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Planning Local Elevator Feed Mill Facilities

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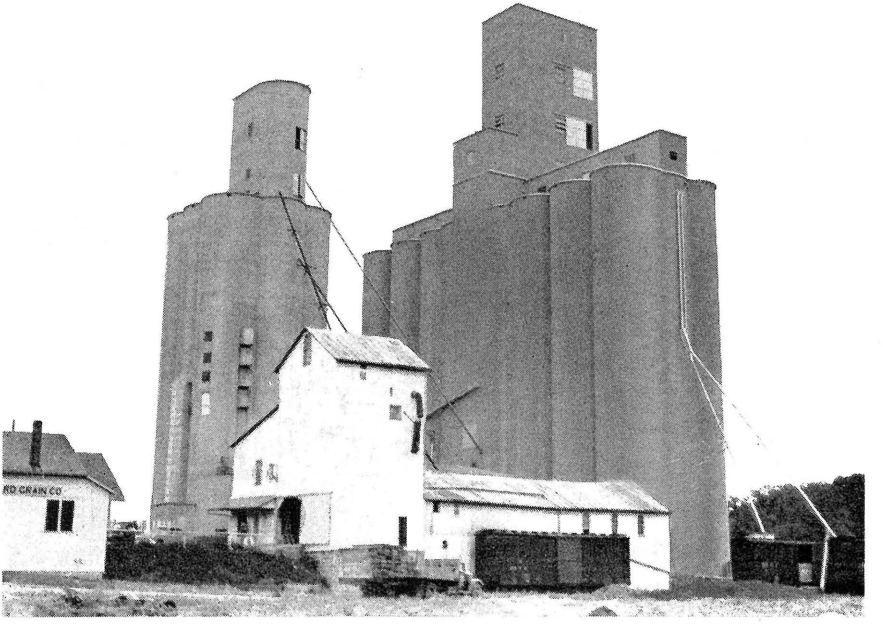

OHIO AGRICULTURAL EXPERIMENT STATION

Wooster, Ohio

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PLANNING LOCAL ELEVATOR FEED MILL FACILITIES

J. W. SHARP, C. E. FULLER and H. J. ECKER

THE PURPOSE

Many elevators and country feed mills are modernizing or planning to modernize their facilities to meet the demands of the farmer. Building new facilities, remodeling the old, or installing new machinery or equipment involves large capital outlay. Once the change is made it is generally accepted as a long run investment. Recently completed new elevators in Ohio varied in costs from $60,000 to $350,000 depending on the size and type. Investments in new feed mills ranged from $35,000 to $125,000 depending on the type of building and equipment installed. Under circumstances of such high capital outlay for new structures or new machinery and equipment the problem of planning facilities for efficient service is increasingly important.

METHOD

This study analyzed various facilities throughout the state with regard to their speed, efficiency, and ability to render the services required by the farmers. New elevators and feed mills have been constructed based on the experience and ideas of operators, engineers, and contractors, and there has been little agreement concerning design or plan. A sample of 45 of the newer elevators and 45 of the newer feed mills was selected throughout the principal grain and feed areas of the state. Since any particular firm in Ohio generally performs both functions of elevator and feed mill the 45 sample elevators were facilities whose primary function was the elevator and grain business, while the 45 feed mills were selected where the feed business was the primary function.

Two questionnaires were designed, one for the elevators and one for the feed mills. The manager or owner of each firm was personally interviewed. An effort was made to obtain ideas and opinions regarding elevator and feed mill design based on the experience of the owner or manager that would serve as a basis for the "ideal" plant in Ohio.

PLANNING GRAIN HANDLING AND STORAGE FACILITIES

The trend in number of elevator and feed mill facilities has been down for the last 15 years. Many of these facilities were eliminated because of obsolescence when volume was not sufficient to justify modernization. Improvements in transportation, both farm and commercial, have also eliminated the need for many facilities throughout the state. Both the size and volume of business of the remaining facilities are greater than before. Thus, in making improvements in existing facilities or planning new facilities, consideration should be given to some important factors influencing size and location of facilities.

Fig. 1.—A typical new concrete facility.

SIZE AND LOCATION

After the need for a country elevator and feed mill has been determined there are several factors to consider in determining the size and location of the handling and storage facilities. Some of the factors are:

(1) Trends in productions of all grains within market area.
(2) Marketing trends of grain as to demands for off-farm storage.
(3) Type and condition of competitive agencies.
(4) Type of farming.
(5) Trends in livestock numbers.
(6) Type of feeding.
(7) Transportation facilities available.

The location of a plant within an area is important. Most new facilities are constructed on the site of the old facilities in the form of additional buildings. Many lots prove too small for additional facilities, thus transferring traffic congestion to the streets. This has met with disfavor with most of the councils of the municipalities, sometimes resulting in ill feeling with police, customer, and elevator. Of the 45 new elevators visited, the average space was 4.2 acres, the low being one-fourth acre. The average of over four acres was greatly influenced by new construction at the edge of towns which resulted in purchase of more space than was needed in some cases. The average minimum space requirement suggested by the 45 managers was two acres. Anything less would result in various inconveniences.

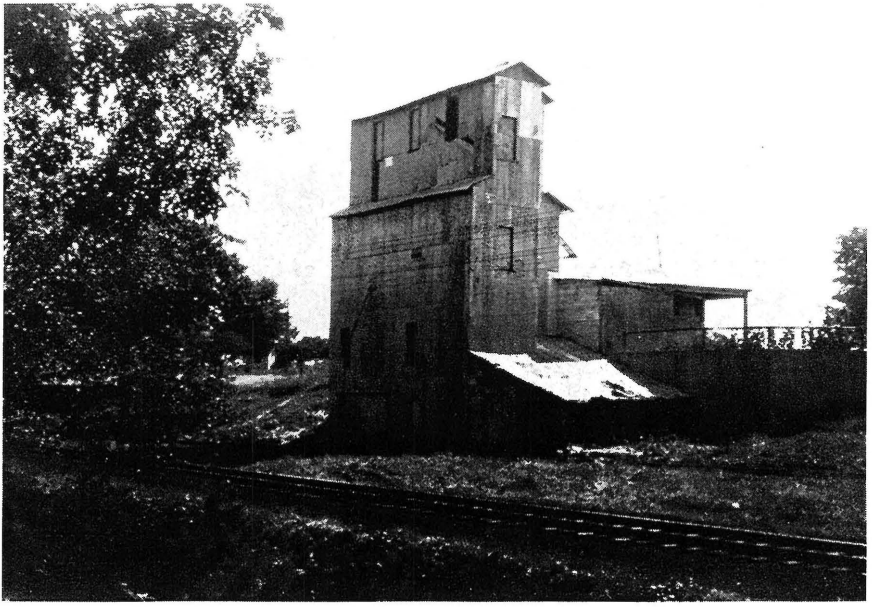

Fig. 2.—An old facility.

