Volume 5

Special Reports

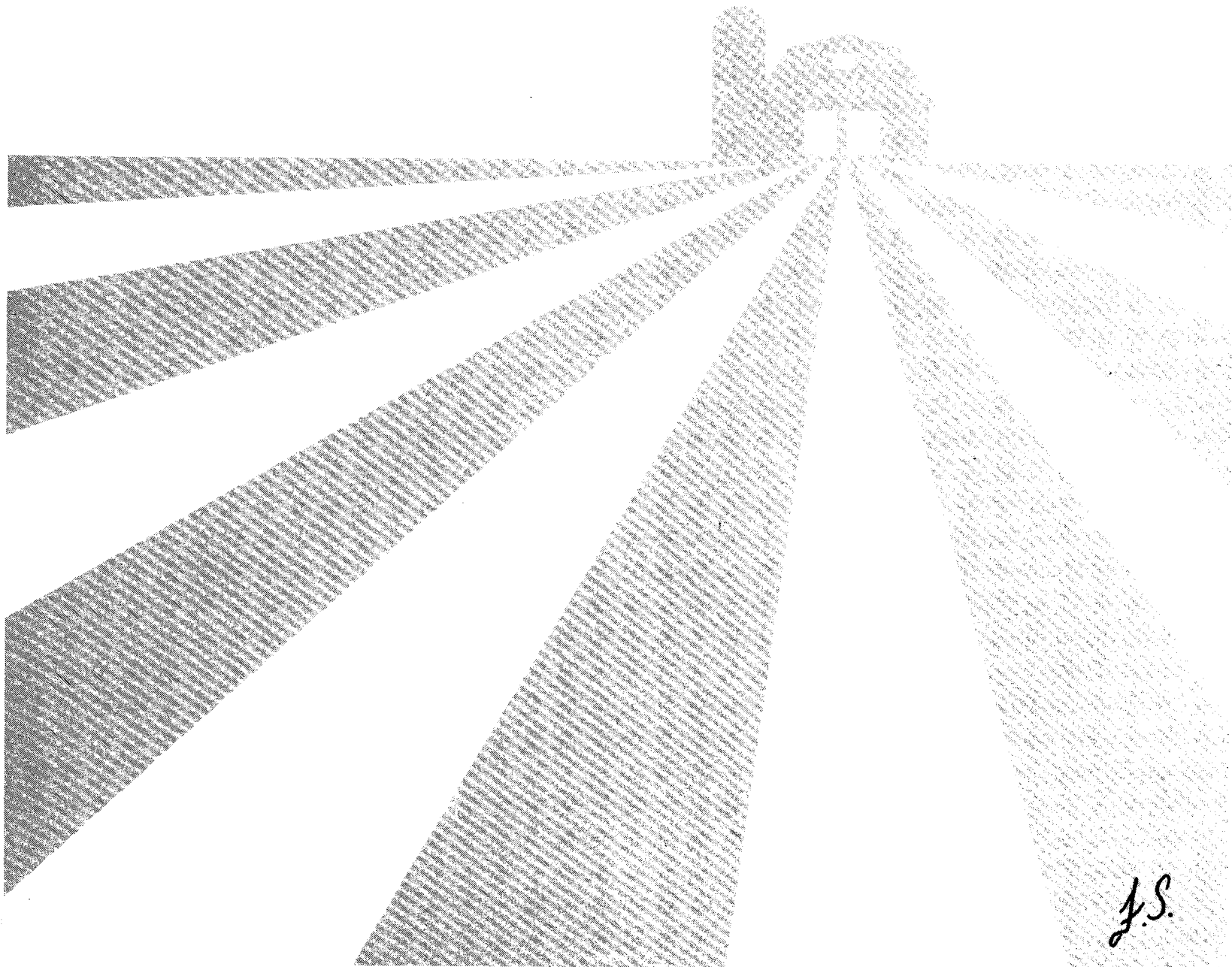
Part 9

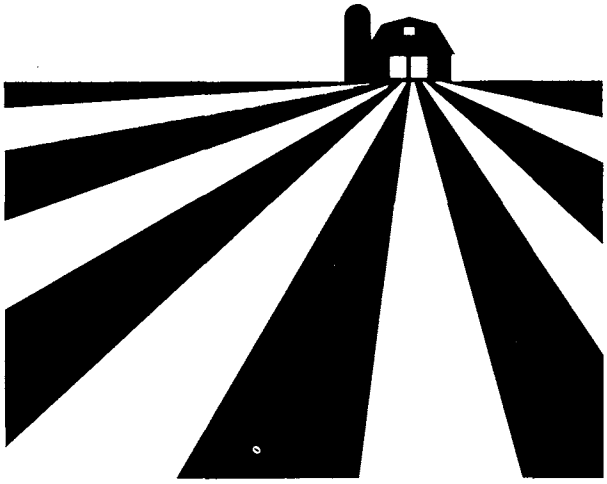
1979 Farm Energy Survey

AC78-SR-9

1978
CENSUS OF
AGRICULTURE

U.S. Department of Commerce
BUREAU OF THE CENSUS





1978 CENSUS OF AGRICULTURE

AC78-SR-9
Issued November 1982

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CLARIFICATION SHEET

The following pages are reprinted for clarity: XV, 71, and 103.

U.S. Department of Commerce
BUREAU OF THE CENSUS

Table B. **Percent of Relative Standard Error for Selected Energy Data: 1979**—Con.

	Number of selected equipment							Farms with heated buildings	Farms with hot water facilities
	Wheel tractors	Trucks	Automobiles	Combines	Forage harvesters	Irrigation pumps	Electric motors		
United States	2.0	2.2	2.9	3.5	2.6	7.7	4.7	3.7	3.7
REGIONS									
Northeast	5.5	6.2	8.1	13.3	11.5	13.5	10.8	9.6	7.9
North Central	3.3	3.7	4.5	4.7	3.5	14.2	6.7	5.8	5.8
South	2.9	3.2	5.3	5.6	4.0	16.3	8.7	5.2	5.6
West	5.4	5.4	5.9	7.7	6.7	10.6	12.0	7.6	6.9
DIVISIONS									
New England	11.1	9.3	12.3	18.1	7.0	20.2	17.6	8.1	10.3
Middle Atlantic	6.3	7.5	9.8	13.6	14.2	18.2	12.6	12.5	9.7
East North Central	4.6	5.1	6.4	6.5	6.6	18.1	9.8	9.4	7.9
West North Central	4.7	5.1	6.2	6.6	4.0	16.2	9.0	7.3	8.7
South Atlantic	4.3	4.6	7.9	9.3	6.5	15.7	11.7	7.4	9.3
East South Central	4.6	5.5	9.9	11.6	8.1	13.8	19.9	9.8	8.4
West South Central	6.1	5.9	9.8	8.7	5.7	22.6	15.1	9.9	12.0
Mountain	5.7	5.8	6.9	10.4	9.4	9.2	13.9	9.2	7.5
Pacific	8.9	9.1	9.7	10.4	9.3	15.0	18.0	12.4	11.3
NEW ENGLAND									
Total	11.1	9.3	12.3	18.1	7.0	20.2	17.6	8.1	10.3
MIDDLE ATLANTIC									
New York	7.0	11.0	10.9	18.5	19.3	33.7	13.2	17.0	10.2
New Jersey	11.2	12.8	15.3	19.2	10.2	25.7	18.8	22.5	15.6
Pennsylvania	11.0	12.1	18.8	20.3	19.8	8.3	23.1	20.4	17.5
EAST NORTH CENTRAL									
Ohio	10.8	12.6	13.3	15.5	7.5	6.7	21.6	18.4	20.4
Indiana	10.2	13.9	20.4	11.9	7.3	24.6	15.6	22.6	15.8
Illinois	10.5	9.4	12.1	11.3	9.1	18.6	19.6	20.4	20.9
Michigan	9.2	10.2	18.4	16.2	13.4	21.4	15.2	18.5	17.8
Wisconsin	8.7	10.8	11.8	20.3	15.6	49.4	21.1	21.4	12.5
WEST NORTH CENTRAL									
Minnesota	10.3	10.8	15.0	14.4	8.6	30.9	20.6	17.2	15.6
Iowa	7.8	9.0	11.2	8.8	8.8	41.4	15.1	14.0	21.3
Missouri	10.8	11.9	14.6	22.0	10.6	10.8	29.2	19.7	23.5
North Dakota	22.6	19.4	23.2	27.0	9.9	34.4	37.2	14.1	29.5
South Dakota	12.6	17.9	18.0	18.4	7.9	28.9	24.1	18.1	23.5
Nebraska	16.3	15.4	19.8	17.1	9.4	23.6	25.9	17.1	21.3
Kansas	14.5	13.1	20.7	18.3	10.0	32.4	19.7	25.2	21.5
SOUTH ATLANTIC									
Delaware	14.2	17.1	17.6	16.7	5.9	48.0	24.3	9.4	17.7
Maryland	10.9	14.5	12.9	21.1	22.8	67.3	15.9	17.4	13.7
Virginia	9.3	9.8	19.3	21.1	20.3	38.6	20.8	27.4	22.9
West Virginia	10.7	11.4	22.2	23.8	8.8	18.8	25.6	19.2	29.3
North Carolina	10.0	11.5	21.6	20.3	15.0	20.4	28.6	11.0	28.7
South Carolina	11.2	12.8	13.2	18.2	51.9	19.8	31.6	14.6	16.1
Georgia	10.9	10.2	14.8	17.4	9.1	27.4	27.2	16.1	17.6
Florida	10.2	10.3	15.6	25.1	12.2	18.2	19.2	15.2	16.9
EAST SOUTH CENTRAL									
Kentucky	6.6	6.8	20.7	24.6	11.3	27.1	23.8	20.1	14.2
Tennessee	7.1	7.3	15.2	19.8	7.0	34.7	24.0	24.4	17.1
Alabama	16.4	21.0	13.2	28.2	8.8	23.0	59.9	12.0	15.6
Mississippi	11.5	10.3	16.3	20.8	81.0	22.3	22.1	14.2	17.1
WEST SOUTH CENTRAL									
Arkansas	10.2	9.2	24.4	16.2	8.5	25.0	26.4	13.4	28.2
Louisiana	9.6	9.8	17.6	12.9	13.4	18.6	32.5	17.4	9.8
Oklahoma	12.1	10.9	15.6	17.4	2.1	27.8	32.7	29.3	32.7
Texas	10.3	10.1	16.4	17.9	6.8	31.1	24.0	14.6	14.8
MOUNTAIN									
Montana	14.6	16.6	16.8	21.8	8.6	18.7	28.8	23.3	8.6
Idaho	10.9	10.6	12.8	19.0	31.0	16.0	23.3	15.3	18.9
Wyoming	10.9	13.2	14.2	20.0	6.2	28.7	109.7	37.2	11.5
Colorado	13.6	12.6	17.4	21.4	7.2	19.4	27.7	18.7	15.4
New Mexico	12.4	12.9	16.3	31.6	.7	18.1	39.6	17.0	16.8
Arizona	31.6	29.8	28.9	35.8	33.7	51.1	34.2	23.0	15.7
Utah	17.2	13.3	16.7	15.5	63.3	21.3	27.4	23.9	19.4
Nevada	16.0	12.8	19.6	47.4	24.7	22.2	32.0	22.7	41.3
PACIFIC									
Washington	12.1	11.5	15.9	15.4	8.3	21.3	22.0	16.7	17.1
Oregon	11.9	11.0	16.7	18.5	28.6	26.6	31.4	18.8	22.4
California	15.0	15.8	15.7	21.6	9.1	20.1	26.1	24.1	17.4

