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ABSTRACT

A project that trained four Egyptian graduates of agricultural engineering and mechanization in the field of local manufacturing processes in Iowa is described. With support from the U.S. Agency for International Development, training was conducted by Iowa State University and ALMACO (a small manufacturer of agricultural machines). Training covered procurement of raw materials; planning, scheduling, selecting appropriate materials and processes; cost and value analysis; shop skills; and supervision and training of others. A focus was adopting the technology to a specific agricultural machine--the PMC 10 (Plot Master Combine)--to fit Egyptian conditions. After a week of orientation, training was provided by both the university and the company from May 27 to August 1, 1986. A list is provided of the topics and schedule of university lectures and labs, which had to be interpreted to the Egyptian students. Also considered are the industrial training activities: observations, hand-on experience in plant processes, instruction about the operation of a plot combine, and design and manufacture of a machine attachment. Field trips were also made to 12 manufacturing plants. (SW)

INTERNATIONAL PROJECT
Education, Industry and Government

by

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International Project: Education, Industry and Government

Sounds of "Maa Salaama" echoed through the halls of Davidson this summer on the Iowa State University campus when a group of four Egyptians spent three months here. They were here as the result of Iowa State University's proposal to train Agricultural Engineering and Mechanization graduates, in local manufacturing processes (cottage industries). The proposal accepted by AMIDEAST/Partners for International Education and Training on May 9, 1986 was a partnership including education, industry and government. The partners consisted of Iowa State University (ISU), ALMACO - a small manufacturer of agricultural machines at Nevada, IA, and the United States Agency for International Development (USAID), respectively.

The purpose of the USAID - funded project was to train the Egyptian participants in the field of local manufacturing processes including procurement of raw materials, planning, scheduling, selecting appropriate materials and processes, cost and value analysis, shop skills, supervision and training of others. Particular emphasis was given to the adoption of the technology to a specific agricultural machine, the PMC 10 combine, to fit Egyptian conditions.

The participants included Mr. Aly Ibrahim Mohammed Moussa, Agricultural Engineer with the Agricultural Mechanization Research Institute; Mr. Magdy Ahmed Bayoumi Ibrahim, Agricultural Engineer for a workshop service center; Mr. Magdy Tewfik Ibrahim El Tantawy, Agricultural Engineer for a workshop service center, and Mr. Ahmed Osama Mohammed Ibrahim El Ashab, Agricultural Engineer with the Agricultural Mechanization Research Institute.

The university's involvement with this project began with a telegram on February 4, 1986 from the American Embassy in Cairo to the Secretary of State in Washington D.C. with an outline of program needs and nominations of four Egyptian participants. On February 12, Iowa State University was extended an invitation to submit a proposal to participate in a local manufacturing process program. This contact was made by Richard Davis, Partners for International Educatic and Training in Washington D.C. A letter of intent outlining ISU's capacity to fulfill the program requirements was sent on April 1, 1986.

Prior to the arrival of the four Egyptians, several planning meetings were held both on-campus at the Iowa State University Agricultural Engineering Department and at ALMACO in Nevada, Iowa. All aspects of the proposed training plan were reviewed by the ALMACO management team, the faculty team from the Agricultural Engineering Department and the staff from the Office of International Services headed by Dr. Martin Limbird.

The program began with arrival of the four Egyptians on Sunday, May 18, 1986. The participants were set up with a subleased two bedroom furnished apartment within two blocks of the campus. Monday was the start of "orientation week" conducted by Ms. Julie Rose, Coordinator of Special Programs, with the Office of International Services at Iowa State University.

During orientation week, the participants were led on a walking tour of the campus and enrolled in the student health clinic service. Temporary social security numbers were obtained for the participants through the Admissions & Records Office so they might easily access the services of the student health clinic and the university library.

Orientation week included sessions on the history of Ames and the settlement of the Midwest; an introduction to ISU's programs in agriculture and to the agricultural extension service; tours of the ISU Ag 450 farm (a 400 acre intergrational farm which is operated by students in the Ag 450 class); a 650-acre Iowa family farm; the Agronomy and Agricultural Engineering Research Center; the ISU Plant Introduction Station; the ISU Meat Lab; the ISU Horticultural Research Station; and the Living History Farms near Des Moines, Iowa. The participants were also given an overview of the Iowa agricultural industrial climate.

The participants were assisted in obtaining necessary personal safety items including lab coats, industrial quality eye protection, steel-toed shoes and welding gloves which they would use in the laboratory and factory training facets of the program..

Education/Industry Phase

Formal training at the Agricultural Engineering Department and at ALMACO began on Tuesday, May 27, 1986 (Monday, May 26, was Memorial Day Holiday). The training schedule involved a half-day in the Agricultural Engineering Department with lectures and labs. The remaining half-day session at ALMACO dealt with plant operation and hands-on work in the machine shop.

