SEASONAL BEHAVIOR OF MARKETING PATTERNS FOR GRAIN FROM NORTH DAKOTA

William W. Wilson and John Crabtree

The grain handling and transportation system in North Dakota is in a state of transition as a result of institutional and technological changes. Changes in technology and relative input prices have resulted in economies of larger farm trucks, economies of size and density in the elevator system and, consequently, pressure to abandon uneconomic branch lines. Recently, there has been a shift from single car sales and shipments to multi-car sales and shipments. All of these factors contribute to the evolution of the grainhandling and transportation system.

Planning of new grain marketing facilities and/or expansion of existing ones is complicated by seasonality in grain marketings. The typical seasonal pattern in grain marketings has been for a peak to occur during and immediately following harvest with lower movements during the remainder of the year. The level of grain handled during the peak and off-peak periods determines utilization of marketing facilities (i.e., elevators and transportation services) and unit costs of providing the service. Utilization is typically very high during periods with peak demands and low during the off-peak periods.

The effect of seasonal grain marketings is important in at least two respects. First, for a given marketing system, managers must allocate resources throughout the year in response to seasonal demands. Decisions made without consideration of seasonal variation in demand would result in shortages or surpluses. Second, the evolution of marketing facilities, particularly in the elevator sector, may result in changes in capacity. If capacity is built to accommodate demands during peak months, the facilities would be underutilized during off-peak months. Likewise, if capacity were built to accommodate average annual throughput, shortages would evolve during the peak months and facilities would be underutilized during off-peak months.[1]

Wilson is assistant professor and Crabtree is research assistant, Department of Agricultural Economics.

[1]Generally, optimum plant design subject to seasonal markets requires relatively more variable inputs and less fixed, relative to the case of stable marketings within a year.

Timing of producer marketing decisions is affected by many factors. The cumulative effect of these factors has been for marketings to be greatest during the harvest and immediate post-harvest period. Those during the remainder of the year have been relatively less. The price level and expected appreciation in prices during the marketing year and on-farm inventory levels are of particular importance in the producer's marketing decision. Other factors which affect timing of grain marketings are interest costs, which reflect opportunities foregone by holding grain, storage capacity, cash flow needs, participation in farm programs and individual tax situations.

Several factors have changed in recent years. First, higher interest rates mean greater opportunity costs of holding grain. Second, the seasonal behavior of prices has deviated from the norm in several recent years. Whether this is a permanent shift in seasonal price patterns or an aberration is uncertain. Nevertheless, seasonal price changes do influence producers' expectations of price appreciation within a crop year. Consequently seasonal patterns of grain marketings are also affected.

This study describes seasonal patterns of grain marketings in North Dakota. A secondary objective is to evaluate changes in the seasonal pattern of marketings since 1967.

General Procedures

Seasonality in grain marketings are analyzed using a statistical procedure for calculating monthly indexes. The indexes are based on 100. Deviations from 100 indicate the nature and extent of seasonality in the particular time series.

Seasonal analysis of grain marketings requires the use of monthly data. The value of an observation in time series data is affected by four forces. Three components are interdependent and recurrent. The other component is not repetitive and occurs randomly. Trend (T) is one of the components and indicates the long-term direction of change in the time series. The cyclical (C) component accounts for cyclic behavior in the series over several years. For analytical purposes, the trend and cyclic components (TC) are treated as one influence. The seasonal component (S) in the time series indicates the intrayear variability which is the same over several years. The irregular component (I) is included to account for randomness in the time series. These latter influences occur because of weather, strikes, embargoes, and other factors which are not recurrent. The purpose of time series analysis is to decompose the monthly data so that variations in the individual components can be examined.

Of particular interest in this study is the seasonal component which is an indicator of the variation in grain marketings during the year. The multiplicative model was used to decompose the series of monthly data so the nature and extent of seasonality could be examined.