When locating on a new site the choice first must be governed by the adequacy of transportation. If rail transportation moves through your area the choice of lot will be limited depending on availability of siding. This lot should also be convenient for customers, preferably on or near a good paved highway in order to take advantage of the rapid increase in the volume of truck transportation of grain. Of the 45 elevators visited only three did not have loading facilities for both truck and rail. Even when located on a railroad the 45 operators indicated that it was important to have facilities for handling large semi-trailer trucks, especially in the rush seasons.

In choosing a new lot, especially in a small town, consideration should be given to inconveniences of dirt and dust to the town. When there is a choice one should locate at the edge of town where prevailing winds will carry the dust away from and not over town. More than one-half of the elevators and feed mills visited on this study had difficulty with complaints of dust and dirt by the local citizens.

PART I

ELEVATOR FACILITIES

A sample of 45 of the more modern elevator facilities was selected on the basis of size and volume of business in the principal grain producing counties in the state. The elevators were grouped into four groups for ease of comparison. Table 1 shows a breakdown of the sample elevators according to size.

Although the average capacity of the elevators in the groups below is larger than the average elevator size in Ohio, 36 of the 45 elevator managers said that their plant was not large enough.

TABLE 1.—Average Storage Capacity of the 45 Sample Elevators Grouped According to Size

	Number of Elevators in Each Group	Average Storage Capacity per Group
(bushels)		(bushels)
Group I 0-49,999	13	30,000
Group II 50,000-99,999	14	73,357
Group III 100,000-199,999	13	127,231
Group IV 200,000 and over	5	577,000
Total	45	132,355

The needs of an elevator in Ohio usually fall into three categories: (1) space for grain handling and ordinary operation, (2) space for long time grain storage, (3) space for short time grain storage such as that used for grinding accounts.

When determining the size of the elevator the amount of space needed for handling and storage, the number of bins and the amount of conditioning and blending should be considered. Of the 45 elevators contacted in this study, 42 did some type of blending of grain. Table 2 shows that 32 of the 45 managers needed more bins.

TABLE 2.—Number of Bins in Present Elevator and Number of Bins Preferred If Building a New Elevator By 45 Ohio Elevators

Elevator group	Average number of bins	If building again managers indicated they would need		
		Less	Same	More
I	12.2	0	5	8
II	11.2	1	4	9
III	15.4	0	3	10
IV	23.8	0	0	5

The managers were asked for the proportion of their total capacity used for ordinary operation and also if this was as much as they needed. The net excess, of course, could be used for long and short time storage. Table 3 shows that especially for the smaller capacity group they are operating on very limited capacities. Excess capacity becomes more evident in Group III which is the 100,000 to 199,999 bushel range.

It should be noted that the elevators in Groups I and II still handle considerable amounts of stored grain but it is stored in facilities leased by the elevator. Many of these elevators are forced to find storage elsewhere for their customers.

One of the important facts to consider in establishing the size and location of a plant is the adequacy of the transportation facilities. If the railroad offers frequent switching service, twice or more often per day, less total reserve capacity is needed. This reserve capacity can be in storage facilities or in railroad cars on the siding. The amount of grain that is handled in the rail cars is determined by the size and flexibility of the siding. Where switches are made daily or every other day, the siding should accommodate several cars and with flexibility enough that all cars on the siding can be filled without a switch. The capacity

TABLE 3.—Computation of Bushels of Capacity Deficiency or Excess According to Capacity USED and NEEDED for Ordinary Elevator Operation for 44 Ohio Grain Elevators, by Groups

Elevator group	Number of elevators	Total capacity per group	Capacity USED for ordinary operation	Net difference	Grain stored (Includes leased storage)	Net difference	Grain stored on grinding account	Net difference
I	13	390,000	309,000	+81,000	434,000	—353,000	23,150	—376,150
II	14	1,027,000	370,000	+657,000	749,800	—92,800	54,100	—146,900
III	12*	1,494,000	371,000	+1,123,000	978,000	+145,000	35,000	+110,000
IV	5	2,885,000	865,000	+2,020,000	1,762,000	+258,000	64,000	+194,000
Total	44	5,796,000	1,915,000	+3,881,000	3,923,800	—42,800	176,250	—219,050
			NEEDED					
I	13	390,000	391,000	—1,000	434,000	—435,000	23,150	—458,150
II	14	1,027,000	560,000	+467,000	749,800	—282,800	54,100	—336,900
III	12*	1,494,000	415,000	+1,079,000	978,000	+101,000	35,000	+66,000
IV	5	2,885,000	865,000	+2,020,000	1,762,000	+258,000	64,000	+194,000
Total	44	5,796,000	2,231,000	+3,565,000	3,923,800	—358,800	176,250	—535,050

*One elevator did not report volume.

of the sidings of the 45 sample elevators varied from a low of two cars to a high of 40 cars. Table 4 shows siding capacity and the number having open end sidings.