TABLE 25. CUSTOMWORK PERFORMED BY OTHERS FOR FARM OPERATORS FOR STATES: 1979

	FUEL WAS PROVIDED BY FARM OPERATOR									
	SOIL PREPARATION		PLANTING		CULTIVATING		PESTICIDE, HERBICIDE, AND/OR FERTILIZER APPLICATION		HARVESTING	
	FARMS	ACRES	FARMS	ACRES	FARMS	ACRES	FARMS	ACRES	FARMS	ACRES
UNITED STATES	45 564	4 281 477	35 123	3 265 612	23 758	2 147 471	34 841	3 780 476	90 547	7 947 737
REGIONS										
NORTHEAST	1 963	134 259	1 319	34 618	227	4 262	1 202	49 423	3 857	152 650
NORTH CENTRAL	21 779	2 367 422	16 445	1 917 822	11 260	1 373 006	16 018	2 294 382	62 227	5 522 714
SOUTH	17 062	1 220 785	14 070	840 607	9 793	458 269	13 458	976 709	19 705	1 491 963
WEST	4 760	559 011	3 289	472 565	2 478	311 934	4 163	459 962	4 758	780 410
DIVISIONS										
NEW ENGLAND	209	3 725	147	1 600	87	498	184	2 962	268	8 534
MIDDLE ATLANTIC	1 754	130 534	1 172	33 018	140	3 764	1 018	46 461	3 589	144 116
EAST NORTH CENTRAL	9 683	682 633	7 751	552 137	5 576	329 030	7 579	791 005	25 461	1 294 477
WEST NORTH CENTRAL	12 096	1 684 789	8 694	1 365 685	5 684	1 043 976	8 439	1 503 377	36 766	4 228 237
SOUTH ATLANTIC	8 938	370 600	8 671	324 441	6 236	243 596	7 435	402 670	8 621	445 823
EAST SOUTH CENTRAL	3 929	138 017	3 033	106 160	2 096	61 559	3 219	248 117	4 094	185 341
WEST SOUTH CENTRAL	4 195	712 168	2 366	410 006	1 461	153 114	2 804	325 922	6 990	860 799
MOUNTAIN	2 064	192 543	1 905	321 050	1 328	174 001	1 261	125 186	2 900	420 598
PACIFIC	2 696	366 468	1 384	151 515	1 150	137 933	2 902	334 776	1 858	359 812
NEW ENGLAND										
TOTAL	209	3 725	147	1 600	87	498	184	2 962	268	8 534
MIDDLE ATLANTIC										
NEW YORK	838	98 864	407	16 650	70	1 120	430	27 805	2 322	97 273
NEW JERSEY	134	4 482	114	2 642	70	2 644	93	4 588	270	19 405
PENNSYLVANIA	782	27 188	651	13 726	-	-	495	14 068	997	27 438
EAST NORTH CENTRAL										
OHIO	2 258	125 947	1 868	101 034	1 219	66 548	1 290	79 868	4 825	221 185
INDIANA	2 386	222 795	1 751	98 775	1 451	66 375	1 812	145 275	6 076	155 425
ILLINOIS	2 547	216 093	1 640	185 843	1 345	104 423	2 425	420 560	3 992	480 571
MICHIGAN	918	64 725	1 013	110 910	799	70 641	1 057	95 717	1 895	112 798
WISCONSIN	1 574	53 073	1 479	55 575	762	21 043	995	49 585	8 673	324 498
WEST NORTH CENTRAL										
MINNESOTA	699	62 649	2	(D)	2	(D)	845	179 190	6 575	558 098
IOWA	4 080	388 165	2 724	285 305	1 866	326 328	2 212	306 830	16 999	1 617 332
MISSOURI	2 282	121 897	1 363	114 871	836	43 909	1 980	234 252	3 737	263 541
NORTH DAKOTA	630	178 800	665	121 600	40	(D)	120	35 000	2 637	499 056
SOUTH DAKOTA	507	51 348	210	(D)	-	-	-	-	2 778	378 335
NEBRASKA	1 541	259 210	1 165	158 650	415	24 400	1 165	154 525	1 198	228 555
KANSAS	2 357	622 720	2 565	651 320	2 525	647 320	2 117	593 580	2 842	683 320
SOUTH ATLANTIC										
DELAWARE	34	2 798	37	3 132	33	2 332	36	5 575	76	5 180
MARYLAND	265	15 395	350	17 600	140	12 035	100	12 185	1 130	52 555
VIRGINIA	1 125	40 600	1 479	42 304	987	37 325	1 393	45 414	1 587	71 024
WEST VIRGINIA	343	10 731	133	3 856	125	3 100	302	6 785	403	9 568
NORTH CAROLINA	3 465	96 715	3 583	68 236	2 845	48 778	2 435	119 549	2 591	78 209
SOUTH CAROLINA	1 309	65 897	1 293	70 828	753	48 458	1 048	46 323	1 276	110 378
GEORGIA	1 324	88 438	1 257	78 439	633	51 818	1 022	83 461	1 074	77 946
FLORIDA	1 073	50 026	539	40 046	720	39 750	1 099	83 378	484	40 963
EAST SOUTH CENTRAL										
KENTUCKY	1 282	27 568	1 001	27 118	950	20 595	1 190	24 920	1 585	43 753
TENNESSEE	925	17 741	792	13 454	342	6 530	644	35 594	1 007	30 984
ALABAMA	280	10 380	273	9 750	173	2 519	236	23 965	612	31 919
MISSISSIPPI	1 442	82 328	967	55 838	631	31 915	1 149	163 638	890	78 685
WEST SOUTH CENTRAL										
ARKANSAS	432	24 754	80	2 782	-	-	214	16 585	926	63 039
LOUISIANA	617	35 409	208	14 159	83	9 910	348	41 682	845	54 795
OKLAHOMA	717	164 569	540	132 095	70	16 870	592	75 230	2 584	262 978
TEXAS	2 429	487 436	1 538	260 970	1 308	126 334	1 650	192 425	2 635	479 987
MOUNTAIN										
MONTANA	320	89 017	306	97 572	180	99 110	204	82 400	418	111 459
IDAHO	533	17 691	470	12 276	279	5 877	290	11 517	839	87 379
WYOMING	1	(D)	-	-	30	600	65	4 485	62	21 370
COLORADO	291	30 243	632	155 128	460	23 508	406	9 893	974	59 667
NEW MEXICO	376	17 539	243	27 347	230	15 584	133	3 362	155	17 501
ARIZONA	200	28 934	111	25 186	87	26 191	122	12 679	1	(D)
UTAH	321	7 377	133	3 421	62	3 131	31	650	410	(D)
NEVADA	22	(D)	10	120	-	-	10	200	41	112 998
PACIFIC										
WASHINGTON	1 288	159 609	411	109 341	422	102 696	594	133 996	693	155 201
OREGON	436	10 200	301	8 023	175	2 245	602	51 858	525	46 825
CALIFORNIA	972	196 659	672	34 151	553	32 992	1 706	148 922	640	157 786

TABLE 3. ENERGY PURCHASES, USAGE, AND STORAGE, BY 1978 STANDARD INDUSTRIAL CLASSIFICATION: 1979--CON.

