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Food Grain Drying, Storage, Handling
and Transportation

No. 2

BRIEF DESCRIPTION FOR A
CORN HANDLING FACILITY
IN TROPICAL AREAS



FOOD & FEED GRAIN INSTITUTE
KANSAS STATE UNIVERSITY

MANHATTAN, KANSAS 66502

**BRIEF DESCRIPTION FOR A CORN HANDLING FACILITY
IN TROPICAL AREAS**

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The following is a brief description of a system for conditioning corn for safe storage in tropical areas.

INTRODUCTION

The system includes facilities for receiving either bagged or bulk ear corn. The main functions performed are shelling, drying, and cleaning. Facilities for each of these functions are described.

In addition, equipment for applying grain protectants or grain fumigants for insect control are included. Short term storage facilities for grain during fumigation or holding for pickup are provided. Facilities for sacking corn after conditioning are also included.

Discussion of Design

The attached design was made to incorporate the following criteria:

1. Ear corn is delivered by farmers in small wagons or trucks of not over about five tons capacity.
2. Corn will be shelled, dried and recleaned.
3. Grain will be treated with Phostoxin as it is conveyed from the cleaner to bulk storage. It must be held here about four days to allow the gas to kill all stages of insect growth and to be dissipated.
4. Grain will be bagged and stored awaiting pickup. Bagged grain will be handled by hand.
5. Waste cobs, etc. will be bagged and returned to the farmer or sold.
6. Oil is available for the dryer and electricity is available.
7. A plant capacity of 350-tons per week was specified. Because receiving rates vary from day to day, shelling capacity was set at 100-tons per eight-hour day. Bulk storage is provided for one week and bag storage for 100 tons.

Description of major units:

A truck scale of 15-ton capacity has been provided. If all ear corn is delivered in bags or in small wagon loads (no trucks) then two small platform scales of about one-ton capacity each might be suitable and the total cost would be reduced by about \$8,000.

The sheller and cleaners are located on a roofed concrete slab; this will provide good air circulation for the workers and should provide for better sanitation.

The entire product from the sheller goes to a large cleaner where cobs and husks are removed from the grain and sacked. If the waste could be used for ruminant animal feeding, consideration should be given to the installation

of a grinder to process the cobs for feed. If oil for fuel is not readily available, this material could be used in a furnace to provide heat for drying.

The sheller requires the largest amount of power, 20 H.P., of any unit. If electricity is not available, one large, 60 H.P., diesel engine could be used to power the sheller and dryer and a small electrical generator to furnish power to the motors used on conveyors, etc. If an engine is used, the air for the dryer should be pulled through a duct surrounding the engine; this will utilize the waste heat from the engine for drying and will significantly reduce drying costs.

A storage bin of about 50-tons capacity is located ahead of the dryer. If very wet grain, about 20-25% moisture, is being received the dryer will have to be operated for about 16 hours per day. Only one man would be required for operating the dryer and second cleaner during the second shift.

Corn should leave the dryer at less than 12 percent moisture and be recleaned before storing.

Phostoxin is recommended for fumigation of the corn. Phostoxin pellets would be added at the cleaner discharge through a small feeder device. As an alternative a grain protectant such as malathion or pyrenone (pyrethrins-piperonyl butoxide) could be sprayed or dusted on to the corn at this point. Periodically the inside of all bins and equipment and the premises in general should be sprayed with methoxochlor to kill insects around the premises. After at least four days storage the grain may be safely removed and sacked.

If the grain needs to be size graded for marketing, cylinder graders could be installed ahead of and over the sack-off bin and another sack-off bin provided. This operation would not be used in the United States.

Utilities:

The electrical load will require approximately 50 kilowatts power supply. This will be a 220-volt three-phase service.

As a drying rate of 100 tons per 16 hour day and drying from 25 to 12% moisture approximately 650 gallons of fuel oil will be required for the dryer.

Cost of project:

The prices of equipment and buildings are based upon U.S. prices and do not include freight. Labor for construction is based upon U.S. rates and may be less for local conditions. The overall freight cost should be about balanced by savings in labor for construction.