TABLE 4.—Capacity of Railroad Siding and Number of Elevators With Sidings Open at Both Ends or Dead End for 45 Ohio Elevators

Elevator group	Capacity of Siding (Number of Cars)			Railroad Siding Open at	
	Average	Low	High	One end only	Both ends
I	8	3	20	13	0
II	6.7	3	22	8	6
III	7.6	3	29	11	2
IV	14.2	2	40	4	1
Total				36	9

TYPE OF CONSTRUCTION

Many types of construction were found at the elevators and mills visited. A larger percentage were of various forms of concrete which included poured concrete, concrete stave, and concrete block. When planning new construction a check on insurance rates should be made and this considered in the cost of maintenance.

EQUIPMENT

Grain receiving and shipping equipment is rather standard throughout the trade. Controversy does arise on the amount and size of this equipment with regards to the local elevator's needs. The following information is concerned with the equipment being used at the 45 sample elevators along with the recommendations of the managers as to what is needed.

Office and Scales

The office and supply display room is one of the most important facilities of the elevator. The office should be so located to permit the manager full visibility of as much of the operation as possible from the office. At most elevators the operations involved in determining the grade and price of the grain are at the office. With proper visibility and the aid of reliable intercommunication equipment the manager can direct much of the operation from the office, also allowing him to be on

hand for the transaction of business requiring his direction. All managers indicated the need for space allotted to a varied amount of supplies and hardware items. The office should be clean and have space allotted for transactions of a private nature. A private office for the manager was one of the important factors in counseling with customers in order to keep the accounts receivable problem at a minimum. All 45 managers indicated the need for such an arrangement.

The type of scale being installed in Ohio at present is the 40 to 50 feet platform scale with dial indicator (Figure 4). According to the managers, this type of scale increases receiving capacity significantly. The automatic stamping device assured speed and accuracy while the visible scale dial developed customer confidence. Thirty-nine of the 45 elevator managers thought that the platform should be long enough to weigh a large semi-truck in one weighing. Most scales at the 45 elevators were not of this length.

Fig. 3.—Modern office and scales.

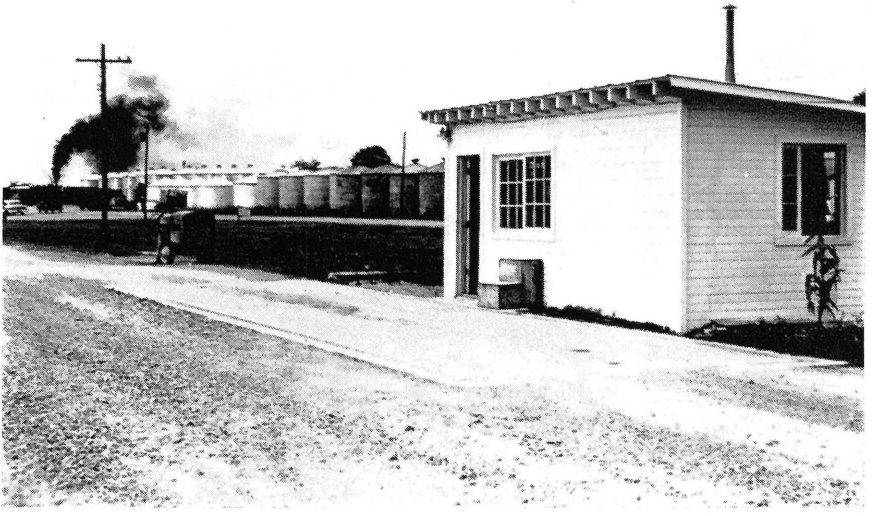

Fig. 4.—New long type scale that can handle semi-truck loads at one weighing.

According to Table 5 the average length and capacity is less than the ideal length as indicated by the managers. This was 45 to 50 feet and capacity of 50 tons.

TABLE 5.—Capacity and Length of Truck Scales, and Number of Scales Having Ticket Stamping Devices Used by 45 Sample Ohio Elevators by Groups

Elevator group	Ticket Stamping Device		Average length (feet)	Average capacity (tons)
	Yes	No		
Group I	7	6	35.5	29.3
Group II	10	4	32.7	28.6
Group III	13	0	29.6	25.1
Group IV	5	0	36.6	31.0

Driveways and Dumps

The type of driveway and number of dumps reflect directly the speed at which grain can be received. In other areas of the elevator one only needs to increase the size of the equipment in order to increase receiving speed. In dumping, however, the farmer's vehicle has to be considered. All end gates in wagons and trucks are not perfectly designed for speed at the elevator. It oftens requires time to unwire or disassemble some makeshift arrangement for the endgate of a wagon or truck. Considering all factors, 37 out of the 45 elevators' managers said that a double driveway was a necessity.

The height of the driveway should be at least 22 feet in order that large trucks can be dumped without shoveling.[1] Twenty-two of the managers indicated that much shoveling was necessary because of the lack of height of the driveway at their elevator.

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[1]This was found by measuring the height of a semi-truck being dumped at one of the elevators.

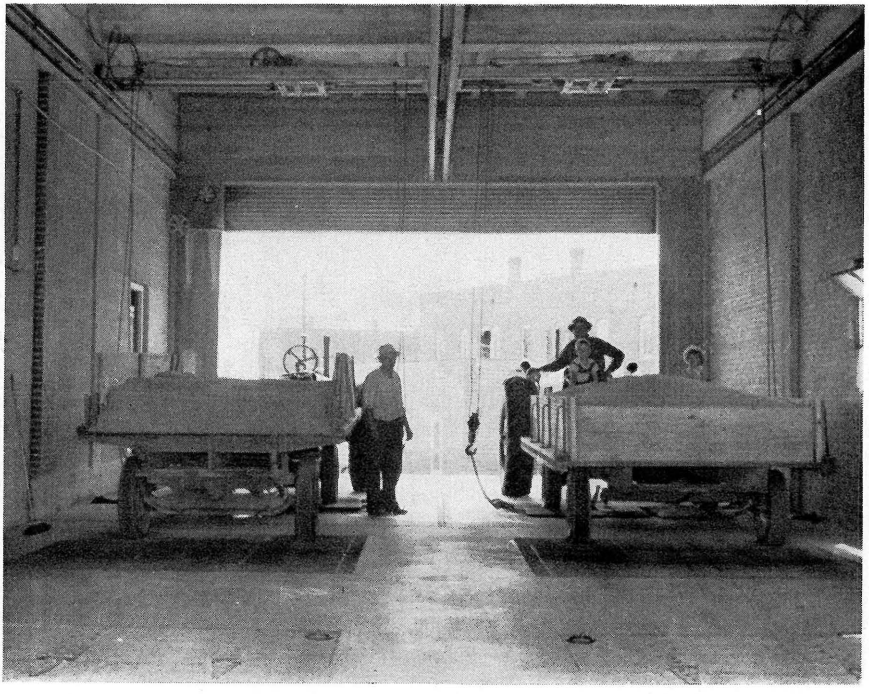

Fig. 5.—Double driveways that are suitable for both heavy trucks and wagons.

