FINAL TECHNICAL REPORT

for

GRANT #DE-FG02-8(R510150

PROJECT TITLE

"MODERNIZING THE HANDLING OF EAR CORN"

MASTER

TABLE OF CONTENTS

- I Summary
- II Pictures
- III Results
- IV Publicity
- V Financial Report
- VI Conclusions

DISCLAIMER

This book was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Submitted By

Charles F. Kleptz, P.E.

ef
DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

I SUMMARY

The goal of the project was to modernize the handling of ear corn. This was accomplished in the following manner.

The corn was picked with a three roll JD 300 picker pulled by a tractor. Pulled behind the picker was a side dump wagon with a capacity of 150 bushels of ear corn. When the dump wagon was full, a grain truck was driven along side of the wagon and the dump wagon, controlled by the tractor driver, was emptied into the truck. After two dumps of the wagon, the truck was driven to the storage area.

The storage area consisted of ten (ten) 2,000 bushel corn cribs set in a semi circle. The reason for the semi circle was so that the elevator that filled the cribs could be moved from one crib to the next without changing the fill point. At the storage area, the truck full of corn was dumped into the platform feeder. By using a platform feeder to feed the elevator, all ten (10) cribs could be filled without moving it.

After the harvest was complete, the corn remains in the cribs until needed for feed or until the corn is sold. During the time that the corn remains in the cribs, the turbine ventallator draws air through the corn and dries it.

One major change from the original application was that instead of building a hopper bottom in the bottom of each crib, it was decided to have an auger remove the corn that would not flow down by gravity.

At the time of pouring the concrete for the base, a drag hole was left in the concrete to fit the drag on the elevator that filled the crib. Also, at this time a pivot point was cast in the concrete so that the auger could be moved from crib to crib. A cable and guides were put around the bottom of each crib before filling and left there until needed to empty the crib.

PICKING THE CORN

DUMPING THE DUMP WAGON

DUMPING CORN IN PLATFORM FEEDER

ELEVATING THE CORN

STORAGE AREA

III RESULTS

Overall, the system performed exactly as planned. As designed, the system has a capacity of approximately 300 bu/hr which, counting break downs etc., means that one (1) crib or 2,000 bushels a day can be harvested.

The only real problem that we encountered was with the picker, and it was not part of the project. At the time this grant was awarded, we already had our corn planted in wide rows but had a narrow row planter on order. Since we had to buy a picker, we bought a narrow row one to match the new planter on order, therefore, we could only pick two wide rows instead of three.

The truck and its' new tail gate did the job perfectly, however, next year we plan to raise the sides on the truck so we can fill it with more corn and make fewer trips back to the storage area.

The platform feeder, although not originally designed for this job, did it well with no real problems.

Also, the elevator to fill the cribs was no problem.

We found that we could empty 200 bushels of corn from the truck and elevate it to the cribs in thirteen minutes.

The cribs and the ventallators were no problem and all performed well.

After the completion of the project, we realized just how unique the ventallator system was designed. It was probably the one single thing that made the corn keep so well. The first crib was filled with 29% moisture corn and it has kept beautifully.

Everyone familiar with the project was skeptical of its' value but when the first crib was opened up and the moisture level had dropped to under 20% without any problems, it made a lot of believers out of these skeptics.

At the writing of this final report we still have not emptied the first crib enough to use the auger but we do not expect any problems because this is a catalog item designed for this purpose.

IV PUBLICITY

1. October 25, 1979 - Demonstration of system attended by the following:
Delbert Byg, Extension Agricultural Engineer, Cooperation Extension Service, Ohio State University
Jerry Hannewald, Manager, Operations Processing Group, "The Andersons", Maumee, Ohio
Philip Seifert, Engineer, "The Andersons", Maumee, Ohio
Larry Frost, Ear corn and Cob Division, "The Andersons", Maumee, Ohio.
2. November 27, 1979 - Field Day with the following in attendance:

Gary Begeman Massey-Ferguson P.O. Box 668 Columbus, Ohio	James L. Meng Pioneer Hi-Bred Tipton, Indiana - 45072
"Bud" Byg Agricultural Engrg. The Ohio State Univ. 2073 Neil Ave. Columbus, Ohio - 43210	Larry Shepherd Agronomy Dept. The Ohio State University 1885 Neil Avenue Columbus, Ohio - 43210
Martin V. Cunningham John Deere Co. 701 Georgesville Rd. Columbus, Ohio - 43228	Max McMichael VerMeer Rep. R.R. 1 Spencerville, Ohio - 45887
Ralph Dull Dull Homestead, Inc. Brookville, Ohio - 45309	Dave VerMeer VerMeer Mfg. Co. 5299 Plumwood Columbus, Ohio - 43229
Don Eakert Agronomy Dept. The Ohio State Univ. 1885 Neil Ave. Columbus, Ohio - 43210	Tim White The Ohio Farmer 1350 W. Fifth Avenue Columbus, Ohio - 43212
Jerry Grooms Publications Cooperative Extension Service 2120 Fyffe Road Columbus, Ohio - 43210	Lyman Gonyou AVCO New Idea Coldwater, Ohio - 45828
James E. Henry Agricultural Engrg. Dept. The Ohio Agricultural & Research & Development Center Wooster, Ohio - 44691	Gunnar Knudson Blair Mfg. Co. Blair, Nebraska - 68008
David List AVCO New Idea Coldwater, Ohio - 45828	Archie Henderson Farm Mgr. Woodland Manor Farms Union, Ohio - 45322

