Sugarbeet Production Costs and Practices in the Red River Valley

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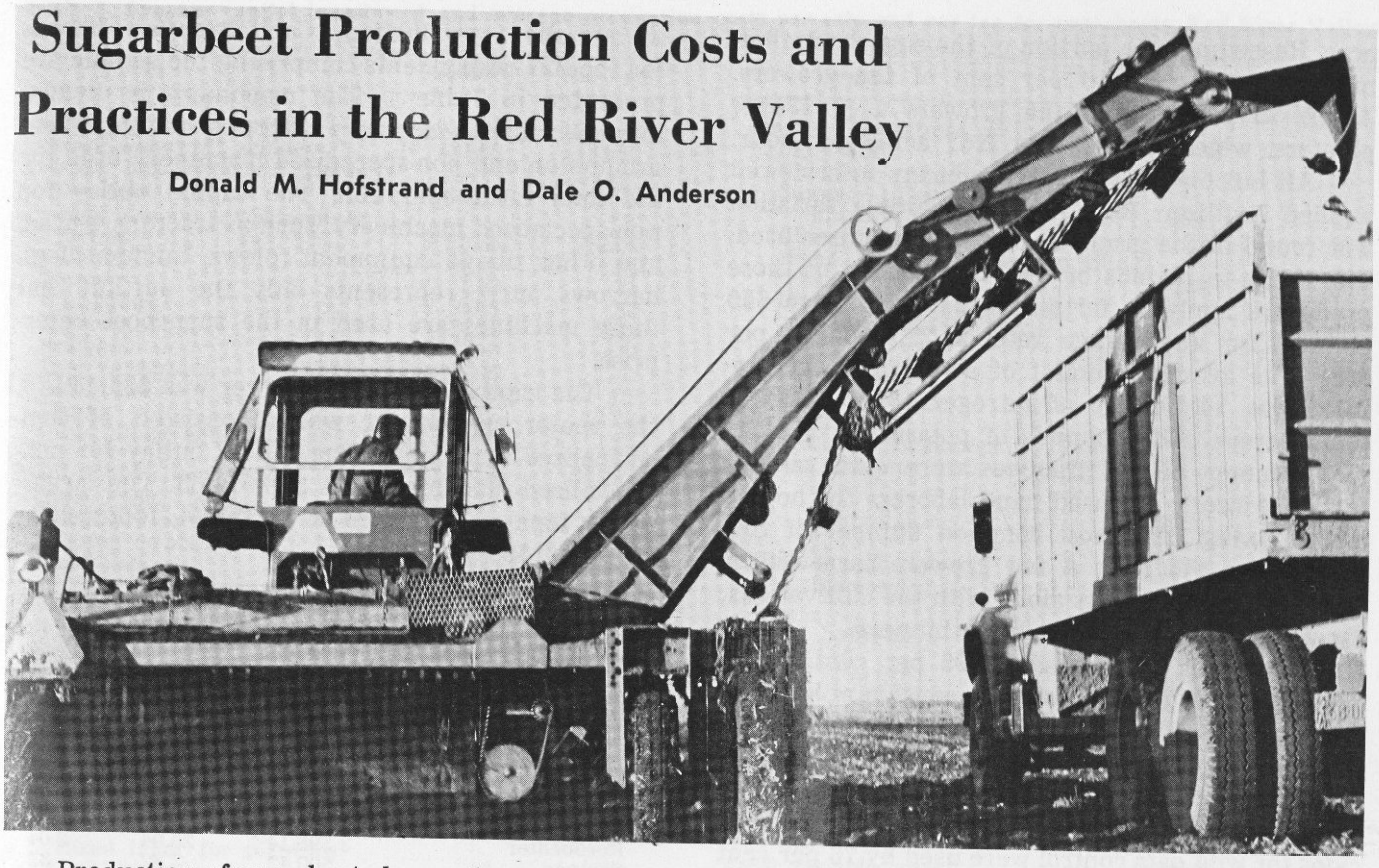

Production of sugarbeets has undergone many technological changes and adjustments in the past decade. Specialized machinery, especially for sugarbeet harvesting, has been substituted for labor. Capital in the form of chemicals has been substituted for hand labor for weed control. The labor requirements have decreased, whereas the capital investment requirements in specialized machinery and equipment have substantially increased. These technological changes and advances in sugarbeet production have made previous information on production costs and capital investments out of date. Because of these numerous and rapid changes, it is very important that production costs data and investment requirements be realistic, accurate, and current.