TABLE 6.—Number of Dump Pits Serving Both Elevator and Mill and Average Receiving Capacity for 45 Ohio Elevators, by Groups

Elevator group	Dumps serving both elevator and mill		Receiving capacity (Bushels per hour)		
	Yes	No	Low	Average	High
I	3	10	800	1,850	3,000
II	2	12	1,000	2,423	7,000
III	4	9	1,200	2,877	6,000
IV	1	4	3,500	11,000	25,000
Total	10	32	800	3,398	25,000

Each driveway had a separate hoist and 15 of the 45 elevators had double driveways and two or more hoists (Figures 5 and 6). Out of the 45 elevators in this study 32 had separate dumps for the elevator and mill. This enables elevators to give continuous service to feed customers even during harvest rush. Two of the elevators in this study had no feed grinding service.

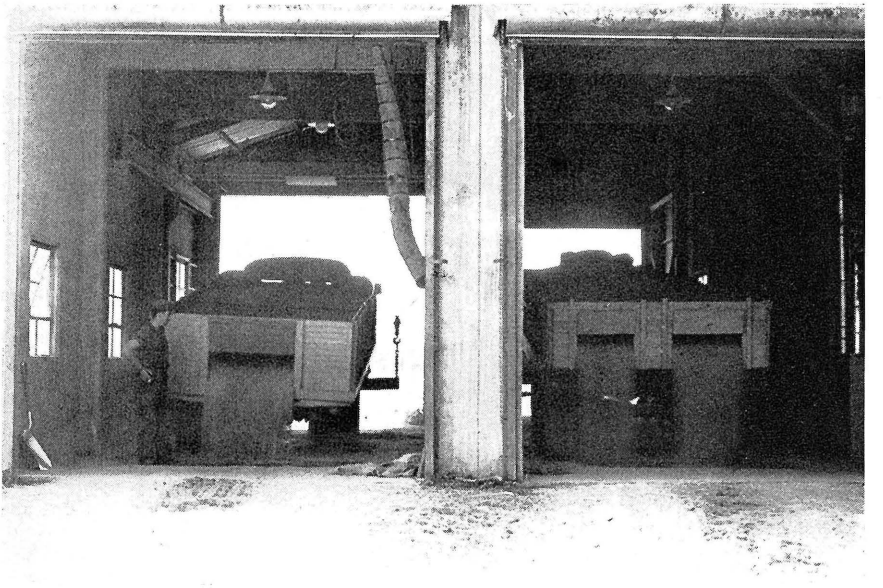

Fig. 6.—Another driveway adapted to both trucks and wagons.

In establishing the type of receiving equipment consideration should be given to the type of equipment used by the farmer in transporting his grain to the elevator. Table 7 shows the type of equipment that the farmers use to transport grain.

TABLE 7.—Percent of Corn, Wheat, Soybeans, and Oats Delivered to the Elevators by Farmers in Trucks and in Farm Trailers* by Elevator Groups

Elevator group	Corn		Wheat		Soybeans		Oats	
	Truck	Farm Trailer	Truck	Farm Trailer	Truck	Farm Trailer	Truck	Farm Trailer
I	50.1	49.9	47.3	52.7	38.5	61.5	40.2	59.8
II	46.8	53.2	44.6	55.4	45.9	54.1	45.7	54.3
III	63.9	36.1	57.7	42.3	49.0	51.0	43.8	56.2
IV	89.7	10.3	88.3	11.7	87.8	12.2	89.3	10.7
Total	64.0	36.0	65.4	34.6	57.0	43.0	53.0	47.0

*Farm trailers here are considered to be a unit of a farm tractor pulling a four-wheel trailer.

Fig. 7.—Typical farm and commercial trucks that bring grain to the elevator.

It should be noted that slightly over 60 percent of the grain was delivered to the elevators by truck. The managers indicated that the trend has been toward greater truck use which means larger loads.

Legs and Distributor

Grain is moved from the dump pits to the elevator leg either by power drive equipment or gravity. The power equipment at the elevators in the sample included 22 single drag chains, 21 double drag chains, one screw, and one by gravity. More than half of the managers indicated that if building again they would investigate more the possibilities of the screw conveyor, especially for corn.

The conveyors move the grain to the leg, or in the case of corn to the sheller and then to the leg. The number of legs in the elevators varied from one to six, with three legs the number most frequently found. Managers indicated that the number of legs depends on the type of house. When the leg construction permits receiving, loading out, and drying grain all at the same time they are sufficient. Thirty-seven of the managers indicated that three legs were needed to have this flexibility.

The greatest distributor problem was caused by the amount of dust in the headhouse. Five of the elevators had new dust proof shielded distributors controlled automatically from the floor. These had a minimum amount of dust and were easily and accurately controlled without going to the headhouse. The distributor should be placed high enough on most country elevators to distribute the grains to all bins by gravity. The recommended slope of the spouts to the various bins should not be less than 45 degrees. All elevators having spouts with slopes less than 45 degrees were subject to "plug ups" in damp grain.

TABLE 8.—Height of Loading Out Chutes of 45 Grain Elevators in Ohio

Elevator capacity in bushels	Height in Feet				
	0–39	40–59	60–79	80–99	100 & over
0– 49,999	2*	0	10	1	0
50,000– 99,999	0	2†	6	3	3
100,000–199,999	0	0	5	1	7
200,000 and over	0	0	2	0	3

*Both had blowers.