3. The Ohio Farmer, February 2, 1980 Issue - See enclosed
4. April 26, 1980 - I am to present my system at the annual meeting of the American Society of Agricultural Engineers
5. June 5, 1980 - My farm is on a tour set up by the Montgomery County Extension Service

STRAIGHT TALK FROM ANDY

by **Andy Stevens**, Editor

How many gallons per acre?

My neighbors have asked several times, "How many gallons of alcohol can we get per bushel of corn?" About 2.5 gallons of grain alcohol can be produced from a bushel of No. 2 corn.

Alcohol fuel is the "sun-thetic" fuel. We should do all we can to promote it. We burn 120 billion gallons of gasoline each year in the United States. About half our consumption is imported. It's past time to turn around this drain on our economy.

Farmers are pacesetters

This nation's slowdown in growth during the past few years is often listed as one of the major causes of inflation. Productivity is defined as the amount of goods and services produced from a given input of labor and capital.

A recent USDA publication shows agriculture productivity has increased faster than other parts of our economy. This is one reason U.S. farm products can compete favorably in foreign countries. Last year, the U.S. farm worker (farm operator, family member or hired laborer) supplied an estimated 65 people at home and abroad with food.

Back in 1820, about 70% of the work force was engaged in farming. That meant that 2½ million people were working on farms. At that time, U.S. population was less than 10 million.

The farm worker produced only enough to supply four people. That was before the first American "agricultural revolution" which marked the change from hand-powered to horse-powered equipment. By 1900, one farm worker supplied products for 6.9 people.

From 1900 to 1940, the number of people supplied by the average U.S. farm worker had increased by about four, reaching 10.7. But in the next 20 years, 1940 to 1960, the number of people supplied per farm worker more than doubled to 25.8. From 1960 to 1978, it more than doubled again. The figure for 1978 was 65.

Your farming efficiency allows Americans to be the best fed people on earth. And they spend the smallest share of their incomes for food. The less spent on food, the more that is available for other goods and services. □

**Number of persons supplied
with farm products by one
U.S. farm worker**

Year	Total	At Home	Abroad
1820	4.1	3.8	0.3
1900	6.9	5.2	1.7
1920	8.3	6.9	1.4
1940	10.7	10.3	0.4
1950	15.5	13.8	1.7
1960	25.8	22.3	3.5
1970	47.1	39.9	7.2
1977	59.8	42.8	17.0
1978	65.0	46.5	18.5

lane
CLEAR SPAN BUILDING CORP.

**1 PER COUNTY
DISPLAY BLDGS. ONLY**
Receive up to \$300 Rebate
toward any accessory purchase.
(offer does not apply to a discount
on base Ad building price)
**OFFER EXTENDED TO FIRST 10
BUYERS OFF THIS AD**

AGRICULTURE		
30x48x12		\$2,793
40x48x14	FRAMED OPENING INC.	\$3,876
40x72x14		\$4,995
48x72x14	STEEL I-BEAM CONSTRUCTION	\$5,995
48x96x14		\$7,864
AGRICULTURE-COMMERCIAL		
16x24x8	FRAMED OPENING INC.	\$1,987
24x24x8		\$2,492
40x42x8	STEEL I-BEAM CONSTRUCTION	\$3,946
60x100x14		\$12,714
70x100x14		\$14,443

**BUILDINGS NOT
EQUIPPED AS SHOWN**

Available in buildings 50 to 100 wide
sliding doors up to 30 wide

**F.O.B. - FACTORIES LOCATED IN NUMEROUS
LOCATIONS IN THE UNITED STATES**
Buildings available any width,
any height any style

Snow and wind loading
requirements in certain areas
may affect advertised prices.

ALL BUILDINGS ACSC APPROVED!

SAVE! SAVE! SAVE
BUY THE BEST
AT THE BEST PRICE!

CALL FOR PRICE GUARANTEES ~
EAST, MIDWEST
AND WEST (call collect) 517-263-8474
TOLL FREE IN MICH 800-292-0033
OUTSIDE MICH 800-248-0065

DEALER INQUIRIES ACCEPTED
WE HAVE A FEW AREAS OPEN
FOR DEALERSHIP

OR WRITE TO: LANE CLEAR SPAN BUILDING CORP.
P.O. Box 952, ADRIAN, MICHIGAN 49221 211

Name _____
Address _____
City _____ State _____ Zip _____
Phone _____ Date to Build _____ Size _____

SOD AND STALK RIPPER

TRASH-EATER AND CHISEL COMBO BY TAYLOR-WAY

Here's the big-
job implement you need to
do 2 jobs at once. 20" Coulters,
spaced 9" apart and mounted on 1½" Square
Axles to give you the kind of dependable
performance and service you
expect from Taylor-Way.

