Agricultural Economics Report
Number 1

February 1951

PROSPECTIVE MARKETING POSITION OF FARM PRODUCTS ADAPTABLE TO IRRIGATION IN NORTH DAKOTA

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Objectives of the Study

(1) To determine the market outlook -- local, national, and international -- for the agricultural commodities which are adapted to irrigation in the Missouri River Basin and production of which is likely to be increased significantly as a result of the Missouri River Basin development.

(2) To provide a basis to be used in conjunction with production data in determining the probable competitive position of various agricultural commodities in the Missouri River Basin.

(3) To determine the probable need for additional marketing facilities and means of maximizing the use of marketing facilities now available in the various areas.

Before examining the market prospects of various farm products likely to be expanded with the irrigation development in North Dakota, the present position of the Missouri River Basin in the national market, and of North Dakota in the production pattern of the Basin, is presented. Such a review places the production potentials of North Dakota in proper perspective with respect to the regional and national supply situations prevailing at present.

1/ This study is undertaken under a cooperative agreement between the North Dakota Agricultural Experiment Station (Project ND 701) and the Bureau of Reclamation, U.S. Dept. of the Interior, Region 6.

2/ Assistant Agricultural Economist. The author acknowledges the cooperation and valuable advice received from R. Schickele and other members of the Department of Agricultural Economics, and from Wallace McMartin and other members of the Bureau of Reclamation.

Importance of Missouri River Basin Agriculture

Recent production figures for the principal agricultural commodities in the seven Basin States of North Dakota, South Dakota, Nebraska, Kansas, Montana, Wyoming, and Colorado are shown, for two reasons: (1) to indicate how important the region now is agriculturally, and (2) to get some idea of the present relative importance of agricultural commodities suited to the proposed irrigation areas in North Dakota.

The gross receipts from agricultural production from the seven Basin States accounted for about one-seventh of the U.S. agricultural production in recent years (see Table 1). North Dakota's contribution to the gross cash farm income of the Basin States was about one-seventh.

Table 1. Gross Farm Income: Seven Basin States as percent of U.S., and North Dakota as percent of Basin States*

	1936-45	1946	1947
	(percent)		
Seven Basin States in percent of U.S.	12.9	13.6	15.0
North Dakota in percent of Basin States	14.4	14.6	14.9

* Derived from Agricultural Statistics 1948 and earlier years; cash receipts from farming and value of products consumed on farms.

In terms of output, the seven States produce about 50 percent of the U.S. barley, rye, and wheat; 40 percent of all flax and sugar beets; 20 percent of all oats and alfalfa hay; and about 12 percent of the nation's corn and potatoes. As to livestock, this region produces about 30 percent of the U.S. sheep, 25 percent of its cattle, and a little over 10 percent of all chickens, eggs, hogs, and milk.

North Dakota produces over one-half of the Basin's flax, about one-third of its barley, rye and potatoes, 20 percent of its milk, and 10 percent of its other livestock products. (See Table 2.)

Table 2. Seven Missouri River Basin States Production: Regional production in percent of U.S., and North Dakota in percent of region.*

Commodity	Basin States Production in percent of U.S.			North Dakota in pct. of Basin States		
	1936-45	1946	1947	1936-45	1946	1947
	percent	percent	percent	percent	percent	percent
Wheat	47.4	52.3	51.7	25.1	23.2	20.7
Corn	11.8	14.1	12.6	6.3	5.7	8.1
Barley	43.7	49.0	49.5	30.6	35.5	36.5
Oats	18.6	19.8	23.3	24.2	21.0	21.9
Rye	52.0	49.6	51.9	34.2	23.0	32.3
Flax	39.4	43.0	47.9	56.8	50.9	59.9
Potatoes	12.8	12.3	14.2	32.4	31.5	36.7
Truck crops	28.6	29.1	30.8	....	....	....
Alfalfa hay	19.6	22.5	24.1	3.3	3.3	2.9
Sugar beets	44.8	41.4	40.2	3.6	3.9	3.2
Eggs	11.1	11.5	11.6	9.0	9.1	9.1
Chickens	13.4	13.1	12.6	11.2	10.9	10.3
Hogs	12.3	12.4	12.1	10.1	8.9	8.0
Sheep	28.8	29.8	28.4	7.6	7.2	6.7
Cattle	22.4	24.7	24.1	9.9	9.8	9.3
Milk	10.3	9.1	8.9	18.2	18.2	18.5
Wool (shorn)	27.6	27.7	26.6	7.2	6.6	6.4

* Derived from Agricultural Statistics 1948 and earlier years.

Some Projections of Potential Production under New Irrigation

1. The Missouri River Basin

Assuming that the region is at present producing those farm commodities in which its advantages are the greatest or its disadvantages the least, what shifts in agricultural production can be expected if large new areas will come under irrigation?

At least a partial attempt has been made to answer this question in a recent BAE publication.[1] This report contains estimates on present and anticipated production on lands proposed for irrigation. A large part of the data of the report is based on preliminary estimates made by the Bureau of Reclamation in 1948 and earlier years.

[1] Henderson, S. Changes in Crop Production Anticipated from Proposed Irrigation and Reservoir Development in the Missouri River Basin, USDA, BAE, Feb. 1950.

Such estimates include present and anticipated acreage of various crops, expected long-time average yields, and the value of production based on 1939-44 farm prices. These estimates may, of course, be changed as detailed studies are made of the Basin. A brief resume of some interesting highlights in the BAE report which pertain to the project at hand is given here.

There are at present about 5,000,000 irrigated acres in the seven Basin States. Proposed new irrigated acreage is expected to be around 5,233,000 acres. In addition, more water is to be applied to around 1,943,000 acres already under irrigation.1/

The State of North Dakota now has about 29,000 acres of irrigated land. It is proposed to bring in about 1,225,000 additional acres under irrigation in that State.2/

While the number of acres under irrigation in the Basin States would be more than doubled, the proposed new acreage represents only about 5 percent of the present cropland, or 1.5 percent of the total land area of the Basin. For North Dakota, the new irrigation is equal to 6 percent of the present cropland, or about 3 percent of the total land area of the State.3/

For the Basin as a whole, only 181,000 additional acres not used for crops now would be brought under cultivation as a result of this proposed new irrigation. Marked changes, however, would result in the acreage of specific crops and summer fallow under irrigation. Wheat could decrease from 1,200,000 acres (23 percent of the land area proposed for irrigation) to 73,000 acres (1 percent of that area). Fallow could decrease from 826,000 acres to 4,000 acres. The largest acreage increases could be expected for alfalfa hay, sugar beets, and potatoes. At present there are around 160,000 acres of alfalfa on the total land area proposed for new irrigation. This could be increased to 1,540,000 acres, or 29 percent of that area. No sugar beets are assumed to be grown now on the land to be irrigated, but around 500,000 acres, or 10 percent of the acreage, could be grown under irrigation. Potatoes could increase from about 1,000 acres to around 150,000 acres.4/

Irrigation would have its greatest effect in terms of increased production rather than in increased crop acres. The crops that would show the biggest changes in production are alfalfa hay, potatoes, and sugar beets. The Basin production of alfalfa hay would be increased by two-thirds, that of potatoes by about one-half, and that of sugar beets by one and two-thirds times. Compared with present national supplies, sugar beet output would be increased by 75 percent.