†Both experienced difficulty reaching back of car.

In order to "load out" by gravity into cars the origin of the loading out spout should be at least 60 feet in height. Elevators in this sample having less height had difficulty filling the back of the car. Usually hand shoveling or improper loading resulted. Some elevators without adequate height installed blowers.

Corn Shellers

Shelling corn at the country elevator in the volume required to keep up with the harvest rush presents the most commonly reported difficulty in receiving and handling grain.

Managers indicated major problems of breakage due to stones and pieces of metal. During the rush of harvest, corn is usually high in moisture which cuts down the capacity of the sheller. Only two of the sample elevators had shelling capacity of over 1,250 bushels per hour per sheller of corn with less than 20 percent moisture.

Eighteen of the managers said that they needed more shellers and 22 said that they needed more sheller capacity but would rather get it through improvement in sheller design. Five elevators were satisfied with their corn shelling equipment.

TABLE 9.—Corn Shelling Capacity* per Sheller in Bushels per Hour of 45 Elevators in Ohio

Elevator capacity in bushels	Corn Shelling Capacity per Sheller in Bushels per Hour				
	Under 500	500–749	750–999	1000–1249	1250–over
0– 49,999	1	8	1	2	1
50,000– 99,999	2	2	3	6	1
100,000–199,999* †	0	5	4	3	0
200,000 and over	0	3	1	1	0

*Moisture of corn less than 20 percent

†One not given.

A very popular opinion of the managers was for the shelling equipment to be located in an adjoining structure to the elevator. Since corn shelling equipment was undergoing rapid development heavy investment in permanent type shelling facilities was considered hazardous by many of the managers.

Dryers

It was the opinion of over 80 percent of the managers that a grain dryer was an absolute necessity for economical handling and condition-

ing grain at the country elevator.[2] The drying capacity of the various elevators varied from 75 bushels per hour to over 1,250 bushels per hour.

Managers indicated that care must be taken in installing grain dryers to cut down drying labor costs. When dryers are installed in the elevator adequate storage space above and below the dryer is necessary so that supervision need not be continuous. More than one-half of the managers having dryers said that the holding bin above and the catch bin below should each be four times the normal hourly capacity of the dryer.

TABLE 10.—Number of Dryers and Number of Elevators Not Having Dryers and the Capacity in Bushels per Hour of the Dryers When Removing Five Percent Moisture From Grain at 45 Elevators in Ohio

Elevator capacity in bushels	Number of dryers	Number of elevators not having dryers	Drying capacity removing five percent moisture				
			0–249	250–499	500–749	750–999	1000 & over
			(Bushels per Hour)				
0– 49,999	9	4	5	2	2	0	0
50,000– 99,999	5	4	1	1	3	0	0
100,000–199,999*	18†	0	2	4	11	1	0
200,000 and over‡	7	0	2	1	2	0	2

*One elevator in this group had two dryers.

†The manager of one elevator didn't know drying capacity of his dryer.

‡Two elevators in this group had two dryers each.

Table 11 shows approximately the existing conditions of dryer storage bins at the sample elevators.

When installing a new dryer it is difficult to estimate the size needed. Out of the 37 elevators having dryers, 15 indicated that they were not large enough for their needs, especially in the corn harvest season. This usually has been the result of extra volume that was not anticipated when dryers were installed and a new service offered.

[2]Most of the 37 elevators that had grain dryers had difficulty establishing discount policies, shrinkage losses, and drying costs. Various rules of thumb were being used due to the lack of information along this line.

TABLE 11.—Capacity of Dryers' Storage Bins

Elevator Group	Number of Elevators Having Bins	Average Capacity of Bin in Bushels
I	5	1,400
II	8	2,100
III	12	2,870
IV	5	10,120

Cob Disposal

A great deal of discussion, experimentation, and expense has been involved in handling the corn cob surplus at country elevators. Industrial demand has absorbed a very small percentage and farmers in the community often haul a few back to the farm for use as litter. The bulk of the elevators burn cobs either in a pile or in a specially built incinerator.

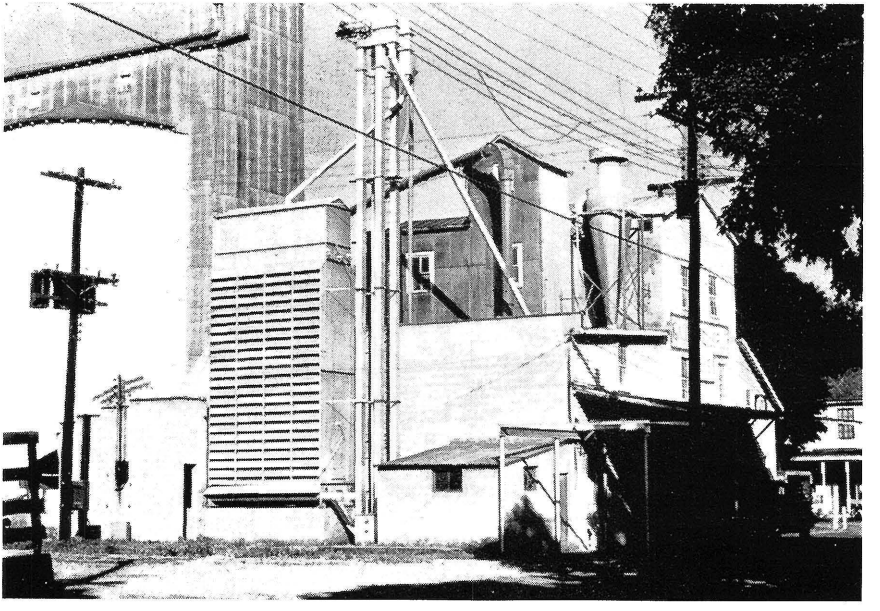

Fig. 8.—Dryer installed outside the elevator.

Fig. 9.—Dryer installed within the elevator. Notice the metal air exhaust vents on side of one of the silos.