Easy adjustment.

See
your
Taylor-Way
dealer

MFG. BY TAYLOR IMPLEMENT DIV. PITTSBURGH FORGINGS CO. ATHENS, TN 37303 USA

INCREASE YOUR PRODUCTIVITY

A DOUBLE DUTY RESERVE FUEL TANK
For Extra Fuel and Front-End Weight
Available in white, red or John Deere green with yellow striping tape. Use with or without tractor weights. Tanks come complete, ready for fast installation. Made of 3/16 and 12-gauge metal. Four sizes available — 35 gal., 50 gal., 56 gal. and 72 gal. with up to 800 lbs. added front-end weight. Fits JD, IH and others.

TRANSPORT BRACKETS
200 Series Corn Head and Grain Table
Adapts easily to category 2 or 3 tractors or quick couplers. Move your head easier into small shops with low clearance and through narrow doors.

RESERVE FUEL TANK FOR COMBINES
Fill Up Just Once Per Day!

Three sizes available — 44 gal. for JD 6600 and 7700 or 33 gal. for JD 4400. Plus 37 gal. for JD 6620, 7720 and 8820. Comes complete for easy installation.

"Custom Made Product Line"

CONTACT YOUR LOCAL IMPLEMENT DEALER FOR DETAILS.

SIMONSEN IRON WORKS, INC.

SIOUX RAPIDS, IOWA 50585 PH. 712/283-2544

Got the Fuel Bill Blues? Beat the system by going SOLO.

What is a SOLO?

The HS Tarm MB-SOLO is an unusually heavy and durable wood-fired boiler. Specifically designed to connect easily to your present oil or gas boiler down in the basement.

With a single loading of firewood, SOLO maintains a constant, complete combustion wood fire — and thus constant heat & domestic hot water — for up to 12 hours. Or one whole winter's night.

And if the wood fire should go untended for longer periods, SOLO protects you like no woodstove can. By automatically activating your present oil or gas boiler to guarantee you uninterrupted heat.

Because SOLO is linked directly to your present boiler, you can use firewood to supply all your home's heat & domestic hot water — or part of it. You can burn wood in winter to save money. And use gas or oil when wood is not convenient.

Convert your hot water central heating system to wood this week with this HS TARM add-on boiler!

HS TARM
Multifuel Heating Systems.

UNITS NOW AVAILABLE

Can be seen at:
L & N HEATING CO., INC.
4606 Kinsman Rd.
Mesopotamia, OH 44439
216-693-4347

Open Tues. thru Sat. 9 to 5
Closed Sun. & Mon.

Call or write for free literature!

the Ohio farmer® CONTENTS

February 2, 1980
Volume 265, Number 3

Hugh Chronister, Publisher
Andrew L. Stevens, Editor
Vanessa Callaway, Associate Editor
Roger W. Nielsen, Associate Editor
Beverly Wagner, Associate Editor
Marilyn Burns-Peterson, Assistant Editor
Tim White, Assistant Editor
Karol Seymour, Editorial Assistant
James Murney, Advertising Manager
Ron Stiebler, Advertising Salesman
T. D. Harman, Research Director

On the cover:

Planting's still around the corner, but it's not too early to plan for stashing this season's crop. Grain handling idea number one: Gary Lee's semicircle concept (see story, page 34). (Photo by Vanessa Callaway.)

14 Their grain moving problems go with the wind

For the Kochenderfers, selling their dairy cows was a tough decision. And it brought on more problems, like how to convert their silo storage for cash grain. They found their answer blowing in the wind — a pneumatic grain conveyor.

20 Leave it to an engineer

Charles Kleptz used a grant from the Department of Energy and some engineering savvy to come up with an automated system for harvesting, handling and drying ear corn. In the future he may even gassify the cobs to help dry down his corn.

54 Co-op members "jazz it up" in New Orleans

The National Council of Farmer Cooperatives' members (and an OHIO FARMER editor) were treated to a mini Mardi Gras in the "Crescent City". But besides the fun, current issues were discussed and last year's decisions were summarized at the annual meeting. (See related stories on page 55 and 56.)