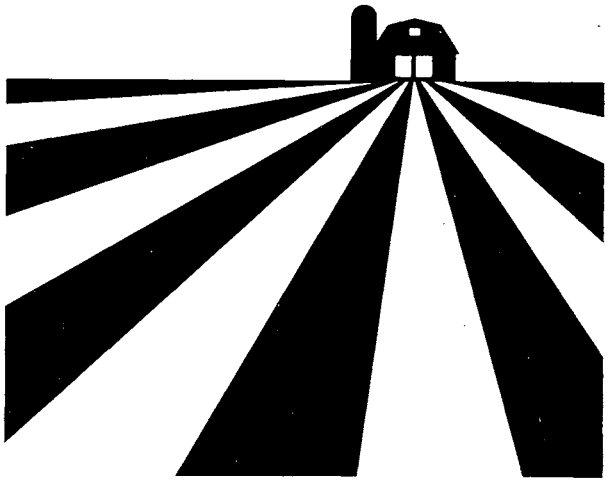
SOUTH	TOTAL	CASH GRAIN FARMS (011)	FRUIT, NUT, OR VEGETABLE FARMS (016,017)	OTHER CROP FARMS (013,019)	DAIRY FARMS (024)	POULTRY FARMS (025)	OTHER LIVESTOCK FARMS (021, 027,029)
LP GAS. . . . . FARMS. .	313 261	46 263	7 413	77 690	9 144	18 679	154 072
GALLONS, 1,000. .	517 643	82 347	13 466	175 919	11 797	86 736	147 377
$1,000. .	267 150	41 401	6 797	90 425	6 257	44 986	77 284
PURCHASED FOR--							
USE ON FARM . . . . . FARMS. .	145 236	25 634	3 044	47 882	5 459	15 688	47 529
GALLONS, 1,000. .	352 282	57 616	8 267	135 177	7 691	79 073	64 457
$1,000. .	180 418	28 620	4 257	69 124	4 034	41 079	33 304
USE ON OTHER FARMS. . . FARMS. .	1 719	388	130	743	70	44	344
GALLONS, 1,000. .	1 108	168	8	574	32	42	284
$1,000. .	574	79	4	307	13	24	147
PERSONAL USE. . . . . FARMS. .	209 599	28 702	4 962	41 616	5 334	7 277	121 708
GALLONS, 1,000. .	164 253	24 562	5 191	40 169	4 074	7 621	82 635
$1,000. .	86 158	12 702	2 535	20 994	2 210	3 883	43 833
QUARTERLY PURCHASES . . . FARMS. .	177 025	28 187	4 168	44 896	4 492	12 487	82 795
GALLONS, 1,000. .	394 788	64 953	10 770	142 880	7 676	75 166	93 343
JAN. 1 TO MAR. 31 . . . FARMS. .	143 725	21 766	3 563	30 402	4 087	12 237	71 670
GALLONS, 1,000. .	105 889	13 498	2 705	25 435	2 513	30 624	31 113
APR. 1 TO JUNE 30 . . . FARMS. .	115 465	20 500	2 979	25 652	2 771	8 273	55 290
GALLONS, 1,000. .	64 024	13 811	2 834	21 433	1 374	9 842	14 730
JUL. 1 TO SEPT. 30. . . FARMS. .	125 651	21 539	3 146	36 638	2 762	7 667	53 899
GALLONS, 1,000. .	106 339	18 489	2 455	58 337	1 494	8 848	16 716
OCT. 1 TO DEC. 31 . . . FARMS. .	150 742	23 459	3 752	34 498	3 897	12 047	73 089
GALLONS, 1,000. .	118 537	19 155	2 777	37 675	2 295	25 851	30 784
STORAGE CAPACITY. . . . . FARMS. .	299 589	45 237	6 621	72 163	8 977	18 312	148 279
GALLONS, 1,000. .	162 884	27 006	2 698	47 521	3 936	25 021	56 703
PURCHASED GALLONS, 1,000. .	502 438	80 729	13 248	166 913	11 699	86 253	143 596
ESTIMATED INVENTORY ON DEC. 31, 1979[1] . . . .GALLONS, 1,000. .	77 131	12 833	1 394	21 273	1 914	13 036	26 681
NATURAL GAS . . . . . FARMS. .	68 491	10 345	1 578	18 203	1 632	4 085	32 648
MILLION CU. FT. .	62 156	24 230	800	17 662	386	4 534	14 543
$1,000. .	136 019	54 061	1 721	38 201	965	10 212	30 860
PURCHASED FOR--							
USE ON FARM . . . . . FARMS. .	20 941	4 961	190	7 060	902	3 432	4 396
MILLION CU. FT. .	52 069	22 905	520	14 452	200	3 966	10 027
$1,000. .	112 274	50 909	1 061	30 610	514	8 871	20 310
PERSONAL USE. . . . . FARMS. .	57 337	7 273	1 492	14 010	1 154	2 559	30 849
MILLION CU. FT. .	10 087	1 326	281	3 210	186	568	4 516
$1,000. .	23 745	3 152	660	7 591	451	1 341	10 550
QUARTERLY PURCHASES . . . FARMS. .	26 798	5 280	805	7 753	439	2 641	9 880
MILLION CU. FT. .	54 549	22 906	681	15 609	199	4 068	11 086
JAN. 1 TO MAR. 31 . . . FARMS. .	23 187	4 217	802	5 467	439	2 622	9 640
MILLION CU. FT. .	7 702	2 396	196	1 597	75	1 599	1 840
APR. 1 TO JUNE 30 . . . FARMS. .	23 264	4 493	728	6 989	419	2 000	8 635
MILLION CU. FT. .	16 318	7 671	152	4 921	35	566	2 973
JUL. 1 TO SEPT. 30. . . FARMS. .	23 190	4 299	695	7 210	419	2 082	8 485
MILLION CU. FT. .	19 138	8 663	153	5 624	28	532	4 139
OCT. 1 TO DEC. 31 . . . FARMS. .	24 069	4 633	803	5 927	439	2 612	9 655
MILLION CU. FT. .	11 390	4 177	179	3 466	62	1 370	2 135
COAL. . . . . FARMS. .	23 385	1 418	235	11 738	1 264	716	8 014
TONS. .	129 664	6 356	1 757	60 657	5 899	13 268	41 727
DOLLARS. .	5 954 990	299 517	68 766	2 731 755	345 848	648 307	1 860 797
PURCHASED FOR--							
USE ON FARM . . . . . FARMS. .	3 923	291	89	1 509	621	475	938
TONS. .	18 017	(D)	(D)	4 438	1 271	6 403	4 062
DOLLARS. .	770 005	(D)	(D)	172 575	69 394	301 876	159 662
PERSONAL USE. . . . . FARMS. .	21 068	1 127	181	10 986	866	242	7 666
TONS. .	111 647	(D)	(D)	56 219	4 628	6 865	37 665
DOLLARS. .	5 184 985	(D)	(D)	2 559 180	276 454	346 431	1 701 135
QUARTERLY PURCHASES . . . FARMS. .	9 167	759	143	3 862	602	362	3 439
TONS. .	60 385	3 379	1 619	20 973	2 954	12 088	19 372
JAN. 1 TO MAR. 31 . . . FARMS. .	6 414	612	42	2 781	297	360	2 322
TONS. .	24 813	(D)	(D)	(D)	1 132	(D)	7 810
APR. 1 TO JUNE 30 . . . FARMS. .	1 751	-	-	839	124	181	607
TONS. .	3 660	-	-	1 667	(D)	(D)	941
JUL. 1 TO SEPT. 30. . . FARMS. .	1 634	-	2	858	68	179	527
TONS. .	5 743	-	(D)	(D)	450	(D)	1 831
OCT. 1 TO DEC. 31 . . . FARMS. .	7 125	724	141	2 727	536	356	2 641
TONS. .	26 169	(D)	(D)	(D)	(D)	(D)	8 790
ELECTRICITY . . . . . FARMS. .	652 394	78 949	22 573	167 910	24 247	29 234	329 481
KWH, 1,000. .	14 368 519	1 743 410	532 150	4 275 175	1 057 872	1 177 401	5 582 511
$1,000. .	644 198	79 682	25 891	189 472	46 089	53 906	249 157
PURCHASED FOR--							
USE ON FARM . . . . . FARMS. .	381 264	50 678	13 620	94 450	22 627	25 228	174 661
KWH, 1,000. .	6 781 379	790 230	313 322	2 233 500	793 296	921 831	1 729 200
$1,000. .	308 998	37 115	15 154	101 618	34 986	42 060	78 064
PERSONAL USE. . . . . FARMS. .	552 775	64 873	17 687	143 233	16 005	19 245	291 732
KWH, 1,000. .	7 587 140	953 181	218 828	2 041 675	264 576	255 569	3 853 310
$1,000. .	335 200	42 567	10 737	87 854	11 103	11 846	171 093
KEROSENE. . . . . FARMS. .	58 991	7 147	4 090	20 654	2 223	1 758	23 119
$1,000. .	13 743	1 654	550	6 840	869	535	3 295
MOTOR OIL AND GREASE. . . . FARMS. .	768 341	106 863	28 679	191 889	23 348	26 374	391 188
$1,000. .	114 614	27 264	4 516	35 451	4 695	3 401	39 287
OTHER . . . . . FARMS. .	91 361	9 460	2 850	20 866	2 262	3 284	52 639
$1,000. .	18 683	2 070	913	3 737	455	689	10 819

[1]CALCULATED BY APPLYING MIDPOINT OF PERCENT RANGE OF FULLNESS TO THE GALLONS OF CAPACITY.

1978 CENSUS OF AGRICULTURE

Volume 5

Special Reports



Part 9

1979 Farm Energy Survey

AC78-SR-9

Issued September 1982

U.S. Department of Commerce
Malcolm Baldrige, Secretary
Guy W. Fiske, Deputy Secretary
Robert G. Dederick, Under Secretary for Economic Affairs

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Bruce Chapman, Director
Shirley Kallek, Associate Director for Economic Fields
Michael G. Farrell, Assistant Director for Economic and Agriculture Censuses

AGRICULTURE DIVISION

John H. Berry, Chief

ACKNOWLEDGMENTS—Many persons participated in the conduct of the 1979 Farm Energy Survey. Primary direction was by **Shirley Kallek,** Associate Director for Economic Fields, and **Richard B. Quanrud,** Assistant Director for Economic and Agriculture Censuses (to June 1981), and **Michael G. Farrell,** his successor.

This report was prepared in the Agriculture Division under the general supervision of **Orvin L. Wilhite,** Chief (to January 1980), and **Arnold L. Bollenbacher,** his successor (to June 1982).

Clerical processing was performed in the Data Preparation Division, Jeffersonville, Ind.

Staff of the Administrative Services Division provided the forms design services.

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Representatives of the Economic Research Service of the U.S. Department of Agriculture and the U.S. Department of Energy contributed to the development of the content and tabulation plans for the survey.

Special tribute is paid to the thousands of farm and ranch operators who furnished the information requested in this survey. Only through their cooperation was it possible to collect and publish the data in this report.

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CONTENTS

INTRODUCTION

HISTORY AND PURPOSE

The 1979 Farm Energy Survey was conducted to supplement the energy data collected in the 1978 Census of Agriculture. This survey was conducted on a sample basis following the census to provide needed data on farm energy uses and requirements without burdening all farm operators. Detailed information is provided on such items as: expenditures for selected types of energy, amount of selected energy items purchased by quarters, fuel storage facilities and inventories, fuel sources, energy-consuming equipment, crop drying facilities, heated and air-conditioned buildings, customwork performed for and by others, and energy conservation practices.

The 1979 Farm Energy Survey is the first survey collecting detailed energy information to be taken in connection with a census of agriculture.

AUTHORITY AND AREA COVERED

The 1979 Farm Energy Survey was authorized under the provisions of title 13, United States Code. Section 182 authorizes the Secretary of Commerce to take surveys deemed necessary to furnish annual or other data on the subjects covered by the census. This survey was conducted under the provisions of these sections for the conterminous United States.

SOURCE OF DATA

The data presented in this publication came from the 1979 Farm Energy Survey. However, standard industrial classification (SIC) and value of sales data used in the cross tabulations were from the 1978 Census of Agriculture. Both the survey and the census were conducted by the Bureau of the Census.

The principal items included on the report form were determined in meetings with officials from the U.S. Department of Agriculture and the U.S. Department of Energy, which have primary responsibility for agricultural energy policies and programs. Also, requests and suggestions were made by the Census Advisory Committee on Agriculture Statistics. The form was subsequently approved by the Office of Management and Budget (OMB).

SCOPE OF THE SURVEY

The farm operators included in the survey were selected from a stratified sample of farm operations in the conterminous United States included in the 1978 Census of Agriculture. Horticultural specialty farms and abnormal farms (Indian reservations, institutional, experimental and research farms) were excluded from the survey. However, volume 5, Part 7, 1979 Census of Horticultural Specialties, conducted concurrently with the energy survey, contains some energy data.

The sample was to provide estimates for selected items with an acceptable level of accuracy for publication at the State level for all States, except the six New England States. Data for these States are combined and shown as Division totals.

TABULAR PRESENTATION

State data—Tables 1 through 27 summarize data for 42 States, the 9 divisions, the 4 regions, and the United States (excluding Alaska and Hawaii). Data for Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut were combined and are published only as totals for the New England Division. Table 1 shows all energy expenses and volumes purchased as enumerated by the survey. Table 2 breaks down the expenses and volumes purchased for on farm, on other farms, and personal use. It serves as a basis for analyzing statistics presented in tables 3, 4, and 5, which include quarterly purchases, storage and inventory of fuels, and sources of fuels for all energy enumerated. For a more detailed explanation of the enumeration of both farm and personal energy data, see the General Explanation, **Limitations of Data.** Tables 6 through 26 include energy data on farm equipment and facilities and customwork performed for and by others. Table 27 shows how many farms are practicing selected energy conservation measures.

U.S., region, and division data—Tables 1 through 3 present 1979 energy purchase and storage data by 1979 size of farm, 1978 value of sales, and 1978 SIC.

DEFINITIONS AND EXPLANATIONS

The General Explanation includes definitions and explanations of selected terms used in the tables.

"SEE TEXT" REFERENCE

Items in the tables which are followed by reference "See text" are explained or defined in the General Explanation.

ABBREVIATIONS AND SYMBOLS

The following abbreviations and symbols are used throughout the tables:

– Zero.
(D) Data withheld to avoid disclosing information for individual farms.
(X) Not applicable.
(NA) Not available.
(Z) Less than half of the unit reported.

GENERAL EXPLANATION

BACKGROUND

Prior to the 1978 Census of Agriculture, the most current estimates of farm energy requirements were based on the 1974 Census data. Since then, the prices of gasoline and diesel fuel have more than doubled. In 1979 alone, the price of imported crude oil rose 60 percent, and there is a possibility of our supply of foreign oil being disrupted. In 1979, there were shortages of diesel fuel in some States. This has come at a time of an increasing shift from gasoline to higher efficiency diesel-powered equipment. Federal and State agencies, cooperatives, and private businesses need more accurate information on which to base long range planning decisions.

