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**MORE INCOME FOR NORTH DAKOTA FARMERS:
THE POTENTIAL ROLE OF LIVESTOCK ENTERPRISES**

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Highlights

- **Income from livestock marketing has declined as a proportion of total gross farm income in the past two decades.**
- **Income from cattle and calves accounts for about 65-75 percent of total livestock income in the state.**
- **Income from milk has ranged from 14-20 percent of total livestock income in the state.**
- **Income from swine, a promising growth enterprise for the state, has generated only 5-8 percent of total livestock income.**
- **Livestock income is very important to counties in western North Dakota, relatively unimportant in the eastern counties.**
- **Enterprise budgets for beef and swine indicate positive returns to operator and unpaid labor, management, and equity capital for 1992.**
- **Less than 30 percent of North Dakota's feed grain output is used within the state to support livestock production.**
- **Large quantities of unused roughage and crop residue, currently unused, could support additional livestock production.**
- **Livestock production can be a complementary enterprise with crop production adding to farmer income levels and stability of income.**
- **Constraints to increased livestock production in the state can be resolved largely through a program of focused research and education.**

MORE INCOME FOR NORTH DAKOTA FARMERS: THE POTENTIAL ROLE OF LIVESTOCK ENTERPRISES

Marvin R. Duncan, Vernon Anderson, Timothy Faller,
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I. Current Situation and Trends of Livestock on North Dakota Farms

North Dakota farmers historically relied on income from livestock marketings for about 30 percent of total gross farm income. Prior to the second world war that figure was higher--up to about 60 percent for two years during the 1930s because of low crop prices during the period. Beginning in 1972 the proportion of income generated by livestock marketings began to decline and has averaged close to 24 percent during the 1980s and early 1990s.

Volatile export demand and federal government subsidy support for crop-related agriculture made crop-related income relatively more important than livestock income to North Dakota during the past 20 years. Ample supplies of red meats also held down prices and livestock's contribution to total farm income until recently, when lower supplies and resulting price increases have brought profitability to red meat producers.

Positive returns to cattle and hog producers at a time of lower crop prices and declining farm subsidies have increased interest in the role of livestock production in North Dakota agriculture as a means of improving and adding stability to farm income and adding to economic activity in the towns and cities. This report explores a range of issues associated with the usefulness of adding to the state's livestock production and, identifies research and extension priorities to provide the information base farmers will need for making sound business decisions.

A review of statistical information about livestock production in North Dakota helps to put its past contribution in perspective. Livestock and livestock products have averaged from 20-30 percent of total cash income for the past 20 years. As a proportion of total cash income, income from livestock from 1988 through 1990 averaged 27 percent compared to income from crops at 54 percent and government payments at 19 percent. Cash income from farm marketings and government payments are presented in Table 1. Income from cattle and calves accounts for 65-75 percent of the total livestock income. This figure also includes dairy cows and calves marketed. Income from milk ranged from 14-20 percent followed by hogs at 5-8 percent of the total livestock income. Income from sheep and turkeys is very similar, accounting for 1.0 to 1.5 percent of livestock income. Income for selected species of livestock is illustrated in Figure 1. There has been little change in the proportion of income from cattle and calves, hogs, milk, sheep, and turkeys for the last 14 years.

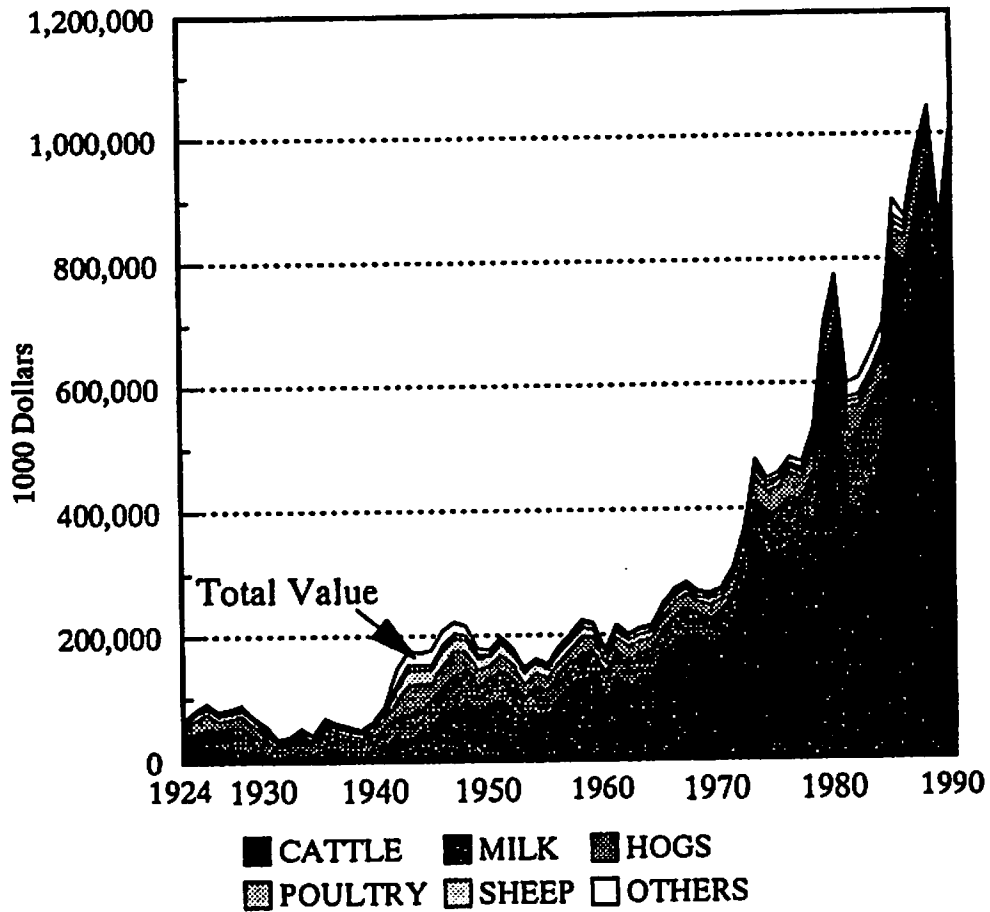
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TABLE 1. CASH RECEIPTS FROM MARKETINGS AND GOVERNMENT PAYMENT, WITH PERCENT OF TOTAL, NORTH DAKOTA, 1924-1990