1/ Ibid p.54.
2/ Ibid p.55
3/ Ibid p.55
4/ Ibid p.15

Table 3. Present and anticipated production of specific crops on land proposed for new and supplemental irrigation - Missouri River Basin.

Crop	Unit	Production *			Anticipated increase or decrease as percentage of present production		
		Present	Anticipated	Increase or Decrease	On lands for irrigation	7 Basin States **	United States **
		(thousands)	(thousands)	(thousands)	(percent)	(percent)	(percent)
Wheat	bu.	19,017	3,328	-15,689	-82.5	-3.7	-1.8
Barley	bu.	15,596	26,081	10,485	67.2	8.4	3.6
Corn	bu.	27,550	52,241	24,691	89.6	7.9	0.9
Oats	bu.	12,897	21,113	8,216	63.7	3.8	0.7
Alfalfa	ton	1,427	5,391	3,964	277.8	65.6	12.9
Potatoes	bu.	10,867	35,783	24,916	229.3	51.6	6.6
Sugar beets	ton	2,228	9,435	7,207	323.5	167.4	74.9

* Adapted from Table 8, p.19, BAE report, Changes in Crop Production Anticipated from Proposed Irrigation and Reservoir Development in the Missouri River Basin, by Sidney Henderson and based on data from the Bureau of Reclamation.

** As percent of 1936-45 average production for 7 Basin States and U.S., from Agricultural Statistics, 1948 and earlier years.

In terms of dollars, the most important crops would be sugar beets, alfalfa hay, and potatoes.[1] Sugar beets would make up 31 percent of the anticipated value of all crop and pasture production on the new irrigated land, alfalfa hay 20 percent, corn 17 percent, and potatoes 11 percent.

If this production pattern would materialize under the new irrigation development, the Basin value of production at 1939-44 prices would increase from a present value of $40,984,000 under dryland conditions to an anticipated value of $176,320,000 under irrigation, or a four-fold increase in value of $135,336,000. On the land requiring supplemental water, the Basin would yield an increase of another $24,700,000, making a total estimated increase from irrigation of about $160 million. North Dakota could expect an increase from a present value of $9,344,000 to an anticipated value of $49,190,000, or a five-fold increase of $39,846,000.[2]

Some shortcomings of the estimates.-- These projections present a pattern of crop production under certain assumed conditions of suitability of physical factors (climate, soils, and topography) and past price relationships. To make this part of the picture complete, a corresponding production pattern of livestock and livestock products under irrigation is needed. However, it is much easier to evaluate the projections as they now stand. Any such evaluation, of course, requires a close examination of the assumptions on which the projections are based.

The land use projections for new irrigation are largely derived from patterns existing at present in established irrigation projects. The resulting large increases in sugar beets and potatoes are hardly compatible with the constancy of price relationships assumed in the value projections, nor with the general market prospects in the long run. At least for these two commodities, if these projections should materialize, production costs would have to be remarkably favorable as compared to those in old established areas in order to meet regional competition. An increase of 75% in sugar beet production would require a drastic change in U. S. sugar policy.

A closer examination of the long-range demand prospects for the crucial farm products will be presented in a subsequent section of this report.

2. The Missouri Souris Division

In the preceding section an attempt was made to show how the crop production could be affected as a result of new irrigation in the Missouri River Basin. It appears worthwhile to carry forth similar projections for proposed new irrigation within the State of North Dakota.

1/ 1939-44 prices as used by the Bureau of Reclamation and appearing in op. cit. table 13, p.25 and table 48 p.70.

2/ Op cit. Table 36, p.58.

The land proposed for new irrigation in North Dakota is divided into five divisions of irrigable 1/ acreage as follows: (1) Missouri-Souris Division, 1,107,000 acres; (2) North Dakota Pumping Division, 69,120 acres; (3) Knife Division, 15,400 acres; (4) Heart Division, 13,915 acres; (5) Cannonball Division, 20,390 acres; or a total of 1,225,825 acres for the State. (See Table 4.)

Table 4. Missouri-Souris (North Dakota portion) and other Divisions showing acreage proposed for new irrigation, by subdivisions. *

Division and unit	New land**
	(acres)
Missouri-Souris Division (N. Dak. portion):	
Crosby-Mohall Unit	1,000,000
New Rockford	55,000
Jamestown and Oakes	52,000
North Dakota Pumping Division (15 units)	69,120
Knife Division	15,400
Heart Division:	
Dickinson Unit	915
Heart Butte Unit	13,000
Cannonball Division:	
Cannonball Unit	12,390
Thunderhawk Unit	8,000
Total for North Dakota	1,225,825

* Supplied by U.S.Dept. of Interior, Bur. of Reclamation, Missouri-Souris District, Bismarck, N.Dak.

** There is no supplemental irrigation in this division.

The Missouri-Souris Division has been further subdivided into Units. The largest of these is the Crosby-Mohall Unit, consisting of roughly about 1,000,000 irrigable acres in the northwestern part of the State. This Unit will be used in the making of projections of potential production under irrigation of the Missouri-Souris Division, because: (1) it is by far the largest Unit for which irrigation is proposed in North Dakota, and (2) it is also the one Unit in the State that could exert a marked influence on the relative importance of agricultural commodities in the State, should later soil studies back up the preliminary findings. 2/

1/ Considered irrigable on the basis of preliminary soil surveys and, as more soil surveys are made, this may be changed.

2/ The recent findings from the Bowbells Block Survey do not necessarily vitiate the following analysis, if sufficient irrigable land can be found by moving the project area farther east.

To get a rough idea of the present cropping system of the Crosby-Mohall Unit, the proportion of land devoted to various crops was assumed to be the same as those of Renville [1]/ County. (See Table 5.) These percentages were applied to the 1,000,000 acres, to determine the number of acres of each crop in the Unit. Then Renville County yields [2] were applied to the resulting acreage of each crop and the approximate present production was determined. (See Table 6 and 7.)

Such projections of the possible production under irrigation are of necessity rough approximations. Reliance on the use of yield data and cropping systems of existing projects having similar characteristics was not entirely satisfactory because none had completely similar characteristics: (1) The growing season of the Crosby-Mohall Unit is 121 days, while that of other projects is around 130 days. (2) No existing project had a similar location with respect to local, regional, and national markets -- which might also affect, to a large extent, what crops are grown. (3) In many respects the soils of the existing projects are dissimilar to those of the Crosby-Mohall Unit.

In order to use the cropping systems of the existing projects, it was necessary to make two assumptions: (1) that the existing variation in climatic factors is not sufficient to affect cropping systems and yields to a marked degree; (2) that the soils are sufficiently similar in the existing projects and the proposed irrigation area.