These factors led the Bureau of the Census to make a more concerted effort to obtain additional data on energy uses. In planning the 1978 Census of Agriculture, it was decided to collect data on the cost, volume, and various forms of energy used in agricultural operations. Both the U.S. Department of Agriculture and the U.S. Department of Energy expressed an interest in obtaining as much detailed data of this nature as possible.

Several questions were asked in the 1978 Census of Agriculture to obtain data on expenditures for selected types of energy, gallons purchased, and fuel storage capacities. The collection of detailed energy data in the agriculture census was thought to be impractical. It was decided to do a follow-on sample survey of respondents to the census to obtain data on energy. Follow-on surveys have become an integral part of the agriculture census effort. This method permitted fewer questions on the report form for the main census, thus reducing respondent burden.

The 1979 Farm Energy Survey was developed to meet the needs of the user requiring more detailed data. The survey data will be used as a benchmark to revise and refine data systems of both the U.S. Departments of Agriculture and Energy.

SURVEY PREPARATION

Meetings were held the latter part of 1978 with the Bureau of the Census, the U.S. Department of Agriculture, the U.S. Department of Energy, and other data users to discuss general plans for the survey, and to consider data requests for the report form. Following these meetings, a test version of the report form was developed in conjunction with the U.S. Department of Agriculture. The test version was mailed in July 1979 to approximately 1,500 farmers in 10 States, and to a cluster sample of about 100 farmers in 2 other States. Two mail followups were made to nonrespondents in the 10 States, and a field followup to both respondents and nonrespondents was made by members of the Agriculture Division staff in the two cluster sample States to obtain the farm operator's reaction to the report forms. Based on results of the content test and recommendations from the Agriculture Division staff, the final version of the report form (Form 79-A35) was developed and mailed.

DATA COLLECTION

The Survey was conducted primarily by mail for maximum economy, supplemented by telephone calls to selected nonrespondents. Approximately 33,800 report forms were mailed from March to June 1980 as the necessary data became available from the 1978 Census of Agriculture. The operators were asked to fill out and mail the report form to the Bureau of the Census. Four followup mailings were made to most nonrespondents. There were no field followups on delinquent cases, but telephone followups were made toward the end of the enumeration period to approximately 2,900 selected nonrespondents. Details of the followup selection process and the statistical adjustments procedures are further explained in this section.

The telephone followup interviews were conducted in September and October by a telephone unit at Jeffersonville, Ind. When the farm operator was contacted, an effort was made to obtain the required data. If the required data could not be obtained, the farm operator was asked to complete the report form and mail it to the Bureau of the Census. These followup operations resulted in the completion of 2,000 of the 2,900 selected nonrespondent cases by the end of October.

Overall response to the survey was somewhat lower than for the main agriculture census, but it was comparable or better to responses received for the other follow-on surveys. Approximately 27,400 (81 percent) of the report forms mailed out were collected by October 1980.

DATA PROCESSING

Completed forms were clerically reviewed. Where significant data were omitted, entries unclear, or inconsistent responses, respondents were contacted by telephone and the information was collected, confirmed, or corrected.

After the report forms were edited and corrected, the data were keyed to magnetic tapes. Data were subjected to a detailed item-by-item computer edit. The edit included comprehensive checks for consistency and reasonability of data and, when needed, adjustments were made based on similar size farms within the same area. Entries of large magnitude and significant computer-generated changes to the data were verified.

Many of the acceptability limits on data were necessarily wide because of variations in practices, making it impossible to identify and correct all errors or to always supply precise estimates for all the incompleteness in the reports. These factors and others may affect the reliability of data for some minor items, but they should not have a significant effect on major data items.

Also, prior to tabulation, the entire data file was subjected to a series of consistency checks. Inconsistencies in the data were identified and corrected.

Prior to publication, tabulated totals were reviewed to identify remaining inconsistencies and potential coverage problems. Comparisons were made to the 1978 Census data and other check data. Selected report forms were reviewed and problem entries were either verified as being correct or the data were corrected.

LIMITATIONS OF DATA

During processing, the data were accepted as reported unless there were obvious reporting errors or gross inconsistencies among selected data. In general, only acres in the place, amounts of fuels purchased, percent of purchases, fuel storages, fuel inventories, sources of fuels used, equipment sizes, and fuel types were imputed if the data were not reported. Amounts purchased by quarter were imputed only for larger volume users. Imputations for these data were based on the matching 1978 Census report form, comparable adjacent report forms, or telephone followup.

For other items that were not generally imputed, there existed a possibility for undercount. However, care was taken to ensure that if there was any evidence of an item not reported, that item would be imputed. Because of the limited cross-check data within the report form, the possibility for undercount is greatest for self-propelled equipment not enumerated in the 1978 Census, motors, crop dryers, buildings, and hot water facilities.

Care should be taken in use of the irrigation data in table 19 for States, because the value of sales of agricultural products was used as the primary stratifier for the sample selection. Estimates of irrigation will tend to have more sampling error than other data items due to the lower correlation between the amount of irrigation and the value of sales of agricultural products in some States. The amount of error will also increase for States in which irrigation is infrequently reported (see **Statistical Adjustments**).

With the exception of major or frequently reported items, estimates from this survey should not be used as the universe totals without comparison to data from the 1978 Census of Agriculture and other benchmark sources. Much of the usefulness of the survey is from its use as a relative indicator. For example, a data user may wish to know what percentage of all combines are fueled by diesel, and what percentage of those have a head width of 18 feet or more.

Respondent interpretation of or failure to read instructions has resulted in some reporting errors in the amount of energy purchased for household use. It was stated in the instruction sheet (appendix) that if you live on the acres reported in section 1, item 4, of the report form include your household expenses. Many respondents who apparently lived on the place did not include their personal energy expenses. Also to a lesser extent, some respondents who evidently lived off the place did include their personal energy expenses. Since the respondents generally were giving the correct percent for work on the place and work done on other farms the data for those items were not affected.

The design and wording of the report form was also a factor in respondent reporting. For example, fewer automobiles were enumerated in the survey than in the census because the survey wording made it more clear that only automobiles used in connection with the farm business should be listed.

DEFINITIONS AND EXPLANATIONS

The data shown in the tables are derived from the farm energy survey. In general, the subject matter terms used for column headings and data line captions of the tables are indicative of the data source. Terms in this section provide a more detailed description of selected items and terms than are available on the tables, report form, or the instruction sheet. For an exact wording of the questions on the 1979 Farm Energy Survey report form and the instruction sheet, see the appendix.

Farms—For statistical purposes, a farm is defined by the Bureau of the Census as any place from which $1,000 or more of agricultural products were sold or normally would have been sold during the year.

Operator—The term "operator" designates a person who operates a farm, either doing the work or making the day-to-day decisions about such things as planting, harvesting, feeding, marketing, etc. The operator may be the owner, a member of the owner's household, a salaried manager, a tenant, a renter, or a sharecropper. For census purposes, the number of operators is the same as the number of farms.

Storage capacity—This is the maximum storage capacity available on the place by the most current type of fuel stored. Both farm and household storages are included in this item. Care was taken to ensure that storage capacity was not understated by failure to report.

Other self-propelled harvesting equipment—This includes any self-propelled harvesting equipment not specified on the report form. The respondent coded "other" in section 13 and the entry was clerically recoded from the respondent's description.

Other self-propelled equipment—Any self-propelled equipment that did not fall in the harvesting category or any of the other named self-propelled equipment is included under "other self-propelled equipment."

Acres irrigated—This includes land watered by artificial or controlled means such as sprinklers, furrows or ditches, spreader dikes, or purposeful flooding during the year. Land irrigated prior to the survey year but not in the survey year is excluded.

Land flooded during high water periods was to be included as irrigation only if the water was diverted to agricultural land by dams, canals, or other works. Table 19 for States shows acres irrigated only with energy-consuming pumps.

Crop drying system—This item includes any equipment used in the drying of crops or curing of tobacco by an artificial means. Generally, if a respondent had two or more dryers using the same fuel, he would only report one system.

Other crop drying or curing energy type—This includes any type of energy (e.g., diesel, wood, kerosene) used as a heat source not specified in section 15 of the report form. If the respondent's written description could not be coded as one of the prelisted energy types it was coded "other."

Storage buildings—This includes farm buildings used to store items which need to be cooled and/or kept warm. The respondent coded "other" in section 16 of the report form and the entry was clerically recoded from the respondent's description.

Other buildings—Any heated or air-conditioned building that did not fall in the category of storage or any of the specified building types is included under "other buildings."

Customwork—This category consists of acres that were prepared, planted, cultivated, chemically treated, and/or harvested with energy-consuming equipment for hire. If the respondent did customwork for others as an operator of a business operated separately from his/her farm, it was not to be included in the survey.

Value of agricultural products sold—This item refers to the gross market value, before taxes and production expenses, of all agricultural products sold or removed from the place in 1978 regardless of who received the payment. It includes receipts by the operator as well as the value of any shares received by partners, landlords, contractors, and others associated with the place. It is also referred to as value of sales.

The total value of agricultural products sold represents the sum of all crops, including nursery products sold, and livestock and poultry and their products sold. It does not include income from farm-related sources such as customwork, agricultural services, government farm programs, recreation and other related sources, or income from nonfarm sources.

FARM CLASSIFICATIONS

Energy expenditures, amounts purchased, quarterly purchases, and fuel storage capacities and inventories are classified by 1979 size of farm, 1978 value of agricultural products sold, and 1978 standard industrial classifications in tables 1 through 3 for the United States, regions, and divisions. The 1978 Census data were used for the latter two cross-tabulation tables to minimize respondent burden by not asking exact value of agricultural products sold by item.

Size of farm—This classification includes land in farms according to the following size groups: 1 to 49 acres, 50 to 99 acres, 100 to 179 acres, 180 to 259 acres, 260 to 499 acres, 500 to 999 acres, 1,000 to 1,999 acres, and 2,000 acres or more. Size of farm is the same as "Acres in This Place" and appears in section 1 of the report form (appendix).

Value of agricultural products sold—Data collected in this survey are cross-classified by 1978 value of agricultural products as reported in the 1978 Census. Sales data classifications include farms with the following values of sales: $500,000 or more, $100,000 to $499,999, $40,000 to $99,999, $10,000 to $39,999, $5,000 to $9,999, $2,500 to $4,999, and less than $2,500.

Standard industrial classification—Farms are classified according to the 1972 SIC Manual to promote uniformity and comparability of statistical data collected by various agencies. An establishment (farm, ranch, nurseries, greenhouses, etc.) primarily engaged in crop production (major group 01) or livestock production (major group 02) is classified in the 3-or 4-digit industry group, that accounts for 50 percent or more of the total value of sales from agricultural products. If the total value of agricultural products sold by an establishment was less than 50 percent from a single 4-digit industry, but 50 percent or more from the products of two or more 4-digit industries within the same 3-digit industry group, the establishment is classified in the miscellaneous industry of that industry group; otherwise, it is classified as a general crop farm in industry 0191 or a general livestock farm in industry 0291.

All farms in the 1978 Census were classified by SIC, and data from the farm energy survey were cross-tabulated by the same. The SIC's in this report include cash grain farms (011); fruit, nut, or vegetable farms (016, 017); other crop farms (013, 019); dairy farms (024); poultry farms (025); and livestock farms other than dairy or poultry (021, 027,029).

