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Estimated Returns From Operating 800 Acres in the Spring Wheat Area Under Four Different Plans

A Method of Determining What to Produce

C. M. Hampson, Poul Christophersen

WITHDRAWN

**Agricultural Economics Department
Agricultural Experiment Station
South Dakota State College of
Agriculture and Mechanic Arts
Brookings
Cooperating with the
Bureau of Agricultural Economics
United States Department of Agriculture**

Foreword and Acknowledgments

This is one of a series of three circulars which is being published on the economics of agriculture in the Spring Wheat Area of South Dakota. The three publications are:

Experiment Station Circular 19, An economic study of farming in the Spring Wheat Area.

Experiment Station Circular 20, Estimated returns from farms of large, medium and small size of business in the Spring Wheat Area.

Experiment Station Circular 21, Estimated returns from operating eight hundred acres in the Spring Wheat Area under four different plans.

Circular 19 is of historic nature in that it gives results that have been attained. It presents a summary of four years of study of farms, and attempts to explain why some farms are more profitable than others. Circular 20 discusses the comparative returns that may be expected from farms of large, medium and small size of business, under different situations of prices, production and land valuations. Circular 21 discusses the comparative returns that may be expected from diversified farms of a given area, operated under four different plans of organization and under different price and production situations.

Acknowledgments are due to the Division of Farm Management and Costs of the Bureau of Agricultural Economics, United States Department of Agriculture for aid in collecting and tabulating data on which the publications are based. Credit is also due to the farmers who, by faithful co-operation in keeping records and supplying information, have made the study possible. The authors also appreciate the assistance given by members of the Department of Agricultural Economics of the South Dakota State College.

Estimated Returns From Operating 800 Acres in the Spring Wheat Area Under Four Different Plans

By

C. M. Hampson, Poul Christophersen

The relatively low prices farmers receive for their products, and the continued high costs of interest, taxes, and the products farmers buy, increase the need of study of factors which tend to give the best possible net returns from a farm business. The purpose of this circular is to discuss the relative profitableness of different enterprises on diversified farms in the Spring Wheat Area of South Dakota.

The plan of the circular is to show the organization and to give the estimated returns of four farms, on each of which the enterprises are of different relative importance. Three of the farms are assumed to be 800 acres in area. The fourth farm is assumed to be 800 acres in area but the size of business is increased by placing cattle out on pasture during the summer, a practice common to the area. Each of the hypothetical farms is very similar to some one actual farm from which records were secured. These similarities include acres of crops, numbers of livestock, amounts of power and equipment used, labor used, receipts and expenses, and income. The farms selected as patterns are common types within the area.

The standards of production used in calculating the budgets of the farms are based on unpublished data secured from the study upon which this circular is based, and from records secured from the United States Division of Crops and Livestock Estimates. The standards of labor required and the use of tractor and horses in producing crops were taken from South Dakota Circular 6, "Tractor and Horse Power in the Wheat Area of South Dakota." The prices used are based on those of 1932, but were adjusted for a normal ratio of prices between farm products and for compensation received from AAA contracts.

The information presented is based on farm business records which were kept by farmer cooperators, and through several visits to the cooperators. These farmers live in seven counties of the spring wheat produc-