More than one-half of the elevators burn their cobs on the elevator site, 20 by incinerator and 7 by burning in an outside pile. Twenty-nine of the elevators haul all or part of their cobs away to be burned. This is the result of local ordinances restricting cob burning within the municipality or inadequacy of the cob burner during rush seasons. In

TABLE 12.—Number of Elevators* Using Different Types of Cob Disposal of the 45 Sample Elevators by Groups

Elevator Group	Incinerator	Burn Outside in Pile	Haul Away	Farmers Get Them
I	7	1	9	11
II	7	1	12	11
III	6	2	6	9
IV	0	3	2	5
Total	20	7	29	36

*Total of all methods is greater than 45 because some elevators use more than one method.

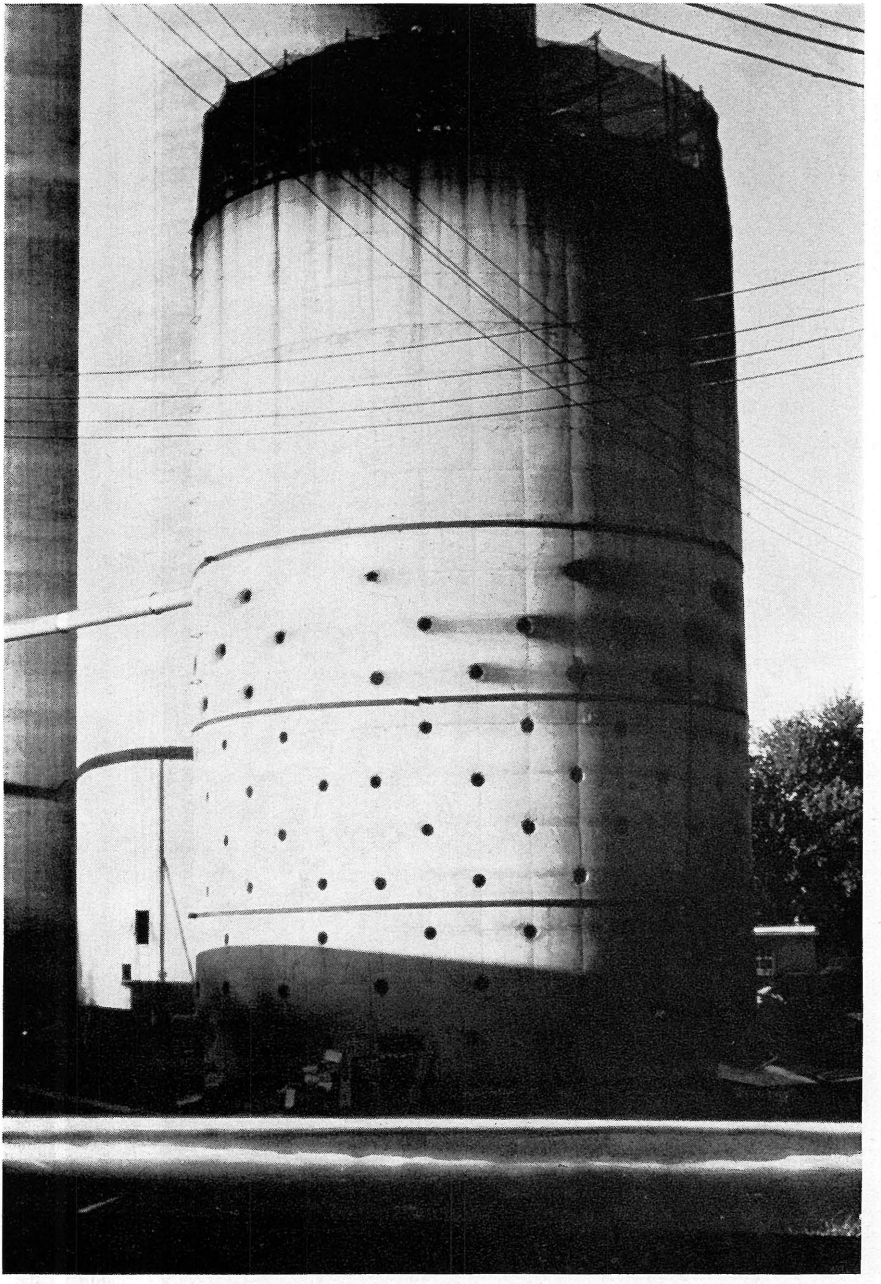

Fig. 10.—Modern cob burner.

Groups 1 and 2 farmers take away almost 45 percent of the cobs, while in Groups 3 and 4 they take away approximately 25 percent. This leaves more than one-half of the cobs to be disposed of in some other manner. This surplus is a direct expense to elevators in all groups during 15 weeks of the year.

Those who are fortunate enough to be able to burn cobs in a pile outside have very little expense but when an incinerator is used considerable expense is involved. A recent estimate for building an incinerator for burning cobs was $7,420.[3] An estimate of the upkeep and repair on the incinerators of this sample group was $565 annually. The average cost of cob disposal for all elevators was $1,385 annually.

Elevators which have had the greatest success in farmer use of cobs are those having well constructed cob bins. Various types of conveyors are available in order to ease the loading problem. Four elevators in this group are crushing the cobs and selling them to the farmers. Their farmer customers prefer the crushed cobs for litter and were willing to pay up to $5 per ton for them.

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[3]According to bid made by contractor to a local elevator on November 1, 1955.

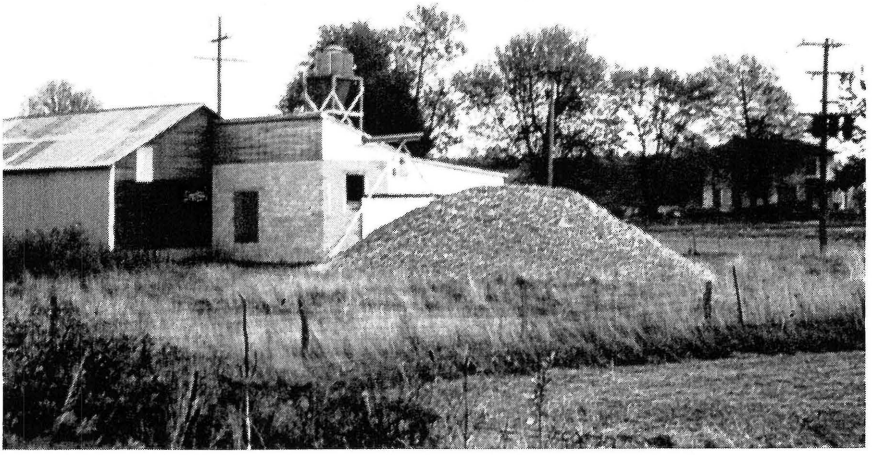

Fig. 11.—A typical cob pile where cobs are burned.