In general, the model employs the ratio-to-moving average method for time series decomposition. The model removes the trend, cyclical, and irregular components from the time series so that the seasonal effect can be examined. In short, a 12-month moving-average of the original data is computed and interpreted as the trend-cycle component (TC). Dividing the original series (TCSI) by TC leaves the seasonal-irregular (SI) component for each month. An average of the SI's for each month over a period of years is calculated to remove the irregular factor. The irregular component is removed because it contains residual variations, such as the sudden impact of political events, the effect of strikes, unseasonable weather conditions, reporting and sampling errors, etc. Removal of the residual variations from the seasonal-irregular component (SI) results in a seasonal index (S), which should be interpreted as the percentage of the annual average. The seasonal index (S) is more accurate as an indicator of seasonality than the seasonal-irregular (SI) component because the irregular part of the component has been removed. A calculated seasonal index equal to 100 indicates that movements are equal to (or 100 percent of) the monthly average movement (averaged over the year). Indexes greater than 100 should be interpreted as monthly movements greater than the annual average.

Data Source

Data were obtained from the North Dakota Public Service Commission. The statutes of the state of North Dakota require public warehouses to report shipments on a monthly basis. Shipments are reported by origin, by commodity, by destinations, and by mode of shipment. The four commodities with the largest movement, measured in terms of volume, were used. They were hard red spring wheat, durum, barley, and oats. These commodities acocunted for approximately 80 percent of the total shipments of grain from North Dakota.

The destinations used were Duluth/Superior, Minneapolis/St. Paul, and the Pacific Northwest. Most grain shipped from North Dakota is to these destinations. Shipments to all destinations also were analyzed. The origins used were the nine crop reporting districts in North Dakota shown in Figure 1. Shipments were analyzed by commodity from the state to all destinations over the period 1967-68 to 1978-79.[2]

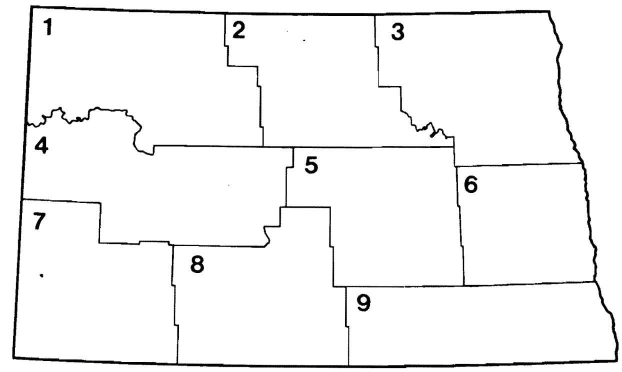

Figure 1. Crop Reporting Districts in North Dakota.

Results of Analysis

The discussion focuses on the crop years 1967-68 to 1978-79 for the four commodities selected, as well as all grains, from the state to all destinations.

Analysis of Shipments from the State to All Destinations

All Grains

Seasonal-irregular (SI) ratios for all grains to all destinations are presented in Figure 2. Average monthly SI ratios are plotted as well as 95 percent confidence intervals. The SI ratios should be interpreted as the percent of the average monthly shipments (e.g., annual movements averaged across months) before the irregular components are removed.

Examination of the SI ratios indicates the nature and extent of seasonality in the time series. Months with peak movements are July through November as indicated by the SI ratios greater than 100. For example, average September movements are 140.7 percent of the annual monthly average shipment. Off-peak movements are the remaining months. Examination of the confidence intervals illustrates the variability in monthly movements as well as the underlying seasonality. Results indicate that there is a 95 percent probability that the SI ratio is within the confidence interval. The figure illustrates the average seasonal movements within a year as well as the variability in a given month. The months with the most variability are September, October, and February.

[2]Shipments were also analyzed by individual origins to individual destinations for each of the commodities. However, in this case the study period was for crop years 1973-74 to 1978-79. These detailed data were not available prior to 1973-74.