A personal interview of sugarbeet producers was conducted to obtain the necessary cost and investment requirement information of sugarbeet production. The study area included Richland, Cass, Traill, Grand Forks, Walsh, and Pembina counties in North Dakota; and Wilkin, Clay, Norman, Polk, Marshall, and Kittson counties in Minnesota. A random sample of the growers of about 12 per cent of the sugarbeet contracts in each of these counties was taken for personal interview. A total of 227 questionnaires were taken. The production year analyzed was 1968.

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Production Practices

Sugarbeets were predominantly grown on summerfallow. Sugarbeets were produced on previously cropped land on portions of 17 per cent of the allotments which accounted for 4 per cent of the total acres of sugarbeets produced. Of the producers growing sugarbeets on both fallowed and previously cropped land, average yield on summerfallow was 13.6 tons per acre and on previously cropped land was 12.3 tons per acre. Average yield of all producers for all production was 12.7 tons per acre.

A four-year rotation was the predominant cropping pattern of 68 per cent of the growers. It usually consisted of sugarbeets planted on summerfallow, followed by two years of small grain production. However, a small portion of the growers substituted potatoes, soybeans, or some other specialty crop for one of the small grain crops.

Sugarbeet planting usually is done during the last week of April and the first two weeks of May. About 80 per cent of the growers used No. 1 seed at a modal planting rate of 1.50 pounds per

acre. Reseeding of a portion of the sugarbeet allotment was done by 16 per cent of the growers. About 75 per cent of the growers used 12-row planters, which cover about 5.67 acres per hour.

All but one of the 227 producers interviewed applied fertilizer. However, considerable variation was found in the grade and rate of fertilizer used. The range in pounds of fertilizer applied of those producers applying fertilizer was from 14 to 650 pounds, for an average rate of 215 pounds per acre. The average amount of actual nutrients applied was 14 pounds of nitrogen, 82 pounds of phosphorous and 6 pounds of potassium.

Summer tillage practices were quite similar for all growers. All used hand laborers for hoeing and thinning. The most common number of row cultivations was four. A few growers harrowed or rotary hoed their beets along with the cultivations. Very few producers used beet thinners.

Chemicals were used by 95 per cent of the growers interviewed. However, considerable variation existed in the kind of chemical applied. Herbicides for the control of annual grasses were used by 87 per cent of the growers on 51 per cent of the total acres used for sugarbeet production. Herbicides for wild oats control were used by 76 per cent of the growers on 41 per cent of the total acres, and 8 per cent of the growers used a herbicide for buckwheat and smartweed control on 2 per cent of the acres. A fungicide for controlling leaf spot was used by 25 per cent of the growers on 12 per cent of the total acres.

The most common sizes of harvesting machinery were the four-row rotobeater and the three-row harvester. The three-row harvester had an average harvesting rate of about .87 acres per hour. Many of the harvesters and rotobeaters used were share-owned by two or more growers. Of the harvesters used, about one-third were share-owned on a one-third, one-half or two-thirds basis. The average number of trucks used was three, with two of them being owned by the growers.

Production Costs

The major purpose of the study was to identify the investment requirements and production costs associated with sugarbeet production. The average farming operation of the growers interviewed reflected a cropland acreage of 981 acres, a sugarbeet allotment of 131 acres and a sugarbeet yield of 12.7 tons per acre.