Year	Livestock and Produce		Crops		Government Payments		Total Cash Income
	Amount	Percent of Total	Amount	Percent of Total	Amount	Percent of Total	
	\$000		\$000		\$000		\$000
1924	54622	21.9	195071	78.1	-	-	249693
1925	71280	25.6	207130	74.4	-	-	278410
1926	82267	40.8	119206	59.2	-	-	201473
1927	68672	28.6	171166	71.4	-	-	239838
1928	72868	31.2	160606	68.8	-	-	233474
1929	80362	37.4	134399	62.6	-	-	214761
1930	63215	42.5	85592	57.5	-	-	148807
1931	49924	62.3	30176	37.7	-	-	80100
1932	32640	53.7	28089	46.3	-	-	60729
1933	36324	41.2	51780	58.8	-	-	88104
1934	48118	48.1	27551	27.5	24416	24.4	100085
1935	38558	41.5	37455	40.3	16855	18.1	92868
1936	62547	58.0	33406	31.0	11918	11.0	107871
1937	53806	42.9	52048	41.5	19623	15.6	125477
1938	47870	47.3	41126	40.6	12284	12.1	101280
1939	45108	33.5	61347	45.6	28098	20.9	134553
1940	57179	37.3	70292	45.8	25914	16.9	153385
1941	79426	34.1	129831	55.8	23603	10.1	232860
1942	120643	36.5	189573	57.3	20599	6.2	330815
1943	153075	35.4	255469	59.1	23950	5.5	432494
1944	151880	33.1	291767	63.6	15055	3.3	458702
1945	152461	31.7	320349	66.5	8746	1.8	481556
1946	181580	34.1	330105	62.0	20426	3.8	532111
1947	199192	28.4	495722	70.6	6814	1.0	701728
1948	194072	28.2	488273	70.8	6984	1.0	689329
1949	164362	31.0	362367	68.3	3547	0.7	530276
1950	168174	33.0	336157	65.9	5927	1.2	510258
1951	190430	33.4	373371	65.5	6562	1.2	570363
1952	171993	32.0	358626	66.7	6882	1.3	537501
1953	142282	29.8	330052	69.1	5589	1.2	477923
1954	156651	32.8	314887	65.9	6017	1.3	477555
1955	149432	28.8	365832	70.4	4212	0.8	519476
1956	176315	30.1	390947	66.7	18732	3.2	585994
1957	197391	33.4	359142	60.7	35164	5.9	591697
1958	220212	33.4	412638	62.5	27260	4.1	660110
1959	217128	35.5	364134	59.5	31189	5.1	612451
1960	175339	31.0	352296	62.2	38565	6.8	566200
1961	213682	38.5	297396	53.5	44336	8.0	555414
1962	199116	29.5	403523	59.7	72884	10.8	675523
1963	208528	27.7	462796	61.6	80367	10.7	751691
1964	212427	32.0	343143	51.7	107677	16.2	663247
1965	247587	30.9	437795	54.6	116317	14.5	801699
1966	271721	30.8	472006	53.6	137457	15.6	881184
1967	280986	33.1	437712	51.5	130850	15.4	849548
1968	267501	31.9	430275	51.3	140243	16.7	838019
1969	264885	29.2	479397	52.8	162966	18.0	907248
1970	272561	28.9	503864	53.4	167239	17.7	943664
1971	304960	31.2	532487	54.4	140517	14.4	977964
1972	366730	27.3	766914	57.2	208122	15.5	1341766
1973	477173	21.0	1676283	73.8	119431	5.3	2272887
1974	448472	18.2	1978025	80.5	30968	1.3	2457465
1975	454913	24.5	1376410	74.2	24883	1.3	1856206
1976	478787	28.1	1199909	70.5	22744	1.3	1701440
1977	472560	27.1	1148257	65.9	122603	7.0	1743420
1978	527537	24.4	1354805	62.7	278179	12.9	2160521
1979	689272	28.6	1672750	69.5	46519	1.9	2408541
1980	773474	28.4	1835331	67.3	116634	4.3	2725439
1981	598003	22.2	1962885	72.9	130659	4.9	2691547
1982	606259	21.6	1999386	71.3	200176	7.1	2805821
1983	647614	19.6	2083241	62.9	578760	17.5	3309615
1984	693387	23.1	1840319	61.4	463245	15.5	2996951
1985	686850	21.7	2001059	63.1	483652	15.2	3171561
1986	671250	22.3	1638464	54.4	700180	23.3	3009894
1987	762141	24.7	1600691	51.9	719783	23.3	3082615
1988	849282	27.1	1573590	50.1	715068	22.8	3137940
1989	870792	31.0	1466735	52.2	474846	16.9	2812373
1990	684765	22.8	1774687	59.1	545378	16.2	3004830

SOURCE: North Dakota Agriculture Statistics Service, USDA.

FIGURE 1. VALUE OF NORTH DAKOTA LIVESTOCK PRODUCTION BY CATEGORY



Source: USDA-ERS, Farm Income Data, A Historical Perspective
 North Dakota Crop and Livestock Reporting Service
 USDA-SRS, Milk Production, Disposition and Income

Livestock production is more important to some counties in North Dakota than to others. The state average is a good indication of livestock contributions to total agricultural income, but may not indicate the importance on a county or regional basis.

Statewide cash receipts from livestock average 22.8 percent of gross agricultural receipts. But, if livestock income is evaluated on a county basis, a different picture results. Livestock income exceeds cash receipts from crops in 23 counties (43 percent) and is approximately equal in two others (Table 2).

