
Red River Valley	10.2	10.0	11.9	13.0	20.6	31.2	29.9	73.5	122.0

Source: Censuses of Agriculture, U.S. Bureau of the Census.

Appendix table 9.-- Potatoes: Number of farms, acreage, and production, Minnesota Crop Report District 1, 1954-66[1]

Year	1.0-9.9 acres	10.0-49.9 acres	50 or more acres	Total	Acres harvested	Production	Acres per farm	Production per farm
	(Number)				(Acres)	(1,000 cwt.)	(Acres)	(cwt.)
1954	368	575	326	1,269	52,090	6,619	41.7	5,216
1955	338	(845)		1,183	52,760	5,300	44.6	4,480
1956	239	458	345	1,042	59,670	7,713	57.3	7,402
1957	164	457	394	1,015	55,700	5,612	54.9	5,529
1958	151	406	370	927	60,800	7,932	65.6	8,556
1959	98	385	402	885	67,700	8,270	76.5	9,344
1960	103	316	444	863	81,200	9,937	94.1	11,514
1961	90	318	539-	947	99,200	10,304	104.8	10,881
1962	72	262	487	821	79,800	9,449	97.2	11,509
1963	77	226	422	725	84,900	10,514	117.1	14,503
1964	52	166	399	617	74,000	7,222	119.9	11,705
1965	53	167	374	594	73,500	10,014	123.7	16,859
1966	49	141	365	555	72,300	7,743	130.3	13,951

Source: Minnesota Agricultural Statistics, State-Federal Crop and Livestock Reporting Service, St. Paul, Minnesota.

1/Farms reporting one or more acres of potatoes.

Appendix table 10.--Potatoes: Per capita consumption (fresh-weight equivalent), United States, calendar year, 1950-65

Year	Processed				Sub-total	Fresh[1]	Total
	Chipped	Frozen	Dehy-drated	Canned			
1950	5.7	.3	-	.3	6.3	100.0	106.3
1951	6.0	.6	-	.2	6.8	106.8	113.0
1952	6.7	.9	-	.5	8.1	93.8	101.9
1953	7.3	.8	-	.6	8.7	99.1	107.8
1954	7.6	1.1	-	.3	9.0	98.1	107.1
1955	8.4	1.8	-	.6	10.8	98.1	108.9
1956	9.0	2.9	-	.6	12.5	90.3	102.8
1957	9.6	2.9	2.1	.6	15.2	94.2	109.4
1958	10.1	3.4	2.8	.6	16.9	87.6	104.5
1959	11.0	4.9	3.9	.5	20.3	86.2	106.5
1960	11.8	6.4	5.0	.6	23.8	84.4	108.2
1961	12.3	6.8	5.1	.7	24.9	84.4	109.3
1962	13.1	9.2	4.8	.6	27.7	80.4	108.1
1963	14.0	10.7	5.1	.5	30.3	81.8	112.1
1964	14.6	14.0	5.5	.6	34.7	75.6	110.3
1965	15.3	14.7	5.5	.5	36.0	67.8	103.8

[1] Includes small quantities used in flour.

Appendix table 11.--Potatoes, Irish: Utilization of sales, United States, crop years 1956-65

Item	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
					(1,000 cwt.)					
FOOD SALES										
Tablestock or processing	146,048	148,408	148,068	149,123	149,199	153,337	150,893	146,532	126,931	138,018
Chips and shoestrings	14,566	17,356	17,063	20,085	21,018	22,642	24,086	26,693	28,783	31,511
Dehydrated potatoes	3,223	3,776	5,917	7,656	10,104	8,518	9,280	9,909	10,801	20,122
Frozen products 2/	4,675	4,827	8,263	9,918	15,042	18,138	18,400	22,425	23,654	37,302
Canned products 3/	2,283	2,606	2,864	2,447	2,809	2,775	2,926	3,240	3,201	3,348
Subtotal	24,747	28,565	34,107	40,106	48,973	52,073	54,692	62,267	66,439	92,293
Total food	170,795	176,973	182,975	189,229	198,172	205,410	205,585	208,799	193,370	230,301
OTHER SALES										
Seed	13,435	13,641	13,079	13,583	14,823	13,823	14,333	14,159	14,191	16,853
Starch and flour	18,336	12,691	18,387	7,718	10,177	20,493	11,285	11,737	2,990	8,081
Livestock feed	7,675	8,950	18,918	6,607	5,348	20,340	7,913	10,103	5,587	5,797
Total other	39,446	35,282	50,384	27,908	30,348	54,656	33,531	35,999	22,768	30,731
Grand total	210,241	212,255	233,359	217,137	228,520	260,066	239,116	244,798	216,138	261,032

1/Data from Irish Potatoes - Utilization, SRS, USDA, issued annually

2/Frozen french fries and other frozen products.

3/Canned potatoes, hash, stews, soups, etc.

Appendix table 12.--Potatoes, Irish: Utilization of sales, Red River Valley, crop years 1956-65[1/]

Item	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
					(1,000 cwt.)					
FOOD SALES										
Tablestock or processing	8,822	6,522	5,658	8,968	9,796	7,338	9,721	9,904	6,483	7,454
Chips and shoestrings	1,670	1,487	1,507	2,600	3,328	3,338	2,971	3,649	2,791	4,096
Dehydrated and frozen products[2/]	100	100	100	500	1,100	1,503	1,700	1,500	1,359	2,655
Subtotal	1,770	1,587	1,607	3,100	4,428	4,841	4,671	5,149	4,150	6,751
Total food	10,592	8,109	7,265	12,068	14,224	12,179	14,392	15,053	10,633	14,205
OTHER SALES										
Seed	2,439	2,150	2,450	2,936	3,194	2,286	2,462	2,392	2,263	2,845
Starch and flour	475	500	700	700	1,549	1,585	1,408	1,327	1,216	1,640
Livestock feed	260	220	5,600	125	300	4,564	450	2,044	300	1,592
Total other	3,174	2,870	8,750	3,761	5,043	8,435	4,320	5,763	3,779	6,041
Grand total	13,766	10,979	16,015	15,829	19,267	20,614	18,712	20,816	14,412	20,246

[1/] Data from published reports of The Red River Valley Potato Growers Association and other industry sources.

[2/] Includes a small amount of chips processed in the Valley.