Capital Outlay

Capital outlay refers to the initial dollar expenditure, or purchase price, for machinery used in sugarbeet production. Capital outlay figures for the 227 respondents comprising the sample are presented in Table 1. The machinery is divided into specialized machinery used only for sugarbeet production and non-specialized machinery used for the total farm operation. The capital outlay for non-specialized machinery, such as tractors, trucks, and other tillage equipment (plows, tandem discs, harrows, etc.), represents only the portion that these machines are used in the sugarbeet enterprise.

The capital outlay per grower was $34,430.73, the major portion of which consisted of non-specialized machinery. The capital outlay for non-specialized machinery was $19,014.65. The largest major item was tractors at $8,585.74, followed by trucks at $6,696.72.

Table 1. Average capital outlay per grower, per acre and per ton for machinery used in sugarbeet production, Red River Valley, North Dakota, 1968.

Item	Per Grower	Per Acre	Per Ton
Specialized machinery			
Planter	$ 3,158.41	$ 24.11	$ 1.89
Row cultivator	1,583.79	12.09	.95
Thinner	337.98	2.58	.20
Rotobeater	3,398.14	25.94	2.04
Scalper	500.42	3.82	.31
Harvester	6,420.31	49.01	3.85
Beet cart	17.03	.13	.02
Subtotal	$15,416.08	$117.68	$ 9.26
Non-specialized machinery			
Tractors	8,585.74	65.54	5.16
Trucks	6,696.72	51.12	4.04
Other tillage equipment	3,732.19	28.49	2.22
Subtotal	$19,014.65	$145.15	$11.42
Total	$34.430.73	$262.83	$20.68

Total Annual Costs and Investment Requirements

A detailed listing of the per acre and per ton production costs and investment requirements of the 227 sugarbeet producers is presented in Table 2. Average annual investment is the amount a grower has invested in machinery in any one year, and was $144.57 per acre and $11.37 per ton.[1]

The total cost of producing sugarbeets was $142.08 per acre and $11.16 per ton. The per acre variable costs accounted for $79.13 of the $142.08 total cost. Variable costs are costs incurred only if production occurs. For example, the variable cost of row cultivating sugarbeets represents the fuel, lubrication, and repair costs of the tractor and

[1]The average annual investment was computed as follows: Average Annual Investment $= \frac{\text{New Cost} + \text{Salvage Value}}{2}$. Average annual investment is different from capital outlay because capital outlay refers to the new cost or initial dollar expenditure for machinery used in the sugarbeet enterprise.

Table 2. Average capital investment and average production costs per acre and per ton for sugarbeets, Red River Valley, North Dakota, 1968

Item	Per Acre	Per Ton
Average cropland acreage	981.00	981.00
Average sugarbeet acreage	131.00	131.00
Average 1968 sugarbeet yield (tons/acre)	12.70	12.70
Average Annual Investment In		
Tractors	$ 36.05	$ 2.84
Planters	13.26	1.04
Thinners	1.42	.11
Cultivators	6.65	.52
Rotobeaters	14.27	1.12
Scalpers	2.10	.17
Beet harvesters	26.96	2.12
Beet carts	.07	.01
Trucks	28.12	2.22
Other tillage equipment	15.67	1.22
Total Annual Investment	$144.57	$11.37
Annual Fixed Costs		
Machinery ownership[1]	20.97	1.64
Housing ownership	1.98	.16
Land use[2]	40.00	3.15
Total Fixed Costs	$ 62.95	$ 4.95
Annual Variable Costs		
Summerfallow and planting		
Fallow and seed bed preparation	3.60	.28
Planting	1.04	.08
Beet seed	2.64	.21
Fertilizer	8.75	.69
Fertilizer Application	.20	.01
Hired labor for fallowing ($1.66/hr.)	.78	.06
Hired labor for planting ($1.84/hr.)	.08	.01
Subtotal	$ 17.09	$ 1.34
Summer operations up to harvest		
Hand labor	24.14	1.89
Chemical	4.61	.36
Summer tillage (cultivating, thinning, etc.)	2.21	.17
Chemical application	.68	.06
Hired labor for summer tillage ($1.66/hr.)	1.04	.08
Hired labor for chemical application ($1.68/hr.)	$ .06	$ .00
Subtotal	32.74	2.56
Harvesting	4.66	.37
Trucking	5.41	.43
Hired labor for harvesting ($1.85/hr.)	1.18	.09
Hired labor for trucking ($1.82/hr.)	3.72	.29
Subtotal	$ 14.97	$ 1.18
Leasing and custom	3.88	.31
Miscellaneous[3]	5.21	.41
Subtotal	$ 9.09	$ .72
Cover crop seed	.27	.02
Cover crop planting	.26	.02
Green manure seed	1.30	.10
Subtotal	$ 1.83	$ .14
Interest on operating capital[4]	3.41	.27
Total variable costs	$ 79.13	$ 6.21
Total costs	$142.08	$11.16