TABLE 2. LIVESTOCK AND CROP STATISTICS ON A COUNTY BASIS, 1989

County	Land Area acres	Pasture Rangeland etc, acres	Receipts From Sales of Products				
			Total Receipts \$000	Livestock	Crop Ratio	Crop Other	
Sioux	705792	78.14	19171	72.56	12.54	5.78	21.65
McIntosh	634688	35.97	35579	65.99	11.86	5.57	28.44
Emmons	961984	40.14	47773	60.18	10.89	5.53	34.29
Dunn	1275008	67.94	37908	67.71	10.59	6.39	25.90
Morton	1228928	57.22	56059	67.08	9.17	7.32	25.42
Logan	640320	43.59	37147	65.64	8.99	7.30	27.06
Oliver	461312	53.08	17808	62.74	7.72	8.13	29.13
Billings	728960	83.91	11121	62.88	7.39	8.51	28.61
Kidder	868864	43.72	36089	57.52	6.01	9.57	32.91
Grant	1066112	52.94	40002	61.72	5.63	10.95	27.32
Mercer	666560	48.59	23093	67.79	5.49	12.34	19.88
Golden Valley	648960	46.43	22122	58.66	5.08	11.55	29.79
Bowman	744320	54.37	23307	55.41	4.18	13.26	31.33
Adams	633088	41.48	22425	55.38	3.75	14.76	29.86
Burleigh	1040192	47.88	46721	52.91	3.33	15.91	31.18
Slope	783808	61.27	19096	55.27	3.13	17.64	27.09
McHenry	1202752	33.90	56593	48.62	2.45	19.86	31.51
Stark	842304	40.93	41202	53.67	2.45	21.95	24.38
McKenzie	1750400	52.05	43659	46.13	1.53	30.08	23.80
Sheridan	632704	32.37	23544	33.61	1.49	22.62	43.77
Dickey	731648	27.95	49462	43.75	1.39	31.39	24.86
Pierce	664256	21.29	32196	34.03	1.37	24.89	41.08
LaMoure	726976	23.28	50523	39.15	1.17	33.33	27.51
Hettinger	726016	22.91	34276	34.71	1.04	33.42	31.87
Stutsman	1449152	27.33	88522	35.52	0.98	36.43	28.06
Eddy	406400	29.24	23788	33.97	0.89	38.27	27.76
Mountrail	1164224	34.97	39458	29.63	0.86	34.52	35.85
Benson	897728	23.43	43329	26.97	0.82	33.07	39.96
Sargent	545856	24.27	40243	32.74	0.80	41.14	26.12
McLean	1321600	26.90	55279	26.95	0.76	35.36	37.70
Wells	831296	19.25	57380	30.01	0.75	39.79	30.20
Ransom	551104	35.82	39548	31.51	0.74	42.58	25.91
Rolette	584000	26.11	29446	26.17	0.57	46.07	27.76
Ward	1308160	24.56	66462	25.30	0.56	45.54	29.15
Poster	413056	21.11	31386	22.45	0.39	57.67	19.88
Griggs	454336	21.29	38765	21.06	0.36	58.44	20.50
Williams	1321088	33.65	57923	16.36	0.31	53.51	30.13
Nelson	636928	15.87	51150	18.64	0.30	61.10	20.26
Barnes	946624	17.40	74047	16.22	0.27	59.34	24.44
Burke	715968	25.15	24992	14.36	0.27	53.97	31.67
Renville	567232	14.78	30784	11.71	0.18	64.22	24.07
Cass	1119296	10.08	155583	12.63	0.18	69.72	17.65
Divide	831808	26.23	48419	11.39	0.18	63.87	24.74
Richland	927424	14.29	158663	11.89	0.16	72.88	15.22
Bottineau	1073408	15.62	61477	9.29	0.14	64.94	25.77
Towner	667456	12.81	41077	7.21	0.11	68.30	24.50
Ramsey	798912	12.61	56310	6.41	0.10	65.48	28.11
Grand Forks	920320	11.67	164099	6.87	0.08	80.87	12.26
Cavalier	967488	13.23	68665	4.27	0.06	70.49	25.24
Pembina	719360	11.13	121787	4.64	0.06	80.38	14.98
Walsh	822976	13.32	141850	4.02	0.05	80.47	15.51
Steele	454528	13.67	67132	3.16	0.04	83.35	13.49
Traill	551040	8.41	109292	2.24	0.03	87.64	10.12
State	44334720	33.27	2813732	26.07	0.52	50.19	23.73

SOURCE: Farm Income and Expenses, United States, North Dakota, Counties, and Plains. Bureau of Economic Analysis. 1984-1989.

Income from other sources averaged almost 24 percent but in 1989 was less than livestock income (23.7 vs. 26.1 percent). Counties are listed according to the livestock/crop ratio (receipts from sales). Livestock agriculture is most important in counties located south and west of the Missouri River and in central North Dakota. The livestock percentage of total agricultural receipts is least in counties adjacent to the Red River and west along the Canadian border. A ratio of 1.00 indicates livestock income equal to crop income.

Including livestock in the farm business is in part a function of available forage and pasture. Table 2 also presents the total acres (percent) in a county which are designated as pasture, rangeland, woodlands, ponds, etc. County acreage also includes public land and/or Native American owned land.

Livestock inventory numbers for the last 10 years are presented in Table 3 with the number of farms/ranches reporting livestock for a similar period of time presented in Table 4. Hog numbers have shown more consistency since 1950 than other species of livestock. The trend indicates a gradual decline with 1991 hog numbers at 265,000 head. Poultry numbers also have declined substantially since 1950.

TABLE 3. LIVESTOCK INVENTORY, JANUARY 1, NORTH DAKOTA, 1980-91

Year	All Cattle	All Hogs ¹	All Sheep	All Chickens ¹
thousand head				
1980	2,000	370	236	520
1981	1,850	265	272	460
1982	2,000	280	280	500
1983	2,050	210	222	510
1984	2,100	260	219	625
1985	2,050	255	215	635
1986	2,000	285	180	540
1987	1,900	275	185	290
1988	1,800	325	169	315
1989	1,600	340	164	255
1990	1,700	280	186	240
1991	1,700	265	222	230

¹Relates to December 1, previous year.