Appendix table 13.--Acres harvested of selected crops, 10 county area of Red River Valley, 1946-66

Year	All wheat	Barley	Oats	All hay	Flax	Corn	Potatoes	Sugar beets	Soybeans	Rye
					(1,000 Acres)					
1946	1,738.8	823.8	789.8	-	260.0	378.8	188.9	-	-	24.9
1947	1,701.3	943.6	676.5	-	462.0	312.4	163.6	-	-	35.9
1948	1,557.2	1,046.8	656.9	543.1	638.9	289.2	156.9	-	-	54.8
1949	1,953.1	808.0	614.0	547.2	588.4	292.2	145.2	-	-	29.2
1950	1,422.6	915.3	669.5	600.3	594.2	303.1	143.0	-	-	23.2
1951	1,696.6	1,086.2	681.5	569.0	604.3	268.4	91.6	-	-	19.6
1952	1,702.4	945.0	618.9	608.9	588.6	237.5	99.2	-	-	17.7
1953	1,635.3	1,028.2	607.2	603.8	664.3	238.3	128.2	-	-	23.2
1954	1,351.0	1,341.0	707.2	613.0	678.8	248.3	137.7	-	39.6	33.6
1955	1,276.2	1,448.6	687.8	626.2	637.6	269.0	122.7	-	72.1	34.5
1956	1,283.8	1,192.9	645.4	605.4	803.1	276.9	134.0	-	182.5	27.7
1957	1,178.0	1,147.2	682.8	552.6	599.7	262.9	123.5	-	158.1	23.3
1958	1,134.3	1,323.6	748.2	528.9	468.1	259.1	150.2	91.6	209.4	23.2
1959	908.2	1,384.6	673.2	511.6	372.5	237.8	154.6	88.6	184.0	19.4
1960	1,157.4	1,191.6	778.4	514.8	431.9	229.2	177.5	102.4	157.9	15.6
1961	1,162.7	1,183.4	767.7	759.5	347.8	178.9	209.3	109.6	184.5	17.5
1962	862.7	961.5	573.8	541.0	377.7	146.2	176.2	132.3	74.1	21.8
1963	994.3	1,114.8	811.9	455.7	412.3	190.8	183.5	116.0	147.2	35.0
1964	1,198.5	977.5	817.7	471.2	347.2	185.5	161.2	117.1	110.7	35.7
1965	1,338.9	937.4	817.5	480.2	340.1	150.9	164.5	143.4	202.0	37.7
1966	1,300.3	1,073.1	775.2	480.2	294.0	117.4	163.5	143.1	215.0	17.9

Appendix table 14.--Potatoes: Number of marketing firms, by sizes of production units, Red River Valley, 1962-63 season

Item	Number of firms	Total acres farmed	Total acres of potatoes	Volume of potatoes produced	Average unit farmed	Average acres of potatoes	Percent of unit in potatoes
	(Number)	(1,000 acres)	(1,000 acres)	(1,000 cwt.)	(Acres)	(Acres)	(Percent)
All firms							
Large	61[1/]	120.9	36.4	4,864	2,238	674	30.1
Medium	257	312.7	74.0	8,386	1,217	288	23.7
Small	540	288.1	60.7	5,610	533	112	21.0
Total	858	721.7	171.1	18,860	848	201	23.7
All firms							
Tablestock	534[1/]	391.1	86.2	9,631	741	163	22.0
Processing	90[1/]	71.5	23.0	2,417	804	259	32.2
Seed	234	259.1	61.9	6,812	1,107	265	23.9
Total	858	721.7	171.1	18,860	848	201	23.7
All firms							
Distributor	8	7.1	3.1	446	889	383	43.1
Agent	4	6.0	2.2	329	1,500	824	54.9
Coop-packer	5[1/]	-	-	-	-	-	-
Packer	12[1/]	8.2	3.9	552	821	388	47.3
Grower packer	567	564.0	131.4	13,649	995	232	23.3
Grower	262	136.4	30.5	3,883	521	116	22.3
Total	858	721.7	171.1	18,860	848	201	23.7

[1/] The number of firms shown includes 7 large firms that do not produce potatoes. Six of these 7 firms sell more for tablestock and 1 sells more for processing. By type of firm, 5 of these firms are coop-packers and 2 are packers.

Appendix table 15.--Ownership and control of potato storage capacity, Red River Valley, 1962-63 season

Item	Number owning storage	Storage owned	Number also renting from others	Storage rented from others	Number renting to others	Storage rented to others	Net storage available in Valley	Number renting only	Storage rented from others
	(Number)	(1,000 cwt.)	(Number)	(1,000 cwt.)	(Number)	(1,000 cwt.)	(1,000 cwt.)	(Number)	(1,000 cwt.)
All firms									
Large	61	9,410	12	1,590	22	2,132	8,867	-	-
Medium	237	8,752	109	1,389	56	894	9,248	20	246
Small	412	5,895	268	2,465	998	395	7,966	128	1,546
Total[1/]	710	24,057	389	5,444	176	3,321	26,081	148	1,792
All firms									
Tablestock	411	12,268	269	3,594	104	1,984	13,877	123	1,455
Processing	85	3,652	30	929	27	724	3,857	5	91
Seed	214	8,137	89	922	44	712	8,347	20	246
Total[1/]	710	24,057	388	5,444	175	3,421	26,081	148	1,792
All firms									
Distributor	8	609	1	36	6	80	564	-	-
Agent	4	1,091	3	258	2	388	961	-	-
Coop-packer	5	888	1	740	-	-	1,628	-	-
Packer	12	2,293	6	647	6	1,232	1,708	-	-
Grower-packer	547	17,451	196	1,712	119	1,608	17,555	20	246
Grower	134	1,726	181	2,051	41	113	3,664	128	1,546
Total[1/]	710	24,057	388	5,444	175	3,421	26,081	148	1,792

[1/] Six grower-packers owned storage but did not use it in 1962. They packed and sold at harvest. One of these six firms leased storage to other producers.

Appendix table 16.--Location and utilization of storage capacity, Red River Valley, 1962-63 season

Item	Number controlling storage	Storage at trackside	Storage on farms	Net storage available	Storage used	Storage idle	Net storage available
	(Number)	(1,000 cwt.)			(1,000 cwt.)		
All firms							
Large	61	8,430	437	8,867	8,055	812	8,867
Medium	252	7,440	1,808	9,248	8,675	572	9,248
Small	540	3,796	4,170	7,966	5,211	2,755	7,966
Total	852	19,666	6,415	26,081	21,941	4,139	26,081
All firms							
Tablestock	533	10,219	3,658	13,877	11,313	2,563	13,877
Processing	85	3,012	845	3,857	3,332	525	3,857
Seed	234	6,436	1,911	8,347	7,296	1,051	8,347
Total	852	19,666	6,415	26,081	21,941	4,139	26,081
All firms							
Distributor	8	564	-	564	518	46	564
Agent	4	961	-	961	950	11	961
Coop-packer	5	1,628	-	1,628	1,628	-	1,628
Packer	12	1,550	158	1,708	1,247	461	1,708
Grower-packer	561	12,483	5,072	17,555	14,313	3,242	17,555
Grower	262	2,480	1,184	3,664	3,285	379	3,664
Total	852	19,666	6,415	26,081	21,941	4,139	26,081