[1]Includes depreciation, taxes, insurance, and interest on investment for all machinery and trucks used in the sugarbeet operation.
[2]Land use represents $20 per acre land charge for two years.
[3]Miscellaneous includes labor procurement cost, excess freight, ton quota exam, etc.
[4]Interest on operating capital represents 9 per cent of one-half of the variable costs.

row cultivator. Total variable cost is divided into subtotals representing the variable costs incurred during various periods of production. The $32.74 per acre variable cost incurred from planting to harvest is the largest because of the $24.14 cost per acre for hand labor.

Fixed costs accounted for $62.95 of the $142.08 total cost. Fixed costs are those costs incurred regardless of whether production occurs or not. For example, the fixed cost for machinery represents the interest, taxes, housing and insurance paid on all machinery used in the sugarbeet enterprise. The major fixed cost was the land charge, which accounted for $40.00 of the total fixed cost.

Percentage Distribution of Sugarbeet Production Costs

The percentage distribution of the total production costs is presented in Table 3. Variable costs accounted for 56 per cent and fixed costs accounted for 44 per cent of the total cost. Land use was the single most significant cost item, accounting for 28 per cent of the total cost. Of the variable costs, all labor costs and all operating costs were of equal importance, each accounting for 22 per cent of the total cost, followed by the all materials cost at 12 per cent of the total cost.

Table 3. Percentage distribution of sugarbeet production costs, Red River Valley, North Dakota, 1968.

Item	Per cent of Total Cost
Variable costs	
Hand labor	17.0
Pre-harvest labor	1.4
Harvest labor	3.4
All labor	21.8
Fertilizer	6.1
Seed	2.9
Chemicals	3.2
All materials	12.2
Machine operating	15.3
Truck operating	3.8
Interest on operating capital	2.7
All operating	21.8
All variable costs	55.8
Fixed costs	
Machinery ownership	14.7
Housing ownership	1.4
Land use	28.1
All fixed costs	44.2

Fletcher and Era . . .

Two New Hard Red Spring Wheat Varieties From Minnesota

L. D. Sibbitt and R. C. Frohberg

INTRODUCTION

North Dakota has developed and maintained over the years, both in the domestic and export market, a reputation for the production of high quality hard red spring wheat. This has not come about by accident; indeed, it has been the dedicated effort of a vast number of scientists working toward a coveted goal. Over the years, more than 50 per cent of the U.S. hard red spring wheat has been produced in North Dakota. During the past 10-year period, hard red spring wheat exports have just about doubled. This has materialized at the expense of some of the other exporting countries. In addition, about 95 per cent of this export has been in the area of hard currency. This is a significant item, not only from the standpoint of the North Dakota farmer, but particularly from the standpoint of the U.S. government that is concerned about the opportunity to sell wheat for hard currency and to improve the U.S. international balance of trade. To maintain this image, it is imperative that we continue to develop, release and produce only those varieties that meet the requirements of both the domestic and foreign markets.