NEWS AND INFORMATION

5	A modern way to spray	50	Grain embargo's impact
15	Pneumatic grain movers	67	Cut corn drying costs
18	Veterinarians in the round	70	Winter meeting time
29	Old ways aren't bad	76	Solar grain dryers
34	Smile and say 'semicircle'	78	Dairy herd health program
40	Minimum tillage draws crowd	80	Swine herd preventive medicine
44	Soybean Qs and As	84	Farmers react to embargo

FARM FAMILY LIVING

89	Spice up your meals	98	The country parson
91	Dreams of spring	100	Fruit and vegetable meeting
95	Travel	102	Crime prevention
96	Patterns	104	Over the back fence

REGULAR FEATURES

3	Straight talk from Andy	13	Livestock lines
6	Marketing news	22	Editorial viewpoint
8	News from Washington	88	Slim, Tim & Orrie
10	Ohio farm news	88	The lazy farmer
12	Ohio people	78	New products

THE OHIO FARMER is a publication of The Harvest Publishing Company, a subsidiary of Harcourt Brace Jovanovich, Inc.

Editorial and advertising offices:
1350 West Fifth Avenue, Columbus, Ohio 43212 / Telephone 614-486-9637

Circulation offices:
2021 East Dublin Granville Rd., Suite 150, Columbus, Ohio 43229 / Telephone 614-846-9671

Gerrit J. Bol, Circulation Manager; **Arthur Borders**, Asst. Circulation Manager.; **Carlyle Wolding**, Asst. Circulation Manager; **Bob Cates**, Asst. Circulation Manager.

Copyright © 1980 by The Harvest Publishing Company, a subsidiary of Harcourt Brace Jovanovich, Inc. All rights reserved. No part of this publication may be transmitted or reproduced in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system, without permission in writing from the publisher.
THE OHIO FARMER (ISSN 0030-0896) is published the first and third Saturdays of each month, except a single issue in June, July and December on the first Saturday, by The Harvest Publishing Company, a subsidiary of Harcourt Brace Jovanovich, Inc., 9800 Detroit Ave., Cleveland, Ohio 44102. James Milholland, Jr., Chairman of the Board; Hugh Chronister, President; Dayton Matlick, Senior Vice-President; Charles Quindlen, Vice-President. Advertising.

NATIONAL ADVERTISING OFFICES:
Chicago, Ill.—333 North Michigan Ave.
Cleveland, Ohio—9800 Detroit Ave.
New York, N.Y.—757 Third Ave.

Shawnee Mission, Kan.—6811 West 63rd St.
Los Angeles, Cal.—3467 W. 8th St.
San Francisco, Cal.—57 Post Street

SUBSCRIPTION PRICE:
In Ohio: One year \$5.00. Elsewhere: One year \$10.00. Second-class postage paid at Cleveland, Ohio and at additional mailing offices.
SUBSCRIBERS: Please send subscription inquiries and changes of address to THE OHIO FARMER, 9800 Detroit Avenue, Cleveland, Ohio 44102. For faster service on all of your subscription questions, please include address label from a recent issue of the magazine.

POSTMASTER: Send Address Changes to THE OHIO FARMER, 9800 Detroit Avenue, Cleveland, Ohio 44102.

Sanders performs surgery on a horse with a broken splint bone. A vet student, Earl Sutherland, is administering anesthesia.

such as IBR and TGE. This is done by first injecting a rabbit with a known virus. The rabbit produces antibodies to fight the disease. Some of the rabbit's antibodies are attached to a fluorescent dye and put on a slide.

A cow's nostril is scraped and part of the scrapings are put on the same slide with the rabbit's antibodies. If the cattle scrapings are infected with a virus, the antibodies will attack the virus and produce clumping. The clumping is visible because the dye glows. This test takes from 24 to 48 hours.

The Urbana Veterinary Clinic serves farmers in a 30-mile radius, but their consulting service radiates even farther. Their swine herd health programs are based on recommendations by Alex Hogg, Extension veterinarian in Iowa.

A summary of Sander's dairy and swine herd health programs appear on page 78. Don points out that every farmer's health program should be coordinated by his local veterinarian to meet his specific needs.

"We're not consultants because we're more talented than others, but we have the equipment to handle it," says Don.

When a baby pig gets diarrhea, he can get immunity from E. coli infections just by nursing his mother.

The round shape of the vet clinic gives them the least amount of wasted hallway space. It's been in operation for 5 years. The 6,300 feet of floor space on the first floor houses the clinic working area. The second floor is a

conference area measuring 600 square feet. Don holds several meetings here every year for groups such as young farmers, 4-H'ers and hog producers.

Down on the first floor, the whole working area is centered around central supply which is located smack dab in the middle of the building. Wedge-shaped rooms radiate from central supply. "At the farthest distance, we are only 30 feet from central supply," says Don. Little more than 42 feet is wasted hallway space. About 40% of the space is devoted to large animal work. Another 40% houses the reception area, exam rooms and small animal facilities. The remaining 20% is garage, laboratory, utility and technician office space.

Ultraviolet lights in air ducts sterilize the air in the operating rooms to help prevent infection. X-ray viewers are located in both the large and small animal operating rooms so the veterinarians can look at the X-rays while surgery is in progress. The large animal operating room has no corners to prevent horses from casting themselves.