Appendix table 17.--Potatoes: Monthly average prices received by farmers, Minnesota-North Dakota, 1954-66 crop years[1/]

Crop year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May
				(Dollars per cwt.)				
1954	1.26	1.25	1.22	1.30	1.30	1.25	3.18	2.75
1955	1.30	1.45	1.55	1.68	2.38	2.98	3.50	4.06
1956	1.12	1.12	1.05	1.00	.90	.75	.70	.65
1957	1.59	1.75	1.63	1.93	2.63	3.70	3.10	2.05
1958	.77	.83	.90	.85	.75	.68	.63	1.63
1959	1.33	1.48	1.40	1.59	1.50	1.98	2.38	2.03
1960	1.34	1.38	1.28	1.28	1.20	1.20	1.40	1.28
1961	1.18	1.03	1.00	.93	.93	1.00	1.08	1.05
1962	1.09	1.05	1.00	1.10	1.15	1.18	.95	.88
1963	.99	1.05	.95	1.02	1.12	1.38	1.58	2.18
1964	1.84	2.90	3.85	4.65	4.62	4.48	4.50	5.55
1965	1.56	1.40	1.38	1.45	1.52	1.65	1.58	1.40

Source: State-Federal Crop and Livestock Reporting Service, Minnesota and North Dakota, in cooperation with Statistical Reporting Service, USDA.

[1/] Simple average of Minnesota monthly average price and North Dakota monthly average price.

Appendix table 18.--Potatoes: Production in 10 counties of the Red River Valley; in Minnesota-North Dakota and total stocks held by growers and local dealers on December 1, January 1, February 1, and March 1, states of Minnesota-North Dakota, 1954-66 crop years

Crop year	Production Red River Valley	Minnesota-North Dakota				
		Fall production	Stocks Dec. 1	Stocks Jan. 1	Stocks Feb. 1	Stocks Mar. 1
	1,000 cwt.	(1,000 cwt.)				
1954	17,370	22,528	15,600	13,550	10,680	8,150
1955	11,821	15,430	10,600	9,000	6,760	4,800
1956	18,462	23,234	16,000	13,600	10,500	7,300
1957	13,887	17,275	10,700	8,950	6,550	4,650
1958	21,226	25,100	16,800	13,800	10,300	6,800
1959	19,452	23,072	16,800	14,300	11,200	8,200
1960	22,847	26,711	19,300	16,500	13,000	9,300
1961	22,929	27,060	19,800	16,900	12,400	9,200
1962	22,434	25,960	18,800	16,100	12,300	9,100
1963	22,296	26,468	18,900	16,500	12,700	9,500
1964	16,390	19,100	13,150	10,800	8,600	6,500
1965	23,692	27,405	20,000	16,650	12,900	9,100
1966	19,538	23,495	17,750	14,700	11,350	8,700
		(Percent)				
1954	77.1	100.0	69.3	60.2	47.4	36.2
1955	76.6	100.0	68.7	58.3	43.8	31.1
1956	79.5	100.0	68.9	58.5	45.2	31.4
1957	80.4	100.0	61.9	51.8	37.9	26.9
1958	84.6	100.0	66.9	55.0	41.0	27.1
1959	84.3	100.0	72.8	62.0	48.5	35.5
1960	85.5	100.0	72.3	61.8	48.7	34.8
1961	84.7	100.0	73.2	62.5	45.8	34.0
1962	86.4	100.0	72.4	62.1	47.4	35.1
1963	84.2	100.0	71.4	62.3	48.0	36.0
1964	85.8	100.0	68.8	56.5	45.0	34.0
1965	86.5	100.0	73.0	60.8	47.1	33.2
1966	83.2	100.0	75.5	62.6	48.3	37.0

Appendix table 19.--Vertical integration of functions within potato marketing firms, Red River Valley, 1962 crop year

Degree of vertical integration	Integrated firms	Function performed			Final sales
		Production	Storage	Packing	
		(Number)			
All firms:					
Storage thru final sales	7	-	X	X	X
Production, packing, and sales	6	X	-	X	X
Production thru final sales	462	X	X	X	X
Production thru packing	229	X	X	X	-
Production thru storage	154	X	X	-	-
Total	858	851	862	704	475
Large firms:					
Storage thru final sales	6	-	X	X	X
Production, packing, and sales	-	-	-	-	-
Production thru final sales	54	X	X	X	X
Production thru packing	1	X	X	X	-
Production thru storage	-	-	-	-	-
Total	61	55	61	61	60
Medium firms:					
Storage thru final sales	1	-	X	X	X
Production, packing, and sales	6	X	-	X	X
Production thru final sales	161	X	X	X	X
Production thru packing	89	X	X	X	-
Production thru storage	-	-	-	-	-
Total	257	256	251	257	168
Small firms:					
Storage thru final sales	-	-	-	-	-
Production, packing, and sales	-	-	-	-	-
Production thru final sales	247	X	X	X	X
Production thru packing	139	X	X	X	-
Production thru storage	154	X	X	-	-
Total	540	540	540	386	247

Appendix table 20.--Potato marketing firms, by form of business organization and number of production units, Red River Valley, 1962 crop year

Item	Marketing firms	cooperation	corporation	partnership	proprietorship	Independent production units	Production units per marketing firm
				(Number)			
All firms							
Large	61	1	24	24	12	426	7.0
Medium	257	1	1	114	141	499	1.9
Small	540	-	-	128	412	694	1.3
Total	858	2	25	266	565	1,619	1.9
All firms							
Tablestock	534	2	13	203	316	1,185	2.2
Processing	90	-	5	19	66	126	1.4
Seed	234	-	6	45	183	308	1.3
Total	858	2	24	267	565	1,619	1.9
All firms							
Distributor	8	-	-	7	1	16	2.0
Agent	4	-	2	2	-	13	3.2
Coop-packers	5	2	3	-	-	364	72.8
Packer	12	-	9	1	2	37	3.1
Grower-packer	567	-	11	174	382	826	1.5
Grower	262	-	-	82	180	363	1.4
Total	858	2	25	266	565	1,619	83.9

Appendix table 21.--Potatoes: Intra-industry transactions, by method of acquisition, Red River Valley, 1962 crop year

