RESEARCH NOTE NC-160

NORTH CENTRAL FOREST EXPERIMENT STATION, FOREST SERVICE—U.S. DEPARTMENT OF AGRICULTURE
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FARM BUILDING CONTRACTORS AND MANUFACTURERS: THEIR ROLE IN MIDWEST FARM CONSTRUCTION

ABSTRACT.--Describes and analyzes the activities of farm building contractors and manufacturers in Illinois, Indiana, Iowa, and Missouri. Contractors and manufacturers are setting the trend in the farm building market in terms of building type and size and materials used.

OXFORD: 833.4:381.2(77). KEY WORDS: farm structures, building trends, specialized builders, construction materials, wood-use.

The farm building industry has changed greatly during the past 25 years. The number of farm buildings constructed annually has declined steadily while the average size of farm buildings has increased. The materials used in farm building construction have also changed. Another significant change is that more farm buildings are being constructed by specialized contractors and manufacturers rather than by farm operators and nonspecialized local carpenters and laborers.

In 1949 more than 800,000 permanent structures were erected on farms[1] by the census period of 1963-65, average annual construction had declined to 161,000 buildings[2]. While the number of buildings constructed declined, size increased. The average floor area per building increased from 520 square feet in 1949 to 1,775 square feet in the 1963-65 period[2].

Lumber used also declined from 4.5 billion board feet in 1952 to 2 billion board feet in 1962[1] partly because fewer farm buildings were constructed and partly because of the substitution of other building materials for lumber. In the 1958-60 period, 58 percent of new farm buildings were constructed with lumber framing as compared with 45 percent in 1963-65[3]. Over the same period, pole framing increased from 24 percent to 31 percent and the number of buildings framed with metal also increased. The trend for exterior wall material was similar.

In view of these developments a study was designed to answer the following questions:

1. What type and size of farm buildings are being constructed by farm building contractors and manufacturers?
2. What is the mix of construction materials used by contractors and manufacturers?
3. How do buildings constructed by contractors and manufacturers compare with total farm buildings with regard to type, size, and the use of various construction materials?
4. What are the implications of increased participation by farm building contractors and manufacturers in farm building construction?

STUDY METHODS

The study was limited to farm building contractors and manufacturers located in Illinois, Indiana, Iowa, and Missouri. A list of contractors and manufacturers in the four States was obtained from American Farm Building Service, Inc., publisher of *Farm Building News*.

[1] *USDA Forest Service. Timber Trends in the U.S. For. Resour. Rep. 17. 1965.*

[2] *U.S. Department of Commerce. Supplement No. 1, 1964 Census of Agriculture, III, Part 3. Sample Survey of Agriculture 1969.*

[3] *The 1958-60 figure was computed from U.S. Department of Commerce, 1964 Census of Agriculture, Vol. 5, Part 5. The 1963-65 period was computed from U.S. Department of Commerce, Supplement 1, 1964 Census of Agriculture, III, Part 3. Sample Survey of Agriculture 1969.*

A questionnaire was mailed to each of the more than 9,000 names on this list. From the responses a sample of 455 farm building contractors and manufacturers (weighted by number of buildings constructed) was selected. Another questionnaire was mailed to each of these; 154 firms responded. Eighty-six percent of these firms are contractors who erect or fabricate buildings only on farm sites; 4 percent are manufacturers only and do no on-site construction; and the remaining 10 percent are both manufacturers and contractors.

RESULTS

Number, Type, and Size of Buildings

More than 7,000 permanent farm buildings were reported constructed during the year 1968 by the respondent contractors and manufacturers. Contractors reported 4,334 buildings constructed and manufacturers reported 2,722. About 40 percent of the contractor-erected buildings were livestock buildings (fig. 1), another 40 percent were machinery storage buildings (fig. 2), and 15 percent were crop storage buildings. Manufactured buildings included a higher percentage of crop storage buildings and a smaller percentage of livestock buildings (fig. 3).

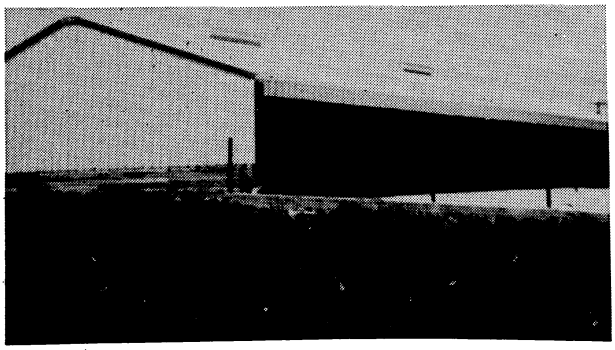

Figure 1.--Beef barn with wood-pole frame and metal exterior walls. (Photo courtesy of University of Illinois, Department of Agricultural Engineering.)