With those general assumptions in mind, the 1948 cropping system of the existing projects of Lower Yellowstone (North Dakota and Montana), Milk River (Montana), and Shoshone (Wyoming) were selected. (See Table 5.) These were applied to 1,000,000 acres to get the acreage of the respective crops. Then the 10-year average yields of the Lower Yellowstone project were applied to the acreage to get the total production of each crop. (See Tables 6 and 7.)

An examination of Table 5 will show that nearly half of the present acreage is devoted to wheat production, a smaller percentage to other grains, only about 0.1 percent of the acreage in potatoes, and none in sugar beets. Under irrigation, the big change would be a decrease in the acreage of wheat, a considerable portion of the acreage devoted to alfalfa hay and sugar beets, and somewhat of an increase in potato acreage.

With a cropping system like that of the Lower Yellowstone project, the wheat acreage would be decreased from 44.6 to 21.6 percent of the acreage, the acreage of alfalfa would increase from 0.1 to 19.0 percent, and that of sugar beets from none to 18.8 percent. A similar comparison for a cropping system like that of the Milk River project would show only 15.6 percent of the acreage devoted to wheat, nearly 1/4 of it devoted to alfalfa, 9.2 percent to sugar beets. For a cropping system

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1/ Renville County percentages were used because about 95 percent of the county falls within the proposed irrigation area of the Crosby-Mohall Unit. The most recent available figures on Renville County are for the year 1944 -- source, Census of Agriculture 1945.

2/ State yields were applied where Renville Co. yields were not available.

Table 5. Comparison of present cropping system with alternative systems after irrigation, Crosby-Mohall Unit, Missouri-Souris Division.

Crop	Percent of cultivated land under irrigation with			
	Estimated present 1/	Lower Yellowstone or grain-sugar beet system 2/	Milk River or forage-grain system 3/	Shoshone or forage-vegetable system 4/
	(percent)	(percent)	(percent)	(percent)
Grains				
Wheat	44.6	21.6	15.6	5.0
Barley	10.5	8.7	10.4	7.3
Corn	0.2	1.7	0.3	less than 0.1
Oats	7.3	15.1	8.5	12.3
Other grains (incl. flax)	8.8	0.2	0.1	0.1
Total grains	71.4	47.3	34.9	24.7
Hay, Forage & Seed				
Alfalfa	0.1	19.0	24.5	14.6
Other hay and forage	8.3	6.0	14.6	16.6
Pasture	2.1	3.7	9.7	9.4
Total hay, forage, seed	10.5	28.7	48.8	40.6
Vegetables				
Potatoes	0.1	1.6	1.5	1.3
Other truck crops	...	1.7	0.2	31.1
Sugar beets	...	18.8	9.2	2.3
Soil building & summer fallow	18.0	1.9	5.4	...
Total percent cultivated acreage	100.0	100.0	100.0	100.0
Total cultivated acreage (million acres)	1.0	1.0	1.0	1.0

1/ Renville County percentages of crops applied to Crosby-Mohall Unit.
2/ Lower Yellowstone (N. Dak. and Mont.) percentages of crops applied to Crosby-Mohall Unit.
3/ Milk River (Montana) percentages of crops applied to Crosby-Mohall Unit.
4/ Shoshone (Wyoming) percentages of crops applied to Crosby-Mohall Unit.

Table 6. Assumed effect of irrigation upon acreage of selected crops, Crosby-Mohall Unit, Missouri-Souris Div.

Crop	Acres of selected crops[1] under irrigation				Per acre yields of selected crops	
	Estimated present	With grain-sugar beet system	With forage-grain system	With forage-vegetable system	Estimated present [2]	Under irrigation [3]
	(thousand acres)		(thousand acres)			
Wheat	446	216	156	50	15.1 bu.	28.1 bu.
Barley	105	87	104	73	20.6 bu.	36.7 bu.
Corn	2	17	3	..	18.9 bu.	32.2 bu.
Oats	73	151	85	123	28.3 bu.	49.7 bu.
Alfalfa	1	190	245	146	....	2.1 tons
Potatoes	1	16	15	13	....	[4] 148.4 bu.
Sugar beets	...	188	92	23	....	12.3 bu.

1/ Percentage of above crops as in Table 5, applied to 1,000,000 acres.

2/ Renville County, 1940-49 average, (planted acreage).

3/ Yields as on Lower Yellowstone project. (9-year average planted acreage yields covering period 1939-48 but excluding 1945. Source: Bur. of Reclamation, Data on Acreages, Crops, Water Deliveries, Costs, Revenues, and Settlement 1939-1944 and 1946-1948.

4/ Anticipated yield on lands proposed for new irrigation, Missouri Basin. (Calculated by dividing anticipated production of potatoes by anticipated acreage of potatoes on land proposed for new irrigation in the Missouri Basin. Source: Changes in Crop Production Anticipated from Proposed Irrigation on Reservoir Development in the Missouri River Basin, USDA, BAE, Tables 6 and 8, pp.15 & 19.

Table 7. Assumed effect of irrigation upon production of selected crops. Crosby-Mohall Unit, Missouri-Souris Div.

Crop and unit	Total production of selected crops under irrigation				Anticipated changes in production as a result of irrigation		
	Estimated present 1/	With grain-sugar beet system	With forage-grain system	With forage-vegetable system	With grain-sugar beet system	With forage-grain system	With forage-vegetable system
	(thousands)	(thousands)	(thousands)	(thousands)	(percent)	(percent)	(percent)
Wheat ..... bu.	6,735	6,070	4,384	1,405	-10.0	-35.0	-79.0
Barley ..... bu.	2,163	3,193	3,817	2,679	48.0	76.0	24.0
Corn ..... bu.	38	547	97	...	1339.0	155.0	...
Oats ..... bu.	2,066	7,505	4,224	6,113	263.0	104.0	196.0
Alfalfa ..... ton	...	399	514	307	...	...	...
Potatoes .... bu.	...	2,374	2,226	1,929	...	...	...
Sugar beets.. ton	...	2,312	I,132	283	...	...	...

1/ Production (rounded off to nearest thousand) calculated by using acres as in Table 6 multiplied by yields.

2/ Acreage under irrigation times yields as in Lower Yellowstone Project.

3/ Present acreage times present yields.

like that of the Shoshone, only 5 percent of the acreage would be devoted to wheat, 14.6 percent to alfalfa, and only 2.3 percent to sugar beets. Under all three of the cropping systems, the potato acreage would be about the same--approximately 1.5 percent of the acreage.

It would perhaps be more meaningful if the differences between the three cropping systems mentioned in the preceding paragraph were stated in qualitative terms. On that basis, a cropping system like that of the Lower Yellowstone Project is essentially a grain-sugar beet system; that of the Milk River Project, a forage-grain system, and that of the Shoshone Project is a forage-vegetable system. Because of physical and economic factors involved, the chances are the cropping system of the Crosby-Mohall Unit will approach a forage-grain system more than the others.