The release of two new semidwarf hard red spring wheat varieties, Fletcher and Era, was announced by the Minnesota Agricultural Experiment station on April 15. Both of these were included in North Dakota Agricultural Experiment Station tests in 1968 and 1969, and a total of 17 trials were grown over the two-year period at seven locations in North Dakota.

AGRONOMIC AND DISEASE DATA

Fletcher and Era demonstrated a high yielding capacity at all North Dakota locations in the 1969 variety trials (Table 1). When averaged over locations, Fletcher and Era both yielded significantly more than the three commercial varieties, Chris, Manitou and Waldron. Era had a yield advantage over Fletcher.

Table 1. Fletcher and Era compared with commercial HRS wheat varieties for yield in North Dakota Experiment Station Variety Trials, 1969.

	Variety				
Location	Chris	Manitou	Waldron	Fletcher	Era
Dickinson	39.8	42.5	42.6	45.9	54.7
Williston	27.1	28.1	16.5	32.7	33.7
Minot	51.4	54.7	48.6	57.1	66.8
Carrington, Dryland	46.0	46.6	44.5	53.3	58.1
Carrington, Irrigated	45.9	50.1	49.6	58.8	63.5
Langdon	53.7	66.6	66.8	66.3	68.3
Fargo	35.0	40.0	48.1	46.2	46.2
Average N.D. Locations	42.7	46.9	45.2	51.5	55.9
% of Chris	100	110	106	121	131

Fletcher and Era are three to four days later than Chris for heading date, better than Chris and about equal to Waldron for lodging resistance, and both are resistant to the prevalent races of stem and leaf rust (Tables 2 and 3). Both varieties are bearded, shattering resistant, and have a satisfactory test weight.

The yield and other agronomic data from the plots of the 1968 and 1969 Uniform Regional Hard Red Spring Wheat Nursery are shown in Table 3.

Table 2. Fletcher and Era compared with commercial HRS wheat varieties for other agronomic characters in North Dakota Experiment Station Trials, 1969.

Variety	Date Headed	Height (inches)	Lodging Score[1]	% Rust		Test Weight (lbs.)
				Leaf[2]	Stem	
Chris	7-6	39	5.7	Tr	0	60.6
Manitou	7-5	39	2.5	40MR-MS	0	60.5
Waldron	7-3	37	1.3	Tr	0	59.7
Fletcher	7-8	33	2.3	Tr	0	61.2
Era	7-8	33	2.3	Tr	0	60.5

[1]1 is erect; 9 is completely lodged.
[2]Tr, Trace; Mr, Moderately Resistant; MS, Moderately Susceptible.

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The yield superiority of Fletcher and Era is evident as in the field plot trials. When all the trials are considered, Fletcher yielded 20 per cent more than Chris and 10 per cent more than Waldron. Era had a yield advantage of 34 and 22 per cent over Chris and Waldron, respectively.

MILLING, BAKING AND PHYSICAL DOUGH DATA

Fletcher has been tested for quality in the North Dakota Field Plot Variety Trials for one year. In addition, it has been tested in North Dakota Nursery Plots for two years. Table 4 lists some of the pertinent average quality data for Fletcher and three conventional height commercial varieties grown at seven locations in North Dakota — 1969 crop. Fletcher is one of the few semidwarf wheats tested to date that has a visual kernel appearance akin to a typical hard red spring wheat. When compared with Chris, Fletcher is about the same in test weight, flour yield, flour ash, crust color and symmetry (general shape) of the baked loaf. A minor fault found in this wheat appears to be crumb grain and texture. The major faults consist of lower vitreous kernel content, wheat and flour protein contents, absorption, loaf volume, crumb color and mixing characteristics. Data accumulated on other samples of Fletcher substantiate, more or less, the findings reported here.