DISCLOSURE ANALYSIS

In keeping with the provisions of title 13, United States code, data are not published that would disclose the operation of an individual farm. These data are suppressed and a (D) is used instead of a number. To ensure the confidentiality of information on a characteristic of an individual farm, it is necessary to suppress data when the value of an item for one or two farms can be definitely or approximately determined by mathematical manipulation.

Suppression of data made within frequency distributions is accomplished in a way that will maintain maximum integrity of the frequency group, and are made whenever possible in adjacent frequency classes. This allows the user, by subtraction from the total, to have a farm count and total quantity reported for the combined suppressed frequencies. Although the published frequency data are not complete, the truncated frequency is available for analytical purposes.

STATISTICAL ADJUSTMENTS

The estimates from this survey are based on a probability sample of farms identified in the 1978 Census of Agriculture. To achieve these estimates, certain adjustments were made to the data collected.

Sample Selection

Farms enumerated in the survey were a sample of farms identified in the 1978 Census of Agriculture. All farms in the 1978 Census were divided into strata based on (1) state of enumeration, (2) whether they were enumerated from the mail list or from the direct enumeration area sample,[1] (3) 2-digit SIC, and (4) the total value of sales of agricultural products. The level of sales used to define strata varied from State to State. All large farms and all farms from the direct enumeration area sample with large expansion factors were included into the sample with certainty. The size of certainty farms varied from $200,000 in West Virginia to $5 million in California. All abnormal farms and farms with a horticultural SIC were excluded from the survey.

Within each noncertainty strata, a systematic sample of farms was selected. Farms in State stratum were ordered by State, county, and approximately by ZIP code within the county. Counties were arranged geographically within each State. Samples were selected independently from State to State and within each stratum. Different integer sampling intervals and random starts were used for each stratum of a State.

Whole Farm Nonresponse

Each farm selected for the sample was mailed a series of report forms and letters to encourage response. All nonrespondents of farms in certainty strata were telephoned. When responses could not be obtained from certainty farms, information was imputed by the Bureau of the Census subject matter experts using 1978 Census information and information from similar farms that did respond to the 1979 Farm Energy Survey.

Nonrespondents of farms in noncertainty strata were enumerated on a sample basis. A 1-in-6 sample of nonrespondents was selected to be enumerated. Budget and time restrictions prevented the enumeration of all of the 1-in-6 sample. Information for the selected nonenumerated nonrespondents was imputed by the Bureau of the Census subject matter experts using information obtained from the 1978 Census of Agriculture, farms enumerated in the survey, and subject matter experts' knowledge of agriculture.

To account for the nonresponse among farms in the sample, an adjustment was made to the expansion factor of enumerated and imputed farms. The expansion factor was adjusted by stratum within a State. The adjustment factor was 6 for all farms in the nonresponse sample.

Method of Estimation

Estimates were prepared by weighting the data for each farm by the initial sampling interval adjusted for nonresponse. A final expansion factor was calculated by multiplying the adjustment factor by the original expansion factor. Weights assigned to individual farms in the survey range from 1 to 2,400.

[1] Consisted of selected geographic areas completely canvassed by direct enumeration and provided reliable estimates for the United States, regions, and States of number and characteristics of any farms not represented in the mail portion of 1978 census. See text of volume 1, **1978 Census of Agriculture**, for more detailed information.

RELIABILITY

The statistics in this report are estimates derived from a probability sample survey. There are two types of errors possible in an estimate based on a sample survey—sampling and nonsampling. Sampling errors occur because observations are made only on a sample, not on the entire population. Nonsampling errors can be attributed to many sources, e.g., inability to obtain information about all cases in the sample, definitional problems, difference in the interpretation of questions, inability or unwillingness to provide correct information by respondents, mistakes in recording or coding the data obtained, and other errors of collection, response, processing, coverage, and estimation for missing data. Nonsampling errors also occur in complete censuses. Specific nonsampling errors are discussed in **Limitations of Data.** The accuracy of a survey result is determined by the joint effects of sampling and nonsampling errors.

Coverage

The target population for this survey is all census farms in the conterminous United States included in the 1978 Census of Agriculture or their successors. The population of farms from which the sample was selected was different from the target population. This difference introduces a coverage error caused by several factors: (1) the list of farms from which the sample was selected was a preliminary list that did not include all farms included in the census, (2) abnormal farms and horticultural specialty farms were excluded from the sample, (3) respondent reporting errors in the census, and (4) farms that went out of business after the census were dropped from the sample.

Abnormal farms were excluded from the survey and, therefore, were not included in the estimates. In 1978, there were 2,302 abnormal farms that accounted for 56 million acres (5.43 percent of the U.S. total) of land, $245 million (.23 percent) in the value of agricultural products sold, and $17.1 million (.28 percent) in energy expenses. Federal and Indian reservation lands represented most of the land in the abnormal farms.

In 1978, there were 32,757 nonabnormal horticultural specialty farms that accounted for 1.52 million acres (.16 percent of the U.S. total) of land, $2.86 billion (2.65 percent) in value of agricultural products sold, and $202.7 million (3.32 percent) in energy expenses. These were not included in the survey.

If the operator of a sample farm continued to operate in 1979 any part of the farm operated in 1978, he was eligible for inclusion in the survey regardless of the size of the 1978 operation.

If the operator of a sample farm did not operate in 1979 any part of the farm he operated in 1978, he was requested to indicate who the operator was in 1979. In order to avoid duplication in the sample, the "new" operator was eligible for inclusion in the survey only if he did not farm at all in 1978. By use of this "successor" procedure, survey estimates account for consolidations and breaking up of farms. This permits some "new" operators to fall into the sample, and prevents an operator

from having more than one chance of being selected in the sample. Unless it was directly obtainable from sample farms, farms starting into business after the census were not included in the survey.

Table A compares the 1978 and 1979 expanded data for farm counts and acres of the selected sample to the 1978 Census. Comparison of the expanded sample for 1978 to the Census is a measure of how well the sample represents the 1978 universe. Comparison of the expanded sample for the 1978 Census to the 1979 Survey measures changes between 1978 and 1979.

Whole Farm Nonresponse

Budget restrictions preventing the enumeration of all farms in the nonresponse adjustment sample introduced a potential bias of unknown size to the survey.

Item Nonresponse and Processing Error

Respondent problems with understanding and answering questions result in many responses to questions asked being incorrect or missing. During processing, respondent data were examined for consistency and reasonableness. Data considered unreasonable or missing were estimated. Estimates for these items were based on responses to related questions, subject matter specialists' knowledge of agriculture, and statistical estimation procedures. Processing errors, item nonresponse, and respondent problems introduce a nonsampling error. There is no measure of the size of this error.

Sampling

The sample used in this survey is one of a large number of possible samples of the same size that could have been selected using the same sample design. Estimates derived from the different samples would differ from each other.

The standard or sampling error of a survey estimate is a measure of the variation among the estimates from all possible samples, and thus is a measure of the precision with which an estimate from a particular sample approximates the average result of all possible samples. The relative standard error is defined as the standard error of the estimate divided by the value being estimated times 100. Table B gives relative sampling errors for selected items.

As calculated for this report, the standard error also partially measures the effect of certain nonsample errors but does not measure any systematic biases in the data. Bias is the difference, averaged over all possible samples, between the estimate and the true values. Obviously, the accuracy of the survey results depends on both the sampling and nonsampling errors measured by the standard error and the bias and other types of nonsampling error not measured by the standard error.

The sample estimate and an estimate of the standard error permit one to construct interval estimates with prescribed confidence that the interval includes the average result of all possible samples (for a given sampling rate).

To illustrate, if all possible samples were selected, each of these was surveyed under essentially the same conditions and an estimate and its estimated standard error were calculated from each sample, then:

1. Approximately two-thirds of the intervals from one standard error below the estimate to one standard error above the estimate would include the average value of all possible samples. An interval from one standard error below the estimate to one standard error above the estimate is a 67-percent confidence interval.
2. Approximately 9/10 of the intervals from 1.6 standard errors below the estimate to 1.6 standard errors above the estimate would include the average value of all possible samples. An interval from 1.6 standard errors below the estimate to 1.6 standard errors above the estimate is a 90-percent confidence interval.
3. Approximately 19/20 of the intervals from two standard errors below the estimate to two standard errors above the estimate would include the average value of all possible samples. An interval from two standard errors above the estimate is a 95-percent confidence interval.
4. Almost all intervals from three standard errors below the sample estimate to three standard errors above the sample estimate would include the average value of all possible samples.

The average value of all possible samples may or may not be contained in any particular computed interval. But for a particular sample, one can say with specified confidence that the average of all possible samples is included in the constructed interval.

For example, an approximate 95-percent confidence interval on the value of gasoline expenditure in New York in 1979 can be constructed as follows:

1. The estimate of the value of gasoline expenditures is $72,968,000 from State Data, table 1.
2. The estimate of the relative standard error of the estimated total is 12.7 from table B.
3. An estimate of the absolute standard error of the estimate can be calculated by multiplying the estimate times the relative error of the estimate divided by 100.

   Absolute standard error = $72,968,000 X (12.7/100)
   = $9,266,936

4. A 95-percent confidence interval is constructed by adding and substracting twice the absolute standard error from the estimate.

   Confidence limit
   Upper = $91,501,872 = $72,968,000 + 2 X ($9,266,936)
   Lower = $54,434,128 = $72,968,000 − 2 X ($9,266,936)

The estimate and confidence interval can be interpreted in the following way. The best estimate of the value of gasoline expenditure in New York is $72,968,000. One can be 95-percent confident that the average result of all possible samples lies in the interval between $54,434,128 to $91,501,872.