Depending on which system is used, for North Dakota the decrease in wheat production under irrigation would be from zero to 5 percent. The increase in barley production would be from 1 to 4 percent, that of corn from zero to 2 percent, and that of oats from 4 to 10 percent. But the most striking changes would result in the State's production of alfalfa hay, potatoes, and sugar beets. Under irrigation, alfalfa hay production could be increased from 152 to 198 percent, potatoes 12 to 15 percent, and sugar beets 180 to 1500 percent. (See Table 8)

For the Basin, the decrease in wheat production would be less than one percent. The increase in alfalfa hay could be from 5 to 8 percent of total Basin production, that of potatoes 4 to 5 percent, and that of sugar beets 7 to 54 percent.

The national production of all grains would hardly be affected at all by decreases in wheat and increases in the production of other grains in the Crosby-Mohall Unit under irrigation. But the nation's production of alfalfa hay would be increased by 1 to 2 percent, and of sugar beets by 24 percent under the grain-sugar beet system and 12 percent under the forage-grain system.

Appraising Future Market Outlets

Any evaluation of production alternatives must be tied to the demand outlook for products grown under irrigation. The major efforts of this project are concerned with appraising demand potentialities of those commodities. In that connection, literature on trends in consumption as well as of family budgets was examined. A resume of preliminary findings and interpretations is presented.

1. Trends in Consumption of Selected Basin Products

The most readily available source of per capita consumption estimates is the disappearance data of the U. S. Department of Agriculture, which are derived as follows: "From the annual supply of each food (production plus beginning stocks plus imports) are deducted feed and seed used, industrial uses, exports and shipments, government purchases, and ending stocks. The residual is considered to be civilian consumption." 1/

1/ USDA Misc. Pub. No.691, Consumption of Food in the United States, 1909-48, p.1.

Table 8. Anticipated changes in production of selected crops as a result of assumed irrigation in the Crosby-Mohall Unit, in North Dakota, and in the Seven Basin States.

Crop and unit	Present production 1/			Anticipated changes in production as a result of irrigation in the Crosby-Mohall Unit					
				North Dakota			Basin States		
	North Dakota	Basin States	United States	2/	3/	4/	2/	3/	4/
	(thousands)	(thousands)	(thousands)	(pct.)	(pct.)	(pct.)	(pct.)	(pct.)	(pct.)
Wheat ..... bu.	106,205	422,389	890,306	5/	-2.0	-5.0	5/	5/	-1.0
Barley ..... bu.	38,287	125,501	287,360	3.0	4.0	1.0	1.0	1.0	5/
Corn ..... bu.	21,260	311,885	2,639,102	2.0	5/	...	5/	5/	...
Oats ..... bu.	52,008	215,728	1,161,282	10.0	4.0	8.0	2.0	1.0	2.0
Alfalfa ..... ton	201	6,046	30,840	198.0	255.0	152.0	7.0	8.0	5.0
Potatoes .... bu.	15,616	48,260	376,122	15.0	14.0	12.0	5.0	4.0	4.0
Sugar beets . ton	156	4,306	9,617	1508.0	728.0	183.0	54.0	26.0	7.0

1/ 1936-45 average.

2/ Grain-sugar beet cropping system as of Lower Yellowstone Project.

3/ Forage-grain cropping system as of Milk River Project.

4/ Forage-vegetable cropping system as of Shoshone Project.

5/ Less than one percent.

These data have several limitations which restrict their usefulness. Because the disappearance data for the several foods are obtained at various levels of distribution, there is a wide gap between these estimates derived in terms of primary distribution weights and actual consumption in the home. Then too, there are limitations in the statistical accuracy of the basic data. Also, per capita consumption estimates are national averages which do not reflect any changes in the makeup of the population and disregard the differences between seasons of the year, regions, urban and rural habits, family size and income, age composition, occupational differences, and many other factors.1/ Yet, with all these limitations, the disappearance data are the most complete set of data on per capita consumption available.

Dairy Products

In the prewar period of 1935-39 the average per capita consumption of all milk was 801 pounds (Table 9). A high point of 813 pounds was reached in 1946. At present (1949) it is about 763 pounds.

Prewar consumption of fluid milk and cream was about 340 pounds per capita annually. In 1946, it rose to 423 pounds per person. Now it is about 50 pounds above prewar and 33 pounds below the 1946 peak.

While per capita cheese consumption has risen one third since prewar, the butter consumption has dropped from 16.7 pounds per person to only 10.5 in 1946. There has been very little change in per capita butter consumption during the past three years.

The consumption of ice cream per person has nearly doubled in recent years. The average for 1935-39 was 9.5 pounds, and in 1946 it was as high as 22.5 pounds. During the past three years an average of about 17 pounds were consumed.

Meats

Average consumption of all meats for the 1935-39 period was 126.2 pounds per person (Table 9). It rose to a high of 155 pounds per capita in 1947. In 1950, 145 pounds per person were consumed.

Consumption of beef has risen between 12 and 15 percent from a prewar average of 55.2 pounds per capita. As much as 69.1 pounds were consumed per person in 1947. In 1950, 63 pounds were consumed.

The high point in veal consumption was reached in 1947 at 10.7 pounds per capita. The 1950 consumption was 8.2 pounds per person, which was a decrease of 6 percent from 1949.

The per capita consumption of lamb and mutton has declined steadily since prewar. In the 1935-39 period, consumption was 6.8 pounds per person, and in 1950 it was only 3.9 pounds.

In 1946, the per capita consumption of pork was 75.6 pounds, or about 20 pounds more than that of prewar. In 1950 the consumption rate of pork was 69.9 pounds per person.

1/ USDA Misc. Pub. No.691, Consumption of Food in the U.S. 1909-48, p.1.
2/ Ibid.

Table 9. Per capita consumption of selected food commodities, calendar years, 1935-39 average, 1946, 1947, 1948, 1949, and 1950, with percentage comparison. 1/

Commodity	Average 1935-39	1946	1947	1948	1949	1950 Prelim.	1950 as a percentage: of 1935-39	1950 as a percentage: of 1949
	(pounds)	(pounds)	(pounds)	(pounds)	(pounds)	(pounds)	(percent)	(percent)
Dairy Products								
Total milk (whole milk equiv, incl.butter)	801	813	794	750	760	763	95	100
Fluid milk & cream	340	423	398	387	385	390	115	101
Butter (actual wt.)	16.7	10.5	11.2	10.0	10.5	10.5	63	100
Cheese	5.5	6.6	6.9	6.8	7.2	7.1	129	99
Ice cream (product wt.)	9.5	22.5	19.3	17.1	...	...	...	...
Meats (carcass weight)	126.2	153.4	155.0	146.4	143.9	145.1	115	101
Beef	55.2	61.3	69.1	63.3	63.5	63.1	114	99
Veal	8.1	9.9	10.7	9.4	8.7	8.2	101	94
Lamb and mutton	6.8	6.6	5.4	5.0	4.1	3.9	57	95
Pork (excluding lard)	56.1	75.6	69.8	68.7	67.6	69.9	125	103
Poultry Products								
Eggs 2/	37.3	46.8	47.4	48.2	47.4	48.0	129	101
Chickens (dressed wt.)	17.9	25.4	23.6	23.0	25.3	26.0	145	103
Vegetables								
Fresh	235	272	252	261	251	258	110	103
Potatoes	131	127	124	112	108	108	82	100
Sugar (refined)	97.0	74.4	91.1	95.6	95.6	96-100	101	103