Why did Don and Judy sink so much money into a large first-class clinic? "There are as many valuable farm animals as pets. The sentimental value may not be as great, but economically, large animals carry great significance. I blood tested a bull that brought \$50,000 for 1/20th interest," says Don.

Purebred cattle bring a premium price. "You can certainly justify the same kind of facilities for valuable large animals as for small pets," he says. □

WAGONS AS MODERN AS THE TRACTORS THAT PULL THEM

ELECTRIC wagons are built for today's farming methods and make the ideal match with modern tractor power and speeds. Wide track stability, high ground clearance, short turning radius and full contact, full swivel

reach collar combine for smooth, easy operation and high maneuverability. Welded steel frames, heavy spindles, wear resistant forged steering rod ends assure long, low maintenance service.

ELECTRIC wagon capacities from 8,000 to 28,000 pounds for every farm need.

Firestone
ELECTRIC WHEEL COMPANY

THE ELECTRIC WHEEL COMPANY
DIVISION OF THE FIRESTONE TIRE & RUBBER COMPANY
Dept. OF, Quincy, Illinois, U.S.A. 62301 / 217-222-5320

Paul Christman Wins Soy Venture Contest With 73.14 B.P.A.

With a yield of 73.14 bushels per acre, Paul Christman of Anna, Ohio, is the grand prize winner in Callahan Seeds' annual Soy Venture competition. Paul won a John Deere Spitfire snowmobile for his soybean yield, which topped the yields of more than 600 farmers who entered the contest.

Paul achieved his winning yield with Callahan 7302, a popular soybean line noted for its excellent vigor, phytophthora resistance and yield potential.

Regional Winners Cash prizes were awarded to these regional winners:

• Kenneth Simmons / Ligonier, Ind. / Callahan 6300 / 70 b.p.a. • Norman Smith / Wellington, Ohio / Callahan 7302 / 68.75 b.p.a. • Kenneth Hathaway / Harrisburg, Ill. / Callahan 7302 / 64.35 b.p.a. • Leo McGraw / Earl Park, Ind. / Callahan 6300 / 62.5 b.p.a. • Lester Settlege / St. Marys, Ohio / Callahan 6300 / 61.1 b.p.a. • David Minich / Camden, Ind. / Callahan 6300 / 59.92 b.p.a. • Dorwin Hoffman / Malinta, Ohio / Callahan 6300 / 58.76 b.p.a. • Ray Poole / Noblesville, Ind. / Callahan 7302 / 57 b.p.a.

The remaining entrants received an Eveready® electric lantern just for competing. Your local Callahan Seeds dealer can tell you how to enter next year's Soy Venture competition. Win or lose, you'll always come out a winner at harvest time with high-yielding Callahan soybean seed.

Paul Christman (seated) and son receive Soy Venture award from Callahan dealer Harold Shopp (left).

- ☐ Send me information about my nearest Callahan dealer.
☐ Send me the following Callahan Seeds brochures:
☐ An introduction to Callahan Seeds
☐ Callahan Soybean Seed
☐ Callahan Wheat Seed
☐ Callahan Sunflower Seed
☐ I'm interested in a Callahan Seeds dealership.
☐ Send me the Callahan Seeds Yield Bulletin and Soybean Management Guide.

Name _____
Address _____
City _____ State _____ Zip _____
County _____ Phone _____

Mail to:
CALLAHAN SEEDS
720 W. 169th Street
Westfield, IN 46074

callahan
seeds

Leave it to an engineer

by **Tim White**
assistant editor

Leave it to an engineer. Since World War II engineering advances have made corn an energy intensive crop. Harvesting has featured larger and larger combines. Storage has required energy-fueled dryers, and transportation demands five-axled trucks.

Leave it to Charles Kleptz, a professional engineer turned restaurant designer, Ponderosa Steak House co-founder, meat packing plant owner, cattleman and, finally, Miami-Montgomery

"In the 140 tons of cobs in my cribs I have the energy equivalent of 15,000 barrels of oil."

counties farmer, to demonstrate the savings that can be made by growing ear corn.

"Since the 1940s no one has worked on developing a system for harvesting, handling and drying ear corn," says Bud Byg, Extension agricultural engineer. "The automated system Charles has put together should open a lot of eyes to the savings available with ear corn," Byg says.

Kleptz got interested in ear corn when he began exploring ways to feed his Angus-based herd of 100 brood cows. Initially he purchased a Harvester silo for

silage. A concern about rising energy costs and the steep initial investment in equipment started him looking for an efficient way to handle grain.

"Look at the cost of a combine vs. a corn picker," Kleptz suggests. "The difference between our \$15,000 three-row picker and an \$80,000 combine is \$65,000. Amortize that over 10 years and you've got a savings of \$6,500 a year," he says.

Storage costs are another place Kleptz feels he can save money with ear corn. "Our costs are 90 cents a bushel. I figure we save at least 40 cents a bushel and we don't have to wait in line to get it dried."