SOURCE: North Dakota Agricultural Statistics No. 60, June 1991.

North Dakota's long-term livestock inventory numbers are shown in Figure 2. Cattle numbers indicate an increase from 1925 to 1975 with a decline in the last 15 years.

The total number of sheep and hogs was similar in 1950, approximately 425,000 head of each species. Sheep numbers increased during the 1950s, but started a steady decline in the early 1960s that continued until 1989 except for a small increase in the early 1980s. Sheep numbers have increased from a low in 1989 to 222,000 in 1991.

TABLE 4. NUMBER OF LIVESTOCK FARMS BY SPECIE AND NUMBER OF ALL FARMS, NORTH DAKOTA, 1979-90

Year	All Cattle	Beef Cows	Milk Cows	Hogs	All Sheep	All Farms
thousand						
1979	22.0	17.2	4.8	4.5	1.8	40.5
1980	21.0	16.8	4.2	4.0	2.1	40.0
1981	20.0	15.8	4.2	3.6	2.1	38.5
1982	19.2	15.2	4.0	2.8	2.2	37.0
1983	19.0	15.1	3.9	2.8	2.0	36.5
1984	18.5	14.8	3.7	3.0	2.1	35.5
1985	17.8	14.3	3.5	3.0	2.0	34.0
1986	17.2	14.2	3.0	3.0	1.8	33.5
1987	16.4	13.7	2.7	2.6	1.9	33.5
1988	16.0	13.5	2.5	2.6	1.8	33.5
1989	16.3	13.8	2.5	2.6	1.9	34.0
1990	16.3	13.9	2.4	2.1	1.9	34.0

SOURCE: North Dakota Agricultural Statistics No. 60, June 1991.

II. Will the Trends Change?

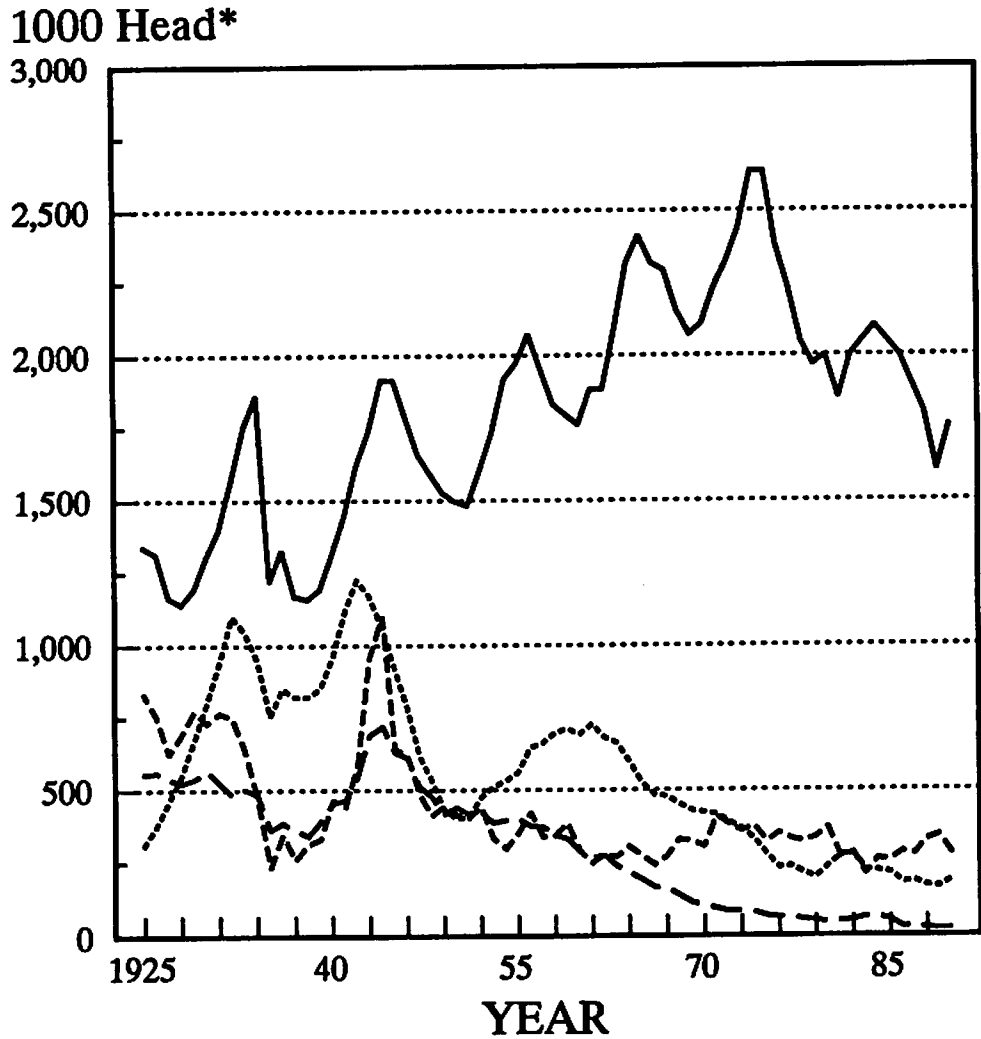
Livestock trends in North Dakota indicate a long-term pattern of steady to declining production (Figure 2). That is particularly true in the eastern third of the state where only a small number of beef and dairy cattle herds remain. In the balance of the state, cattle numbers have risen somewhat since 1950; however, sheep and poultry numbers have declined during that 40-year time period. Finally, hog numbers have fallen by 32 percent in the same 40-year period.

A combination of agricultural export growth, government farm subsidies, and periods of strength in crop prices contrasted with periods of weaknesses in most livestock prices (with milk prices an obvious exception) all contributed to declining interest in--and to less perceived need for--livestock production by North Dakota farmers.