Item	Acquired bulk						Acquired packed				Total acquired	
	Number contracting	Volume contracted	Number pooling	Volume pooled	Number purchasing	Volume purchased	Number handling on brokerage basis	Volume handled on brokerage basis	Volume purchasing	Volume purchased	Number acquiring	Volume acquired
	(Number)	(1,000 cwt.)	(Number)	(1,000 cwt.)	(Number)	(1,000 cwt.)	(Number)	(1,000 cwt.)	(Number)	(1,000 cwt.)		
All firms												
Large	11	1,3336	6	979	34	3,588	13	338	20	1,499	41	7,740
Medium	1	1313	5	5	4	380	2	78	20	2,751	21	3,227
Small	-	--	-	-	5	4	-	-	20	33	26	37
Total	12	1,34349	11	984	43	3,972	15	416	60	4,283	88	11,004
All firms												
Tablestock	4	10105	5	913	30	3,455	12	260	39	755	57	5,488
Processing	8	1,24244	1	66	7	459	1	11	6	590	11	2,370
Seed	-	--	5	5	6	58	2	145	15	2,938	20	3,146
Total	12	1,34349	11	984	43	3,972	15	416	60	4,283	88	11,004
All firms												
Distributor	-	--	-	-	-	-	2	145	8	2,850	9	2,994
Agent	3	82823	-	-	4	464	1	54	3	492	4	1,834
Coop-packer	-	--	3	766	5	1,227	2	7	2	98	5	2,099
Packer	5	43537	1	66	11	2,068	4	89	9	610	12	3,271
Grower-packer	4	8989	7	152	23	212	6	121	38	232	58	806
Grower	-	--	-	-	-	-	-	-	-	-	-	-
Total	12	1,34349	11	984	43	3,972	15	416	60	4,283	88	11,004

Appendix table 22.-- Volume of potatoes sold to final customers, by location of customers and intended use, Red River Valley, 1962 crop year

Item	Number selling to Valley final customers	Volume to Valley final customers	Number selling table-stock outside Valley	Volume of table-stock sold outside Valley	Number selling processing outside Valley	Volume of processing sold outside Valley	Number selling seed outside Valley	Volume of seed sold outside Valley	Sub-total selling outside Valley	Sub-total volume sold outside Valley	Number selling to final customers	Volume sold to final customers
	(Number)	(1,000 cwt.)	(Number)	(1,000 cwt.)	(Number	(1,000 cwt.)	(Number)	(1,000 cwt.)	(Number)	(1,000 cwt.)	(Number)	(1,000 cwt.)
All firms												
Large	44	1,908	46	6,761	15	1,825	16	599	55	9,185	60	11,093
Medium	66	959	116	2,798	44	1,071	32	1,869	142	5,737	168	6,696
Small	247	429	98	641	-	-	-	-	98	641	247	1,070
Total	357	3,297	260	10,200	59	2,895	48	2,467	295	15,563	475	18,860
All firms												
Tablestock	182	1,039	147	6,923	31	827	-	-	147	7,749	229	8,788
Processing	43	1,291	14	383	16	1,752	10	234	28	2,370	54	3,661
Seed	132	968	99	2,893	12	317	38	2,234	120	5,444	192	6,412
Total	357	3,297	260	10,200	59	2,895	48	2,467	295	15,563	475	18,860
All firms												
Distributor	1	13	3	1,642	6	309	6	1,316	8	3,267	8	3,280
Agent	2	826	2	673	2	524	2	140	4	1,337	4	2,163
Coop-packer	3	283	5	1,672	1	9	-	-	5	1,681	5	1,964
Packer	5	180	9	2,515	7	910	1	65	12	3,490	12	3,670
Grower-packer	243	1,704	241	3,698	43	1,144	39	946	266	5,787	342	7,491
Grower	103	291	-	-	-	-	-	-	-	-	103	291
Total	357	3,297	260	10,200	59	2,895	48	2,467	295	15,563	475	18,860

Appendix table 23.--Potatoes: Volume inspected by size rank of firm, Red River Valley, 1955-63 crop years

Year	4 largest firms	5 - 8 largest firms	9 - 20 largest firms	21 - 50 largest firms	51 - 100 largest firms	Subtotal 100 largest firms	Total all firms
			(400 cwt. carlots)				
1955	2,517	1,410	2,676	3,705	2,975	13,283	21,145
1956	3,586	1,980	3,886	5,583	4,833	19,868	32,125
1957	2,915	1,618	2,950	4,425	5,289	17,197	25,557
1958	2,712	1,509	2,649	3,957	3,670	14,497	23,941
1959	4,776	2,172	3,915	5,723	5,576	22,162	35,858
1960	4,489	2,594	4,742	6,942	5,866	24,633	39,295
1961	4,298	1,925	4,317	5,388	4,641	20,569	32,782
1962	5,094	2,567	4,851	6,104	5,890	24,506	36,972
1963	4,826	2,717	5,213	7,031	6,106	25,875	39,714
			(Average size of firm 400 cwt. carlots)				
1955	629.2	352.5	223.0	123.5	59.5	132.8	19.7
1956	896.5	495.0	323.8	186.1	96.7	198.7	28.2
1957	728.8	404.5	245.8	147.5	105.8	172.0	25.5
1958	678.0	377.2	220.8	131.9	73.4	145.0	24.1
1959	1,194.0	543.0	326.2	190.8	111.5	221.6	34.0
1960	1,122.2	648.5	395.2	231.4	117.3	246.3	41.5
1961	1,074.5	481.2	359.8	179.6	92.8	205.7	34.0
1962	1,273.5	641.8	404.2	203.5	117.8	205.1	46.0
1963	1,206.5	679.2	434.4	234.4	122.1	258.8	53.0

Appendix table 24.--Potatoes: Number and percent of potato marketing firms, by size groups based on volume inspected, Red River Valley, 1955-63 crop years

Year	Less than 30 carlots	30-149 carlots	150-299 carlots	300-449 carlots	450 or more carlots	Total all firms
			(Number)			
1955	930	119	18	4	4	1,075
1956	916	178	28	11	6	1,139
1957	836	135	24	4	5	1,004
1958	821	145	20	4	4	994
1959	816	190	32	8	8	1,054
1960	676	217	32	10	12	947
1961	738	182	27	7	9	963
1962	568	184	32	7	12	803
1963	481	214	32	13	10	750
			(percent)			
1955	86.5	11.1	1.7	.4	.4	100.0
1956	80.4	15.6	2.5	1.0	.5	100.0
1957	83.3	13.4	2.4	.4	.5	100.0
1958	82.6	14.6	2.0	.4	.4	100.0
1959	77.4	18.0	3.0	.8	.8	100.0
1960	71.4	22.9	3.4	1.1	1.3	100.0
1961	76.6	18.9	2.8	.7	.9	100.0
1962	70.7	22.9	4.0	.9	1.5	100.0
1963	64.1	28.5	4.3	1.7	1.3	100.0

Appendix table 25.—Potatoes: Volume inspected by size groups of potato marketing firms, Red River Valley 1955-63 crop years