The first half of the training schedule was greatly affected by the occurance of RAMADAN, a period of complete fasting during the daylight hours. Their nights were spent in prayer and feasting, going to bed around 4:00a.m. These hours didn't necessarily complement the working schedules of their American hosts. We modified the schedule starting times by shifting to one hour later and allowed for a midday and afternoon prayer time. Throughout the training program the staff was flexible and adapted the training schedule to meet the participants needs by reducing the work load during RAMADAN and switching from group to individual training sessions as the situation warranted.

Education

The education, or technical update phase of the project was supervised by Victor A. Bekkum. Responsibility for teaching the various subject matter areas included: Dr. Wesley Buchele, Professor; Dr. Stephen Marley, Professor; Dr. Victor Bekkum, Associate Professor and Mr. Herschel Weeks, Instructor; all with the ISU Agricultural Engineering Department. Since the Egyptian visitors did not speak fluent English and the ISU faculty did not speak Arabic, all instruction was interpreted by an Egyptian Iowa State University graduate student in Agricultural Engineering, Mr. Ahmed Abo-Abda. The training sessions were conducted in the instructional laboratories of the Agricultural Engineering Department at Iowa State University.

Their instructional schedule is listed below:

DATE	TOPIC
May 26 (Monday)	Holiday
27 (Tuesday)	Introduction to arc welding, safety
28 (Wednesday)	Arc welding - beads, 6011 & 6013 electrodes
29 (Thursday)	Arc welding - butts & fillets, 6011 & 6013 electrodes
June 2 (Monday)	Arc welding - 7018 & 7024 electrodes
3 (Tuesday)	Oxy-acetylene - Introduction, safety & fusion
4 (Wednesday)	Oxy-acetylene - butts & fillets, joints
5 (Thursday)	Oxy-acetylene - brazing; aluminum, steel & cast iron
9 (Monday)	Metal forming - hand & power tools
10 (Tuesday)	Tapping, dieing; hand & power tool operation
11 (Wednesday)	Hardening processes - heat & carburizing
13 (Friday)	Wood materials - processes, safety, operation of hand & power tools
16 (Monday)	Machinery capacity & efficiency
17 (Tuesday)	Hydraulic components

	21 (Monday)	Fruit & vegetable mechanization
	22 (Tuesday)	Fruit & vegetable mechanization
	23 (Wednesday)	Equipment for ridge-till farming
	24 (Thursday)	Warranty & liability considerations in design
	29 (Tuesday)	Whole day at ALMACO
	30 (Wednesday)	Lathe Operation
Aug.	1 (Friday)	Aluminum welding
	5 (Tuesday)	All day - ALMACO, equipment manufacturing
	7 (Thursday)	Overview of program and wrap-up
	8 (Friday)	Preparations for return home

The following briefly summarizes the topics presented:

Arc welding	Wood processes
Oxy-acetylene welding	Machinery management
Hot & Cold metal	Hydraulics
Power Transmission	Small engines
Appropriate technology	Machinery design
Machine tool operation	Fruit & Vegetable mechanization
Sheet metal	Liability

Industry

The industry phase of the program was conducted under the direction of the president and owner of ALMACO, Mr. Gary Clem. A brochure provided with this report describes the ALMACO operation. Other key members of the industry team included Arlan Sandvik, Executive Vice President/General Manager; Peter Moore, Vice President of Engineering and Mohammad Abu-Rabi, Program Director. Mr. Abu-Rabi is a graduate of Iowa State University in Industrial Engineering and speaks fluent Arabic. Mr. Abu-Rabi also acted as interpreter for the training group while at ALMACO. The primary activities included:

Orientation/Plant tour	Instruction on PMC 10 (plot master combine)
Departmental Observation	

Straw Chopper Design Project

Work Station Design Project

The schedule below provides the details of the industry training program:

Orientation - Plant Tour

- Establishing communication
- Guests' work area location
- ALMACO's plant & manufacturing video
- Mr. Clem's slides of Egyptian Agriculture - technology transfer
- ALMACO's Safety Handbook
- Agricultural equipment production
  - Theory of machine use
  - Materials and processes
  - How things work and where
- Training program introduction
  - Tentative training schedule

Meeting with ALMACO's key members

In the first phase of the training program, the trainees met and learned about the responsibilities and duties of the management team at ALMACO. Each individuals function was explained.

Listed below are the names and positions of ALMACO's management team:

Gary W. Clem, President/Owner
Arlan W. Sandvik, Executive Vice President/General Manager
Peter B. Moore, Vice President of Engineering
J. Paul Clark, Vice President of Finance
John B. Sturtevant, Vice President of Manufacturing
Randal A. Merchant, Sales Manager
Dennis West, Purchasing Agent

Departmental Observation

The second phase involved close observation and increasingly more hands on experience with each of the interdependent departments. It was important to understand the function and operations of the processes in each department.