Based on this limited number of samples, it is found that Fletcher is 1.5 per cent lower than Chris in wheat protein content and 1.6 per cent lower in flour protein. It is 2.1 per cent lower than Chris in absorption, and produces a loaf volume about 88 per cent of the size of Chris. The color of the bread crumb is 1.1 units lower than Chris and the flour mixing properties are at a questionable level. Figure 1 depicts typical farinogram curves for Chris and Fletcher.

Table 5 presents data from another study involving the use of nitrogen fertilizer at two locations in North Dakota. It was found that the wheat protein content of Fletcher was still 1.2 per cent below Chris at equal fertilizer treatments. It was also 1.0 per cent below Chris when Chris had only light fertilization (7 pounds N per acre) and Fletcher was treated with 40 pounds of nitrogen. The absorption for Fletcher was 1.7 below Chris with equal fertilizer treatments and the loaf volume was still only 89 per cent the size of Chris. Mixing characteristics, as determined by the Farinograph, usually lower than Chris, were not affected by the highest nitrogen treatment. In general, even with the use of relatively large amounts of nitrogen fertilizer the wheat and flour protein contents, water absorption and loaf volume are still lower than the check variety, Chris, at both levels of nitrogen treatments.

Era also has been tested for quality in the North Dakota Field Plot Variety Trials for one year. It has, however, been under test for quality two years in the Nursery Plots. Table 4 lists some of the pertinent average quality data for Era.

Like Fletcher, Era also has visual kernel characteristics akin to hard red spring wheat. The test weight of this new semidwarf is almost the same as Chris. However, some 1968 test weight data placed Era significantly higher than Chris. The major faults of Era when compared with Chris are lower wheat and flour protein contents, absorption, dough handling properties, mixing characteristics, loaf volume, crumb color, crust color and symmetry of the loaf.

Based on seven samples for one year (Table 4), these data show Era to be 2.2 per cent and 2.3 per cent lower than Chris in wheat and flour protein contents, respectively. Era is also 0.7 per cent lower in wheat and flour protein than Fletcher. The absorption of this new semidwarf is 3.9 per cent lower than Chris and produced a loaf volume about 14 per cent smaller than Chris.

Table 3. Fletcher and Era compared with commercial HRS Wheat varieties for agronomic characters in the Uniform Regional Nursery at five North Dakota Locations, 1968 and 1969.

Variety	Date Headed	Height (Inches)	Lodging Score[1]	% Rust Leaf[2]	% Rust Stem	Test Weight (lbs.)	Yield (bu/A)	% Chris
1968								
Chris	7-4	37	4.7	Tr	0	57.1	35.2	100
Manitou	7-3	37	3.4	15MR	0	57.0	38.4	109
Waldron	6-30	37	1.5	TrMR	0	57.0	42.3	120
Fletcher	7-6	31	1.0	TrMR	0	57.1	43.3	123
Era	7-7	32	1.0	5M R	0	58.1	48.5	138
1969								
Chris	7-6	38	5.0	Tr	0	60.6	40.3	100
Waldron	7-4	37	1.5	Tr	0	59.5	41.7	103
Fletcher	7-9	33	1.7	Tr	0	60.4	46.7	116
Era	7-9	32	1.7	Tr	0	61.2	53.7	133

[1] 1 is erect; 9 is completely lodged.
[2] Tr, Trace; MR, Moderately Resistant.

Table 4. Pertinent Average Quality Data from Seven Locations in North Dakota for Fletcher, Era and Three Commercial Varieties — 1969 Crop.

Variety	Test Weight	Vitreous Kernels	Protein[1]		Absorption[1]	Loaf Volume	Crumb Color	Mixing		Farinogram Pattern
			Wheat	Flour				Time	Tolerance	
	lbs/bu	%	%	%	%	cc		min.	min.	
Chris	61.4	96	15.3	14.5	65.8	911	8.7	5.9	7.1	6
Manitou	60.9	96	15.1	14.3	64.6	832	8.0	5.6	5.5	5
Waldron	60.7	96	15.5	14.6	65.2	899	8.5	5.3	5.7	5
Fletcher	61.3	89	13.8	12.9	63.7	801	7.6	5.1	4.3	4
Era	61.7	93	13.1	12.2	61.9	792	7.6	5.2	5.1	4

[1]14.0% Moisture Basis.