Table A. **Comparison of Farms in 1978 Census of Agriculture to Farms in 1979 Farm Energy Survey**

	Farms			Acres		
	1978 Census		1979 Farm Energy Survey	1978 Census		1979 Farm Energy Survey
	Published[1]	Expanded[2]		Published[1]	Expanded[2]	
United States	2,439,833	2,414,573	2,256,062	969,019,582	968,300,754	988,793,808
REGIONS						
Northeast	142,197	139,131	141,443	24,459,611	24,386,453	24,987,514
North Central	1,020,346	1,020,968	957,773	358,280,116	352,567,498	362,911,589
South	1,002,348	986,941	898,688	310,805,168	318,812,655	317,426,508
West	274,942	267,533	258,158	275,474,687	272,534,148	283,468,197
DIVISIONS						
New England	28,109	26,563	28,308	5,044,161	4,939,291	5,326,391
Middle Atlatnic	114,088	112,568	113,135	19,415,450	19,447,162	19,661,123
East North Central	447,419	446,717	417,283	92,033,420	90,876,186	92,880,067
West North Central	572,927	574,251	540,490	266,246,696	261,691,312	270,031,522
South Atlantic	317,328	311,017	284,989	61,254,681	61,500,358	61,721,312
East South Central	316,649	314,879	283,652	53,279,385	53,046,041	51,254,231
West South Central	368,371	361,045	330,047	196,271,102	204,266,256	204,450,965
Mountain	125,834	124,133	115,065	210,514,868	208,482,272	215,158,639
Pacific	149,108	143,400	143,093	64,959,819	64,051,876	68,309,558
NEW ENGLAND						
Total	28,109	26,563	28,308	5,044,161	4,939,291	5,326,391
MIDDLE ATLANTIC						
New York	47,505	46,496	45,024	9,815,434	9,856,828	9,636,901
New Jersey	8,704	8,199	9,626	989,723	959,439	888,786
Pennsylvania	57,879	57,873	58,485	8,610,293	8,630,895	9,135,436
EAST NORTH CENTRAL						
Ohio	94,434	95,399	90,910	15,994,987	16,408,557	18,078,647
Indiana	87,844	87,754	86,018	16,986,126	15,818,630	15,401,375
Illinois	109,023	108,223	98,601	29,662,338	28,842,834	29,673,635
Michigan	66,858	65,861	60,080	11,344,803	11,480,311	11,974,999
Wisconsin	89,260	89,480	81,674	18,045,166	18,325,854	17,751,411
WEST NORTH CENTRAL						
Minnesota	102,428	102,247	96,787	28,582,270	28,940,301	32,822,702
Iowa	125,990	126,836	116,448	33,533,041	33,657,877	34,043,842
Missouri	121,371	121,588	108,454	30,793,308	29,600,994	28,032,617
North Dakota	41,046	41,281	37,251	40,642,139	43,723,413	43,160,178
South Dakota	39,494	39,568	40,700	39,191,357	41,542,393	41,322,730
Nebraska	65,743	65,071	68,030	45,941,333	38,866,438	39,481,310
Kansas	76,855	77,660	72,820	47,563,248	45,359,896	51,168,143
SOUTH ATLANTIC						
Delaware	3,535	3,390	3,345	672,392	624,928	691,100
Maryland	17,969	17,162	15,436	2,664,342	2,632,068	2,658,157
Virginia	55,949	54,905	52,807	9,893,812	10,194,612	10,200,863
West Virginia	20,310	19,325	18,341	3,840,854	3,937,881	3,649,339
North Carolina	88,252	88,173	78,442	11,252,183	10,867,712	10,729,508
South Carolina	33,041	31,440	29,019	6,274,641	6,238,072	6,594,696
Georgia	57,970	56,845	50,942	13,633,103	13,826,272	14,868,607
Florida	40,302	39,777	36,657	13,023,354	13,178,813	12,329,042
EAST SOUTH CENTRAL						
Kentucky	109,584	110,653	100,491	14,997,707	15,330,628	15,428,912
Tennessee	96,266	95,222	83,578	13,030,409	12,976,317	11,955,262
Alabama	56,903	56,503	51,675	11,473,549	11,283,125	10,051,147
Mississippi	53,896	52,501	47,908	13,777,720	13,455,971	13,818,910
WEST SOUTH CENTRAL						
Arkansas	58,400	56,135	50,778	15,505,994	15,719,641	14,900,932
Louisiana	38,438	36,213	33,783	9,542,359	9,490,300	10,867,923
Oklahoma	79,007	77,492	72,701	34,226,974	34,932,161	36,904,652
Texas	192,526	191,205	172,785	136,995,775	144,124,154	141,777,458
MOUNTAIN						
Montana	24,266	23,861	22,183	57,246,014	58,762,324	63,460,098
Idaho	26,204	25,523	23,907	13,448,707	12,237,752	12,715,507
Wyoming	8,421	8,247	7,325	29,986,471	27,204,628	30,320,031
Colorado	29,119	28,577	27,369	33,944,806	29,436,932	29,180,320
New Mexico	14,060	14,383	12,946	40,148,660	44,919,695	44,332,120
Arizona	7,415	7,171	6,594	17,569,469	16,829,806	15,793,376
Utah	13,542	13,837	12,497	8,979,087	9,034,934	9,595,210
Nevada	2,807	2,534	2,244	9,191,654	10,056,201	9,761,977
PACIFIC						
Washington	36,743	35,288	37,092	14,702,784	14,608,130	16,941,385
Oregon	33,581	33,347	31,948	17,657,049	19,749,318	17,566,428
California	78,784	74,765	74,053	32,599,986	29,694,428	33,801,745

[1]Excludes abnormal and horticultural specialty farms.
[2]Original sample expanded using 1978 characteristics.

Table B. **Percent of Relative Standard Error for Selected Energy Data: 1979**

	Expenditures for--										
	Gasoline	Gasohol	Diesel fuel	Fuel oil	LP gas	Natural gas	Coal	Electricity	Kerosene	Motor oil and grease	Other
United States	2.8	18.6	4.4	4.9	4.6	22.9	10.0	5.4	12.9	3.4	7.9
REGIONS											
Northeast	8.7	7.8	14.9	9.3	20.1	20.1	25.2	7.6	34.1	7.8	27.0
North Central	4.3	19.6	6.1	6.6	6.9	41.1	19.1	5.2	26.7	5.0	16.0
South	4.7	42.9	7.1	13.2	6.8	36.7	15.6	10.6	16.6	5.9	11.7
West	7.3	15.7	12.9	13.4	12.6	31.3	19.4	15.7	47.9	9.8	12.3
DIVISIONS											
New England	13.7	8.5	15.4	9.8	10.3	20.4	5.3	12.3	23.8	11.2	12.8
Middle Atlantic	10.5	10.5	17.7	11.8	26.0	21.3	26.3	9.0	43.3	9.5	54.0
East North Central	6.0	28.9	7.4	8.6	10.0	17.7	24.0	6.3	40.8	7.0	19.6
West North Central	5.9	26.3	8.5	10.1	9.2	60.1	24.0	7.9	33.2	6.8	24.2
South Atlantic	8.8	63.3	11.2	16.0	10.6	21.9	20.7	6.7	19.3	9.4	16.1
East South Central	7.0	90.5	10.6	16.5	11.6	30.0	22.4	7.7	33.6	9.6	22.1
West South Central	7.8	50.9	12.1	29.5	11.9	43.1	10.7	25.7	56.8	10.3	21.2
Mountain	7.9	16.1	11.0	15.2	12.1	45.3	20.2	15.6	16.8	10.7	10.1
Pacific	12.1	13.4	20.4	20.5	22.8	33.9	33.3	23.9	77.0	15.6	25.0
NEW ENGLAND											
Total	13.7	8.5	15.4	9.8	10.3	20.4	5.3	12.3	23.8	11.2	12.8
MIDDLE ATLANTIC											
New York	12.7	.0	30.8	14.0	50.9	25.9	20.5	14.3	52.3	12.6	76.4
New Jersey	14.9	.0	23.5	18.6	91.1	39.4	30.5	15.3	28.0	14.0	34.0
Pennsylvania	18.4	10.5	21.8	23.0	26.0	37.1	31.6	12.4	73.2	15.8	27.1
EAST NORTH CENTRAL											
Ohio	13.7	9.8	18.0	18.0	22.1	41.3	32.0	11.0	53.2	15.0	44.1
Indiana	16.1	30.5	16.5	30.8	18.9	36.5	27.7	13.1	103.6	18.8	44.0
Illinois	11.8	53.8	13.4	20.2	16.3	27.3	66.7	11.3	140.3	13.8	28.8
Michigan	12.9	75.3	17.9	18.8	26.8	33.0	61.8	13.9	95.9	15.4	39.1
Wisconsin	12.1	87.4	18.0	13.8	32.0	59.9	21.7	16.3	102.6	15.2	39.4
WEST NORTH CENTRAL											
Minnesota	16.5	95.0	20.8	17.0	21.2	53.4	96.8	13.6	93.7	17.9	61.8
Iowa	9.6	32.6	12.4	19.6	15.9	59.8	35.2	12.6	52.7	11.8	61.0
Missouri	13.8	10.7	39.3	56.3	16.7	41.3	13.4	13.1	92.3	17.7	53.0
North Dakota	20.5	17.5	20.1	26.5	19.9	32.3	62.5	22.7	11.2	22.6	12.4
South Dakota	19.9	10.3	22.6	24.1	37.5	25.9	9.3	19.3	77.7	2.3	72.0
Nebraska	19.8	59.3	27.2	39.2	37.1	146.9	.0	33.7	69.8	21.5	100.1
Kansas	14.5	59.1	18.1	39.3	22.0	40.0	.0	22.8	47.8	16.6	15.2
SOUTH ATLANTIC											
Delaware	29.7	7.8	45.6	20.0	34.5	72.3	9.6	14.1	53.4	34.0	41.5
Maryland	21.8	127.3	28.9	16.9	24.2	12.0	41.1	12.9	39.1	15.3	27.1
Virginia	9.9	11.9	14.8	28.1	18.6	35.5	40.1	21.2	34.8	14.0	29.3
West Virginia	11.5	9.7	28.5	21.3	24.1	26.6	25.5	12.0	52.1	15.2	44.6
North Carolina	27.0	108.7	36.5	32.1	19.1	28.7	13.3	15.0	31.2	22.5	33.7
South Carolina	19.4	71.3	21.2	31.0	18.8	24.1	42.2	21.3	58.4	21.5	39.4
Georgia	19.4	7.4	24.5	34.6	26.8	71.1	11.0	11.9	14.3	26.9	56.6
Florida	11.0	108.3	15.2	136.3	26.0	5.7	.0	14.1	36.2	19.8	37.1
EAST SOUTH CENTRAL											
Kentucky	11.6	8.4	17.1	23.6	26.5	64.3	30.9	13.3	70.5	11.6	37.5
Tennessee	8.4	158.6	20.8	31.1	22.6	42.1	31.9	10.0	44.6	10.8	40.2
Alabama	23.8	161.1	27.6	10.7	23.9	32.9	29.3	24.4	52.4	28.5	35.0
Mississippi	12.8	12.4	18.0	39.9	15.7	36.4	.0	11.5	47.9	21.6	38.0
WEST SOUTH CENTRAL											
Arkansas	12.3	58.4	18.3	79.7	14.6	35.1	10.7	13.1	95.0	15.6	26.4
Louisiana	12.9	13.4	16.1	46.5	23.6	28.3	.0	17.4	31.8	13.4	34.4
Oklahoma	14.8	.0	27.1	11.9	35.2	56.9	.0	17.2	97.6	15.7	39.4
Texas	12.9	13.4	20.6	37.4	17.5	52.7	.0	41.7	148.4	18.8	50.5
MOUNTAIN											
Montana	20.3	62.8	26.7	32.6	24.9	30.3	47.9	19.4	13.8	23.9	13.1
Idaho	14.3	8.3	14.9	25.1	38.5	13.5	38.9	24.6	45.9	17.6	30.2
Wyoming	12.3	4.2	23.1	51.8	22.6	33.3	57.4	37.2	30.5	20.2	66.6
Colorado	17.7	.0	24.7	25.1	24.8	86.3	56.6	28.4	18.6	17.7	39.1
New Mexico	17.6	13.1	25.1	71.2	18.2	36.8	17.9	19.6	91.5	16.3	29.9
Arizona	35.0	.0	55.8	12.8	64.6	109.3	13.4	64.6	57.5	70.8	49.1
Utah	16.3	13.4	20.3	31.4	27.9	20.3	31.4	19.6	80.6	17.9	57.3
Nevada	27.9	.0	31.6	42.3	37.8	119.3	27.2	63.6	41.0	16.2	23.1
PACIFIC											
Washington	13.3	.0	17.0	20.7	29.5	34.3	63.6	25.5	75.1	17.6	35.7
Oregon	16.5	.0	20.7	29.5	61.3	22.1	13.5	13.1	153.1	22.0	25.9
California	19.1	13.4	27.4	56.6	25.9	39.5	.0	30.0	31.9	22.4	49.2

Table B. **Percent of Relative Standard Error for Selected Energy Data: 1979**—Con.