Year	Less than 30 carlots	30-149 carlots	150-299 carlots	300-449 carlots	450 or more carlots	Total all firms
			(400 cwt. carlots)			
1955	6,178	7,366	3,681	1,404	2,517	21,145
1956	6,930	10,837	5,745	3,947	4,666	32,125
1957	7,174	8,620	4,929	1,421	3,412	25,557
1958	6,529	9,161	4,021	1,509	2,721	23,941
1959	6,990	12,575	6,515	2,830	6,949	35,858
1960	6,180	13,717	6,963	3,310	9,125	39,295
1961	6,204	11,586	5,583	2,535	6,874	32,782
1962	5,320	12,886	6,548	2,581	9,637	36,972
1963	4,702	14,272	6,676	5,006	9,059	39,714
			(percent)			
1955	29.2	34.8	17.4	6.6	11.9	100.0
1956	21.6	33.7	17.9	12.3	14.5	100.0
1957	28.1	33.7	19.3	5.6	13.4	100.0
1958	27.3	38.3	16.8	6.3	11.4	100.0
1959	19.4	34.9	18.2	7.9	19.4	100.0
1960	15.7	34.9	17.7	8.4	23.2	100.0
1961	18.9	35.3	17.0	7.7	21.0	100.0
1962	14.4	34.9	17.7	7.0	26.1	100.0
1963	11.8	35.9	16.8	12.6	22.8	100.0

Appendix table 26.--Potatoes: Volume inspected by size rank of firms, and share of total inspections, Red River Valley, 1955-63 crop years

Year	4 largest firms	8 largest firms	20 largest firms	50 largest firms	100 largest firms	Total all firms
			(400 cwt. carlots)			
1955	2,517	3,927	6,603	10,308	13,283	21,145
1956	3,586	5,566	9,452	15,035	19,868	32,125
1957	2,915	4,533	7,483	11,908	17,197	25,557
1958	2,721	4,230	6,879	10,836	14,506	23,941
1959	4,776	6,948	10,863	16,586	22,162	35,858
1960	4,489	7,083	11,825	19,767	24,633	39,295
1961	4,298	6,223	10,540	15,928	20,569	32,782
1962	5,094	7,661	12,512	18,616	24,506	36,972
1963	4,826	7,543	12,756	19,787	25,893	39,714
			(percent)			
1955	11.9	18.6	31.2	48.7	62.8	100.0
1956	11.2	17.3	29.4	46.8	61.8	100.0
1957	11.4	17.3	29.3	46.6	67.3	100.0
1958	11.4	17.7	28.7	45.2	60.6	100.0
1959	13.3	19.4	30.3	46.3	61.8	100.0
1960	11.4	18.0	30.1	47.8	62.7	100.0
1961	13.1	19.0	32.2	48.6	62.7	100.0
1962	13.9	20.7	33.6	50.4	66.3	100.0
1963	12.2	19.0	32.1	49.8	65.2	100.0

Appendix table 27.-- Potatoes: The four, eight, and twenty largest firms, by number of years in specified size group and number of years in business, Red River Valley, 1955-63 crop years

Years in designated group	Years of the period in business									Total firms
	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	
	(Number)									
Four largest firms										
1 year	-	-	-	2	-	-	1	-	1	4
2 years		-	-	2	-	-	-	-	1	3
3 years			-	-	-	-	-	-	-	-
4 years				-	-	-	-	-	1	1
5 years					-	-	-	-	1	1
6 years						-	-	-	-	-
7 years							-	-	-	-
8 years								-	1	1
9 years									1	1
Total	-	-	-	4	-	-	1	-	6	11
Eight largest firms										
1 year	-	1	1	1	1	-	-	-	-	4
2 years		-	-	1	2	1	-	1	1	6
3 years			-	1	-	-	-	-	-	1
4 years				1	-	-	-	-	1	2
5 years					-	-	-	-	1	1
6 years						-	1	-	-	1
7 years							-	-	-	-
8 years								-	2	2
9 years									2	2
Total	-	1	1	4	3	1	1	1	7	19
Twenty largest firms										
1 year	4	2	-	-	-	1	1	3	3	14
2 years		6	1	2	-	1	-	2	3	15
3 years			-	2	1	-	-	-	1	4
4 years				2	3	-	1	-	-	6
5 years					1	1	-	-	2	4
6 years						-	1	1	1	3
7 years							-	-	-	-
8 years								-	1	1
9 years									6	6
Total	4	8	1	6	5	3	3	6	17	53

Appendix table 28.--Potatoes: Number of firms and volume packed by specified characteristics, Red River Valley, 1962-63 season

Item	Firms that pack	Volume packed	Firms that wash	Volume washed	Firms that wax	Volume waxed	Firms that prepackage	Volume pre-packaged[1]
	Number	1,000 cwt.	Number	1,000 cwt.	Number	1,000 cwt.	Number	1,000 cwt.
All firms								
Large	61	9,644	33	6,049	33	3,541	22	1,577
Medium	257	6,821	13	494	8	299	8	95
Small	386	2,023	52	383	31	247	51	147
Total	704	18,488	98	6,925	72	4,087	81	1,809
All firms								
Tablestock	391	9,724	83	6,670	62	3,984	78	1,786
Processing	79	2,355	1	8	1	2/	1	10
Seed	234	6,409	14	246	9	102	1	14
Total	704	18,488	98	6,925	72	4,087	81	1,809
All firms								
Distributors	8	419	2	24	2	15	-	-
Agents	4	475	-	-	-	-	-	-
Coop-packer	5	1,994	5	1,979	5	967	5	562
Packer	12	2,973	9	2,185	9	1,367	9	646
Grower-packer	567	12,211	82	2,736	56	1,739	67	600
Grower	108	416	-	-	-	-	-	-
Total	704	18,488	98	6,925	72	4,087	81	1,809

1/ Packages of 25 pounds or less.

2/ Less than 500 cwt.