Now, however, circumstances appear to have changed. Despite the current resurgence in wheat exports, long-term agricultural export growth may be more difficult to achieve. Federal budget constraints may cause reduced farm subsidies. The proposed General Agreement on Tariffs and Trade (GATT) agreement seems unlikely to eliminate market distorting subsidies and surpluses or to reduce the disparity between U.S. farm export subsidies and those of the European Economic Community (EEC). World supply/demand relationships, which have been suppressing crop prices, point to stronger crop prices in 1992. However, the longer term outlook remains somewhat austere.

Conversely, feeder cattle prices from 1987-91, hog prices in 1986-87 and 1990-91, and sheep prices from 1985-89 were more favorable. While the next several years may see lower feeder cattle prices because of cyclical increases in number, the shorter liquidation phase of the hog cycle now under way may offer opportunities to profitably enter hog production within the next few years. Sheep and goat production, particularly on land infested with leafy spurge, may be a viable alternative.

**FIGURE 2. NUMBER OF LIVESTOCK ON FARMS,
NORTH DAKOTA, JANUARY 1.**



All Cattle and Calves,
January 1

All Hogs and Pigs,
December 1 of previous Year

All Sheep and Lambs,
January 1

*All Chickens,
January 1, 10000 Head

Source: Livestock and Poultry Inventory, Bulletin 408, Revised. June 1981; and Agricultural Statistics No. 59.

For North Dakota farmers who experience declining--or only stable--income levels and with continued financial stress for heavily leveraged operators, attention understandably turns toward means to enhance farm income. Livestock production is an alternative that merits consideration.

Any discussion of why North Dakota producers should consider livestock production alternatives should be premised, first, on the potential capacity of livestock to increase net income of farm families and, second, on increasing business activity in North Dakota communities. Other arguments include improved financial resilience of farm businesses; greater use of the state's forage base, adding value to its feed grain crops; and more fully utilizing labor and management skills of farmers.

NDSU Extension Service livestock enterprise budgets were examined to determine the potential for enhancing net income to farmers (NDSU Extension Service 1990, Revised 1992). NDSU Extension Service 1990 beef cow budgets (Table 5) suggest a likely gross return per cow of about \$381 for a herd of 100 cows with spring calves sold in the late fall. If no debt capital is used to finance the operation, returns of \$100 per cow to operator, unpaid family labor, management and equity capital appear achievable. This budget assumes an 85 percent calf crop and sale weight for steer calves of 528 pounds at \$.89 and for heifer calves 498 pounds at \$.83. For the same operation with 40 percent debt financing, the returns to operator, family labor, management and equity capital would be \$29 per cow. These NDSU Extension Service budgets demonstrate that even with declining fed cattle prices, there are currently net returns from cow/calf production.

TABLE 5. BEEF COW HERD SELLING WEANED CALVES IN FALL. BEEF COW BUDGET 1990, NORTH DAKOTA, REVISED 1992

<u>Income</u>				
Steers	43 head	522 lbs	\$.89/lb	\$19977
Heifers	24 head	493 lbs	\$.83/lb	\$ 9821
Cull cows	14 head	900 lbs	\$.42/lb	\$ 5292
Cull hfrs	4 head	875 lbs	\$.60/lb	\$ 2322
Cull bull	1 head	1700 lbs	\$.52/lb	\$ 884
			Total income per herd	\$38074
			Total income per cow	\$ 381
<u>Expense</u>				
		<u>40% Debt</u>	<u>0% Debt</u>	
Feed costs		\$197	\$197	
Livestock expense		\$ 58	\$ 58	
Int. on feed and lvstk. exp.		\$ 3	\$ 0	
Fixed expense		\$ 94	\$ 26	
		\$352	\$281	
Returns to operator and unpaid family labor, management and equity capital				
		\$ 29/cow	\$100/cow	

Hog production in 1986-87 and 1990-91 was profitable. The liquidation of the U.S. inventory now under way will limit that profitability in the near term. However, NDSU Extension Service budgets indicate (Table 6), based on a hog price of \$39 per cwt, that a 150-sow farrow to finish operation with no debt could generate a total annual gross income of \$1,357 per sow and return \$221 per sow to labor, management and equity capital (Table 6). Even with 80 percent debt capital financing, the operation could generate total annual returns of \$95 per sow to labor, management and equity capital. While somewhat more conjectural, poultry--and perhaps even fish farming--also may provide profitable opportunities for North Dakota farmers.

TABLE 6. HOG FARROW TO FINISH BUDGET, NORTH DAKOTA 1990, REVISED 1992

<u>Income</u>				
Slaughter hogs	14.07/sow	240 lbs	@ \$ 39.00/cwt	\$1317
Feeder pigs	0.00/sow	40 lbs	@ \$ 1.00/lb	\$ 0
Cull sows	30%/year	400 lbs	@ \$ 30.00/cwt	\$ 40
Cull boars	4.00/head	450 lbs	@ \$ 26.00/cwt	\$ 4
Purchase repl gilt	0%/year	0 lbs	@ \$ 0.00/cwt	\$ 0
Sow death loss	3%/year	400 lbs	@ \$-30.00/cwt	\$ -4
			Total income/sow	\$1357
<u>Expense</u>				
			80% Debt	0% Debt
Feed costs			\$ 755	\$ 755
Livestock expense			\$ 223	\$ 233
Int. on feed and lvstk. expense			\$ 32	\$ 0
Fixed expense:				
Bld, fac, and sows			\$ 148	\$ 148
Inv investment interest/sow			\$ 104	\$ 0
Total cost per sow			\$1262	\$1136
Returns to operator and unpaid family labor, management and equity capital			\$ 95/sow	\$ 221/sow

Livestock prices are, of course, cyclical. Any successful business plan should be formulated to recognize that current cattle prices may reflect nearly the top of the price cycle and hog prices near the bottom of the price cycle.