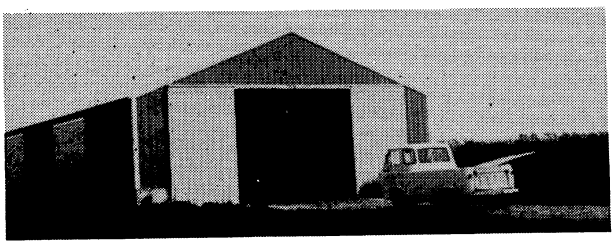

Figure 2.--All metal machine storage building. (Photo courtesy of University of Illinois, Department of Agricultural Engineering.)

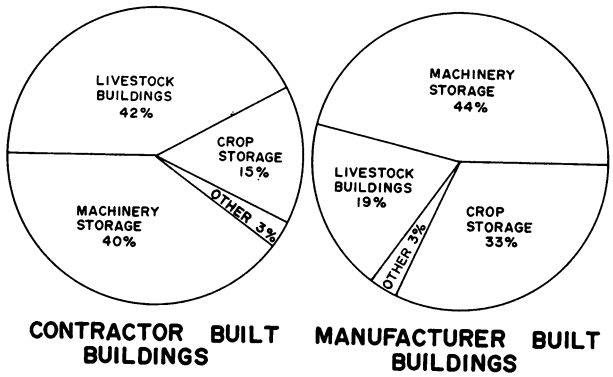

Figure 3.--Percentage of buildings in functional use categories constructed by contractors and manufacturers.

The average size was about 2,700 square feet for contractor-built buildings and 3,500 square feet for manufactured buildings (table 4).

The type of framing used also differed between contractor-built and manufactured buildings. Nearly three-fourths of the buildings constructed by contractors had wood-pole frames; nine-tenths of the manufactured buildings had metal framing (tables 1-3). Both groups of builders used metal exterior wall coverings for about 90 percent of all buildings constructed.

Building Materials Utilization

Adequate information on materials utilization was available only for contractors. More than 50 percent of the contractors used some lumber, exterior plywood, composition roofing, sheet steel, poured concrete, and round poles (table 5). Between 25 and 50 percent used some interior plywood, insulation board, concrete blocks, and square poles. Less than 25 percent of the contractors used particleboard, hardboard, asbestos board, wood shingles, and aluminum. Sheet steel usage was about 18 times as great as sheet aluminum; three times as many square poles were used as round poles; and the use of insulation board far exceeded the use of the other building boards, including asbestos board, particleboard, and hardboard.

Comparisons of Contractor-Erected and Manufactured Buildings With All Buildings Erected on Farms

Since the percentage of total farm buildings constructed by contractors and manufacturers is increasing, it is important to determine whether major differences exist between contractor-manufacturer built buildings and other farm buildings. Any special characteristics of contractor-built and manufactured buildings could have an important influence on projections of the future farm building and materials market.

Table 1.--Use of frame and wall material in contractor-manufacturer built buildings
(In percent)

Frame material	Wall material	Contractor-built buildings (1968)	Manufactured buildings (1968)	Contractor-built and manufactured buildings (1968)	Total buildings erected on farms (1963-65)[1]
Lumber	Lumber	7	3	6	28
Lumber	Metal	4	4	4	19
Pole	Lumber	5	1	4	15
Pole	Metal	69	3	43	15
Metal	Metal	14	88	42	13
Masonry	Masonry	1	1	1	10
Total		100	100	100	100

[1] Source: Baumgartner, The changing market for wood materials used in farm structures.

Table 2.--Number and percent of farm buildings erected by farm building contractors, by functional use, and material used for framing and exterior walls

Material used for framing	Material used for exterior walls	Livestock buildings		Machinery buildings		Crop storage buildings		Buildings for other uses		Total	
		No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Lumber	Lumber	167	10	105	6	43	6	6	4	321	7
Lumber	Metal	55	3	127	7	6	1	7	4	195	4
Pole	Lumber	110	6	91	5	8	1	2	1	211	5
Pole	Metal	1,326	79	1,469	80	126	19	62	39	2,983	69
Metal	Metal	12	1	23	1	480	73	78	50	593	14
Masonry	Masonry	18	1	10	1	0	0	3	2	31	1
All frame and wall types		1,688	100	1,825	100	663	100	158	100	4,334	100

Table 3.--Number and percent of farm buildings manufactured by farm building manufacturers, by functional usage and framing and exterior walls