Appendix table 29.--Potatoes: Volume of potatoes packed by size of package, Red River Valley, 1962-63 season

Item	100 pound bags	50 pound bags	25 pound bags	20 pound bags	10 pound bags	5 pound bags	Total
				(1,000 cwt.)			
All firms							
Large	7,680	387	658	346	528	45	9,644
Medium	6,719	7	75	16	4	-	6,821
Small	1,867	9	119	28	-	-	2,023
Total	16,276	403	853	379	532	45	18,488
All firms							
Tablestock	7,582	356	837	379	525	45	9,724
Processing	2,306	40	10	-	-	-	2,355
Seed	6,387	8	7	-	7	-	6,409
Total	16,276	403	853	379	532	45	18,488
All firms							
Distributor	416	4	-	-	-	-	419
Agent	475	-	-	-	-	-	475
Coop-packer	1,367	65	201	75	256	30	1,994
Packer	2,105	222	284	212	144	6	2,973
Grower-packer	11,498	113	368	91	133	8	12,211
Grower	416	-	-	-	-	-	416
Total	16,276	403	853	379	532	45	18,488

Appendix table 30.--Potatoes: Shipments by utilization, type of potatoes, and volume washed, Red River Valley, 1956-64 crop years

Item	Crop year								
	1956	1957	1958	1959	1960	1961	1962	1963	1964
	(carlots)								
Tablestock and processing									
Red potatoes									
Washed	12,282	9,784	7,969	13,977	16,042	12,497	17,323	17,143	11,756
Dry	9,366	6,048	5,933	8,018	7,986	4,914	6,432	6,557	3,663
Total	21,648	15,832	13,902	21,995	24,028	17,411	23,755	23,700	15,419
White potatoes									
Washed	406	472	242	426	461	332	69	67	90
Dry[1]	4,177	3,719	3,768	6,500	8,321	8,086	7,399	9,055	6,979
Total	4,583	4,191	4,010	6,926	8,782	8,418	7,468	9,122	7,069
Russet potatoes[2]									
Washed	-	-	-	-	-	601	344	699	371
Dry	-	-	-	-	-	260	163	362	328
Total	-	-	-	-	-	861	507	1,061	699
Subtotal (table-process)	26,231	20,023	17,912	28,921	32,810	26,690	31,730	33,883	23,187
Seed:[3]									
Red potatoes	-	-	-	-	-	2,974	3,433	3,334	-
White potatoes	-	-	-	-	-	2,321	2,295	2,031	-
Russet potatoes	-	-	-	-	-	421	427	614	-
Total	6,073	5,374	6,124	7,339	7,420	5,716	6,155	5,979	5,658
Grand Total	32,304	25,397	24,036	36,260	40,230	32,406	37,885	39,862	28,845

Source: Red River Valley Potato Growers Association.

1/Almost exclusively potatoes for processing.

2/Included with whites prior to 1961.

3/Not separated by type prior to 1961.

Appendix table 31.--Potatoes: Shipments for tablestock and processing, washed and dry, by grade, Red River Valley, 1956-64 crop years

Item	Crop year 1956	1957	1958	1959	1960	1961	1962	1963	1964
	(carlots)								
Tablestock and processing									
Washed Reds									
U.S. No. 1	7,141	6,380	7,214	10,901	11,759	8,464	12,879	12,673	8,854
U.S. Commercial	1,868	823	353	908	1,240	2,349	1,983	1,753	1,198
U.S. No. 2	3,260	2,523	402	2,162	3,042	1,684	2,436	2,717	1,704
Unclassified	13	58	-	6	1	-	25	-	-
Total	12,282	9,784	7,969	13,977	16,042	12,497	17,323	17,143	11,756
Dry Reds									
U.S. No. 1	2,987	2,358	4,858	5,093	3,680	1,621	2,657	3,722	1,126
U.S. Commercial	4,771	2,823	646	2,514	3,781	3,046	3,549	2,637	2,282
U.S. No. 2	1,500	677	429	384	524	245	200	197	255
Unclassified	108	190	-	27	1	2	26	1	-
Total	9,366	6,048	5,933	8,018	7,986	4,914	6,432	6,557	3,663
Washed Whites 1/									
U.S. No. 1	203	135	236	266	242	680	304	504	297
U.S. Commercial	114	119	2	43	86	54	41	89	91
U.S. No. 2	88	161	4	114	133	199	56	173	73
Unclassified	1	57	-	3	-	-	12	-	-
Total	406	472	242	426	461	933	413	766	461
Dry Whites 1/									
U.S. No. 1	1,398	965	2,823	2,962	2,105	1,572	1,702	2,821	784
U.S. Commercial	2,093	1,576	595	2,367	4,033	4,501	4,163	4,915	4,753
U.S. No. 2	594	759	350	1,086	2,183	2,270	1,557	1,524	1,770
Unclassified	92	419	-	85	-	3	140	157	-
Total	4,177	3,719	3,768	6,500	8,321	8,346	7,562	9,417	7,307
Summary: By grade									
U.S. No. 1	11,729	9,838	15,131	19,222	17,786	12,337	17,542	19,720	11,061
U.S. Commercial	8,846	5,341	1,596	5,832	9,140	9,950	9,736	9,394	8,324
U.S. No. 2	5,442	4,120	1,185	3,746	5,882	4,398	4,249	4,611	3,802
Unclassified	214	724	-	121	2	5	203	158	-
Grand Total	26,231	20,023	17,912	28,921	32,810	26,690	31,730	33,883	23,187

Source: Red River Valley Potato Growers Association.

1/Includes russets.

Appendix table 32.--Potatoes: Shipments for tablestock and processing, by size of package, Red River Valley, 1956-64 crop years

Item	Crop year								
	1956	1957	1958	1959	1960	1961	1962	1963	1964
	(carlots)								
Tablestock and processing									
All washed[1]									
100 pound bags	-	-	-	10,834	13,498	10,564	12,799	13,860	10,364
50 pound bags	-	-	-	1,029	508	444	783	611	282
25 pound bags	-	-	-	1,352	1,686	1,399	2,037	459	15
20 pound bags	-	-	-	-	-	-	637	1,504	630
10 pound bags	-	-	-	1,188	811	1,023	1,480	1,475	926
Total	-	-	-	14,403	16,503	13,430	17,736	17,909	12,217
All dry[1]									
100 pound bags	-	-	-	5,738	6,393	5,258	13,799	15,895	10,957
50 pound bags	-	-	-	49	45	16	120	60	7
25 pound bags	-	-	-	15	55	16	49	4	-
20 pound bags	-	-	-	-	-	-	3	13	3
10 pound bags	-	-	-	5	30	14	23	2	3
Total	-	-	-	5,807	6,523	5,304	13,994	15,974	10,970
Summary									
100 pound bags	22,399	17,772	16,046	25,180	29,481	23,708	26,598	29,755	21,321
50 pound bags	2,553	1,294	732	1,151	620	483	903	671	289
25 pound bags	543	522	565	1,390	1,824	1,440	2,086	463	15
20 pound bags	-	-	-	-	-	-	640	1,517	633
10 pound bags	734	435	569	1,200	885	1,059	1,503	1,477	929
Grand Total	26,231	20,023	17,912	28,921	32,810	26,690	31,730	33,883	23,187

Source: Red River Valley Potato Growers Association.

1/Data available only for 1959-64.