Kleptz developed his system with an \$18,000 grant from the Department of Energy. The heart of the operation is a 10-bin semi-circular storage area. The bins cost \$1,600 a piece to build, including a concrete pad, the metal crib, a turbine and \$200 in labor costs.

"My main reason for building these was I wanted the flexibility to sell or feed my corn. I didn't have that flexibility with a big silo," Kleptz says. "I also wanted to completely eliminate the shovel and use catalogue equipment so anybody could duplicate it," he adds.

Kleptz set up the cribs with the help of his hired hand and his son. The first one gave them some trouble but once they got the hang of it the three of them could

build one crib a day.

With the wind blowing at 4 mph the turbine at the top of each crib drives 4,000 cfm of air down a hollow core in the middle. Although they haven't recently tested the corn for moisture, Byg and Kleptz feel that this is enough to dry the corn down to 17% moisture content. It was picked at 28%. Kleptz is currently investigating buying a gassifier to convert cobs into gas which could be used to dry the corn down to 15½%. Pioneer uses a gassifier to dry their seed corn and Kleptz thinks a smaller system might be ideal for his farm. "In the 140 tons of cobs in my cribs," he says, "I have the energy equivalent of 15,000 barrels of oil."

This year Kleptz harvested 200 acres of corn. The husked corn was brought off the field in a dump wagon. The wagon dropped the corn into a farm truck. It was driven to the cribs and dumped into a platform feeder. An elevator carried the ears into the cribs. The same elevator will remove the corn through a trough at the bottom of each crib.

The operation requires a man to drive the truck and one to drive the tractor which pulls the corn picker and dump wagon. The truck carries 200 to 225 bushels of corn in each load. It takes 13 minutes to transfer the ears from the truck to the cribs. Kleptz points out that with two trucks, one could be filled while

the other is being emptied.

The only problem Kleptz ran into was with his corn picker. His yield was 150 bushels per acre. The husking bed in the picker was designed for 80 bushels per acre. Next year he plans to use a six-row picker but still would like to see a manufacturer design a higher capacity husking bed.

In fact Kleptz would like to see a manufacturer design an entire system for ear corn harvesting. "Right now it's up to the farmer to design and integrate the components. I hope that some manufacturer will design a complete

"I figure we save at least 40 cents a bushel and we don't have to wait in line to get it dried."

system rather than just part of a system," he says.

Byg, who assembled representatives of several manufacturers and seed companies as well as Extension specialists for a field day on the Kleptz farm, agrees. "Except in seed corn, there is nothing to compare with this," he says. "We hope this will give people something to look at, think about and maybe stir their imaginations."

On the other hand maybe what they need is a good engineer. Charles, have you ever considered manufacturing farm implements? □

Except for a polka dot hat, Charles Kleptz is all business as he fields questions about his ear corn operation from implement manufacturers, seed company representatives and Extension specialists. A retired co-founder of Ponderosa Steak House, Charles Kleptz now runs an 800 acre cattle and grain farm in Montgomery and Miami counties. He harvests and stores 200 acres of ear corn.

V FINANCIAL REPORT

1. See attached report prepared by R. Donald Moore, Cooperative Extension Service, Eaton, Ohio.
2. Comments on Report by Charles F. Kleptz

Although this report shows an 18¢ per bushel savings for ear corn, Mr. Moore has made one wrong assumption. The prices he uses for construction cost on a shelled corn system are 1974 prices against the 1979 prices for an ear corn system. If you update the 1974 prices, it favors the ear corn by nearly 30¢ per bushel. Then, if you double the size of the system, it gives the ear corn another 15¢ per bushel for a savings of 45¢ per bushel. You can then add to this amount 14¢ per bushel for the going market for cobs and you have a total savings of 59¢ per bushel.

One last advantage to the ear corn system is that the cob from one bushel of corn has the heat equivalent of 3/4 gallon of oil. At today's prices, this is an additional 75¢ or a total of \$1.20 per bushel savings.

If all these assumptions hold true, a 40,000 bushel system has a savings of between \$24,000.00 to \$48,000.00 a year over shelled corn.

3. Cost Breakdown of Expenses

Hardware	\$ 19.27	
Elevator	3,002.60	
Steel for casters on elevator	82.00	
Freight on tailgate	50.77	
Sweep Auger	1,219.75	
Hydraulic drive for auger	1,535.35	
Platform feeder	4,409.80	
Hydraulic drive for feeder	461.55	
Crib foundation forms	163.00	
Truck Gate	339.90	
(1) Crib	1,010.65	
Dump Wagon	3,995.00	
Gravel	46.37	
Lumber	24.08	
Concrete	234.32	
Turbine Ventilator	77.11	
Hardware	91.36	
Lumber	26.62	
Hardware	12.01	
Crane Rental	175.00	
Freight	50.79	
Connector Canvas	82.00	
Vent Duct	64.28	
Vent Tubes	147.50	
Anchor Bolts	\$ 125.53	
Hydraulic Hoses	198.34	
GRAND TOTAL		\$ 17,820.46