(continued on next page)

Table 9 - continued)

Commodity	Average 1935-39	1946	1947	1948	1949	1950 Prelim.	1950 as a percentage: of 1935-39	1950 as a percentage: of 1949
	(pounds)	(pounds)	(pounds)	(pounds)	(pounds)	(pounds)	(percent)	(percent)
Grains								
Corn products:								
Cornmeal	22.9	15.9	14.6	14.5	13.5	13.5	59	100
Corn sirup	7.6	11.8	12.3	8.2	8.5	9.0	118	106
Cornstarch	1.3	1.8	1.9	1.7	1.8	1.9	146	106
Corn sugar	2.7	3.8	4.5	4.0	4.1	4.5	167	110
Breakfast cereals	1.6	2.0	1.7	1.5	1.5	1.5	94	100
Hominy	1.4	2.4	2.4	2.4	2.7	2.7	193	100
Oatmeal	3.9	3.7	3.5	3.2	2.9	2.9	74	100
Barley food products 3/	1.4	2.0	1.9	1.5	1.5	1.5	107	100
Wheat:								
Flour 4/	153	154	136	136	135	135	85	100
Breakfast cereals	3.7	3.3	3.3	3.3	3.3	3.3	89	100
Rye flour	2.2	1.8	1.3	1.4	1.4	1.4	64	100

1/ Population estimates used to obtain per capita consumption figures are official census estimates of total population adjusted for underenumeration of children under 5 and for military personnel not eating out of civilian supplies. Weights at various (wholesale) distribution levels; e.g., meats and poultry are measured at the wholesale dressed-weight level; fluid milk and cream, fresh fruits and vegetables, eggs, and grains, at the farm level, but with adjustments for reported distributors' stocks; and processed fruits and vegetables, sugar, and dairy products (other than fresh milk) are measured at the processors' level. Data on calendar year basis.

2/ In terms of number of eggs, the apparent per capita consumption was 298 in 1935-39, 374 in 1946, 379 in 1947, 386 in 1948, 379 in 1949, and 384 for 1950.

3/ All barley food products in terms of malt equivalent.

4/ Includes white, whole wheat, and semolina flour.

(Adapted from Table 3, p.4, National Food Situation, Jan.-Mar. and Oct.-Dec. 1950, USDA, BAE)

Poultry Products

During the prewar (1935-39) the consumption of eggs was 298 per capita (Table 9). In more recent years, the trend in consumption has been upward, and in 1950 it was 384, or nearly one third above the prewar level.

The prewar consumption of chicken averaged 17.9 pounds per capita. The war peak in consumption was reached in 1946 at 25.4 pounds per person. The 1950 figure is at 26 pounds per capita, or about 45 percent above the 1935-39 figure.

Vegetables

The long-time per capita trend in consumption of fresh vegetables has been upward. From a consumption of 235 pounds per person average for the 1935-39 period, a postwar peak of 272 pounds was reached in 1946. The 1950 figure of 258 pounds per capita is about 10 percent above prewar.

On the other hand, the long-time per capita rate of potato consumption has been steadily downward. From a consumption rate of 131 pounds per person as an average for the 1935-39 period, it has declined to 108 pounds in 1950.

Sugar

In recent years no marked trends in the domestic consumption of sugar have been noted. With the exception of 1946, in no year has the rate of consumption been less than 94 percent of the 1935-39 average of 97 pounds.

Grains

The long-time domestic per capita consumption of grain products has been downward. In the case of corn, per capita consumption has decreased for certain uses, while it has increased for others. The postwar consumption of cornmeal is about 1/3 below the 1935-39 average, while the consumption of corn sirup, corn starch, corn sugar, and hominy has increased from prewar. Domestic consumption of breakfast cereals made from corn has remained about the same as prewar.

The per capita consumption of all wheat, oats, and rye products has declined since prewar, while that of barley products has remained unchanged.

2. Evaluation of Consumption Trends

These trends in per capita consumption not only reflect changes in demand but also in supply. They are the final outcome of all the cost and price factors, the conditions of physical production, international trade, consumer preferences, and population growth. Changes in per capita consumption rates, however, are indicative of trends in consumption patterns and demand shifts, and as such are relevant to the Missouri Basin development.

A study of Table 9 reveals that as compared with the prewar period, per capita consumption of fluid milk, cream, and ice cream has increased substantially, even though total milk supply available per person has declined. This suggests a relatively strong demand position of these products, in contrast to butter, whose per capita consumption declined over 40 percent from the prewar level.

Similarly, meats, chickens and eggs show a remarkable increase in per capita consumption. On the other hand, potatoes, wheat and rye products, and sugar are down.

Looking into the future, new irrigation farmers, generally, can be expected to find more or less favorable market outlets for increased supplies as follows:

General Domestic Market Prospects

More favorable	Less favorable
Fluid milk	Butter
Cream	Potatoes
Ice Cream	Sugar
Cheese	Wheat
Chickens	Rye
Eggs	
Pork	
Beef	
Fresh Vegetables	

In the light of these considerations, the potential output increases for potatoes and sugar beets outlined in a previous section might run into serious marketing and price trouble. With butter, although national demand prospects are not strong, there may be a geographic shift in production from major fluid milk sheds into the outlying areas, including the Great Plains. In that case, butter production in North Dakota and especially in irrigation areas, could find the necessary market outlets.

But irrigation farmers in the Basin may want to produce commodities in the "less favorable" column even though their costs are higher than those of farmers in established producing areas. This will be true if they have a still greater disadvantage in producing those commodities in the "more favorable" column. With respect to sugar, of course, legislation and policies of sugar companies will play a decisive role in determining the scope of sugar beet production in the new irrigation areas of the Basin.

Apart from consumption trends, it is useful to examine consumers' responses to changes in price and income. A ten percent decrease in price may cause consumers to increase their purchases of one commodity by more than 10 percent (elastic demand), of another by less than 10 percent (inelastic demand). If income is held constant, an increase in the supply of a given product usually will bring about a decline in price. The smaller this price decline, the better the market prospects for that commodity.

Similarly, a 10 percent increase in a family's income may cause it to increase its purchases of one commodity by more than 10 percent, of another by less than 10 percent or not at all. Again, the market prospects for the products of which consumers tend to buy considerably more as their income increases are more favorable than for those of which consumers are not anxious to use greater quantities with a raise in income. This holds at least as long as we have confidence in a rising living standard for the nation.

3. Price Elasticity of Demand

Several of the agricultural products have often been used to illustrate different elasticities of demand with respect to price. Potatoes have been commonly chosen as an example of a commodity with an inelastic demand. A large quantity of such a commodity has a smaller total value than a small quantity. Consequently, large crops of potatoes bring farmers less in total dollars than do small crops. Pork (or beef), considering all cuts as a whole, is frequently chosen as an example of a commodity having close to unit elasticity -- total consumer expenditures remaining unchanged regardless of whether a large or small quantity is put on the market. Certain fresh vegetables and fruits are sometimes referred to as examples of commodities with elastic demands, on which consumers would spend more in buying a large crop than a small crop.1/

A review of various studies dealing with price elasticity seems to indicate approximately the following position for the major Basin products.