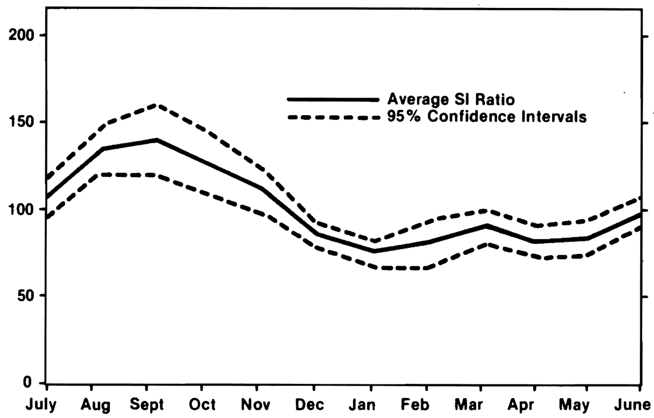

Figure 2. Monthly Seasonal-Irregular Ratios for All Grain Movements from North Dakota.

Seasonal indexes were calculated by removing the irregularity components from the SI ratios. These indexes are shown in Table 1 for all grain movements. The indexes should be interpreted as the percent a particular monthly shipment deviated from the monthly average after the irregular effects were eliminated. For example, movements in December 1978 were 80.8 percent of the monthly average movements in that year. Seasonal factors also were calculated for movements one year ahead. However, these forecasts ignore changes in fundamental factors which may deviate from the seasonal pattern.

Results also indicate that the nature and amplitude of seasonality has changed through time. For example, the monthly seasonal index for August has increased each year from 122.9 in 1967 to 139.5 in 1978. There also has been a general increase in shipments during June and October. Grain movements during the winter months have decreased as indicated by declining indexes in December, January, March, and April. Generally, the seasonal indexes indicate that the inherent seasonality in grain marketings has intensified during the 1970's, resulting in a greater proportion of all grain shipments during the peak months.

Hard Red Spring Wheat

Average seasonal-irregular ratios for hard red spring wheat shipments from North Dakota to all destinations are shown in Figure 3. Examination of the ratios indicates that months with peak movements are June through November with September having the largest. The average September movement is 149.3 percent of the average monthly movements. The off-peak months are the remainder with February having the lowest annual movement.

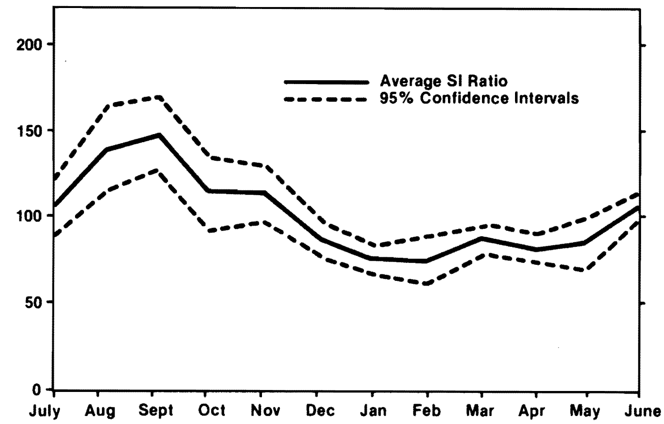

Figure 3. Monthly Seasonal-Irregular Ratios for Hard Red Spring Wheat Movements from North Dakota.

Standard deviations were used to calculate confidence intervals for each month and indicate that August, October, February, and May are more variable relative to

Table 1. Monthly Seasonal Indexes for All Grain Shipments from North Dakota to All Destinations, 1967-68 to 1978-79.