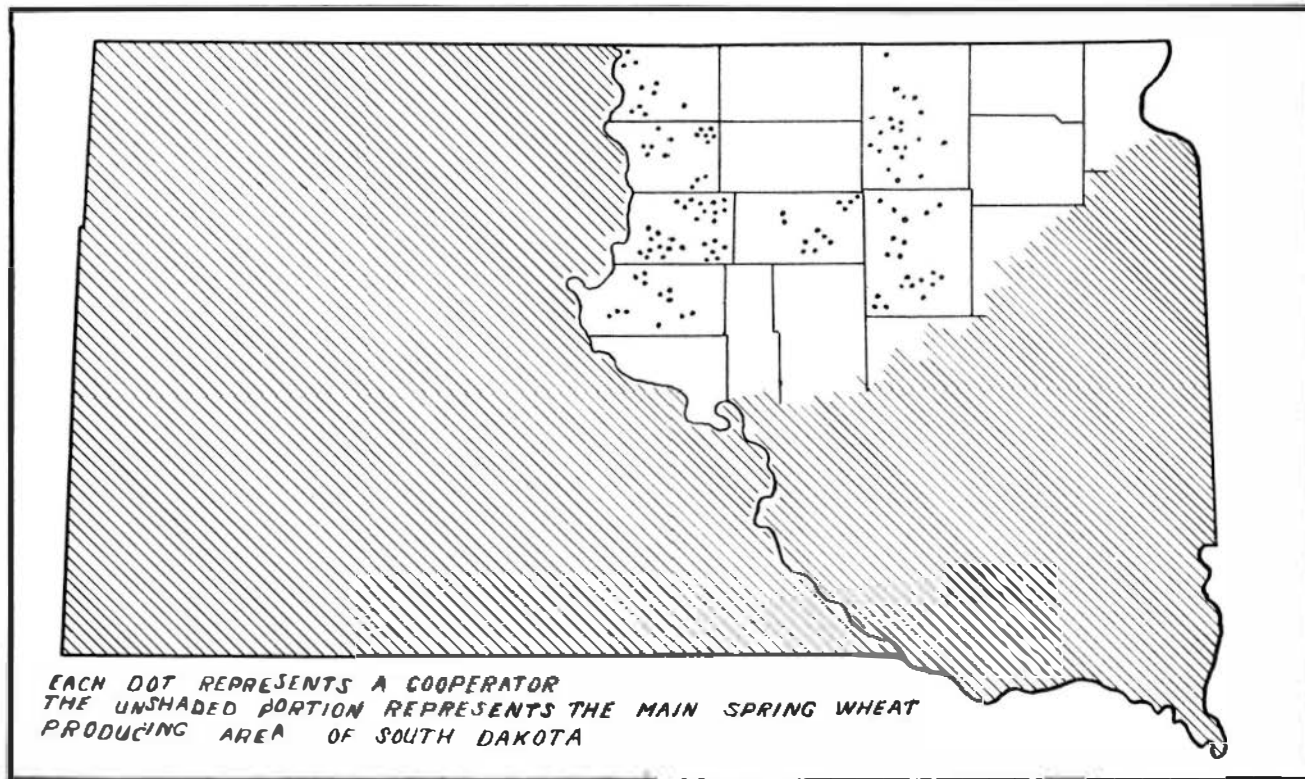


Fig. 1.—Location of farms studied. Each dot represents a cooperator. The unshaded portion represents the main spring wheat producing area of South Dakota.

ing area of the state, Figure 1. During 1930, 44 complete records were secured; during 1931, 29 records; during 1932, 112 records; and during 1933, 98 records. Eighty per cent of the farms studied were diversified farms, and there were a few each of farms highly specialized in the production of wheat, of dairy products, and of poultry.

The average annual precipitation of the region varies from 16 to 25 inches, being somewhat heavier in the eastern part of the area. The average growing season varies from 120 to 140 days. The soil of Brown and Spink county is mostly lacustrine, while the remainder of the soil is glacial. The topography of the area is generally level, however, there are a few ranges of low hills extending across the western counties, and many of the farms have one or more quarters of land which are rough or stony, or at times are too low and wet for cultivation. Only 87 per cent of the total area is in farms, leaving a large amount of land, belonging to various divisions of the Government, which may be secured at nominal rental rates for pasture and for making of native hay. These features plus the lack of capital determine the type of many of the farms in the area.

The crop yields when compared with the ten-year average of the area and expressed as a percentage were 83, 40, 108, and 15, for the years 1930 to 1933, respectively. The extremely low yields of 1933 were caused by a widespread drouth. The yields of 1931, 1932, and 1933 were all reduced somewhat by grasshopper infestation. The total production of pork in 1933 was greatly reduced by shortage of feed that year, but the income was supplemented considerably by the purchase of piggysows and small pigs by the United States Government.

The records of 1932 were selected as a base for calculations because of their being most representative of a long period of years.

The information given in this circular should be applicable to general farms throughout the northeast quarter of the state, especially since the systems used for illustration are very much like actual farms of the area as they were operated during the last four years .

Analysis

The organization plans of a hypothetical diversified farm of 800 acres in the Spring Wheat Area of South Dakota operated under three different systems common to the area are given in Table 1. A fourth diversified farm common to the area but requiring a greater acreage, is also given in the table. The estimated returns for each of these systems are given in Table 4. Tables 2 and 3 give the production and disposal of crops and livestock and livestock products for the four systems.

An 800-acre farm was chosen because records indicate that much smaller acreages under South Dakota springwheat-area-conditions and low prices, do not give sufficient gross incomes to pay the expenses of the farm business and leave a reasonable margin for family living. The returns which may be expected from varying size of business, including land area, are discussed in Circular 20.

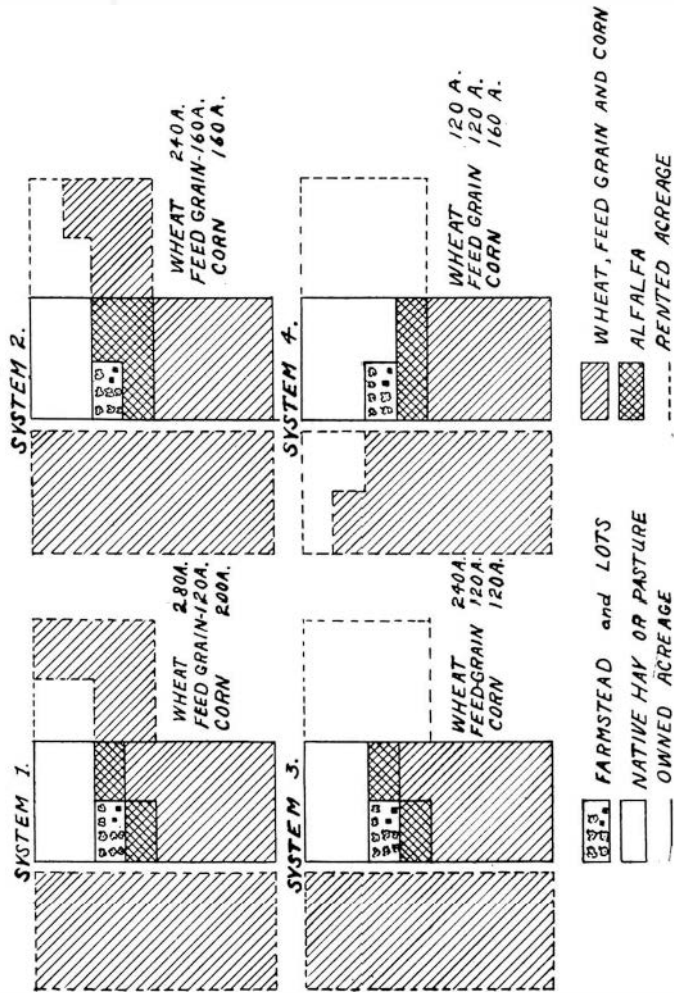


Fig. 2.—Proportional distribution of acreage for operating 800 acres under four different plans.