ECONOMIC APPRAISAL OF HARVESTING, HANDLING AND STORING 20,000 BUSHELS OF CORN FROM 160 ACRES BY THREE COMMON METHODS

This brief economic appraisal and analysis is to compare the economics of harvesting, handling and storing of 20,000 bushels of corn from 160 acres by three common methods. They include: 1) harvest and store as ear corn in 2000 bushel circular cribs using a pull type three 30" row pull type picker with materials handling equipment normally used in materials handling of forages; 2) harvest as shelled corn with a three row 30" header and combine. This corn would be stored in steel bins and dried with propane gas and electricity. The sale of the crop by the two methods listed above will be in the following spring or summer or 6 months after harvest; 3) harvest with a combine and sell from the field to a nearby grain dealer. All machinery and equipment in harvest and handling the corn is assumed to have an eight year life and 20% salvage value.

The first method to be analyzed is the harvesting, handling and storing ear corn.

TABLE I

Fixed Costs: All machinery and equipment in harvesting and materials handling ear corn. All equipment is given an 8 year life. Annual costs as a percent of asset cost.

Depreciation	12.5%
Interest	6.0%
Repair	2.5%
Insurance & Miscellaneous	<u>1.0%</u>
Annual cost as a % of asset cost = 22.0%	

TABLE II

Asset cost of machinery and equipment to harvest and handle ear corn.

			<u>Allocated Cost</u>
Picker	\$14,000	(3 narrow row)	\$14,000
Tractor	\$18,000	(80 hp @ 1/5 of annual use)	\$ 3,600
Dump Wagon	\$ 6,000	(@ 1/2 annual use)	\$ 3,000
Feeder	\$ 5,100		\$ 5,100
Elevator	\$ 2,800		\$ 2,800
Truck (used)	\$ 1,500	(@ 1/3 annual use)	\$ 500
Tractor	\$10,000	(40 hp @ 1/5 of annual use)	<u>\$ 2,000</u>

Annual fixed cost is \$31,000
@ less 20% salvage=24,800 @ 22%/yr. = \$5,456

HARVESTING BY SHELLED CORN METHOD

Harvesting and materials handling costs for 20,000 bushels of shelled corn harvested by a new three row combine is as follows. The fixed costs as a percent of new costs if assumed to be the same as the ear corn system or 22% of asset costs. The total annual acreage of the combine is assumed to be 400 acres of corn, soybeans and wheat. The fixed costs are as follows:

TABLE

<u>New cost</u>	<u>% of annual use</u>	<u>cost allocated to 160 acres of corn</u>
Combine \$48,000	40%	\$19,200
Tractor \$10,000	20%	\$ 2,000
3 Wagons \$ 2,400	50%	<u>\$ 1,200</u>
		\$22,400

\$22,400 less 20% salvage = \$17,920 @ 22% = \$3942

Variable costs are as follows at harvest time:

Labor (2 men, 10 hrs/day @ \$4.50/hr @ 11 days)	\$ 990
66 hrs combine time (@ 5 gallons per hr @ \$1.00)	\$ 330
40 hrs tractor time (@ 2 gallons)	<u>\$ 80</u>
	\$ 1,400

Variable costs at market time:

3 days (10 hrs/day @ \$4.50)	<u>\$ 135</u>
------------------------------	---------------

Total harvesting and handling costs for 20,000 bushels shelled corn:

Fixed costs	\$ 3,942
Variable costs at harvest time	\$ 1,400
Variable costs at market time	<u>\$ 135</u>
	\$ 5,477
Plus additional harvesting losses	<u>\$ 960</u>
	\$ 6,437

Harvesting and machine losses of shelling corn at 25-30% moisture are equal to 2.4 bushel per acre more harvesting corn as ear corn.

2613

22

Variable costs: Harvesting and materials handling of 20,000 bushel of ear corn

Variable Costs at harvest time:

Labor (2 men @ 10 hrs/day @ \$4.50/hr, @ 11 days)	\$ 990
66 hours (80 hp tractor on picker @ 4.5 gallons/hr. @ \$1.00)	\$ 297
66 hours (40 hp tractor on unloader @ 2.0 gallons/ hr. @ \$1.00)	\$ 120
76 hours (running time 1 1/2 ton truck @ 4.0 gallons/ hr. @ \$1.00)	<u>\$ 300</u>

TOTAL VARIABLE COSTS \$1707

Variable costs at storage unloading time

6 days/10 hrs. (1 man, 60 hrs @ \$4.50)	\$ 270
Fuel for equipment (50 hrs. @ 2 gallons @ \$1.00)	<u>\$ 100</u>

TOTAL UNLOADING COSTS \$ 370

Total harvesting and materials handling costs for 20,000 bushels ear corn from 160 acres:

Fixed costs (Table II)	\$5456
Variable costs at harvest	\$1707
Variable costs at market time	<u>\$ 370</u>
	\$7533

Costs per bushel = 37.6¢

It is assumed that only 160 acres are harvested by the above equipment. If the acreage were increased to 320 acres of corn, which would be close to the seasonal capacity of the system, the costs would be as follows:

Fixed & Variable Costs to harvest and handle 40,000 bushels ear corn:

Fixed costs of equipment	\$5456
Variable costs at harvest	\$3414
Variable costs at market time	<u>\$ 740</u>
	\$9610

Costs per bushel = 24.0¢

160 acres @ 2.4 bushel/acre @ \$2.50 = \$960 increased costs of the shelled corn method.