Year	July	August	September	October	November	December	January	February	March	April	May	June
1967-68	112.4	122.9	135.2	113.0	110.6	90.9	80.4	82.9	94.8	81.7	83.3	92.1
1968-69	111.2	124.4	135.1	112.3	110.5	90.7	79.9	83.4	96.0	82.1	82.4	92.7
1969-70	108.1	127.0	135.0	111.7	110.1	91.4	80.2	84.0	96.0	82.4	81.2	94.4
1970-71	105.2	129.9	134.0	111.1	107.6	92.2	81.7	84.9	96.4	84.3	78.3	94.5
1971-72	102.9	130.5	133.0	114.9	106.8	91.9	83.1	84.1	95.6	86.0	76.0	93.7
1972-73	102.3	131.4	131.8	121.4	105.1	90.3	82.5	83.0	95.7	87.1	74.3	92.7
1973-74	102.5	131.9	133.9	128.7	103.7	87.1	79.7	80.6	94.7	87.2	74.1	93.1
1974-75	104.5	133.4	135.4	134.8	103.0	84.2	75.5	77.6	93.1	85.7	75.4	94.6
1975-76	105.9	134.1	138.3	140.2	104.8	81.5	71.1	73.8	89.2	82.8	79.4	97.0
1976-77	107.0	136.5	137.6	143.7	107.4	80.7	67.2	71.0	86.2	78.2	84.0	100.8
1977-78	106.8	138.2	137.8	144.0	108.9	80.6	65.4	69.3	83.1	74.9	87.7	104.0
1978-79	107.6	139.5	137.0	142.2	109.4	80.8	65.1	68.8	82.6	73.5	88.3	105.2
Seasonal factors, one year ahead												
1979-80	108.0	140.2	136.6	141.4	109.6	80.9	64.9	68.6	82.4	72.9	88.7	105.8

the others. The months with the least variability are March, April, and June.

Seasonal indexes, after elimination of the irregularity component, are shown in Table 2 for hard red spring wheat shipments. The results indicate that seasonality has intensified through the years. Indexes for May, June, July, and August have all increased since 1967. Those for October through January have decreased.

Durum Wheat

Seasonal-irregular ratios for durum wheat shipments from North Dakota are shown in Figure 4. Months with peak movements are typically July through November. September is the month with the largest movement when approximately 159.4 percent of the annual average shipments are made.

The confidence intervals indicate that the months with the most variability in grain shipments are June, July, September, and October. The remaining months have relatively less variability.

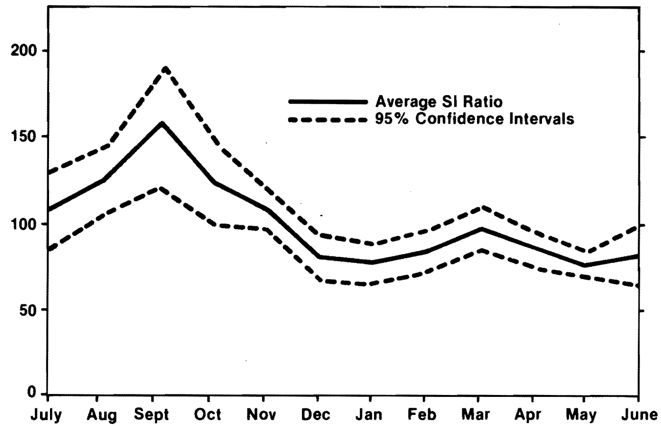

Figure 4. Monthly Seasonal-Irregular Ratios for Durum Movements from North Dakota.

Seasonal indexes, after elimination of the irregularity component, are shown in Table 3. Results indicate that the amount of grain shipped during August and

Table 2. Monthly Seasonal Indexes for Hard Red Spring Wheat Shipments from North Dakota to all Destinations, 1967-68 to 1978-79.