The four plans for operating the farms were set up so as to hold many of the items the same in all of the systems. For example, each farm was equipped with seven horses and one tractor to furnish power, with 125 hens, and with a dwelling valued at \$2000. A similar plan was followed when estimating the amounts and values of improvements and machinery, except where changes in the size of an enterprise required different amounts of improvements or machinery. Yields per acre and per animal were held the same on each farm. This plan makes it easier to compare the dif-

ferent systems and their net returns. Some items were omitted from the farms for the sake of simplicity. These items include sheep, turkeys, colts, spelt, rye, flax, sorghums, sweet clover, and potatoes. The addition of any of these enterprises to the farm would make some difference in both receipts and expenses of the farm, but would complicate the discussion a great deal. Although wheat is the only crop sold according to the budget, it is realized that a surplus of feed grain, and sometimes hay, is also sold.

System 1 represents a farm on which the chief livestock enterprise is hogs; it has a large acreage of wheat, a small beef enterprise, and no dairying for market. In System 2 dairying is the main enterprise from the standpoint of use of labor; the production of hogs and wheat is secondary; and there is no beef herd. The major enterprise of System 3 is wheat, but there are also small enterprises of beef cattle, hogs and dairy. System 4 has beef cattle for the main enterprise, with hogs second; there is a small wheat enterprise, but no dairying for market.

Systems 2 and 4 of this circular appear as Systems 1 and 5 respectively in Circular 20.

Land Use

The differences in the farming systems outlined above might have been due to personal preference in each case, or to soil and topographic conditions. Regardless of the reasons, the main enterprises require the land to be used differently for the production of cash crops, feed crops, and pasture. The land was so divided in each system as to furnish harvested feed crops and pasture in sufficient amounts and desirable proportions for the livestock kept on each farm. The remainder of the crop land was put into wheat, but a systematic crop rotation was followed throughout.

The amount of land in roads, farmstead and unused acreage was assumed to be 40 acres on each farm. The area assigned to farmstead includes space for buildings, garden, shelter belt, feed lots, and small pasture lots. Figure 2 and Table 1 give further information concerning the uses of the land in the different systems.

Numbers of Livestock

The numbers of each kind of livestock kept in each of the four systems are also shown in Table 1. The numbers vary in accord with size of enterprise. In each case young stock are kept for replacements of breeding animals except sires in the cattle and hog herds. Sires are omitted from Table 1 for easier comparison but they were included when computing feed requirements and receipts and expenses. The cows milked in Systems 1, 3 and 4 are of the beef type; in System 2 they are Holsteins. In each of the systems seven horses were allowed for field work, and an annual average of 125 laying hens was included.

Table 1.—Organization plans for operating 800 acres in the Spring Wheat Area of South Dakota under four different systems of farming.

Item	Unit	System 1	System 2	System 3	System 4
		Hogs Wheat Beef cattle	Dairy Wheat Hogs	Wheat Beef Dairy Hogs	Beef cattle Hogs Wheat
Land use:					
Wheat	acre	280	240	240	120
Feed grains	acre	120	160	120	120
Corn	acre	200	160	120	160
Alfalfa	acre	40	60	40	40
Total tilled land	acre	640	620	520	440
Native hay and pasture	acre	120	140	240	320
Farmstead, waste, etc.	acre	40	40	40	40
Total farm	acre	800	800	800	800
Livestock:					
Beef cows	number	9	—	17	37
Milk cows	number	3	20	8	3
Young cattle	number	12	14	27	42
Calves saved	number	10	18	22	36
Brood sows	number	21	16	6	16
Hens	number	125	125	125	125
Work horses	number	7	7	7	7
Total animal units*		53	51	65	99
Capital investment:					
Land owned, \$20 acres		\$ 8,800	\$ 8,400	\$ 8,000	\$ 7,600
Improvements		6,200	7,500	5,500	6,330
Equipment		2,795	2,855	2,670	2,780
Livestock		1,975	2,235	2,325	3,675
Crops		2,145	1,660	1,560	1,600
Total investment		\$21,915	\$22,650	\$20,055	\$21,985
Man labor:					
Required	month	19	30	18	19
Productive work units‡		575	757	327	512
Tractor power:					
Approximate requirements	hour	800	800	700	600

* An animal unit is the approximate equivalent from the standpoint of feed required, of a mature cow or horse. A unit may be one mature cow or horse, two young cattle or horses, five sows, ten pigs, seven sheep, 14 lambs, 100 hens, or 25 turkeys.

‡ A productive work unit is the accomplishment expected of an average man in a 10-hour day when performing work directly connected with securing farm income. Such work as building or repairing buildings and fences, overhauling machinery, clearing land of stones, etc. is not considered productive except when done for hire.

Capital Investment

The ownership of the farms in each system was assumed to be 320 acres owned by the operator, and 480 acres rented for farm use. In System 4, for the want of sufficient pasture, 42 head of cattle were placed on pasture for five months. Alfalfa acreage and farmstead were assumed to be on land owned by the operator of the farm. The total value of land owned by the operator was calculated by valuing crop land at \$30 per acre and native grass land at \$10 per acre. These values are somewhat less than the farmers' valuations but they are higher than the valuations given in the United States Census for 1930.