	Quantity purchased for work on farm								Maximum storage capacity				
	Gasoline	Gasohol	Diesel fuel	Fuel oil	LP gas	Natural gas	Coal	Electricity	Gasoline	Gasohol	Diesel fuel	Fuel oil	LP gas
United States	3.2	18.6	4.4	10.9	6.4	30.8	15.2	7.6	3.1	9.7	5.9	5.7	4.5
REGIONS													
Northeast	9.6	8.4	15.3	14.8	25.2	41.6	39.4	7.9	11.7	.0	28.0	13.3	16.9
North Central	4.7	19.6	6.4	16.5	9.7	70.2	24.8	7.0	4.4	9.8	9.6	6.5	6.7
South	5.0	53.5	6.8	24.6	8.5	42.5	29.3	20.3	5.7	52.4	8.6	15.2	5.8
West	8.3	6.8	12.6	28.4	18.2	33.0	16.0	16.2	8.0	.0	14.4	24.1	14.0
DIVISIONS													
New England	16.3	8.8	15.4	13.8	11.9	22.4	13.2	15.1	11.8	.0	16.9	14.8	12.7
Middle Atlantic	11.4	13.4	18.2	23.1	30.1	46.7	57.4	9.2	13.9	.0	32.5	16.2	21.4
East North Central	6.2	34.9	7.4	27.1	12.4	20.6	38.5	8.0	6.2	16.4	8.7	9.2	12.5
West North Central	6.6	20.1	9.0	17.6	13.4	85.2	9.3	10.9	6.1	12.1	13.8	8.9	7.7
South Atlantic	10.6	91.2	10.4	27.5	12.2	26.4	9.4	11.5	7.5	103.9	11.8	15.7	9.2
East South Central	8.3	78.1	10.3	18.0	17.1	30.0	44.7	10.8	9.0	9.4	9.3	47.4	12.9
West South Central	8.7	8.8	11.6	30.9	15.3	46.6	9.6	42.5	12.1	13.4	16.3	13.7	9.1
Mountain	8.8	6.8	11.7	40.4	18.7	45.4	16.4	19.8	9.1	.0	13.3	14.7	10.9
Pacific	14.1	.0	19.7	39.5	29.7	38.6	11.1	23.2	12.8	.0	23.0	38.8	32.1
NEW ENGLAND													
Total	16.3	8.8	15.4	13.8	11.9	22.4	13.2	15.1	11.8	.0	16.9	14.8	12.7
MIDDLE ATLANTIC													
New York	14.9	.0	32.0	30.9	64.6	39.5	.0	12.3	27.1	.0	32.9	20.8	39.1
New Jersey	16.7	.0	20.7	48.8	85.4	51.0	20.4	22.4	18.1	.0	24.3	27.5	83.3
Pennsylvania	19.1	13.4	22.0	44.5	27.8	94.3	77.6	15.7	14.1	.0	54.5	28.9	25.2
EAST NORTH CENTRAL													
Ohio	15.0	10.1	17.5	49.6	20.9	50.2	80.4	13.6	13.0	9.6	19.4	19.2	31.3
Indiana	13.5	39.6	16.6	94.9	20.5	31.3	13.4	18.5	16.1	28.7	18.5	34.6	25.5
Illinois	12.8	55.7	13.3	53.4	21.6	37.6	8.3	16.8	12.0	21.7	15.1	17.5	22.1
Michigan	13.7	14.6	16.7	42.1	33.2	39.2	10.3	18.1	13.7	19.5	16.8	11.9	22.9
Wisconsin	12.9	66.5	18.6	44.9	43.4	56.0	10.6	17.2	14.8	26.6	29.0	19.3	28.4
WEST NORTH CENTRAL													
Minnesota	17.8	89.9	22.7	40.9	22.3	64.3	.0	17.8	15.3	10.6	24.5	15.1	20.6
Iowa	10.2	21.0	11.8	42.5	24.8	69.6	9.6	14.5	11.4	17.1	11.3	18.1	13.5
Missouri	18.3	11.4	46.0	42.7	29.8	58.0	13.7	20.9	11.6	9.6	31.8	42.1	16.7
North Dakota	23.0	.0	20.9	16.1	29.7	9.5	12.3	27.1	20.5	.0	29.6	21.6	20.6
South Dakota	23.5	21.1	21.7	13.0	48.2	13.2	.0	26.0	20.4	13.4	24.3	22.1	27.4
Nebraska	21.9	67.7	26.3	32.2	47.0	169.6	.0	41.5	21.6	10.5	57.8	40.3	24.7
Kansas	14.2	54.0	17.6	4.3	32.1	41.1	.0	33.7	17.1	13.4	25.2	31.7	22.4
SOUTH ATLANTIC													
Delaware	37.0	8.4	48.9	38.1	39.3	20.5	.0	15.0	19.5	.0	45.0	24.2	32.6
Maryland	25.9	14.4	24.4	34.6	27.4	4.6	11.7	16.9	14.0	.0	21.9	21.3	30.3
Virginia	10.9	13.3	16.0	33.1	21.3	39.1	4.8	38.7	15.3	.0	23.0	35.0	23.6
West Virginia	14.4	9.4	30.2	39.2	20.5	56.6	48.7	26.4	20.8	.0	18.0	27.6	26.9
North Carolina	32.3	125.1	34.4	45.9	21.5	33.2	.0	33.3	16.0	175.8	29.8	25.5	16.7
South Carolina	21.5	8.8	21.8	41.3	23.7	35.3	13.4	40.1	17.1	13.4	35.0	29.8	26.6
Georgia	23.5	8.6	22.4	53.1	33.0	85.9	13.4	17.4	23.7	13.4	25.9	31.3	18.8
Florida	13.6	.0	13.9	124.8	29.9	5.2	.0	15.9	21.5	.0	24.6	50.0	23.2
EAST SOUTH CENTRAL													
Kentucky	13.1	12.1	16.0	35.0	43.1	77.5	61.4	18.7	16.4	13.4	20.6	62.9	32.8
Tennessee	9.4	170.7	19.3	54.6	23.4	58.5	78.1	18.1	13.4	13.4	14.9	34.5	29.0
Alabama	29.5	140.7	26.6	13.9	30.7	9.8	34.7	29.3	24.1	11.8	24.4	13.3	18.9
Mississippi	14.8	14.0	18.1	65.4	23.3	46.0	.0	19.0	20.3	.0	15.5	48.9	14.6
WEST SOUTH CENTRAL													
Arkansas	13.9	9.0	17.6	13.0	17.0	48.8	9.6	19.2	18.7	13.4	20.0	47.4	18.2
Louisiana	16.4	.0	16.3	55.4	24.5	20.3	.0	23.1	25.8	.0	22.0	21.6	31.4
Oklahoma	17.6	.0	24.6	21.8	40.7	87.4	.0	31.6	20.9	.0	20.3	10.2	17.0
Texas	14.0	13.4	20.3	55.5	27.5	54.1	.0	61.6	20.2	.0	31.9	19.1	14.4
MOUNTAIN													
Montana	19.6	8.1	28.1	84.8	32.3	24.2	22.8	26.0	15.6	.0	24.2	28.4	26.3
Idaho	17.4	9.4	15.7	48.8	55.3	7.7	50.3	26.3	17.4	.0	34.1	21.3	40.4
Wyoming	12.9	4.3	22.5	3.9	33.3	82.4	62.2	43.6	16.8	.0	36.3	52.5	23.4
Colorado	18.1	.0	23.9	37.3	42.3	36.0	21.9	36.3	24.5	.0	23.7	45.0	22.0
New Mexico	19.7	13.4	24.9	80.4	26.3	36.0	.0	26.2	20.4	.0	43.7	43.4	15.9
Arizona	63.1	.0	61.0	12.5	76.3	109.3	13.4	74.4	61.9	.0	50.2	12.5	53.8
Utah	16.1	.0	21.0	88.2	.0	23.2	27.2	41.4	29.6	.0	22.6	41.9	31.2
Nevada	23.4	.0	32.3	59.7	54.9	9.3	.0	61.9	21.3	.0	35.9	33.0	30.0
PACIFIC													
Washington	14.6	.0	16.8	27.2	31.5	57.8	11.1	29.0	14.6	.0	24.0	30.9	70.2
Oregon	18.7	.0	20.0	74.7	71.5	31.2	.0	17.8	18.7	.0	27.6	34.4	46.1
California	21.6	.0	26.5	71.1	34.4	43.2	.0	29.7	21.2	.0	34.6	80.0	37.9

Table B. **Percent of Relative Standard Error for Selected Energy Data: 1979**—Con.