With per capita income constant, an increase in supply is likely to result in:

Moderate price decline for:	Substantial price decline for:
Fluid Milk	Potatoes
Fresh Vegetables	Cereal Products
Meats	Butter
	Eggs
	Sugar

On the whole, most commodities showing an upward trend in per capita consumption also seem to have a greater price elasticity of demand than those showing a downward trend in consumption. Again, whether new irrigation farmers will find it profitable to get into products with an inelastic demand depends upon how effectively they will be able to reduce production costs per unit.

1/ Waite, W.C. and Cassady, R., The Consumer and the Economic Order, McGraw-Hill Book Co., New York, 2nd Ed., 1949, pp.161-2.

4. Income Elasticity of Demand

A vigorous democratic nation not only aims at increasing production, but also at reducing poverty among its families to a minimum. This means that a healthy national development will lead to fewer and fewer families living below an acceptable decent living standard. In fact, such an improvement in income distribution appears to be the most effective way for expanding market outlets for most consumer goods.

Assuming prices constant, which of the Basin products can be expected to find an expanding market demand as family incomes increase?

In the 1935-36 Family Budget study,[1] figures were put out on a national level as well as regionally. At about the same time (1934-36) but on a somewhat different basis, studies of money disbursements of wage earners and clerical workers were published for selected cities[2] in each geographical region. The 1942 consumption study[3] was made entirely on a national basis, while the 1948 study[4] was made on both a national basis (composite of 68 cities) and for selected large cities in different locations of the country.

None of these consumption studies give a direct clue as to what the local consumption patterns of food commodities might be in the Basin States. To determine these in a way comparable to the other consumption studies is, of course, out of the question because of the cost involved. There are a number of things to be brought out of the 1935-36 and the 1942 national consumption data, however, which might have some use to help in determining local consumption patterns of food products in the Missouri River Basin, or more particularly in the Missouri-Souris Division. But first, what do these consumption studies show that is of any value here?

In the first place, the two studies, 1935-36 and 1942, cover two periods in which the economic conditions were quite different. The first study was made during a period of severe economic depression when the national income was only $60 billion and unemployment was over 10 million. The second study was made during a period of rather high business activity (early wartime) when national income was over $120 billion and unemployment was declining rapidly.

Tables 10 and 11 have been adapted from tables in a progress report entitled "The National Food Allotment Program."[5] The tables are derived from the 1935-36 and 1942 studies and show the relationship

1/ Family Food Consumption & Dietary Levels, Misc. Pub. 405, 452, USDA, 1941.

2/ Money Disbursements of Employed Wage Earners and Clerical Workers, 1934-36, U.S. Bur. Labor Stat. Bul. No. 636, 637, 638, 639, 640, and 641, 1937.

3/ Family Food Consumption in the United States, USDA, Misc. Pub. No.550, 1944.

4/ 1948 Consumption Studies Report 1 - 8, USDA, BHN & HE.

5/ The National Food Allotment Program, by Rainer Schickele, P&MA, USDA, Oct.20, 1945 (mimeo.) p.23.

Table 10. - Annual per Capita consumption and money value of major food groups, by family income classes, non-farm population, 1936-1942

Income class (dollars)	Dairy products (except butter)		potatoes and sweet potatoes		Leafy, green and yellow vegetables		Eggs		Meat, poultry and fish	
	Lb.	Dol.	Lb.	Dol.	Lb.	Dol.	Lb.	Dol.	Lb.	Dol.
1936 1/										
0 - 500	181	7.09	85	2.44	41	2.73	23	3.59	69	11.80
500 - 999	292	13.98	117	3.66	58	4.53	32	5.30	105	21.08
1000 - 1499	372	17.56	119	3.83	72	5.68	36	6.10	127	26.59
1500 - 1999	385	19.86	122	3.95	82	6.44	39	6.63	143	30.50
2000 - 2999	421	22.03	124	3.98	91	7.22	42	7.20	160	35.20
3000 - 4999	452	24.40	124	3.87	102	7.91	44	7.41	185	41.69
5000 - over	520	29.25	133	4.15	127	9.84	48	9.20	262	59.37
Average	346	17.25	116	3.67	73	5.67	34	6.03	130	27.38
1942 2/										
0 - 500	369	18.41	148	4.99	90	6.97	43	8.42	69	18.10
500 - 999	373	20.23	134	4.35	107	8.60	45	9.64	98	27.27
1000 - 1499	408	23.97	148	4.16	105	8.79	50	11.20	104	32.71
1500 - 1999	461	28.20	148	4.68	110	9.52	56	12.64	122	38.80
2000 - 2999	447	30.37	143	4.76	125	10.32	54	12.84	149	50.02
3000 - over	462	32.53	136	5.14	128	12.48	52	12.77	164	57.68
Average	435	27.39	143	4.68	115	9.64	51	11.88	129	42.37

Income class (dollars)	Grain products		Sugar and syrup		Income class (dollars)	Grain Products		Sugar and syrup	
	Lb.	Dol.	Lb.	Dol.		Lb.	Dol.	Lb.	Dol.
1936 1/					1942 2/				
0 - 500	223	10.58	64	4.03	0 - 500	233	17.68	51	4.78
500 - 999	172	12.57	65	4.87	500 - 999	202	17.68	50	5.25
1000 - 1499	167	13.61	69	5.25	1000 - 1499	183	19.90	52	5.77
1500 - 1999	167	14.28	69	5.48	1500 - 1999	161	20.84	45	5.16
2000 - 2999	171	14.77	71	6.04	2000 - 2999	163	22.93	50	5.88
3000 - 4999	167	14.57	72	7.10	3000 - over	153	23.81	46	5.84
5000 - over	200	15.47	82	9.02					
Average	177	13.39	68	5.75	Average	177	20.93	49	5.50

1/ Total income per family (money plus non-money).
2/ Money income per family, annual rate based on first quarter, 1942. Expanded to annual rates without adjustment for seasonal variation.

Source: The National Food Allotment Program by Rainer Schickele. USDA, P&MA, Oct. 1945 (mimeo) pp. 24-27.

Table 11. - Effect of income on consumption and money value of major food groups, 1936 and 1942 (per capita consumption and money value of foods by family income groups as percent of average consumption and money value), non-farm population.