The dwelling, poultry buildings and equipment, and water system were held at the same value on each farm. The other farm buildings and fences vary according to the size of the various enterprises, and a silo was included in the investment of System 2. Proper adjustments were made in machinery investments where considerable differences existed in the acres given to any one type of crop. A tractor, a truck and an automobile were included in the equipment of each farm, but no combine or thresher was included on any farm. Livestock values per animal were held uniform in each system, but the total value varied because of the various sizes of the enterprises. The same statement may be made of the values of feeds and supplies on hand at the time of making the inventories, about January first.

Cash operating capital necessary for family living expenses and for paying labor and buying feed, seed, fuels, etc. varied somewhat in the different systems. It was assumed the current receipts from dairy products would care for such expenses in Systems 2 and 3, and sufficient cash grain was inventoried in Systems 1 and 4 to care for such items. The total values of each of the above investments are given in Table 1.

Labor

The operator of each farm system was credited with 12 months of labor. All other labor was assumed to be hired, since this is the only fair way of comparing the systems. In each system the wheat was harvested with a combine and the rest of the small grain was cut with a binder and threshed. Thirty acres of corn were picked by the regularly employed labor; the remainder of the corn husking was done with transient labor. Much of the corn was hogged down, thus saving considerable labor. The total months of man labor employed for work other than custom work are shown in Table 1. The hours of work performed by men, horses and tractor, and the mileage of trucks was computed from South Dakota Circular 6 and unpublished data. Ample allowance was made for all operations under average conditions.

If the amount of productive work performed on a farm is used as a measure of size of business, then System 2 is approximately 60 per cent larger than any of the other systems, and should have greater gross returns than any of the others. In Table 4 this is found to be the case.

Crop Production

The field operations assumed to be performed in operating the farms are quite common to the region and represent reasonably thorough soil preparation and cultivation, such as should result in crop yields equal to those shown in Table 7. The yields used in making the budgets are somewhat above the average of the region, as given by the United States Division of Crops and Livestock Estimates, but they are considerably below those obtained on the best farms of the area.

Alfalfa in each system remains on the land five years. All manure from the stables and feed lots is applied to land which is put into corn. No commercial fertilizer is used on farms in the area. The production and disposal of each crop for each system is shown in Table 2.

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Table 2.—Estimated production and disposal of crops on 800-acre farms operated under four different systems of farming in the Spring Wheat Area of South Dakota.

Item	Unit	System 1	System 2	System 3	System 4
Wheat:					
Used for seed	bu.	280	240	240	120
Landlord's share	bu.	440	440	440	220
Sold	bu.	2,300	1,900	1,900	900
Used for feed	bu.	60	60	60	80
Total production	bu.	3,080	2,640	2,640	1,320
Harvested for grain	acre	280	240	240	120
Oats:					
Used for seed	bu.	80	160	160	120
Landlord's share	bu.	300	450	300	150
Used for feed	bu.	220	1,190	740	380
Total production	bu.	600	1,800	1,200	600
Harvested for grain	acre	20	60	40	20
Harvested for hay	acre	20	20	40	40
Barley:					
Used for seed	bu.	90	120	60	90
Landlord's share	bu.	270	360	180	270
Used for feed	bu.	720	960	480	720
Total production	bu.	1,080	1,440	720	1,080
Harvested for grain	acre	60	80	40	60
Corn:					
Used for seed	bu.	25	20	15	20
Landlord's share	bu.	540	360	270	360
Used for feed	bu.	2,675	2,050	1,155	1,780
Total production	bu.	3,240	2,430	1,440	2,160
Harvested for grain	acre	180	135	80	120
Harvested for fodder	acre	20	--	40	40
Harvested for silage	acre	--	25	--	--
Alfalfa:					
Harvested for hay	acre	30	50	30	30
Pastured	acre	10	10	10	10
Native grass:					
Harvested for hay	acre	--	--	--	80
Pastured	acre	120	140	240	240
Total feed available:					
Concentrates	ton	102	101	57	75
Dry roughage	ton	90	85	140	180
Silage	ton	--	100	--	--
Pasture	day	6,900	5,700	8,700	8,700*

* Pasture requirements exceeded supply and 42 head of cattle were placed on outside pasture for the summer season.

Livestock Production

The methods assumed to be used in producing the livestock and the livestock products of each of the four systems are quite common to the area and represent practices followed by the better livestock men. The gains in weight of animals, the production of butterfat and eggs, the production of offspring, the death losses, and the use of farm products in the home are all based on averages of the farms studied. The standards used are slightly above the average production of the cooperators, but are considerably below those of the best farms on record. The feed require-

ments used are likewise slightly above the average, thus justifying higher production and at the same time avoiding the risk of shortage of feed in years of moderate drouth. Stubble and straw are not included in the budget of feeds. This provides considerable additional feed for years of extreme drouth, also a better fertility program for the land. Total production and disposal of livestock and livestock products are shown in Table 3. Feed requirements and production per animal are given in Table 7.

In each of the four systems, all livestock except sires of hogs and cattle, were produced on the farm. All young cattle were sold from pasture as long yearlings, except in System 2 where all of the calves, other than the most promising heifers, were sold for veal. Skimmilk was omitted from all computations. All dairy products were considered at butterfat prices because that is the form in which they are most commonly marketed within the area. It was assumed that the cattle on System 2 were Holsteins and were better fed than the cattle in the other systems, thus accounting for the higher production of butterfat per cow in that system.