Year	July	August	September	October	November	December	January	February	March	April	May	June
1967-68	96.8	106.2	139.2	122.7	128.9	99.4	80.9	72.6	93.5	84.0	78.0	96.7
1968-69	94.7	111.5	140.9	120.9	128.7	98.6	79.5	72.7	93.2	82.9	76.7	98.1
1969-70	90.2	121.8	142.0	119.0	126.9	98.5	78.5	73.1	90.6	82.7	75.4	100.2
1970-71	86.8	132.9	141.6	115.2	123.0	99.6	79.9	73.8	87.7	83.3	72.8	101.8
1971-72	83.2	140.1	143.8	113.5	121.2	98.9	80.6	73.2	85.8	84.4	71.3	102.6
1972-73	84.6	142.2	145.7	112.2	118.0	96.7	81.1	73.9	85.5	85.5	71.4	104.0
1973-74	86.7	140.4	150.0	111.8	114.5	92.7	79.6	74.5	85.7	87.1	73.6	105.7
1974-75	91.8	137.4	152.2	109.5	110.9	89.7	77.3	74.5	85.7	88.2	76.4	107.9
1975-76	96.7	136.0	155.4	105.4	110.7	86.3	73.1	72.8	85.2	88.0	80.2	110.9
1976-77	103.8	138.2	153.6	101.0	109.8	84.1	69.0	72.5	84.4	86.0	84.1	115.2
1977-78	108.3	142.5	150.6	96.2	108.1	83.3	66.7	72.6	82.9	84.4	86.8	118.8
1978-79	110.8	145.4	147.7	93.2	106.2	83.9	66.4	73.1	82.9	83.4	87.1	120.5
Seasonal factors, one year ahead												
1979-80	112.0	146.9	146.2	91.7	105.3	84.2	66.2	73.4	82.9	83.0	87.3	121.4

Table 3. Monthly Seasonal Indexes for Durum Wheat Shipments From North Dakota to all Destinations, 1967-68 to 1978-79.

Year	July	August	September	October	November	December	January	February	March	April	May	June
1967-68	108.8	109.3	130.6	125.0	121.0	95.7	84.8	84.4	98.9	86.4	80.7	74.8
1968-69	109.0	109.3	131.1	123.2	119.6	94.9	86.3	85.0	100.4	86.4	81.8	75.9
1969-70	107.4	109.2	130.9	121.2	116.9	95.2	87.9	85.0	102.7	85.7	84.1	77.8
1970-71	106.3	110.5	129.7	117.4	111.0	96.1	91.0	86.4	105.2	86.3	84.5	77.5
1971-72	103.6	111.1	131.3	117.9	107.6	95.2	91.7	87.8	105.8	86.1	84.7	75.3
1972-73	101.6	113.9	136.5	121.7	104.3	90.8	89.6	89.7	104.4	86.8	81.1	72.1
1973-74	100.2	120.3	147.6	127.0	$03.2	83.6	82.7	89.1	101.0	87.1	77.4	70.7
1974-75	103.8	130.4	157.8	127.4	103.1	77.6	75.6	85.1	95.4	87.6	74.2	72.4
1975-76	108.4	139.9	168.4	126.9	104.2	70.8	68.8	78.6	89.6	86.3	74.7	78.1
1976-77	113.4	147.4	173.8	125.0	104.7	66.0	65.0	72.6	85.1	83.8	75.7	86.3
1977-78	116.1	152.7	176.9	122.6	103.2	62.7	63.5	68.3	83.0	81.3	77.3	93.4
1978-79	118.7	156.7	176.5	117.7	101.2	62.5	64.4	66.3	82.5	80.7	77.8	96.8
Seasonal factors, one year ahead												
1979-80	119.9	158.6	176.2	115.2	100.2	62.3	64.9	65.3	82.2	80.3	78.0	98.6

September has increased since 1967. There have been large decreases in the amount of grain shipped during December and January. Consequently, seasonality in durum movements has intensified during the 1970's relative to 1967.

Barley

Seasonal irregular ratios for barley shipments from North Dakota are shown in Figure 5. Peak months for barley shipments are June through September and January is the month with least movement. On average, 152.4 percent of the monthly average shipments are made during August. Confidence intervals were calculated for each month and indicate that September, January, and February are months with more variability relative to the other months.