The color of the loaf crumb is the same as Fletcher, which is 1.1 units lower than Chris. The mixing properties of Era are possibly a little better than Fletcher but still significantly lower than Chris. A typical farinogram for Era is shown in Figure 1.

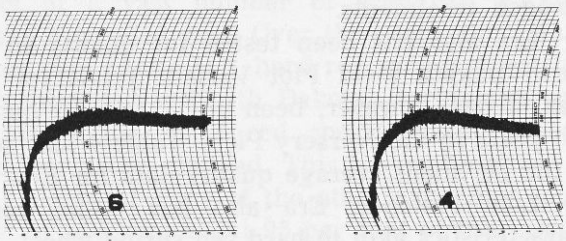

Figure 1. Farinograms used to determine mixing time and mixing tolerance. Evaluation 6 represents Chris. Evaluation 4 represents Fletcher and Era.

Pertinent data are presented in Table 5 for Era, which also was included in the fertilizer study (reported for Fletcher and Chris). In this experiment these data showed that for the highest level of fertilization, Era was 2.7 and 2.9 per cent below Chris in wheat and flour protein content, respectively. It was also 4.2 per cent lower than the comparably grown Chris in water absorption and produced loaves of bread about 15 per cent smaller. Even when Era at the highest fertilizer level is compared with Chris at the lowest fertilizer treatment, the wheat and flour protein contents are 2.5 per cent lower in both instances. In this same comparison, the absorption is 3.8 per cent lower and the loaf volume 14 per cent smaller. Mixing characteristics also were significantly lower than the check variety, Chris.

In general, the overall quality of Era, even at the highest level of fertilizer treatment was still much below the characteristics displayed by Chris for both the high and low fertility treatments.

SUMMARY

From an agronomic standpoint, both Fletcher and Era are acceptable. However, based on these limited quality data over a period of two years, it appears that both Fletcher and Era show an undesirable and consistent, excessively low protein content, low absorption, low loaf volume and certain other characteristics which classifies both of these varieties as unacceptable for commercial production in North Dakota for a typical high quality hard red spring wheat. Should any new varieties having the objectional quality characteristics exhibited by Fletcher and Era be produced in substantial amounts in North Dakota, markets, both foreign and domestic, now in its possession might be lost.

The North Dakota Agricultural Experiment Station, North Dakota State University, Fargo, is not cooperating in the release of Era and Fletcher wheats. No Foundation or Registered seed of Era or Fletcher wheat will be accepted for increase and release in North Dakota by North Dakota Agricultural Experiment Stations. Therefore, no allotments of seed of Era or Fletcher wheat will be made to counties in 1970 or 1971.

Table 5. Pertinent Average Quality Data for Fletcher, Era and Chris from Fertilizer Plots Grown at Two Locations in North Dakota — 1969 Crop. Also Data for Chris Grown Comparably with Relatively Light Fertilizer Treatment.

Variety	Test Weight	Vitreous Kernels	Protein[1]		Absorption[1]	Loaf Volume	Crumb Color	Mixing		Farinogram Pattern
			Wheat	Flour				Time	Tolerance	
	lbs/bu	%	%	%	%	cc		min.	min.	
Chris[2]	61.5	96	15.6	14.6	65.6	842	9.0	5.2	5.4	5
Chris[3]	61.7	96	15.8	15.0	66.0	852	9.0	5.2	5.6	6
Fletcher[3]	61.6	90	14.6	13.4	64.3	762	8.0	5.0	4.6	4
Era[3]	62.8	95	13.1	12.1	61.8	728	7.2	5.0	4.4	4

[1]14.0% Moisture Basis.
[2]Fertilization 7 pounds N per acre.
[3]Fertilization 40 pounds N per acre.