Table 3.—Estimated production and disposal of livestock and livestock products on 800-acre farms operated under four different systems of farming in the Spring Wheat Area of South Dakota.

Item	Unit	System 1	System 2	System 3	System 4
Cattle Enterprise:					
Calves saved	number	11	18	23	36
Calves sold for veal	number		12		25
Yearlings sold	number			16	25
Yearlings used in home	number		1	1	1
For replacement:					
Yearlings	number	4	5	6	10
2-year-olds	number	3	4	5	8
Cows sold	number	3	3	4	7
Cows bred	number	12	20	25	40
Meat sold	pound	7,500	5,100	15,600	25,200
Meat used in home	pound	500	500	500	500
Net meat production	pound	8,000	5,600	16,100	25,700
Death loss after weaning	number	1	2	2	3
Butterfat sold	pound		4,640	1,240	
Butterfat used in home	pound	360	360	360	360
Net butterfat production	pound	360	5,000	1,600	860
Hog Enterprise:					
Pigs saved	number	144	96	36	96
Hogs sold	number	111	73	27	73
Hogs used in home	number	4	4	4	4
Sows sold	number	21	14	5	14
Sows bred	number	24	16	6	16
Meat sold	pound	30,750	22,450	8,250	18,830
Meat used in home	pound	1,100	1,100	1,100	1,100
Net meat production	pound	31,850	23,550	9,350	19,930
Death loss after weaning	number	8	5	1	6
Poultry Enterprise:					
Hens, average	number	125	125	125	125
Meat sold	pound	800	800	800	800
Meat used in home	pound	200	200	200	200
Eggs sold	dozen	720	720	720	720
Eggs used in home	dozen	280	280	280	280

All pigs were produced from spring litters farrowed by gilts and sold at an average weight of 225 pounds. The weights varied slightly between the systems because of the amount of feed available. The poultry and egg production was held the same on each of the farms.

Prices

Prices used in computing both receipts and expenses for the four farm systems were based on those received and paid in 1932, but adjusted for a long-time normal ratio of prices between farm products and for compensation received from AAA contracts with wheat and hog producers. Prices per unit of products sold are shown in Table 7.

Receipts and Expenses

Totals for the various items of receipts and expenses are shown in Table 4. The amounts received per unit of product sold and the rates of charging expenses are given in Table 7. The charges made for sires, seed, feed, veterinary services, repairs, taxes, and insurance on buildings and crops, are based on the four-year average of all of the farms on record. Because of the depression the four-year average may be lower than a long-time average. Charges for each item of expense vary in accord with the size of enterprise as it is found in each system. No charge was made for the labor of the farm operator, but all other labor was charged at the average rate of \$25 per month for the actual work needed for production. The depreciation charge allows an amount sufficient to make major repairs and to replace improvements and equipment over a period of years so as to keep them in good condition. Gross income tax was not an expense of 1932 but was added to conform to current tax laws.

The value of the use of the dwelling and of farm products used in the home were assumed to be the same in each system and were omitted from the calculations. Miscellaneous receipts represent largely the average income to all of the farms on record for services rendered in public work. Many farmers living in the wheat area secure additional income from combining, threshing, silo filling, etc. Such income was not included in the calculations; likewise the cost of such work was not included in the cash expenses.

Systems 1 and 2 are the more intensively farmed and have larger receipts and larger expenses than the other two systems. This is true because the size of business of Systems 1 and 2 is actually larger than that of the other two systems, although the same number of acres are farmed. In Systems 1 and 2 the investment, labor, sales and costs are greater per acre than in the other systems where wheat farming and cattle grazing are the major enterprises.

TYPE OF FARM BUSINESS IN SPRING WHEAT AREA 13

Table 4.—Estimated receipts, expenses and income from 800-acre farms operated under four different systems of farming in the Spring Wheat Area of South Dakota

Item	System 1	System 2	System 3	System 4
	Hogs Wheat Beef cattle	Dairy Wheat Hogs	Wheat Beef Dairy Hogs	Beef cattle Hogs Wheat
Farm Receipts:				
Wheat	\$1,725	\$1,425	\$1,425	\$ 675
Cattle	288	207	636	1,019
Cream	—	1,253	335	—
Hogs	1,634	1,193	439	1,001
Poultry and eggs	166	166	166	166
Miscellaneous	45	45	45	45
Total farm receipts	\$3,858	\$4,289	\$3,046	\$2,906
Farm Expenses:				
Breeding livestock	12	18	12	18
Seeds	45	45	45	40
Commercial feed	33	40	23	40
Veterinary and medicines	27	23	22	36
Twine	24	38	24	28
Labor (exclusive operator)	175	450	150	175
Threshing	117	194	115	101
Combining wheat	350	300	300	150
Corn husking	97	54	32	54
Silo filling	—	30	—	—
Tractor, gas and oil	288	288	252	216
Tractor repairs	44	44	39	33
Auto truck (100%)	40	60	40	40
Auto (50%)	60	60	60	60
Repairs and upkeep	84	118	74	79
Miscellaneous	25	25	25	25
Insurance, property	47	53	43	48
Insurance, hail	90	84	72	60
Taxes, real estate and personal	220	240	190	220
Taxes, gross income	29	35	24	19
Cash rent for pasture	20	20	40	55
Livestock on pasture	—	—	—	105
Total cash expenses	1,827	2,214	1,582	1,602
Depreciation	760	800	710	737
Total farm expenses	\$2,587	\$3,044	\$2,292	\$2,339
Farm Income: (Receipts minus expenses)	\$1,271	\$1,245	\$ 754	\$ 567
(Interest on investment @ 5%)	\$1,096	\$1,132	\$1,003	\$1,099
Labor Income:	\$ 175	\$ 113	\$ -249	\$ -532
(Farm income minus interest on investment)				