PART II

FEED MILL FACILITIES

Where feed was the most important item an effort was made to include all feed mill facilities but when large dollar volume facilities were used grain became most important item in dollar volume. This was generally unavoidable since most of the more modern feed mill facilities of large volume were in conjunction with large grain facilities.

In the grouping of feed mill facilities the size is generally determined by the physical volume of feed handled. Thus the 45 sample feed mills are grouped according to the annual sale of commercial feed rather than total receipts. Table 14 shows the volume of commercial feed of the 45 sample feed mills grouped according to commercial feed sales.

The area of business of the 45 sample feed mills varied between the four groups with Group 1 covering an average of 167 square miles; Group 2, 214 square miles; Group 3, 189 square miles; and Group 4, 428 square miles. The average number of competitors falling within these trade areas was four. The average distance of the nearest competitor selling the same brand of feeds was 9.3 miles.

MILL AND WAREHOUSE

The size and structure of the warehouse facilities depends on the amount and type of inventory needed for any particular operation. The inventory turnover is also an important factor in determining the warehouse space needed. The group with the smallest volume of business averaged $6,144 in inventory. The largest volume group needed three times the storage space for a $19,308 average inventory but were able to do, on the average, about six times the volume due to inventory turnover. (There are various reasons for variation in inventory which are not a part of this study, but the actual size of the inventory and its effect on facility planning are considered.)

There are many ways in which the volume and structure of the business can affect facilities needed for a particular operation. Almost all the operators agreed that the mill should be just large enough for efficient use. Those that had too much space had trouble keeping waste at a minimum. All agreed that the mill room should be just large enough to house the machinery necessary to perform the services of a mill and that no storage for sack feed should be provided in the mill proper. The warehouse should, then, be separate from the mill with enough floor space for a systematic arrangement of each variety of feed.

TABLE 13.—Average Annual Receipts from Various Sources of Sales and Services of 45 Feed Mills Grouped by Volume of Sales

Total receipts	Number of mills	Commercial feeds*	Cash grain†	Grinding and mixing	Fertilizer	Seed	Other‡	Average total receipts§
0–249,999	9	88,125	47,000	3,714	16,429	7,800	16,250	162,125
250,000–499,999	12	107,857	143,667	8,636	30,818	15,818	53,370	365,571
500,000–749,999	13	170,300	234,000	10,333	44,200	18,400	75,150	593,636
750,000 and over	11	214,167	695,000	8,091	56,250	27,667	105,000	1,222,750

*Includes all grain sold as feed.

†All grain merchandised.

‡Petroleum products and lumber excluded.

§Average total receipts is the average of all mills in the group and will not be the total of the columns in the table. Some mills do not handle fertilizers and some do not buy cash grain; thus, the makeup of the total receipts of the individual mills in each group will not be the same.

TABLE 14.—Average Annual Sales of Commercial Feeds and Average Annual Dollar Inventory of Commercial Feeds with Computation of Feed Turnover, 45 Feed Mills

Total receipts from sale of commercial feeds	Number of mills	Average annual commercial feed sales sold per mill	Average annual receipts from sale of commercial feed*	Average inventory commercial feed	Annual turnover of feed inventory†
		(tons)	(dollars)	(dollars)	
0– 74,999	9	423	42,000	6,144	6.8
75,000–124,999	12	1,001	103,000	7,950	13.0
125,000–174,999	13	1,395	143,000	11,531	12.4
175,000 and over	11	2,685	240,000	19,308	12.4

*To nearest thousand dollars.

†$\frac{\text{Sales (Annual)}}{\text{Inventory}} = \text{Turnover}$

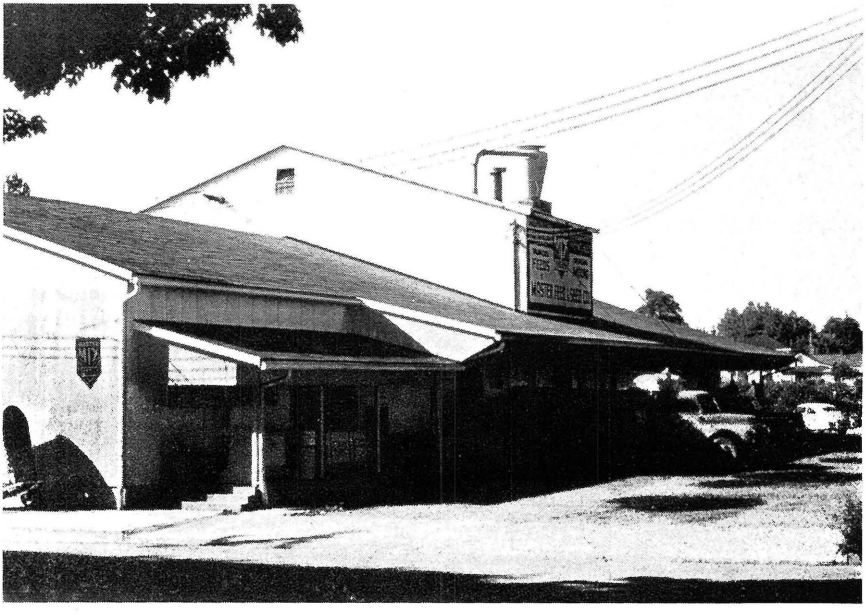

Fig. 12.—A modern feed mill.