Total harvesting and handling costs of 20,000 bushel of shelled corn is \$6437 - 32.2¢ per bushel

STORAGE COSTS ARE NOW CONSIDERED

Storage costs for the two corn handling systems are taken from Publication EES 519, MM358, "Economics of Farm Drying & Storage Systems in Ohio," Cooperative Extension Service, Ohio State University.

The date in this publication reflects 1974 costs and prices. Close evaluation of asset costs and variable costs are comparable to 1979 costs with few exceptions. The costs of propane gas and electricity costs will increase shelled corn costs an average of 3.5¢ per bushel over 1974 costs.

Attached are tables from the publication that reflect relative costs of corn drying and storage systems.

The total annual storage cost of ear corn in 20,000 bushel cribs is 32.98¢ per bushel. The least cost system of drying and storing 20,000 bushel of shelled corn is the automatic batch dryer and steel bins at 52.40¢ per bushel with the batch in bin storage at 52.75¢ per bushel. To correct these shelled corn systems to 1979 prices, we would need to add 3.5¢ per bushel for increased energy costs. The total costs for the above shelled corn systems would be 55.90¢ and 56.25¢ per bushel respectfully.

Please peruse appendix tables 9, 12, and 18 of this publication for a complete detail of fixed and variable costs of drying and storing shelled and ear corn. In the ear corn system and the shelled corn storage systems, there is a charge of 13.13¢ which adjusts for interest costs for holding the corn for six months before selling.

Thus, the comparative costs of harvesting, handling and storing 20,000 bushels of ear corn and shelled corn are as follows:

COSTS PER BUSHEL TO HARVEST, DRY AND STORE 20,000 BUSHEL CORN

	<u>Ear Corn</u>	<u>Shelled Corn</u>
Harvest costs and handling costs	37.60¢	32.20¢
Storage and drying costs	<u>32.98¢</u>	<u>55.90¢</u>
Cost per bushel	70.58¢	88.10¢

HARVEST SHELLED CORN AND SELL AT HARVEST

My analysis of harvesting and handling shelled corn to sell at harvest as compared to the shelled corn storage system is the following:

1. The improvement of basis in this area on corn from harvest time to June the following year is about 40¢ per bushel. The costs and discounts to dry corn from 26% to 15.5% is about 35¢ per bushel. Thus, one will lose about 80¢ per bushel not to store and dry on the farm but will pick up 13¢ per bushel in interest by having the cash at an earlier time.

Thus, the alternative of harvesting 25% moisture shelled corn and delivering for sale in the fall of the year is a poor choice where the basis is unfavorable at harvest time. If basis at harvest time would improve to say within 20¢ of the June basis, then harvest and delivery for sale at harvest time would become a viable alternative.

EAR CORN OR SHELLED CORN FOR SALE

On the above two storage systems, ear corn and shelled corn--one has two separate products for sale. When the uses of the cob is valued in the market place in central Ohio, then dry ear corn would become a distinct advantage over shelled corn. The ear corn has about 20% more energy per bushel than shelled corn as uses of the cob are developed. The farmer who has not committed himself to a shelled corn system will have another option to consider.

This demonstration should encourage farmers to reconsider ear corn harvest and storage. The technology of ear corn harvesting and materials handling has not been considered by equipment dealers and farmers the past two decades. Farmers should take another look.

VI CONCLUSIONS

The system over all has only minor problems. The only real problem now seems to be the availability of a larger corn picker. Two companies are working on this problem and hopefully, one will be available in the not too distant future. This is the only reason why the system is not quite as fast as a combine.

The biggest contribution that this grant has made is that there is now an automated system where by corn can be harvested and the cob saved without secondary equipment. It is an accepted fact that the cob holds a lot of potential, if it were available for fuel.

Purdue University is researching the feasibility of salvaging the cob behind the combine. However, since it comes out of the field at 60-70% moisture, I do not feel that this is practical as cobs will rot at this moisture level.

If the cob were available for fuel, the following is a partial list of the ways it could be used to save energy.

1. Dry corn
2. Heat source for commercial and domestic heating
3. Gas production for burners through gasification
4. Gasification for engines
5. Fuel source for the generation of electricity
6. Alcohol

Considering the national corn yield average of 100 bushels per acre, the cob would have a heat equivalent of 75 gallons of oil per acre and since it is a renewable fuel, we must look at it very hard and long.