Income class (dollars)	Dairy products (except butter)		Potatoes and sweet potatoes		Leafy, green and yellow vegetables		Eggs		Meat, poultry and fish	
	Percent of average consumption or value									
1936 1/	Cons.	Value	Cons.	Value	Cons.	Value	Cons.	Value	Cons.	Value
0 - 500	52	41	73	66	56	48	68	60	53	43
500 - 1000	84	81	101	100	80	80	94	88	81	77
1000 - 1500	108	102	103	104	99	100	104	101	98	97
1500 - 2000	111	115	105	108	112	114	115	110	110	111
2000 - 3000	122	128	107	108	125	127	124	119	123	129
3000 - 5000	131	141	107	105	140	140	129	123	142	152
5000 - over	150	170	115	113	174	174	141	153	202	217
Average	100	100	100	100	100	100	100	100	100	100
Ave. in lb./$	346	17.25	116	3.67	73	5.67	34	6.03	130	27.38
1942 2/										
0 - 500	85	67	104	107	78	72	84	71	54	43
500 - 1000	86	74	94	93	93	89	88	81	76	64
1000 - 1500	94	88	104	89	91	91	98	94	81	77
1500 - 2000	106	103	104	100	96	99	110	106	95	92
2000 - 3000	106	111	100	102	109	107	106	108	116	118
3000 - 5000	106	119	95	110	111	130	102	107	127	136
Average	100	100	100	100	100	100	100	100	100	100
Ave. in lb./$	435	27.39	143	4.68	115	9.64	51	11.88	129	42.37

1/ Total income.
2/ Money income.
Expanded to annual rates without adjustment for seasonal variation.

Source: The National Food Allotment Program, by Rainer Schickele, USDA, Production and Marketing Administration, October, 1945 (mimeo.) pp. 24-27.

Table 11 - continuation sheet

Income class (dollars)	Grain products		Sugar and syrup	
	Percent of average consumption or value			
	Cons.	Value	Cons.	Value
1936 1/				
0 - 500	126	79	94	70
500 - 1000	97	94	96	84
1000 - 1500	94	102	102	91
1500 - 2000	94	107	102	95
2000 - 3000	97	110	104	105
3000 - 5000	94	109	106	125
5000 - over	113	116	121	157
Average	100	100	100	100
Ave. in lb./$	177	13.39	68	5.75
1942 2/				
0 - 500	132	84	104	87
500 - 1000	114	84	102	95
1000 - 1500	103	96	106	105
1500 - 2000	91	100	92	94
2000 - 3000	92	110	102	107
3000 - 5000	86	114	94	106
Average	100	100	100	100
Ave. in lb./$	177	20.93	49	5.50

Source: The National Food Allotment Program, by Rainer Schickele. USDA, Production and Marketing Administration, October, 1945 (mimeo.) pp. 24-27.

between income and food consumption and expenditures during these two periods. Data are shown for non-farm families only, since farm families produce quite a bit of their food. While the data for the two periods are not strictly comparable for various reasons (such as difference in sampling design and definition of income), they do show the effect of income on consumption.

The data in Tables 10 and 11 have been expanded to annual rates without adjustment for seasonal variation. Table 10 shows the per capita consumption and per capita expenditure rate for each income group and for the average of all income groups in each of the two periods. Table 11 shows what the percent per capita consumption and per capita expenditures are for each income group in terms of percent of average of all income groups.

In the depression period of 1935-36 the lowest income families consumed: about half as much as the average family of dairy products; slightly more than half as much of such foods as potatoes, fresh vegetables, eggs, and meats; about the same amount of sugar, and nearly twice as much of the grain products. On the other hand, the highest income group during the same period consumed: nearly four times as much of meats as the lowest income group; about three times as much of milk and fresh vegetables; twice as much of such foods as eggs and potatoes; nearly one and one-half times as much sugar, and about 10 percent less of grain products, than the lowest income group. Generally, the rate of consumption increase for these foods has been the highest in the low-income groups, and flattens out as incomes increase beyond the middle income levels. This shows that a given income rise in the low-income groups would strengthen demand more than the same rise in the higher income groups.1/

A somewhat different picture is shown in the prosperity period of 1942. The lowest income groups consumed: slightly more than half as much of meats as the average income family; slightly less of such foods as dairy products, fresh vegetables, and eggs; about the same of potatoes and sugar, and nearly twice as much of grain products. Compared to the consumption rates of the previous period, the low income groups consumed: about twice as much of dairy products, potatoes, fresh vegetables, and eggs in 1942 as did low income groups in 1935-36; about the same of meats and grain products in the later period as did low income groups in the earlier period.

During both periods, the variations in expenditures for the foods mentioned in the preceding paragraphs were a lot wider than the variations in consumption. (Table 11) This is because food consumption increases faster in terms of money value than in terms of pounds as income rises. The food expenditures in the higher income groups are affected by greater outlays for quality, packaging, and additional services.

Comparison of food consumption for spring 1943 with spring 1942 shows that the influence of income on the consumption of most food groups was about the same in both periods. (See Table 12.) For meat

1/ Ibid.

Table 12. Effect of income on consumption of major food groups, 1942 and 1948 (per household weekly food consumption by family income groups as percent of average consumption); urban housekeeping families of two or more persons in the United States. 1/

Income class (dollars) 2/	Percent of Average Consumption						
	Dairy Products	Potatoes and sweet potatoes	Leafy green and yellow vegetables	Eggs	Meat, poultry, and fish	Grain products	Sugar and sweets
$	%	%	%	%	%	%	%
Spring 1942							
Under 500	60	100	63	65	45	73	71
500 - 999	69	78	78	64	61	102	75
1000 - 1499	85	92	87	68	76	102	95
1500 - 1999	101	97	89	82	82	88	88
2000 - 2499	102	107	104	87	106	103	111
2500 - 2999	104	98	108	87	114	94	101
3000 - 4999	113	106	108	85	126	105	110
5000 - 9999	129	126	140	100	150	112	129
Average 3/	100	100	100	100	100	100	100
Average in pounds	12.93 *	8.83	7.69	1.73 #	9.21	9.00	3.26
Spring 1948							
Under 1000	61	68	88	74	68	95	77
1000 - 1999	81	89	84	86	81	110	97
2000 - 2999	98	106	96	98	96	103	99
3000 - 3999	112	117	104	107	108	109	117
4000 - 4999	109	106	117	113	110	99	101
5000 - 7499	109	83	102	100	108	83	88
7500 and over	125	92	135	176	130	92	97
Not classified	84	81	90	92	96	84	87
Average	100	100	100	100	100	100	100
Average in pounds	15.92 *	7.26	7.63	1.94 #	10.29	9.34	4.86

1/ Adapted from Table 17 in Report No.5, 1948 Consumption Studies, USDA, BHN & HE.
2/ For spring 1942, classification was by first quarter 1942 income, annual rate, before income tax. For spring 1948, classification was by 1947 income after Federal income tax.
3/ Includes families with incomes of $10,000 or over, not shown separately. Original source of 1942 data, Family Food Consumption in the United States, USDA Misc. Pub. 550.

* 2 quarts (milk equivalent)
# Dozens

products the rate of increase in consumption was less steep in 1948 than in 1942, because the lower income families used more of the meat products, relative to higher income groups, in 1948 than in 1942. The food expenditures were higher in 1948 than they were in 1942. Thirty-two percent of the income of urban families of two or more persons was spent for food, as compared with 26 percent in 1942. 1/

Now, what use can be made of the consumption data presented in Tables 10 and 11? True enough, the data have serious limitations. The figures have been expanded to annual rates without any adjustment for seasonal variations. The figures represent a national composite picture of consumption rates and expenditures. Figures are on a sort of composite per capita basis which does not take into consideration variation in individuals. But the figures do show rather consistent demand responses for various foods as income increases.