Also important in planning feed mill facilities, especially when they are separate from the elevator structure, is storage for feed grains. The managers were asked the amount of storage needed for corn and oats for the ideal operation of their present business.

TABLE 15.—Amount of Storage Needed for Oats and Corn for Ideal Operation at Feed Mills in Ohio by Groups

Group	Number of Mills	Corn	Oats	Total
		(bu.)	(bu.)	(bu.)
I	9	1,164	1,211	2,375
II	12	1,380	2,390	3,645
III	13	1,873	1,227	3,900
IV	11	1,575	1,883	3,458

The storage indicated in Table 15 represents only that space needed to hold the inventory of feed grains and not provide storage for customers. The bin size indicated by the managers was 520 bushels average. According to the total storage needs indicated by these mills the average feed mill would need five to eight bins of 500 bushels capacity for use in holding inventory of corn and oats.

Most of the managers indicated that the office should be completely separated from the feed mill. This could be done by having a separate building for the office or a dust and noise proof wall separating mill and warehouse from office. The sales tickets were made out for the customers at the offices of 28 of the 45 feed mills; the remainder were made out by the feed mill personnel.

EQUIPMENT

Dumps and Hoists

All the managers were in agreement that a ground level or floor level dump pit with truck hoist is absolutely essential in today's modern feed mill. Eight of the 45 feed mills did not have dump pits and hoists. Farmers were bringing their grain to these mills in sacks. This usually resulted in smaller batches of grinding. For those mills having dumps and truck hoists the average weight of the grinding batch was 1,700 pounds and for those eight mills not having dump pits and hoists it was 1,100 pounds. Managers indicated that this was a factor which lowered costs of grinding.

Grinding and Shelling

The speed of grinding and shelling caused more bottlenecks in mill operation than any other factor covered by this study. More than half of the managers indicated that their hammermill was too small or short of power.

TABLE 16.—Hammermill Size, Average Motor Horsepower and Number of Hammermill with Automatic Screen Changes in 45 Sample Feed Mills

Item	Size of Grinder (Inches)							
	12	14	15	16	18	20	22	24
Number of Feed Mills	4	5	14	7	9	5	2	1
Number of Hammermills	4	6	15	7	11	5	2	2
Average Motor Size (H. P.)	47	57	56	60	64	69	75	75
Number Hammermills having automatic screens	0	0	4	1	2	4	0	0

Usually a small capacity corn sheller is adequate for most feed mills. Managers indicated that flexibility of corn shelling and grinding is necessary when making a new installation. The drag from the dump should be constructed so that ear corn could bypass the sheller and feed directly to the hammermill if needed.

The charges to the farmer for grinding and mixing varied widely over the state. The charges varied from 10 to 20 cents per 100 pounds for grinding and mixing at the 45 feed mills. This represents the average charge per 100 pounds for the first 500 pounds of grinding.

TABLE 17.—Number of Mills Making Specific Charges for Grinding and Mixing at the 45 Sample Feed Mills in Ohio

Number of Mills	Cents per 100 Pounds
2	20
23	15
1	13
4	12
15	10

Most of the managers thought that their charges were too low and many estimated that charges were insufficient to cover costs of providing the service. The actual cost of providing this service was not known by any of the managers.

Mixers

Mixing feed at the local mill is the most important service. Farmers usually provide their own grain and the mill sells them supplementary feeds either as ingredients or prepared supplements. In this operation good, fast, and efficient mixing is necessary. Most of the problems in mixing at these sample feed mills could be answered by having either more mixers or larger mixers or both.

TABLE 18.—Number of Mills Having Specified Numbers of Mixers and the Number of Mills Indicating Whether Their Mixers were Adequate of the 45 Sample Feed Mills in Ohio

Receipts from sale of commercial feed	Number of mills	Number of mixers	Is this number adequate at peak load								
			Yes			No					
			No. of mixers			No. of mixers					
		1	2	3	1	2	3	1	2	3
0– 74,999	9	3	5	1	0	3	1	3	2	0
75,000–124,999	12	1	10	1	0	5	1	1	5	0
125,000–174,999	12	2	11	0	0	5	0	2	6	0
175,000 and over	11	0	7	4*	0	5	4*	0	2	0
Total	45	6	33	6	0	18	6	6	15	0

*One listed in this group has four mixers.

Only six of the 45 feed mills have 3 or more mixers. Of the 33 that had 2 mixers 15 said that they were too small for their peak needs.

The mixing capacity of a feed mill can be increased by increasing the size of the mixers along with the number of mixers. The size of the mixer is important wherever there is need for splitting too many batches of feed. Although it is impractical and almost impossible to eliminate all split batches, most of them can be eliminated with a three- or five-ton mixer. One feed mill in the sample had a five-ton mixer and there were six three-ton mixers installed. In all these instances the size of batches was considerably larger than the average for the 45 feed mills.

The average batch for the mills having 3 or 5-ton mixers was 2,240 pounds, while the average batch for the mills having 2 tons or less size was 1,410 pounds.

Other Services

One of the most recent services offered at many of the feed mills is blending liquid molasses into bulk feeds. This is done in two different ways—by pouring molasses directly on the feed as it is mixing and by a molasses blending machine. Sixteen of the 45 feed mills had mechanical molasses blenders of some type. An additional 15 indicated that they planned on installing one soon. The remaining 14 thought that liquid molasses blending was not necessary to their business. These were using a dry molasses mix. The managers of the feed mills now having molasses blenders said that a molasses storage tank of at least 2,500 gallons, preferably located in the basement of the mill, was advisable.

Bulk handling of feed and feed ingredients is another service offered at many mills. Seven of the 45 in the sample handled some ingredients and supplements in bulk form. Generally the equipment costs of these installations were considerably more than storage for like amounts of sack feed.

The most common use of bulk feed handling equipment was on the farm and mills usually provide the service of putting the farmer's mixed feed in his wagon or truck in bulk form. A total of 31 of the 45 feed mills were providing this service. The facility cost of this service is quite low since only conveying equipment to move feed from the mixer to the wagon or truck is necessary.