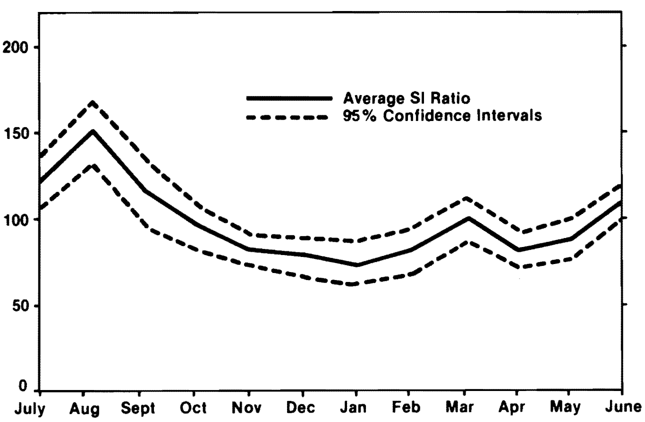

Figure 5. Monthly Seasonal-Irregular Ratios for Barley Movements from North Dakota.

Seasonal indexes were calculated by eliminating the irregularity component and are shown in Table 4. Results indicate that the movements during August, September, and October have increased relative to the late 1960's. Shipments during some of the winter months have decreased relative to the late 1960's. In general, results indicate that the amplitude of seasonality in grain movements has increased in the 1970's — the peak is greater and the valley deeper.

Oats

Seasonal-irregular ratios for oats shipments from North Dakota are shown in Figure 6. Results demonstrate that months with peak movements are July, August, and September. The average August shipment is 177.9 percent of the monthly average. Off-peak months are January, March, April, and May. The confidence intervals indicate that February and April are months with the most relative variability.

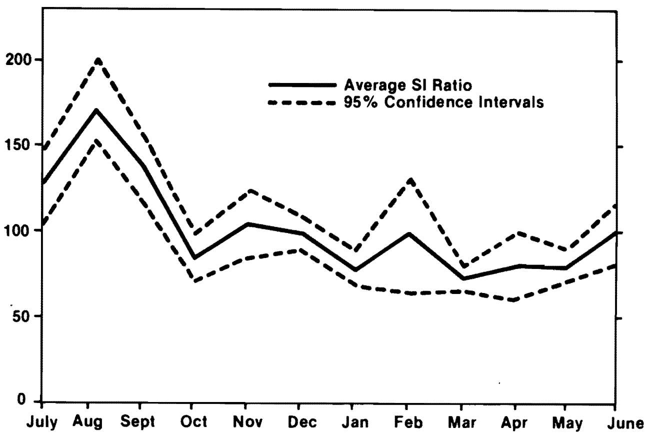

Figure 6. Monthly Seasonal-Irregular Ratios for Barley Movements from North Dakota.

Seasonal indexes were calculated by removing the irregularity component. The results are shown in Table 5 and indicate the changing seasonality since 1967.

Table 4. Monthly Seasonal Indexes for Barley Shipments from North Dakota to all Destinations, 1967-68 to 1978-79.

Year	July	August	September	October	November	December	January	February	March	April	May	June
1967-68	128.4	145.4	116.2	87.0	75.3	75.4	79.9	84.8	103.9	85.6	101.3	117.4
1968-69	129.1	142.6	115.0	86.5	76.3	77.3	79.4	87.5	107.0	85.4	98.2	116.6
1969-70	128.8	137.4	115.1	86.6	78.0	80.5	79.1	90.8	109.7	84.2	94.1	114.8
1970-71	129.1	132.3	113.8	89.4	81.9	82.7	78.4	92.2	112.0	84.4	88.6	111.4
1971-72	129.4	130.5	113.4	93.2	86.9	82.4	78.5	92.3	112.3	85.1	82.5	105.2
1972-73	128.9	134.9	113.9	100.1	92.3	80.5	76.7	87.7	110.9	86.1	77.1	100.9
1973-74	127.1	144.0	118.5	107.1	95.0	76.7	74.1	80.9	107.1	85.6	74.3	99.0
1974-75	127.2	156.3	123.4	112.6	93.4	74.1	69.7	72.5	103.4	84.8	75.2	101.2
1975-76	127.3	167.2	128.4	113.6	88.7	72.2	68.1	66.9	98.4	82.4	79.0	105.4
1976-77	126.2	175.8	132.7	112.6	82.2	73.6	65.9	63.2	95.6	78.8	84.1	111.8
1977-78	123.7	179.2	136.3	110.8	76.9	74.3	65.5	61.9	92.7	75.2	89.0	117.0
1978-79	122.8	180.2	137.7	110.0	73.4	74.8	64.2	61.7	93.1	73.7	91.2	119.0
Seasonal factors, one year ahead												
1979-80	122.3	180.6	138.5	109.6	71.6	75.0	63.5	61.7	93.3	73.0	92.3	120.1

Table 5. Monthly Seasonal Indexes for Oats Shipments from North Dakota to all Destinations, 1967-68 to 1978-79.