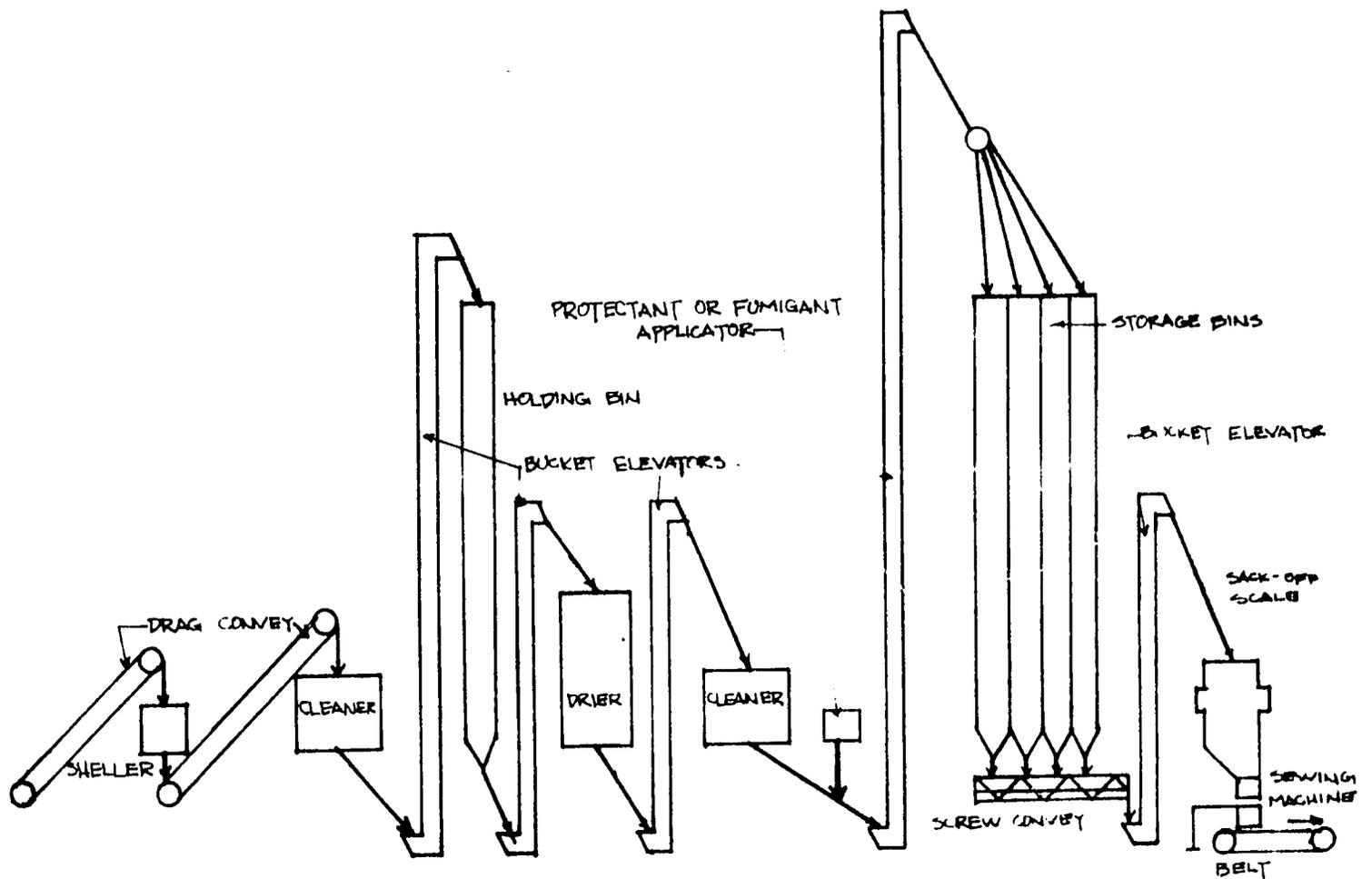
The overall estimated cost for the facility would be \$65,000.