Income

Farm Income and Labor Income of each of the four systems is given at the bottom of Table 4. Farm Income is the difference between the sum of the receipts and the sum of the expenses, not including interest. It represents returns for the use of the operator's capital invested in the farm business and for his services, both as a laborer and as a manager. Since all labor except that of the operator was charged as an expense, differences between farms due to unpaid family labor were eliminated.

Labor Income is calculated by deducting a uniform interest charge from Farm Income. It represents net returns to the operator for his own labor and management after paying all expenses, including a charge for

family labor and a charge for the use of his capital. Labor Income is a fair measure for comparing returns to all farmers, since even those operators who have no indebtedness are charged with interest on the capital used, and those who have workers within the family are charged with labor performed. In addition to Labor Income the farmer and his family have the use of the house and food and fuel furnished by the farm.

It will be observed that the labor income of Systems 3 and 4 is in each case a minus quantity. The labor income of System 3 is the higher because it is the smaller minus figure; that business lost less during the year than did that of System 4. The difference in labor income between Systems 1 and 4 is \$175 plus \$532, or \$707.

Comparing Returns

The relative merits of the four farming systems as measured by labor income are given in Table 4. This measure indicates that among diversified farms of equal acreage and similar productivity, those which are farmed rather intensively are more likely to be profitable than are those which are farmed less intensively. System 1 had a large hog enterprise to supplement wheat production, and System 2 had large enterprises of both hogs and dairy cattle to supplement the wheat. These were the two more profitable systems. System 3 was of the more extensive type in that both the hog and dairy enterprises were small and the major enterprise was wheat. System 4 had a large hog enterprise, but the major enterprise was grazing beef cattle, which is decidedly extensive in nature.

Such comparisons have their limitations because they are based on definite prices of each receipt and expense item, definite production of both livestock and crops, and a definite area of land. The returns from any system would vary somewhat with any change in any price, any quantity of labor or materials used in production, or any rate of production. However, the comparisons made seem valid under the conditions and standards used, and the conditions and standards are very similar to those found on actual typical farms in 1932. For these reasons the computations and discussions found in this circular should have considerable practical use in the spring wheat area of the state when determining what to produce on individual farms.

It is interesting to note that the least profitable system, with beef cattle as the major enterprise, is that which most nearly resembles the type of agriculture pursued by the first settlers in the area when pasture was cheap or free. The system with wheat as the major enterprise is most nearly like the type of agriculture next tried by the early settlers, and its returns are next to the lowest. The trend in the area is towards more intensive farming with fairly large dairy and hog enterprises, and the feeding of beef cattle. The more intensive types of farming seem at present to be the most profitable. Increase in land values and the division of large farms into smaller ones, has no doubt hastened the trend.

No claim is made that any one of the systems represents the best plan that might be devised for operating 800 acres of land in the spring wheat area, because other combinations of crops and livestock enterprises could probably be set up which would have some advantage over the systems

offered. For example, sweet clover might have been sowed with a nurse crop, thus increasing total pasture carrying capacity of the farms and providing a better program for the maintenance of fertility. Or the addition of a few sheep or turkeys might have shown greater profit, or the beef cattle might have been fed out with profit. The labor incomes for the four systems should be compared as relative and not as absolute figures.

With these reservations in mind a summary of the reasons for the differences in the estimated returns for the four systems may now be given:

The better net returns of Systems 1 and 2 as compared with those of Systems 3 and 4 were due primarily to the larger size of business of the first two systems. They each had more productive work per acre, and a more rapid turnover of capital than that of Systems 3 and 4. These factors resulted in larger total receipts to Systems 1 and 2, and since the total expenses were not as high in proportion as were the receipts, the farm incomes and labor incomes are better than those of Systems 3 and 4.

The low net returns of System 3 were due primarily to its small size of business. It had a small amount of productive work per acre, the smallest capital investment, and the smallest total receipts. It had relatively higher total expenses than did Systems 1 and 2 and it also had a slow turnover of capital.

System 4 was the least profitable of all. It had the lowest amount of productive work per acre, the lowest gross receipts, and the slowest rate of turnover of capital. The expenses also were relatively the highest of all. Discussion in Circular 20 indicates that more than 2000 acres are necessary if a diversified farm with grazing beef cattle as a major enterprise is to be profitable under conditions as they existed in the Spring Wheat Area of South Dakota during 1932. (The effect of lower valuation of land for beef production is discussed in Circular 20).

If the foregoing reasons for the larger net returns of Systems 1 and 2 are valid, then many farmers in the Spring Wheat Area of South Dakota could increase their profits by farming more intensively during a period of low prices for farmers' products.

The question then arises, would the more intensive systems be the more profitable under different price conditions, different rates of production, and different sizes of business. An attempt to answer these questions is made in the following pages.

Effect of Changes in Prices

The incomes from the different systems, as previously stated, would be changed if any change were made in computing the receipts and expenses. Table 5 gives the estimated labor income for each system due to varying price conditions, assuming there would be no other change which would affect receipts or expenses.