Increased livestock production would add increased business activity as demand for production inputs and services increases. Production inputs include buildings, equipment, feed and veterinary supplies. Professional services ranging from veterinarians to feed ration formulation would be in greater demand as well. Input-output studies at NDSU's Agricultural Economics Department indicate the indirect impact on the North Dakota economy of a dollar's worth of livestock production exceeds that of a dollar's worth of crop production by more than 20 percent (Hertsgaard et al. 1984). For example, each dollar of livestock revenue results in \$4.49 in direct and indirect economic activity. That compares to \$3.69 generated by each dollar of crop revenue.

If dairy, cattle feeding, swine production and poultry production are profitable, value can be added to feed grain crops by marketing those crops through livestock. Livestock can also effectively utilize low-quality grains. Underutilized grassland, hayland, and crop residue could be a source of livestock feedstuffs. Beef cow herds and sheep flocks can be wintered on straw, grass, and grass hay if alfalfa hay or protein supplements are available as calving and lambing approaches.

Crop residue may be underutilized in North Dakota. According to the 1987 Census of Agriculture, 980,918 acres of cover crop; 1,218,830 acres of idle cropland [including Conservation Reserve Program (CRP) acres]; and 171,804 acres of woodland were not harvested in the state. Additionally, only a small percentage of available residue was collected for livestock feed from the vast majority of the state's 26.9 million acres of harvested cropland. Moreover, some of the additional 2.3 million acres in CRP since 1987 potentially could be devoted to animal agriculture when the contracts expire.

Available labor and management resources are an important consideration in supporting increased livestock production. Some grain producers may have as much as 500-800 annual hours of available labor that could be productively utilized in livestock operations. These operations can be complementary with crop farming. The strong management skills producers possess could be effectively used, with minimum redirection, in profitable livestock enterprises. In some cases a livestock enterprise could prove more profitable than commuting to off-farm employment.

A final rationale for increasing livestock production is as a means of reducing variability in farm income. Crop yields are subject to substantial weather-related variability in the Great Plains. Moreover, in a worldwide marketplace crop prices demonstrate considerable volatility as well. Livestock enterprises, even with cyclical variability, can add a stabilization of farm cash flow and income that can help assure the farmers' ability to meet fixed production costs, including debt servicing. Profitable livestock enterprises, of course, enhance total operator incomes.

III. What Are the Future Opportunities?

A number of opportunities appear to exist for North Dakota farmers to expand livestock production--and by so doing to improve farm profits and community-based economic growth. Alternatives include both beef cattle and swine production. Opportunities may also exist in poultry, sheep, goat, fish and wild game production.

New dairy cattle operations may not offer growth potential for a variety of reasons, including distance from processing and markets and the very large initial fixed investment. However, for those North Dakotans currently involved in dairy, a very profitable option may be to improve the performance of the existing dairy herd. Raising the average production of a herd to the U.S. average of 14,370 lbs. could improve the profitability of a dairy farm now producing at the state's average output of 11,977 lbs.

Beef production may be the alternative enterprise with the most potential if livestock enterprises are added to a cash grain farm. Cattle production currently is the state's largest livestock enterprise. North Dakota producers provide less than 2 percent of the nation's beef supply, so increased output is not likely to materially impact national supply/demand relationships. Beef production often can be increased with only modest investment in fixed assets. While competitive demands on management may occur during calving, generally speaking, crop and livestock production can be complementary. Finally, North Dakota has surprisingly large quantities of roughage--usable by beef cattle--that currently go unused.

Unused roughage and readily available feed grains could provide an excellent opportunity for more North Dakota cattlemen to background at least a portion of their calf crop. However, profitability may decline in the next few years when backgrounding calves during the liquidation phase of the cattle price cycle.

The volume of roughage in the form of bean, wheat, barley, and oat straw that is available as a residue of crop production is documented in Table 7. Currently, only a small amount is utilized in livestock production. Even after accounting for the value of the residue as fertilizer and in erosion control and after calculating the cost of collections, the feed value substantially exceeds the total cost of the residue. For example, bean straw has a feed value of \$31.92/ton and a cost of under \$20. Wheat straw has a feed value of about \$36/ton and a cost of about \$18.50. More than 268,000 tons of bean straw are potentially available and over 10 million tons of wheat straw are potentially available.

TABLE 7. AVERAGE COLLECTIBLE CROP RESIDUE IN NORTH DAKOTA

	Collectible Tons	Collection Costs	Fertilizer Value	Value of Erosion	Total Cost Per Ton ¹	Feed Value ²
Spring Wheat	6,755,306	12.88	2.07	3.49	18.44	36.12
Durum Wheat	3,296,548	12.88	2.07	3.49	18.44	36.12
Winter Wheat	331,278	12.88	2.07	3.49	18.44	36.12
Barley	3,815,214	12.88	2.47	2.92	18.27	36.98
Oats	103,040	12.88	2.55	4.16	19.59	48.16
Corn	2,650,957	12.88	4.41	1.65	18.94	42.62
Beans	268,026	12.88	2.49	4.50	19.87	31.92

¹Fertilizer value and erosion control foregone and the cost of collections.

²Feed value is calculated based on total digestible energy of the residue relative to prairie hay, as found in M.E. Ensminger "Feeds and Nutrition Digest." Five-year average price of prairie hay, \$43/ton, is used as reported by North Dakota Crop and Livestock Service.

SOURCE: Johnson, Roger G., and Dean A. Bangsund. Biomass Resource Assessment and Potential for Energy in North Dakota. Department of Agricultural Economics, North Dakota State University.

North Dakota is also a relatively minor player nationally in pork production with only 1/2 of 1 percent of the nation's output. Swine production, while substantially more management-intensive than beef production, is also complementary with crop production in terms of timing of management demands. While fixed capital investment can be quite high under some production systems, the initial costs may be minimized by converting unused buildings to less intensive systems of swine production.

Finally, the most compelling reason for increasing swine production is to add further value to the 4.3 million tons of feed barley and corn produced in North Dakota (North Dakota Agricultural Statistics Service). Currently only about 1.2 million tons are estimated to be consumed by livestock in North Dakota.