Appendix table 33.--Potatoes: Private brands, advertising, and brand recognition, Red River Valley, 1962-63 season

Item	Private brands			Advertising			Brand recognition gained by sellers
	Firms	Brands	Average per firm	Firms	Amount	Average per firm	
		(Number)		(Number)	(Dollars)	(Dollars)	(Number)
All firms							
Large	52	122	2.3	33	23,891	724	17
Medium	35	45	1.3	18	3,953	220	5
Small	-	-	-	-	-	-	-
Total	87	167	1.9	51	27,844	546	22
All firms							
Tablestock	33	103	3.1	27	18,908	700	9
Processing	2	4	2.0	1	378	378	1
Seed	52	60	1.2	23	8,558	372	12
Total	87	167	1.9	51	27,844	546	22
All firms							
Distributor	2	4	2.0	2	2,646	1,323	1
Agent	3	9	3.0	1	216	216	-
Coop-packer	5	23	4.6	5	3,176	635	1
Packer	9	21	2.3	9	9,694	1,077	5
Grower-packer	68	110	1.6	34	12,112	356	15
Grower	-	-	-	-	-	-	-
Total	87	167	1.9	51	27,844	546	22

Appendix table 34.--Potatoes: Entry and exit of firms paying inspections, Red River Valley, 1955-63 season

Item	Season 1955 -56	1956 -57	1957 -58	1958 -59	1959 -60	1960 -61	1961 -62	1962 -63	1963 -64
					(Number)				
Dropped out:									
1956-57	89	89							
1957-58	43	43	43						
1958-59	34	34	34	34					
1959-60	45	45	45	45	45				
1960-61	37	37	37	37	37	37			
1961-62	37	37	37	37	37	37	37		
1962-63	24	24	24	24	24	24	24	24	
In all years	211	211	211	211	211	211	211	211	211
Came in:									
1956-57		19	19	19	19	19	19	19	19
1957-58			17	17	17	17	17	17	17
1958-59				12	12	12	12	12	12
1959-60					18	18	18	18	18
1960-61						37	37	37	37
1961-62							24	24	24
1962-63								27	27
Were in and out during period:									
Years in:									
1 year	173	143	112	67	83	66	98	54	84
2 years	67	77	113	84	82	73	76	48	33
3 years	46	61	74	79	86	74	67	49	32
4 years	52	72	73	67	101	65	71	52	45
5 years	51	65	77	76	80	75	65	47	34
6 years	45	51	66	65	70	63	70	54	40
7 years	43	54	51	51	55	49	45	54	34
8 years	78	77	71	69	77	70	72	56	83
Subtotal: In-out	555	600	637	558	634	535	564	414	385
Grand Total	1,075	1,139	1,104	994	1,054	947	963	803	750

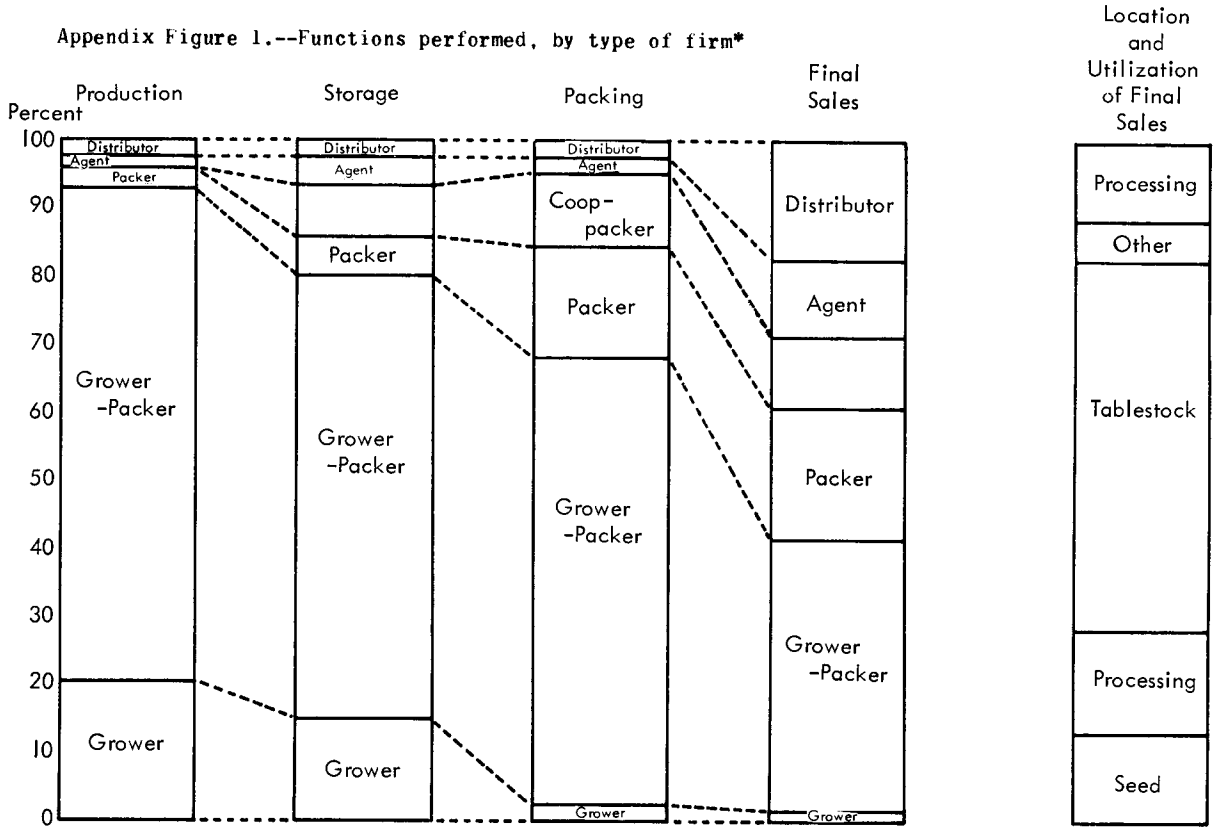
Appendix table 35.- Potatoes: Average volume of inspections paid by firms entering and leaving, Red River Valley, 1955-63 seasons