An examination of Table 11 shows the degree of consumers responses to income increases in their purchases of various foods. Of special importance is the effect of income raises in the lower-income range, since by far the larger part of the nation's families fall in that range.

From these studies, we can conclude with considerable confidence the following demand response with rising family incomes. With prices constant, an increase in family income will result in:

Substantial consumption increases for:	Moderate or little consumption increases for:
Meats	Grain products
Dairy products	Sugar
Butter	Potatoes
Fresh vegetables	
Eggs	

All these considerations point to a strong market prospect for increase in livestock and livestock products and fresh vegetables, and a weak market for cereal grains, potatoes, and sugar. Tying this prognostication back into the potential production increases under irrigation outlined in a preceding section, the anticipated expansion of potato and sugar beet production might run into serious marketing and price trouble, while the expansion of alfalfa, pasture, feed grains, and fresh vegetables might well be pushed further and prove more profitable in the long run. For this reason, the suitability of proposed irrigation areas for alfalfa, irrigated pasture, and fresh vegetables deserves special emphasis.

1/ 1948 consumption studies, Report No.5, USDA, BHN & HE.

Competitive Position of Proposed Irrigation Areas of North Dakota

1. Effects of Prospective Population Shifts

Three population factors that affect the market outlook for North Dakota farm products are: the total national increase in population; the population shift to the Pacific Coast States, and the population shifts within the state -- between farm and city.

The United States is still essentially a young, rapidly growing nation in spite of the great technological and industrial developments that took place within it. Recent population estimates would seem to indicate that the country could well expect a population of about 190 million by 1975 or 1980. This is a 25 percent increase in population over the next 25 or 30 years. If average per capita domestic consumption rates of agricultural products were maintained pretty much as they are now and there was only a moderate volume of agricultural exports, this would mean a market for about 25 percent more food and fiber. But, tied in with population increases, further changes in diets can also be expected. The nutritionists have done much in educating the people into wanting to improve their diets. So much so,that in the past decade of high employment at rather high wages, there has been a substantial increase in per capita consumption over the prewar period of 1935-39 of all meats, poultry products, and most dairy products. This all indicates a very favorable national demand outlook for livestock products 25 or 30 years hence.

To help supply this national market of livestock products, North Dakota appears in a good competitive position with respect to the production on irrigated farms of beef, lamb, and milk for manufactured dairy products.

There has been a considerable westward shift in population during the past decade. Between 1940 and 1950, the population of California increased by 51 percent, that of Oregon by 39 percent, and that of Washington by 36 percent. Present indications are that these population shifts will continue. The rate of migration, of course, may decrease probably by as much as 50 percent of what it was over the past decade. This population increase in the Pacific Coast States has made North Dakota and other Basin States less dependent upon eastern markets. North Dakota has a geographic advantage over eastern areas in sharing the western markets. This is particularly true of the Minot area, which is served by the main line of one of the transcontinental railraods.

Within the past decade, North Dakota, like the nation, has experienced a rather remarkable agricultural prosperity and with it a high level of employment within its cities and villages. This prosperity was accompanied by an increase in population of cities and villages (1000 and over) by 22 percent, while the over-all State population decreased by about 4 percent between 1940 and 1950. The largest increases have occurred in cities of over 5,000 people, which

as a group had 25 percent greater population in 1950 than in 1940. Among these were Williston with a 27 percent increase and Minot with a 32 percent increase.

Such a farm-city migration as has taken place during the past decade makes for increased local market demand, especially for perishable foods. Irrigation areas have a locational advantage of serving this increased local demand.

2. Location and Transportation Factors

Work is in progress which is aimed at getting together information that would aid in the further answering of the following questions. How does the competitive position of North Dakota (or more specifically the Minot trade area) compare with other established areas for the (irrigation) products suited to North Dakota conditions? Does the Minot trade area -- with its potential power, fuel, transportation, and population -- have "locational" advantages with respect to the west coast markets?

3. Adequacy of Marketing Facilities 1/

A reconnaissance study of dairy, poultry, grain, feed, and seed marketing and processing facilities in the Minot trade area was made in the summer of 1950. From this study it would appear that plant capacity would not be an obstacle to the increase in production of dairy and poultry products, feeds, and seeds. For example, milk plants could handle about 60 percent more milk with present facilities. With 3 or 4 churnings a day, plants engaged in butter manufacture could make, respectively, 17 or 56 percent more butter. Poultry processing plants could handle at least twice their present volume, and feed processing and seed handling plants could handle 6 times their present volume. However, serious seasonal gluts of grain marketing facilities occur each year. These have been somewhat aggravated by rapid technological advance in harvesting methods, government storage policy, changes in varieties of crops grown, inadequate box cars, etc.

1/ A further discussion of the adequacy of marketing facilities will be made in a forthcoming report.

Summary

The Basin States (North Dakota, South Dakota, Nebraska, Kansas, Montana, Wyoming, and Colorado) account for about 1/7 of the U.S. gross cash farm income.

North Dakota accounts for 1/7 of the gross cash farm income of the Basin States.

There are now about 5,000,000 irrigated acres in the seven Basin States. Proposed new irrigated acreage is expected to be around 5,233,000 acres, or about 5 percent of the present cropland.

The State of North Dakota now has about 29,000 acres of irrigated land. It is proposed to bring about 1,225,000 additional acres, or 6 percent of the present cropland of the State, under irrigation.

Alfalfa hay, potatoes, and sugar beets would show the biggest increase in production under proposed programs of irrigation. Compared with present national supplies, sugar beet output would be increased by 75 percent, thereby necessitating a drastic change in U.S. sugar policy.

If irrigation is introduced in the Crosby-Mohall Unit, the chances are that the cropping system will approach a forage-grain system rather than a grain-sugar beet or forage-vegetable system.

Per capita consumption trends of dairy products (with the exception of butter), meats, fresh vegetables, and poultry products have generally been upward, while those of butter, potatoes, and grain products have been downward.

General market prospects are "more favorable" for fluid milk, cream, ice cream, cheese, chickens, eggs, pork, beef, and fresh vegetables. They are "less favorable" for butter, potatoes, sugar, wheat, and rye.

Recent population estimates would indicate about a 25 percent increase in U.S. population by 1975 or 1980.

Within the past decade there has been a shift in population to the West Coast States. This shift is expected to continue, but at a somewhat reduced rate.

Within the past decade also, there has been a population shift from farms and open country to towns and cities, in the State of North Dakota.

The total increase in U.S. population, the population shift to Pacific Coast States, and the farm to town and city movement within North Dakota, are all factors favorable to the market outlook for North Dakota farm products likely to be grown under irrigation.

It does not appear that lack of processing plant capacity and marketing facilities would be an obstacle to increased production of dairy and poultry products, feed, and seed. Farm-to-market roads will need improvement and to be kept open the year round, especially in the areas of irrigation development.