For farmers with very few resources, sheep and goats may provide increased stability of income. However, while the financial barriers to entry are relatively low, the management requirements are quite high at certain times of the year. The Hettinger Research Extension Center sheep project has successfully demonstrated that the needed management skills can be both successfully taught and quickly learned by new producers. With sheep and goats, income stability and utilization of leafy spurge infested pastures may be more important than income enhancement.

Both poultry and fish production may hold promise for North Dakota farmers. A recently completed NDSU feasibility study of the broiler industry suggests the state could profitably develop an integrated broiler production and processing industry to supply western United States and Canadian markets (Golz). A major determinant in developing such an industry may be whether or not North Dakotans are interested in the kinds of jobs and income potential that industry can provide. Meanwhile, generally profitable turkey production enterprises operate in the central part of the state.

Aquaculture also holds interest for some entrepreneurs in the state. While the potential is interesting, there is not yet enough experience to develop confidence that such ventures can consistently be profitable. However, pilot ventures now beginning production could provide that confidence once some years of operating experience are acquired.

On balance, then, a reasonably wide range of opportunities exists for profitably increasing livestock production in North Dakota. Beef cattle appear to hold the greatest impact for the state, with swine second. Depending on the preferences of North Dakotans, a profitable integrated poultry industry appears attainable. As with most new ventures, individual producers may wish to start at a relatively small scale to gain experience and test profitability. However, it is useful to remember meaningful income enhancement occurs only when a commercial scale of production is reached.

IV. Constraints to Achieving Opportunities

As potentially beneficial to North Dakota's farmers and rural communities as increased livestock production might be, there are

constraints to be removed if the full potential of livestock production is to be achieved. Some constraints may be insurmountable and some clearly present more difficult challenges than others.

Management skills needed for livestock enterprises may prove to be a constraint, but one that can be removed by education. It is often observed that top-quality production management in livestock enterprises requires both a higher level of management oversight over a more extended period than is true for crop production. Indeed, livestock production may be more responsive to high-quality management and less subject to vagaries of weather than is true for crop production. It is not clear that crop farmers considering livestock ventures fully recognize the high level of sustained management commitment that is required for long-term success with livestock.

Another management issue is generational in nature. It is no longer true that most North Dakota farmers have extended experience with livestock production at an earlier point in their farming career or while growing to adulthood on a farm. Indeed, many of the people whose income and balance sheet situations could benefit most from a profitable livestock enterprise may have no practical livestock production management experience. For these people, an effective educational program would be an essential ingredient to success. Current experience with the North Dakota sheep project demonstrates that with intensive management education, farmers new to livestock production can quickly acquire the skills necessary for success.

Business management skills, so important to success in any endeavor, also need upgrading when livestock is added to the farm business. Not only does the farm business become financially more complex with more and different risks to manage, but quite often debt capital will be used, at least in part, to finance the new livestock enterprise. Moreover, decisions on fixed investments in buildings and facilities must be balanced with investment decisions on the livestock themselves. Careful business analysis is essential to help assure an investment mix and size of investment that can become profitable. Finally, in any cyclical industry the timing of entry is an important factor in the likelihood of success. In short, those who enter at the bottom of the price cycle are apt to do much better than those who enter at the top.

Access to capital and the terms on which it is acquired are vital in both planning and implementing a profitable livestock enterprise. Some farmers have investment portfolios outside agriculture or equity in land that assures them access to capital, whether equity capital or debt capital. However, that group of farmers probably has only limited incentive to enter livestock production.

Farmers with low income and equity positions are apt to find livestock production most appealing. Yet this group will be viewed by lenders as high-risk borrowers for the debt capital to finance livestock production. From a lender's perspective, these farmers will typically have little equity capital to put into the venture, will already be highly leveraged, and may not have demonstrated--for whatever reason--sustained profitability of their current farm business.

Although open to debate, the statutory climate for lenders in North Dakota may not be as conducive for new lending to farmers on high-risk ventures as is true in some other states. Lenders sometimes raise a number of concerns: (1) length of time required to recover the loan collateral in case of default [especially true for farm real estate or collateral attached thereto], (2) the inability to obtain deficiency judgments, (3) the possible inability to collect the loan principal during periods of financial stress, (4) questions associated with perfection of liens, (5) the ease of bankruptcy filing, and (6) the statutory requirements for the Farm Credit System surrounding reconsideration of adverse credit decisions and loan restructuring. Additionally, many lenders were weakened financially by the recent period of farm financial stress. Some have become more risk averse as they strive to improve their own financial condition. Finally, the stronger the likelihood of profitability from new livestock ventures in North Dakota, the less likely that any statutes unique to North Dakota or to agricultural lending will materially inhibit credit availability, though credit price could still reflect whatever risk is perceived by lender.

Another constraint to growth in livestock production may involve market access and specialized marketing skills. This constraint is both one of infrastructure and knowledge. The state has but limited capacity to slaughter livestock and process meat products. Moreover, outside certain specialized niches there are very large economies of scale in such enterprises. Those realities mean that marketing options must be carefully evaluated in determining the profitability of livestock enterprises.

For some livestock production enterprises it may be necessary that sufficient output levels be quickly reached to justify construction of competitively sized state-of-the-art processing plants. This may be especially true for poultry and fish but, at least arguably, may be true for hogs as well.

Market information systems and market knowledge are the lifeblood of a market economy. Yet North Dakota's systems have fallen behind those of other major livestock states. The lack of market intelligence is true for the private and public sectors and in livestock businesses, as well as the communication business. Fortunately, such information and the systems to produce and disseminate it can follow rather quickly the growth of profitable livestock production. Access to increased funding could enable NDSU to play a leadership role in market development that would go substantially beyond its current output.