Material used for framing	Material used for exterior walls	Livestock buildings		Machinery buildings		Crop storage buildings		Buildings for other uses		Total	
		No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Lumber	Wood	41	8	25	2	1	1/	10	9	77	3
Lumber	Metal	29	6	46	4	4	1/	18	16	97	4
Pole	Wood	9	2	25	2	0	0	0	0	34	1
Pole	Metal	30	6	49	4	0	0	5	4	84	3
Metal	Metal	410	78	1,050	88	860	96	80	71	2,400	88
Masonry	Masonry	0	0	0	0	30	3	0	0	30	1
All frame and wall types		519	100	1,195	100	895	100	113	100	2,722	100

1/ Less than 0.5 percent.

Table 4.--Average size of farm buildings erected by farm building contractors, by functional use and framing and exterior walls
(In square feet)

Material used for framing	Material used for exterior walls	Livestock buildings	Machinery buildings	Crop storage buildings	Buildings for other uses	Average building
Lumber	Lumber	1,955	1,983	1,576	1,625	1,903
Lumber	Metal	2,323	1,504	1,896	3,071	1,803
Pole	Lumber	2,195	2,102	1,297	2,500	2,124
Pole	Metal	3,261	3,145	3,137	4,784	3,230
Metal	Metal	2,917	2,587	1,066	859	1,135
Masonry	Masonry	2,667	2,188	1/	125	2,266
All frame and wall types		3,023	2,900	1,503	2,533	2,720

1/ No masonry crop storage buildings erected.

Table 5.--Percentage of contractors[1] using various materials and material utilization per firm--1968

Building Material	Unit	Percent of contractors using	Total material utilization	Material utilization per firm
Lumber	fbm	85	23,384,300	235,040
Exterior plywood	ft^2	60	1,454,500	13,593
Interior plywood	ft^2	26	1,060,020	9,727
Particleboard	ft^2	9	52,500	473
Hardboard	ft^2	20	97,100	875
Insulation board	ft^2	45	1,422,340	12,930
Asbestos board	ft^2	8	12,667	114
Wood shingles	squares	15	1,260	11
Composition roofing	squares	52	75,935	684
Concrete blocks	No.	44	278,150	2,529
Concrete	yd^3	61	75,870	709
Aluminum	squares	19	15,710	145
Sheet steel	squares	68	281,123	2,627
Round poles	lin ft	51	310,461	3,014
Square poles	lin ft	43	1,130,197	11,416

1/ Information from 111 contractors.

When data from an earlier Forest Service report[4] and the present study are compared, we find that contractor-built buildings are dominated by the pole frame-metal wall type and most manufactured buildings are all metal (table 1). These two types accounted for 85 percent of contractor built and manufactured buildings and only 28 percent of total farm buildings. Contractor-built and manufactured buildings are also larger than the average size of farm buildings reported in the 1963-65 Sample Survey of Agriculture.

According to estimates of the volume of various wood materials used per square foot of floor area for all farm buildings[5] the average farm building used 2.39 board feet of lumber, 0.55 square foot of plywood, and 0.17 square foot of building board per square foot of floor area in the years 1963-65. Contractor-built and manufactured buildings in 1968 used only 1.56 board feet of lumber, 0.13 square foot of plywood, and 0.13 square foot of building board per square foot of floor area (table 6).

Although differences in the time periods and regions used for the comparisons could account for some of the differences, there are strong indications that contractors and manufacturers are becoming the trend setters in the farm buildings and materials market. Observation of the operation of these farm builders may provide the best insights into future developments for those interested in serving the farm building market.

Table 6.--Contractor use of various materials per square foot of building floor area--1968

Building material	Unit	Use per square foot of building area
Lumber	fbm	1.561
Plywood (interior and exterior)	ft^2	.131
Building board[1/]	ft^2	.130
Wood shingles	squares	.000007
Composition roofing	squares	.007
Concrete blocks	No.	.023
Concrete	yds	.007
Aluminum	squares	.0009
Steel	squares	.019
Poles (square and round)	lin ft	.117

1/ Includes particleboard, hardboard, asbestos board, and insulation board.

[4] *David C. Baumgartner. The changing market for wood materials used in farm structures. USDA For. Serv. Res. Pap. NC-61, 6 p., illus. North Cent. For. Exp. Stn., St. Paul, Minn. 1971.*

[5] *Developed by the USDA Forest Service, Division of Forest Economics and Marketing Research, in 1970.*

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1974

☆ U. S. GOVERNMENT PRINTING OFFICE: 1974--762574