Equipment List

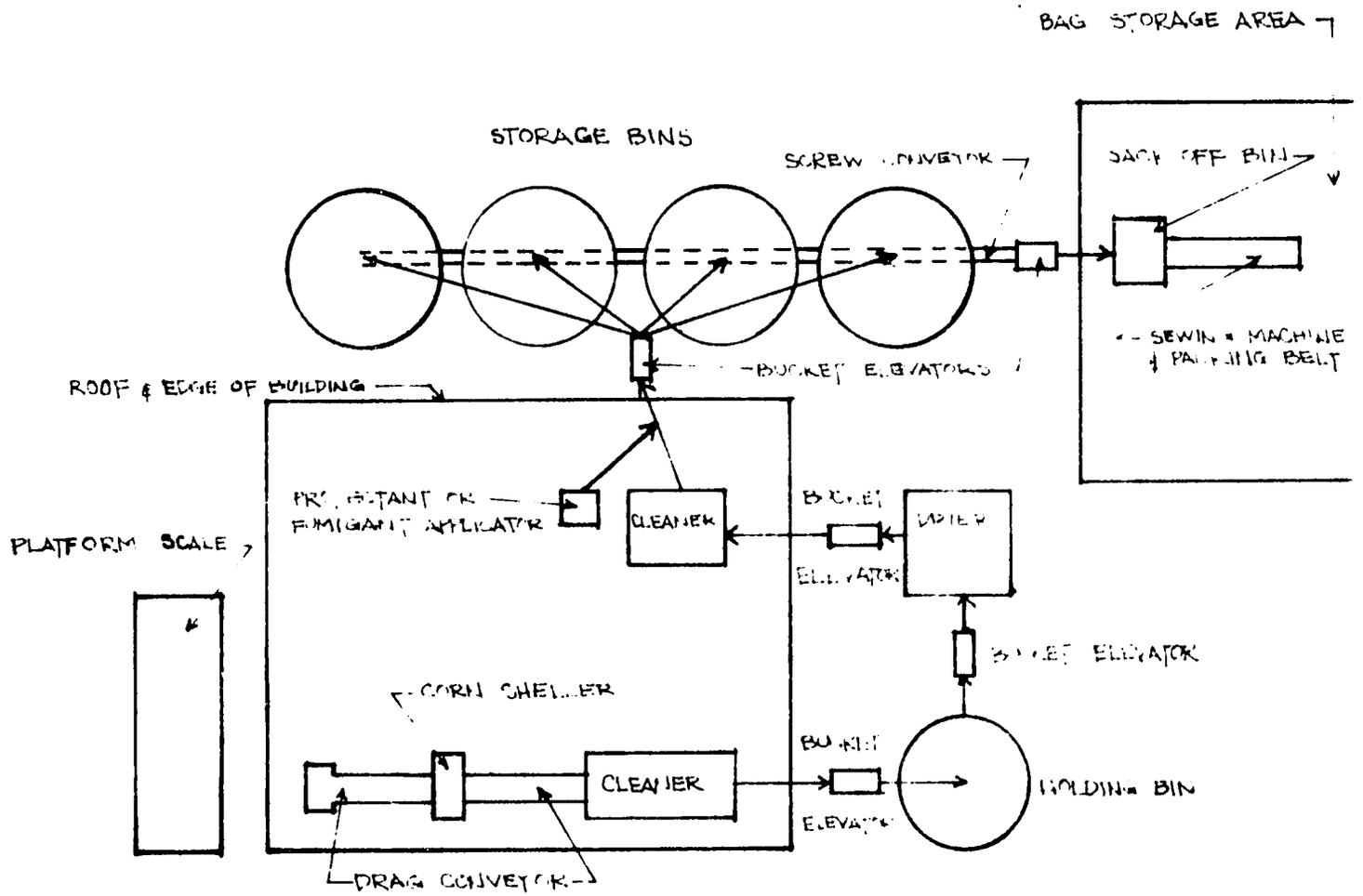
1. 15-ton capacity, 8' x 20' platform, scale.
2. 14' drag conveyor to sheller with 1 H.P. motor.
3. Corn sheller, 12 T/hr. capacity with 20 H.P. motor.
4. 16' drag conveyor to cleaner with 1 H.P. motor.
5. 40' bucket elevator with 1 H.P. motor.
6. 50-ton bolted steel bin, hopper bottom.
7. 36' bucket elevator with 1 H.P. motor.
8. 7-ton 1 hour capacity dryer with 10 H.P. motor.
9. 12' bucket elevator with 1 H.P. motor.
10. 7-ton/hour capacity cleaner with 1 H.P. motor.
11. Protectant or fumigant applicator.
12. 70' bucket elevator with ladder, platform and 2 H.P. motor.
13. 4 bolted steel bins, 75 tons capacity, hopper bottoms.
14. 70', 6" screw conveyor with 2 H.P. motor.

15. 12' bucket elevator with 1 H.P. motor.
16. 4' x 4' sacking bin.
17. Gross weight bagging scale.
18. Sewing machine.
19. Open building, 40' x 65', for sheller and cleaners.
20. Bag storage warehouse 30' x 30'.

CORN SHELLING AND STORAGE UNIT



DESIGNED BY: T.O. HODGES
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OTHER FOOD GRAIN, DRYING, STORAGE AND HANDLING PUBLICATIONS

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KANSAS STATE UNIVERSITY, MANHATTAN, KANSAS

- No. 1 Rice Drying Technology and Equipment which might be applicable to Tropical Developing Countries. June 1968. Prepared by Dr. T. O. Hodges.**

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for the

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