Infrastructure can be a constraining factor in the start-up of any new venture. If infrastructure includes supply, service, transportation, marketing, and financial institutions, it could be asserted that in each case the constraint is initially a real one. However, where constraints can be removed by private firms adding new product lines, outlets, and expertise, these constraints will soon be eased by the demonstration of a profitable market. In the case of feed mills and slaughter plants where substantial capital investment is required--often in advance of full utilization--the constraint will be longer lasting and more difficult to resolve. In the case of slaughter and processing plants, the problem is the classic chicken

and egg syndrome. To achieve a high level of livestock output, an efficient and cost effective processing alternative may be required. On the other hand, without a high level of livestock output available as throughout for such a plant, the plant may not be forthcoming. This dilemma raises interesting questions regarding public sector support, such as loan guarantees, facility buybacks, and credits. Should these benefits go to farmers or to those providing the essential marketing and processing infrastructure?

Shelter and facility needs are a more difficult constraint, but can be dealt with at the individual producers's level. Hence, they may not be as difficult to remove as some might suggest. In fact, the constraint is vastly more difficult for some types of livestock enterprises than for others. Cow/calf operations may need only limited investment and existing facilities are often adaptable at relatively low cost. Hog production requires from moderate to major investment in facilities for most potential producers. Poultry and fish production both require major investment. Moreover, unless used for the livestock for which they are constructed, these facilities have almost no alternative uses and in the case of loan default have little or no value to the lender--indeed facilities can be a liability.

The same arguments can be made for supply and marketing facilities. Here, however, some provisos are useful. Many farmers and businesses have the financial capacity to remove this constraint on their own volition. Additionally, large firms already integrated from supply and processing through to consumer marketing may be interested in providing lease capital or debt capital backed up by supply contracts. Thus, a number of alternatives exist to remove this constraint, and market forces can be innovative if solid profit opportunities are apparent. Finally, no one should underestimate producer innovation in attempting to solve this constraint.

Meshing livestock production into crop farming, and assuring appropriate technology transfer and production efficiency in each, presents challenging production and business management problems. These problems are solvable if several resources are brought to bear. Important research focused on bringing to farmers and ranchers practical guidance on optimum enterprise mix and management strategies will pay high dividends. This research and the extension of its results to producers should have a high priority as part of a coordinated effort to improve farm profitability through livestock production. But just as important, farmers themselves must be committed to solving the problems involved. Without long-term commitment, livestock may not be a profitable enterprise on most farms. Private businesses, farms, and lenders must participate in a partnership to assure efficient transfer and application of appropriate and profitable technology.

V. Priority Research and Extension Activities for the Future

An interdisciplinary team of animal scientists, agricultural engineers, agronomists, and agricultural economists will play a role in evaluating livestock options, creating production and cropping systems, and developing management and marketing alternatives for

North Dakota farmers. A team effort involving researchers and extension workers can improve the likelihood of successful adoption of profitable livestock enterprises on North Dakota farms.

The research of highest priority involves the analysis of potential profitability as a result of adding livestock enterprises to cash grain and grain/livestock farms. Analysis of this type would explore the complement or competition for resources in the farming operation. The role of management would be explored, and the impact on profitability and business resilience of differing levels of capitalization--both debt and equity--would be evaluated. Finally, the contribution to profitability and income stability of differing livestock enterprises and scales of operation could be evaluated.

Lenders may at first be reluctant to extend credit for livestock enterprises. Thus, an important research effort will identify and evaluate lender concerns. Where these can be allayed by improved information on livestock enterprises, bankers can be provided such information. Where improved financial, business, management, and marketing skills are desired on the part of farmers and their lenders, an integrated resource management team consisting of financial and management specialists--combined with animal and range scientists--can play a constructive role in helping lenders and borrowers identify their needs and develop the business and financial planning needed to resolve the concerns.

Timely and relevant information on production, marketing, and business management of livestock enterprises on North Dakota farms will be critical to successful livestock diversification programs by farmers. The university's extension specialists will carry a pivotal role in developing and delivering such extension education.

Finally, as North Dakota producers begin to gear up for increased livestock output, the availability of markets and processing facilities becomes critical to profitability. Agricultural economists can assess such needs and conduct feasibility studies into alternatives for removing market and processing shortfalls as barriers to a profitable and larger livestock sector in North Dakota's farm economy.

VI. Summary

Livestock income, as a proportion of North Dakota farm income, has declined from the proportion level prior to 1970. While livestock profitability has been a factor in that structural adjustment, government farm subsidies underwriting production of farm program crops has been an important factor as well. Now, with somewhat reduced levels of program crop price protection and improved income prospects from animal agriculture, it is timely to revisit the role of livestock production on North Dakota farms.

Weighing the livestock option in the state's agriculture makes sense from at least four perspectives. First, beef cattle and swine production are profitable. Positive returns flow to operator, unpaid labor, management, and equity capital from production of these species. Moreover, since the state's production of beef cattle and swine represent a small proportion of national output, increased

production in North Dakota would not have a material adverse impact on national output and prices.

Second, ample underutilized feed resources are available. North Dakota has ready access to roughage that has little or no economic value unless used in livestock production. Additionally, less than 30 percent of the state's feed grain production is consumed by livestock within the state. The balance of feed grain output is shipped out of the state as a bulk commodity with little or no additional economic value added to the state.

Third, additional livestock production holds the potential to add a measure of stability to farm income. If price protection for government program crops is further reduced, enterprises that can both add income and stability to farm income will play a welcome role in the state's agriculture.

Finally, livestock production has a somewhat stronger impact in the creation of off-farm jobs and income generation than does field crop production. Thus, increasing livestock output can be a means of adding more value--hence jobs and income--to the state's agricultural output.

While opportunities appear to exist, some constraints may need to be resolved. More knowledge about livestock management by farmers, lenders, and other input businesses needs to be fostered. Another potential constraint may be a less desirable statutory climate for lenders and suppliers than is the case in some other states. The need to develop a stronger input supply and marketing infrastructure is also apparent if profitable livestock production is to increase.

On balance, the opportunities for livestock to play a stronger role in North Dakota's economic growth are quite bright. No constraints exist that cannot be resolved. Moreover, the role of research and education can be important in fostering development of a larger and profitable livestock sector in North Dakota.

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