Item	Season 1955 -56	1956 -57	1957 -58	1958 -59	1959 -60	1960 -61	1961 -62	1962 -63	1963 -64
	(1,000 cwt.)								
Dropped out:									
1956-57	5.0	5.2							
1957-58	4.0	6.2	3.5						
1958-59	9.3	13.9	7.3	6.7					
1959-60	6.0	8.9	7.7	6.3	6.7				
1960-61	16.0	24.1	18.6	13.0	20.5	20.3			
1961-62	10.2	12.1	9.9	10.2	11.9	14.3	8.4		
1962-63	8.4	13.8	10.2	9.2	13.2	14.2	10.2	11.5	
In all years:	18.3	28.9	23.1	21.7	33.7	32.7	25.6	31.7	32.4
Came in:									
1956-57		11.6	17.8	15.4	22.4	30.3	24.9	32.0	25.7
1957-58			9.3	9.5	14.7	30.6	28.9	28.4	44.6
1958-59				7.5	20.7	32.4	25.6	20.4	16.8
1959-60					21.3	27.6	25.9	26.0	27.7
1960-61						16.4	17.9	28.3	31.0
1961-62							28.9	36.3	37.5
1962-63								26.4	31.9
Were in and out during period:									
Years in:									
1 year	2.8	1.8	2.3	2.1	2.8	2.2	4.4	2.1	12.0
2 years	3.6	4.4	3.1	5.0	7.4	1.0	5.3	3.9	4.2
3 years	6.0	6.8	2.1	3.5	4.6	6.1	3.1	4.5	6.0
4 years	3.3	4.1	3.4	3.8	4.7	9.8	8.8	7.3	9.5
5 years	4.9	10.6	9.1	5.5	6.2	6.3	8.1	15.7	21.0
6 years	2.9	4.2	4.3	5.0	7.5	11.9	8.6	11.8	8.7
7 years	3.2	6.1	5.2	6.9	6.3	8.4	7.9	7.3	11.2
8 years	7.9	11.1	9.6	10.5	14.4	16.0	12.3	14.6	11.9
Average all firms	8.0	11.4	9.4	9.7	13.7	16.8	13.6	18.7	21.2

Appendix table 36.--Estimated cost, potato storage and packing facilities, Red River Valley, 1963

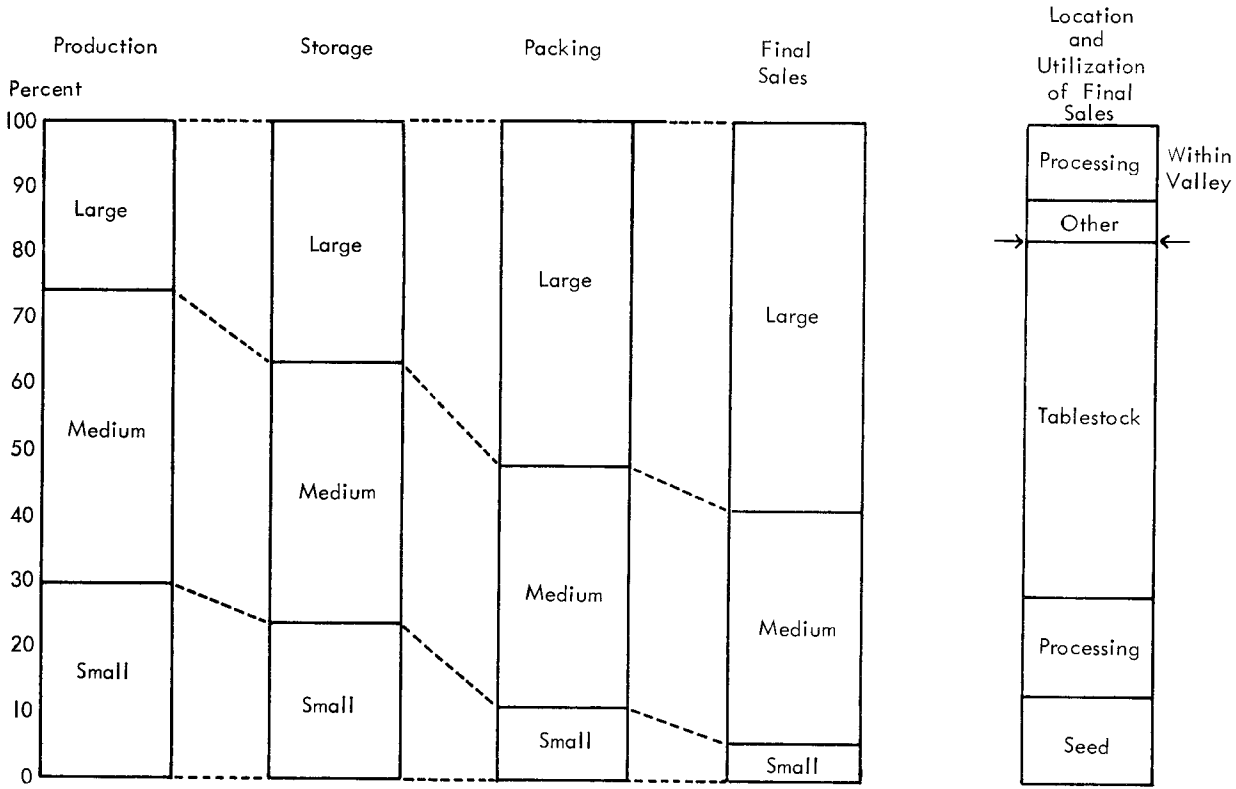
Storage capacity	Storage structure cost	Packing capacity rate	Packing structure cost	Subtotal structure cost	Fluming equipment cost	Packing equipment cost	Subtotal equipment cost	Total cost
(1,000 cwt.)	(Dollars)	(cwt./hour)			(Dollars)			
42	50,400	100	10,660	61,000	1,712	10,410	12,122	73,122
		200	12,310	62,710	2,125	14,396	16,521	79,231
60	66,400	100	10,660	77,060	1,861	10,410	12,271	89,331
		200	12,310	78,710	2,342	14,396	16,738	95,448
120	102,600	100	10,660	113,260	2,213	10,410	12,623	125,883
		200	12,310	114,910	2,700	14,396	17,096	132,006
		300	13,820	116,420	3,055	16,751	19,806	136,226
240	181,100	100	10,660	191,760	2,716	10,410	13,126	204,886
		200	12,310	193,410	3,202	14,396	17,598	211,008
		300	13,820	194,920	3,557	16,751	20,308	215,228
386	291,200	200	12,310	303,510	3,982	14,396	18,378	321,888
		300	13,820	305,020	4,371	16,751	21,122	326,142

Appendix Figure 1.--Functions performed, by type of firm*



* Measured as a percent of volume

Appendix Figure 2 -- Functions performed, by size of firm*



* Measured as a percent of volume

Appendix Exhibit 1 - States producing potatoes, by seasonal and regional groups

13 Early states		
North Carolina	Alabama	Oklahoma
South Carolina	Mississippi	Texas
Georgia	Arkansas	Arizona
Florida	Louisiana	California - Early
Tennessee		
7 Intermediate states		
New Jersey	Virginia	Missouri
Delaware	Kentucky	Kansas
Maryland		
29 Late states		
9 Eastern	9 Central	11 Western
Maine	Ohio	Nebraska
New Hampshire	Indiana	Montana
Vermont	Illinois	Idaho
Massachusetts	Michigan	Wyoming
Rhode Island	Wisconsin	Colorado
Connecticut	Minnesota	New Mexico
New York	Iowa	Utah
Pennsylvania	North Dakota	Nevada
West Virginia	South Dakota	Washington
		Oregon
		California - Late