Year	July	August	September	October	November	December	January	February	March	April	May	June
1967-68	99.9	191.3	157.2	96.7	112.0	92.1	74.1	83.7	79.6	65.7	74.3	74.3
1968-69	99.8	188.5	158.0	95.4	113.2	92.7	74.6	83.5	80.1	66.9	74.1	77.2
1969-70	100.7	181.5	158.3	93.9	113.2	94.4	75.6	83.5	79.8	68.3	74.6	83.3
1970-71	103.0	173.3	157.1	90.4	112.8	94.1	77.6	82.8	79.7	72.5	74.5	90.8
1971-72	108.2	162.7	154.4	87.1	110.9	94.8	78.9	82.0	77.7	76.6	75.7	99.6
1972-73	113.9	157.8	150.0	81.8	107.0	95.3	79.1	80.8	76.5	80.8	76.9	106.8
1973-74	120.4	156.0	144.4	78.2	100.0	97.2	78.9	80.7	74.1	81.7	79.1	110.5
1974-75	125.7	164.8	137.0	75.1	92.3	99.2	77.6	78.9	74.0	81.0	81.6	110.7
1975-76	128.0	176.5	132.2	73.6	84.5	101.9	76.4	77.6	73.9	77.8	84.5	107.7
1976-77	128.3	191.3	129.2	70.9	79.9	105.0	74.7	75.1	75.7	74.5	86.7	105.2
1977-78	127.4	200.1	129.3	69.1	76.6	106.7	74.8	73.9	76.5	71.6	88.0	102.2
1978-79	128.1	204.6	129.2	68.1	76.4	106.9	75.4	72.4	77.4	70.8	88.1	100.6
Seasonal factors, one year ahead												
1979-80	128.5	206.9	129.2	67.6	76.2	107.0	75.7	71.6	77.8	70.4	88.1	99.8

Seasonal indexes indicate there has been large increases in shipments during June, July, August, and December; decreases in movements occurred primarily in September, October, and November. In general, there has been a change in the amplitude of seasonality in oats shipments since 1967.

Analysis of Shipments by Crop Reporting District and Destination

Generally, grain shipments to Duluth/Superior are more seasonal than those to other destinations. Movements to Duluth/Superior range from 50 percent of the annual average in January to 168 percent in September. The seasonal range in marketings to Minneapolis/St. Paul is between 75 percent and 140 percent of the annual average. Movements from the state to the Pacific Northwest vary throughout the year but the differences are not significantly different across months.

Seasonality in movements vary across the individual crop reporting districts. Generally, the crop reporting districts in the western part of the state have relatively less seasonality, presumably due to their access to the Pacific Northwest. For example, movements from crop reporting district 4 to the Pacific Northwest range from 85 percent to 130 percent of the annual average in June and September, respectively. However, these movements are not significantly different from each other. Movements from the eastern crop reporting districts to the Pacific Northwest are more sporadic, and generally, significant differences are observed. For example, movements from crop reporting district 6 to the Pacific Northwest in September range from 6.7 percent to 433 percent of the annual average in 1978 and 1974, respectively.

Conclusion

The purpose of this study was to describe the seasonal behavior of marketing patterns for grain from North Dakota. Grain marketings do exhibit seasonal behavior which is recurrent from year to year. The results illustrate that it is common for marketings in the peak months to be 160 percent of the annual average. Similarly, during the off-peak months it is common for marketings to be 50 percent of the annual average. Months with peak movements are typically those in the late spring and during and immediately post harvest. However, specific seasonal patterns depend on the commodity, the origin, and the destination. Generally, movements to Duluth/Superior have the most seasonality, followed by Minneapolis/St. Paul. Those to the Pacific Northwest generally have the least seasonality.