	Number of selected equipment							Farms with heated buildings	Farms with hot water facilities
	Wheel tractors	Trucks	Automobiles	Combines	Forage harvesters	Irrigation pumps	Electric motors		
United States	2.0	2.2	2.9	3.5	2.6	7.7	4.7	3.7	3.7
REGIONS									
Northeast	5.5	6.2	8.1	13.3	11.5	13.5	10.8	9.6	7.9
North Central	3.3	3.7	4.5	4.7	3.5	14.2	6.7	5.8	5.8
South	2.9	3.2	5.3	5.6	4.0	16.3	8.7	5.2	5.6
West	5.4	5.4	5.9	7.7	6.7	10.6	12.0	7.6	6.9
DIVISIONS									
New England	11.1	9.3	12.3	18.1	7.0	20.2	17.6	8.1	10.3
Middle Atlantic	6.3	7.5	9.8	13.6	14.2	18.2	12.6	12.5	9.7
East North Central	4.6	5.1	6.4	6.5	6.6	18.1	9.8	9.4	7.9
West North Central	4.7	5.1	6.2	6.6	4.0	16.2	9.0	7.3	8.7
South Atlantic	4.3	4.6	7.9	9.3	6.5	15.7	11.7	7.4	9.3
East South Central	4.6	5.5	9.9	11.6	8.1	13.8	19.9	9.8	8.4
West South Central	6.1	5.9	9.8	8.7	5.7	22.6	15.1	9.9	12.0
Mountain	5.7	5.8	6.9	10.4	9.4	9.2	13.9	9.2	7.5
Pacific	8.9	9.1	9.7	10.4	9.3	15.0	18.0	12.4	11.3
NEW ENGLAND									
Total	11.1	9.3	12.3	18.1	7.0	20.2	17.6	8.1	10.3
MIDDLE ATLANTIC									
New York	7.0	11.0	10.9	18.5	19.3	33.7	13.2	17.0	10.2
New Jersey	11.2	12.8	15.3	19.2	10.2	25.7	18.8	22.5	15.6
Pennsylvania	11.0	12.1	18.8	20.3	19.8	8.3	23.1	20.4	17.5
EAST NORTH CENTRAL									
Ohio	10.8	12.6	13.3	15.5	7.5	6.7	21.6	18.4	20.4
Indiana	10.2	13.9	20.4	11.9	7.3	24.6	15.6	22.6	15.8
Illinois	10.5	9.4	12.1	11.3	9.1	18.6	19.6	20.4	20.9
Michigan	9.2	10.2	18.4	16.2	13.4	21.4	15.2	18.5	17.8
Wisconsin	8.7	10.8	11.8	20.3	15.6	49.4	21.1	21.4	12.5
WEST NORTH CENTRAL									
Minnesota	10.3	10.8	15.0	14.4	8.6	30.9	20.6	17.2	15.6
Iowa	7.8	9.0	11.2	8.8	8.8	41.4	15.1	14.0	21.3
Missouri	10.8	11.9	14.6	22.0	10.6	10.8	29.2	19.7	23.5
North Dakota	22.6	19.4	23.2	27.0	9.9	34.4	37.2	14.1	29.5
South Dakota	12.6	17.9	18.0	18.4	7.9	28.9	24.1	18.1	23
Nebraska	16.3	15.4	19.8	17.1	9.4	23.6	25.9	17.1	21
Kansas	14.5	13.1	20.7	18.3	10.0	32.4	19.7	25.2	21.
SOUTH ATLANTIC									
Delaware	14.2	17.1	17.6	16.7	5.9	48.0	24.3	9.4	17.7
Maryland	10.9	14.5	12.9	21.1	22.8	67.3	15.9	17.4	13.7
Virginia	9.3	9.8	19.3	21.1	20.3	38.6	20.8	27.4	22.9
West Virginia	10.7	11.4	22.2	23.8	8.8	18.8	25.6	19.2	29.3
North Carolina	10.0	11.5	21.6	20.3	15.0	20.4	28.6	11.0	28.7
South Carolina	11.2	12.8	13.2	18.2	51.9	19.8	31.6	14.6	16.1
Georgia	10.9	10.2	14.8	17.4	9.1	27.4	27.2	16.1	17.6
Florida	10.2	10.3	15.6	25.1	12.2	18.2	19.2	15.2	16.9
EAST SOUTH CENTRAL									
Kentucky	6.6	6.8	20.7	24.6	11.3	27.1	23.8	20.1	14.2
Tennessee	7.1	7.3	15.2	19.8	7.0	34.7	24.0	24.4	17.1
Alabama	16.4	21.0	13.2	28.2	8.8	23.0	59.9	12.0	15.6
Mississippi	11.5	10.3	16.3	20.8	81.0	22.3	22.1	14.2	17.1
WEST SOUTH CENTRAL									
Arkansas	10.2	9.2	24.4	16.2	8.5	25.0	26.4	13.4	28.2
Louisiana	9.6	9.8	17.6	12.9	13.4	18.6	32.5	17.4	9.8
Oklahoma	12.1	10.9	15.6	17.4	2.1	27.8	32.7	29.3	32.7
Texas	10.3	10.1	16.4	17.9	6.8	31.1	24.0	14.6	14.8
MOUNTAIN									
Montana	14.6	16.6	16.8	21.8	8.6	18.7	28.8	23.3	8.6
Idaho	10.9	10.6	12.8	19.0	31.0	16.0	23.3	15.3	18.9
Wyoming	10.9	13.2	14.2	20.0	6.2	28.7	109.7	37.2	11.5
Colorado	13.6	12.6	17.4	21.4	7.2	19.4	27.7	18.7	15.4
New Mexico	12.4	12.9	16.3	31.6	.7	18.1	39.6	17.0	16.8
Arizona	31.6	29.8	28.9	35.8	33.7	51.1	34.2	23.0	15.7
Utah	17.2	13.3	16.7	15.5	63.3	21.3	27.4	23.9	19.4
Nevada	16.0	12.8	19.6	47.4	24.7	22.2	32.0	22.7	41.3
PACIFIC									
Washington	12.1	11.5	15.9	15.4	8.3	21.3	22.0	16.7	17.1
Oregon	11.9	11.0	16.7	18.5	28.6	26.6	31.4	18.8	22.4
California	15.0	15.8	15.7	21.6	9.1	20.1	26.1	24.1	17.4

Estimation of Sampling Error

Sampling error was estimated using a random group method of estimation within each stratum. When the sample was selected, each sample farm in a stratum was assigned one of eight random groups. An estimate of the stratum was made for each of the random groups within each stratum. The sampling error of the estimate was calculated using these estimates from the random groups.

UNPUBLISHED DATA

In addition to the published data, State level cross tabulations are available at a minimal cost for U.S., regions, and divisions tables 1 through 3. Because of the specialized nature of and low response rate for the year of manufacture and for the amount of equipment use (e.g., tractor hours, truck and car miles, and amount of crops dried), it was not practical to publish the data. However, special tabulations can be made for selected items on a reimbursable basis. Additional information on the availability and cost of unpublished data may be obtained by writing the Chief, Agriculture Division, Bureau of the Census, Washington, D.C. 20233.

SUMMARY OF FINDINGS

Energy Purchases

Farm and ranch operators represented in this survey spent approximately $10.3 billion for energy purchases in 1979. Of the total expenditures, gasoline accounted for the largest part (37 percent), followed by diesel fuel (23 percent), electricity (21 percent), and LP gas (8 percent). Fuel oil, natural gas, motor oil and greases, gasohol, kerosene, coal, and other energy products accounted for the remaining 11 percent. (See State Data, table 1.)

The three major fuels used in farming are gasoline, diesel, and LP gas. In comparing the results of the 1979 Survey to the 1978 Census, some of the difference can be attributed to actual changes taking place in agriculture, such as conservation of energy or shifting from one fuel to another. However, some of the difference is due to sampling and nonsampling errors. Gasoline purchases were 3.51 billion gallons in 1978 and 3.33 billion gallons in 1979, diesel fuel purchases were 3.16 billion gallons in 1978 and 3.05 billion gallons in 1979, and LP gas purchases were 1.22 billion gallons in 1978 and 1.15 billion in 1979.[2] The price of gasoline rose 49 percent from 59 cents in 1978 to 88 cents per gallon in 1979. Diesel fuel prices rose 67 percent from 46 cents in 1978 to 77 cents per gallon in 1979. LP gas prices only rose 32 percent from 38 cents in 1978 to 50 cents per gallon in 1979.

The survey shows 102.2 million gallons of fuel oil, 96.1 billion cubic feet of natural gas, and 30.9 billion kilowatt hours of electricity were purchased for farming in 1979. The price of fuel oil rose 60 percent from 47 cents in 1978 to 75 cents per gallon in 1979. The price of electricity was 4.3 cents per kilowatt hour in 1979. Natural gas was $2.19 per thousand cubic feet. (See State Data, table 2.)

By examining the quarterly purchases of energy items, the time of the year of the highest energy purchases can be determined. Between April 1 and September 30, 57 percent of the gasoline, 64 percent of the diesel fuel, and 61 percent of the natural gas were purchased. From January 1 to March 31 and from October 1 to December 31, 71 percent of the LP gas and 78 percent of the fuel oil were purchased. (See State Data, table 3.)

Fuel Storage

The inventory as of December 31, 1979, for most fuels was about half of the storage capacity. Gasoline with storage capacity of 699 million gallons had inventories of 47 percent. Diesel fuel with storage capacity of 804 million gallons had inventories of 53 percent. Fuel oil with storage capacity of 120 million gallons had the largest relative inventory of 56 percent. (See State Data, table 4.)

The ratio of storage capacity to total purchases varied widely among the different fuels. Gasoline storage capacity was only 16 percent of the total gasoline purchases as compared to 26 percent for diesel fuel, 44 percent for fuel oil, and 33 percent for LP gas. (See State Data, tables 1 and 4.)

For an analysis of the ratio storage capacity to purchases only on those farms with storage capacity, refer to U.S., Region, and Division Data, tables 1 through 3. These tables can be used for a more thorough analysis by 1979 size of farms, 1978 value of agricultural products sold, and 1978 standard industrial classifications of storage capacity as well as the other topics previously introduced.

Fuel Sources and Delivery

For all major fuels, less than 30 percent of farms purchasing fuel purchased it from a cooperative. Almost all farms had fuel oil and LP gas delivered to them, while the percent of farms having gasoline and diesel fuel delivered was considerably less—63 and 84 percent, respectively. (See State Data, table 5.)

Self-Propelled Equipment

Many different types of self-propelled equipment were included in this survey. Gasoline and diesel fuel were by far the major fuels used to power them.

Of all wheel tractors, slightly over 51 percent were gasoline powered and about 47 percent were diesel powered. Ninety-five percent of the wheel tractors with 100-horsepower or more were diesel powered. Essentially, all motortrucks were gasoline powered. Only about 2 percent were diesel powered and less than 1 percent were LP gas powered. Of the self-propelled combines, 58 percent were gasoline powered as compared to 41 percent diesel powered, and 1 percent LP gas powered. However, 75 percent of the self-propelled combines with a head width of 18 feet or more were diesel powered. (See State Data, tables 6, 7, and 9.)

Diesel fuel was used to power 53 percent of the self-propelled forage harvesters and 14 percent of the self-propelled wind-

[2] Data from the 1978 Census of Agriculture was adjusted to exclude Alaska, Hawaii, and abnormal and horticultural specialty farms.

drowers. Over 60 percent of the self-propelled cottonpickers and cotton strippers were diesel powered and nearly 19 percent of the cotton strippers were LP gas powered. (See State Data, tables 10 through 13.)

Except for crawler tractors, which were largely diesel powered (80 percent), all other self-propelled equipment were over 70 percent gasoline powered. Self-propelled sprayers were 94 percent gasoline powered. (See State Data, tables 14 through 18.)

Irrigation Pumps

More pumps were electrically powered and more acres were irrigated from these pumps than from all other pump types combined. Approximately 62 percent of all pumps were electrically powered and 53 percent of the pump-irrigated land was irrigated with these pumps. Natural gas was the second most important source of power for irrigation pumps with 22 percent of land irrigated followed by diesel fuel with 15 percent. (See State Data, table 19.)

Crop Drying Facilities

LP gas was the major energy source used for crop drying and tobacco curing. It was used by 73 percent of the farms with in-bin systems, 75 percent of the farms with continuous flow systems, 91 percent of the farms with batch dryer systems, and 57 percent of the farms with recirculating systems. The balance of the farms with these systems largely used forced air rather than heat. Fifty-seven percent of the farms with tobacco curing systems (excludes air dried) used LP gas and 36 percent used fuel oil (See State Data, tables 20 and 21.)

Farms With Heated or Air-Conditioned Buildings

The published data on buildings that were heated or air conditioned refers to farms using an energy source to heat or air condition rather than the number of buildings. The number of farms using different types of energy sources may exceed total farms because some farms had more than one building heated by different fuels. LP gas was the principal energy source used to heat farm buildings (46 percent of farms) and electricity was the major energy source used to air condition buildings (97 percent of farms). (See State Data, tables 22 and 23.)

Customwork

The three major types of customwork done for farm operators or performed by farm operators was soil preparation; pesticide, herbicide, and/or fertilizer application; and harvesting. Farm operators provided the fuel for 22 percent of the acres of all customwork performed for them by others. They also provided the fuel for 86 percent of the acres of all customwork they performed for others. (See State Data, tables 25 and 26.)

Energy Conservation Practices

Several questions were asked to obtain data on energy conservation practices that the respondents had started since 1974. The most used conservation practices were increased vehicle maintenance at 42 percent of the farms surveyed, reduced tillage at 32 percent, reduced hot water temperature at 28 percent, and installed additional building insulation at 27 percent. (See State Data, table 27.)

REGIONS AND DIVISIONS OF THE UNITED STATES