If the price of wheat were 15 cents above the basic price of 75 cents, the resulting labor incomes would be \$520, \$398, \$36 and -\$397, respectively for Systems 1, 2, 3, and 4, giving Systems 1 and 2 an advantage over Systems 3 and 4. If the price of wheat were 20 cents below the basic price, the labor incomes would be -\$285, -\$267, -\$629 and -\$712 for Systems 1 to 4, respectively. Systems 1 and 2 would still be the more profitable. A lower minus labor income indicates that a business was operated at a lower loss.

Careful study of Table 5 indicates that no probable combination of prices would make Systems 3 and 4 as profitable as the more intensive Systems 1 and 2, so long as the size of business and the cost factors remain relatively the same as outlined in the foregoing pages.

Table 5.—Estimated labor income resulting from differences in prices of products sold from 800-acre farms operated under four different systems of farming in the Spring Wheat Area of South Dakota

Item	System 1	System 2	System 3	System 4
Labor income with prices unchanged (Table 4)	\$ 175	\$ 113	\$-249	\$-532
Labor income with prices higher for:				
Wheat @ \$0.90, others unchanged	520	398	36	-397
Beef @ 6.00, others unchanged	287	190	-15	-154
Pork @ 7.00, others unchanged	636	450	-125	250
Butterfat @ 0.30, others unchanged	175	252	212	-532
Labor income with prices lower for:				
Wheat @ \$0.55, others unchanged	285	-267	-629	-712
Beef @ 3.50, others unchanged	100	62	405	-784
Pork @ 4.00, others unchanged	-286	-224	-373	-814
Butterfat @ 0.22, others unchanged	175	-119	-811	-532
Labor income with various price combinations:				
Wheat @ \$.75, beef @ \$6.00, pork @ \$7.00 (price relation as in 1926-29)	749	526	108	113
Wheat @ 3.55, beef @ \$6.00, pork @ \$7.00 (price relation as in 1930-31)	289	146	-272	-67
Wheat @ \$.90, beef @ \$3.50, pork @ \$4.00 (price relation as in summer 1933)	-16	10	-242	-931

Effect of Changes in Production

If, through careful selection of high producing cattle, better care, and better feeding of home grown feeds, the production of butterfat per cow were increased to 10 per cent above the basic production shown in Table 7, and no other change were made, the resulting labor incomes would be \$175, \$238 -\$216, and -\$532, respectively for Systems 1 to 4, Table 6. If

the increased production were the result of feeding oil meal or other items involving an increased cost, the net returns would be less than those given above by the amount of the increased cost. In a similar manner, many calculations might be made to show the increased production per acre of crop, per sow, per hen, etc.

Table 6 gives the estimated labor income for each system due to varying rates of production, assuming the changes in rates to be due to differences in breeding, culling, feeding home grown feeds, sanitation, care, and other factors of efficiency which would not increase the total costs. Careful study of the table indicates that no reasonable increase in efficiency of production without added cost would make Systems 3 and 4 as profitable as Systems 1 and 2. The table also indicates that with lower production and low prices, Systems 1 and 2 would still remain the more profitable.

The result of any increase in yield of crops per acre is more difficult to estimate than that of increased production in livestock enterprises. Increased production adds to the expenses of harvesting; and an increase in production of a cash crop due to favorable weather is likely to be accompanied by an increase in production of feed crops. More feed crops give a choice of sales for cash, or of feeding for higher livestock production. Unpublished data indicate that Systems 1 and 2 would likely profit more by increased crop production than would Systems 3 and 4.

Table 6.—Estimated labor income resulting from changes in rates of production due to efficiency on 800-acre farms operated under four different systems of farming in the Spring Wheat Area of South Dakota

Item	System 1	System 2	System 3	System 4
Labor income, production unchanged (Table 4)	\$ 175	\$ 113	\$ -249	\$ -532
Labor income with production increased:				
Beef, 10%, others unchanged	209	113	-179	-419
Hogs, 10%, others unchanged	344	236	-204	-426
Butterfat, 10%, others unchanged	175	238	-216	-532
Total of three commodities	393	361	-101	-313
Labor income with production decreased:				
Beef, 10%, others unchanged	141	113	-319	-645
Hogs, 25%, others unchanged	-248	-195	-362	-791
Butterfat, 25%, others unchanged	175	200	-332	-532
Total of three commodities	-282	-508	-515	-904

Effect of Changes in Size of Business

The estimated returns from farms of large, medium and small size of business are discussed in Station Circular 20. Some of the conclusions in that publication are that farms with a small business are not likely to be as profitable as farms with a moderately large business. The small farms have too little gross income to pay the expenses of the farm business and leave sufficient cash for a good standard of living for the family.

Cash for Family Living

Labor income does not indicate in any way the amount of money a family may have in any one year for its own spending. When computing labor income, charges are made for the non-cash items of depreciation, interest on capital used, unpaid family labor, and for the items designated as such expenses. The difference between the total charges made in a financial statement and the actual cash expenditures should be added to the labor income to determine the total amount a family has for its personal use. Thus in System 1, if the family performed all of the work on the farm and no labor was hired, the cash saved for family living would be \$175. Since depreciation was not a cash expense of the current year, \$760 more would be available for family use; and if no interest payments were made, \$1,096 more would be available. These amounts added to the labor income of \$175 would make a total of \$2,206 for the family to use.