An important conclusion is that not only are marketings seasonal, but the seasonality has intensified since 1967. For nearly all the commodities the proportion of grain handled during the peak months has increased every year since 1967. Likewise the proportion handled during the off-peak months has decreased. Consequently, marketings in recent years have been greater during the peak months and smaller during the off-peak months relative to those during the late 1960's. Whether this is a permanent shift in behavior is uncertain. Nevertheless, it has important implications for allocation of existing marketing services and planning of new facilities.

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The most limiting factor for crop production in western North Dakota is usually moisture. This is why it is so important to plan a post-mine topography in which the amount of runoff is reduced and the amount of water that infiltrates into the soil is increased. Post-mine topographic designing is currently one of the weakest aspects of reclamation planning. This is partly due to the lack of adequate data relating water infiltration and retention to topographic factors, but more importantly because planning for water retention has not been sufficiently emphasized by reclamation workers. The reformed slopes should be as gentle as possible and still blend into the surrounding topography. Long slopes should be avoided, and slopes should predominately be concave in shape to decrease the rate of water runoff and thus increase water infiltration.

Reclamation of areas designated as prime soils is a matter of concern in North Dakota. Prime soils are highly productive soils that meet or exceed soil characterization criteria established by the Soil Conservation Service of the United States Department of Agriculture. Both federal and state reclamation laws require that soil materials from prime lands be removed, stockpiled, and respread separately from nonprime soils. Prime soils in western North Dakota are located in well-drained depressions and at the base of concave slopes where they receive runon water from higher-lying areas. Field and greenhouse experiments in North Dakota indicate that the higher yields on prime soils are primarily due to higher mosture levels from runon water from the surrounding nonprime areas and not to differences in soil properties. If this is true, then separate removal and replacement of prime soil materials is not justified. Rather, restoration of prime soils can best be accomplished by designing a topography conducive to their development. Eliminating the requirement for separate reclamation of prime soils would significantly reduce reclamation costs and at the same time offer the opportunity to improve the total productivity of the reclaimed area.

The first objective of reclamation has been and must continue to be the best possible reclamation of mined lands. But it is in the best interests of all concerned to do this at the lowest practical cost. Most past research has been directed at obtaining needed information to meet the requirements of current reclamation laws and regulations. Much of the future research must also be directed to immediate problems. The optimum depth of replacement of soil materials needs to be more precisely evaluated in terms of water-holding capacity and the movement of soluble salts and sodium. Water infiltration and retention need to be related to soil characteristics and topographic configuration; this information is needed to plan for optimum post-mine land use.

Respreading of available soil material uniformly over the entire area to be reclaimed may not result in the best post-mining land use. Perhaps part of the area should receive a deeper depth of replaced soil material than was originally present before mining, making it suitable for intensive cropping. The remaining area would receive less respread soil and be used less intensively. Should impoundments be designed when feasible to supply water for irrigating the area designed for intensive use? If land can be reclaimed to its pre-mining land use, but if a more expensive alternative plan can result in a higher post-mining producitive level, which plan should be followed? Future research must provide the basis for making these types of decisions.

North Dakota can be justly proud of its land reclamation program. The economy of the state is largely based upon its agriculture. And the maintenance of this agricultural base in turn depends upon the wise use, management, and conservation of the soil. Research has shown that even after the drastic disturbance caused by strip-mining, soils can be restored not only to their original use, but frequently to a higher productive level. Reclamation planning is in its infancy. Coal will be mined in North Dakota well into the next century. The opportunity exists to significantly improve the agricultural base in western North Dakota. Many decisions regarding reclamation and post-mining planning will need to be made. Researchers will not make these decisions — they will be made through the established political processes. But it is the responsibility and the obligation of the researchers to provide sound and reliable information upon which to base these decisions.