Many farm families have appeared to do well during the depression because one or more of the above items were not a cash cost, and such amounts were used to maintain standard of living rather than for the farm business. Some have added to their personal current purchasing power by borrowing money outright, or by making purchases on some credit plan.

Capacity for Carrying Indebtedness

When computing farm income, no charges are made for interest due on indebtedness and none for family living. If we assume \$600 to be the cash cost of family living and deduct that amount from the farm income of Systems 1, 2, 3, and 4, we have remaining \$671, \$645, \$154, -\$33, respectively, which might be used for interest payments. If each of these amounts is capitalized at 6 per cent, we find System 1 could, under the conditions imposed in this circular, pay 6 per cent interest annually on \$11,180, System 2 could likewise pay interest on \$10,750, System 3 on \$2,565, and System 4 could pay no interest at all.

Conclusions

Physical limitations, particularly untillable land and lack of rainfall, determine the type of many farms in the Spring Wheat Area of South Dakota. The type of many farms is also determined by lack of capital. With these limitations in mind the following conclusions may be drawn for diversified farms in the Spring Wheat Area of South Dakota:

1. Better net returns may be expected from a given farm area when operated under an intensive plan of organization than under an extensive plan.
2. Intensive farms should be a better risk for creditors than extensive farms of the same area because of the better net returns to the intensive farms.
3. Extensive farms of 800 acres operated under plans and conditions similar to those outlined in this publication, are not likely to be profitable.
4. Many farmers could increase the net returns from their farm business by changing to a more intensive farm organization.

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5. Any farm similar in organization to one of those outlined as Systems 1, 2, 3, and 4 should secure greater returns than the system with which it compares, if it has superior advantages in the way of better soil, higher quality of crops or livestock, or better management.

Table 7.—Standards used for calculating the budgets of 800-acre farms operated under four different systems of farming in the Spring Wheat Area of South Dakota

Item	System 1	System 2	System 3	System 4
1. Man labor requirements:	months	months	months	months
January	1.0	2.0	1.2	1.0
February	1.0	2.0	1.2	1.0
March	1.3	2.0	1.2	1.0
April	1.7	2.5	1.2	1.5
May	2.0	3.0	2.0	2.0
June	2.0	3.0	1.5	2.0
July	2.0	3.0	2.0	2.5
August	1.5	3.0	1.6	2.0
September	1.5	2.5	1.5	1.5
October	2.0	2.0	2.0	2.0
November	2.0	2.0	1.5	1.5
December	1.0	2.0	1.2	1.0
Total for year	19.0	80.0	18.0	19.0
Regular labor in excess of 12 months of operator's labor calculated at \$25 per month.				
2. Field work with tractor:	acres	acres	acres	acres
Plowing	200	240	240	160
Disking	200	160	240	120
Harrowing	1,280	1,240	1,040	880
Packing	200	160	120	160
Planting corn	200	---	---	---
Cultivating corn	600	480	360	480
Drilling grain	400	400	360	240
Cutting grain	100	140	80	100
3. Total hours of tractor work including belt work:	800	800	700	600
4. Tractor cost per hour:				
Fuel and oil			.36	
Repairs			.055	
5. Rates for custom work hired:				
Combining wheat per acre		\$1.25		
Threshing wheat per bu.		.08		
Threshing oats and barley per bu.		.06		
Husking corn per bu.		.06		
Filling silo per ton		.30		
6. Prices of products sold:				
Wheat* per bu.	\$.75	Culled beef cows per cwt.	\$3.00	
Eggs per doz.	.12	Culled dairy cows per cwt.	3.50	
Poultry per lb.	.10	Yearlings off grass per cwt.	4.50	
Sows* per cwt.	4.50	Veals per cwt.	6.00	
Fat hogs* per cwt.	5.50	Butterfat per lb.	.27	
* Price includes anticipated compensation from AAA contracts.				
7. Crop yields per acre:				
Wheat		11	bus.	
Oats		30	bus.	
Barley		18	bus.	
Corn		18	bus.	
Alfalfa		1.3	tons	
Native hay		.5	tons	
Silage		4	tons	
Carrying capacity of native pasture 5 acres for one animal unit				

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TABLE 7 (Continued)

8. Livestock production:

Cattle:	
Calf crop	90%
Death loss after weaning	4%
Replacement of cows	20%
Average weight of long yearlings sold off grass	700 lbs.
Butterfat production:	
Systems 1 and 4	120 lbs. per cow
System 2	250 lbs. per cow
System 3	200 lbs. per cow
Hogs:	
Pig crop, per litter	6 pigs
Death loss after weaning	5%
March farrowed pigs, average weight when sold	250 lbs.
May farrowed pigs, average weight when sold	210 lbs.
Poultry:	
Eggs per hen	8 doz.
Chicks saved per hen kept	2 head

9. Feed requirement per head

Milk cows:			
250 lbs. butterfat production,*	2,400	2.5	100
200 lbs. butterfat production,	2,000	2.	120
120 lbs. butterfat production,	1,000	2.	150
Stock cows	200	2.	180
Heifers, 2 and 3 years	200	2.	150
Yearlings	200	1.5	120
Calves	40	.5	60
Hogs, per 100 lbs. produced:			
Market weight	250 lbs. 500		
Market weight	210 lbs. 475		
Sows, per head		.25	40
Poultry, 100 head	5,000		
Horses, per head	2,000	2.5	120

* If silage is fed, the grain requirement is 2,000 lbs. and dry roughage, 2 tons.