Listed below are the departments and the assigned time period each of the Egyptians rotated through:

Parts Fabrication	2 hours
Machine Shop	2 hours
Final Assembly	2 hours
Small Threshers	1 hour
Header	1 hour
Planters	2 hours
Paint Room	1 hour
Repair	1 hour
Purchasing	2 hours
Engineering	2 hours
Drafting	2 hours
Maintenance	1 hour

Topics of instruction on ALMACO's PMC 10 (combine)

The third phase of ALMACO's training program involved classes on several ag-related topics. Since PMC 10's were currently located in Egypt, they studied this machine in detail. The goal here was to learn, run, work on and analyze the Plot Master Combine.

Listed below are the topics that were covered during this stage of the program:

- Hydraulic circuits
- Electronics
- Materials and processes
- Fuel Systems
- Engineering and system design
- Safety considerations
- Machine mechanics
- Computer programming
- Testing - Simulation - Data Analysis
- Controls
- Wiring
- Conveying
- Seed cleaning
- System components
- Maintenance
- Engine (power transfer)

Straw Chopper Design Project:

After careful consideration, a design project was chosen that allowed each of the program participants to use his new knowledge in a practical application. They designed a functional straw chopper, conveying system and straw bagging system. The design criteria was provided prior to starting the project.

To achieve a successful design, these steps were followed:

Step I..... Determine the design requirements

Example:

- Available HP vs desired HP
- Stability and system efficiency
- Cost evaluation
- Safety requirements

Step II..... Submit several initial propcsals

Step III..... Submit preliminary design plans

Step IV..... Choose materials and parts needed, also contact suppliers for availability

Step V..... Hand in materials and parts list and final design drawings

Step VI..... Build everything you can build, and watch the parts you cannot make being built

Step VII..... Do in-process quality control

Step VIII.... Evaluate and test the final product

Step IX..... Analyze testing and product performance

Work Station Design Project:

Cost effectiveness being a goal of manufacturing the production manager must keep in mind much of the cost and production methods of any piece of machinery depends on the efficiency of the production work area.

The participants were involved in studying and analyzing the existing production work area and recommending appropriate improvements.

The Egyptian participants were responsible to produce the following reports for the production of ALMACO's PMC:

1. Floor arrangement critique
2. Material flow analysis
3. Safety analysis
4. Manpower distribution analysis

Field Trips

Field trips were scheduled throughout the training period to expose the participants to the variety of agricultural machinery manufacturers in Iowa. For example, Ryan Manufacturing in Mitchellville was doing contract work in welding/sheet metal fabrications, etc. and developing small farm tools (e.g. a soil sampling tool). Their plant, though small, had state-of-the-art

cutting equipment (Laser, computer-directed) and they readily demonstrated the equipment for the participants. A medium-sized manufacturer, Herschel Manufacturing in Indianola, was making cutter blades for harvesting machines. Larger-sized companies such as Vermeer in Pella or John Deere in Ankeny and Waterloo were automated, used robot welders and robot painters, and had millions of dollars in equipment and plant capacity.

Field trips were planned for either a half-day on Fridays or a whole day another day of the week, depending upon the circumstances throughout the training period. The following is a list of Iowa plants visited by the Egyptian participants during the training program:

ALMACO Nevada	plot combines, stationary threshers, plot planters, plot grain drills, misc. small tools & instruments, self-propelled sprayers, banding spray booms, agricultural research equipment (planters, threshers, seed cleaners, self-propelled combines).
HERSCHEL MFG. Indianola	agricultural machinery parts, mower parts (knives, sections, guards & wear plates), sweeps, disk blades.
JOHN DEERE Waterloo	farm tractors.
KINZE MFG. Williamsburg	auger wagons, rear folding planter bars, pull type and mounted 4-8 row planter bars, seed planting units, hydraulic folding ammonia toolbars.
RYAN WELDING & MFG. Mitchellville	multi-purpose planters, soil samplers, contract steel fabrication.
SELF-HELP Waverly	small farm equipment (tractors, planters, tillers, etc.).
SIMONSEN MFG. Quimby	fertilizer spreaders, bulk feed bodies, fertilizer tenders, field cruiser flotation devices.
SUKUP MFG. Sheffield	grain stirring machines, grain spreaders, grain cleaners, grain auger wagons, powersweep unloaders.

UNITED FARM TOOLS Delwein	field sprayers, stalk shredders, potato de-viners, sugar beet defoliators, edible bean cutters, edible bean windrowers, bean cutter-pullers, forage high dump wagons, grain drills.
VERMEER MFG. Pella	irrigation sprinklers, bale carriers, bale unrollers, balers, hay rakes.
WAVERLY TRACTOR CO. Waverly	intermediate size tractors, 16" plows, 2-row cultivators, 60" & 70" rotary mowers.
WRIGHT WELDING Des Moines	welding equipment supplier - demonstrations by factory representatives of oxy-acetylene, mig tig, plasma arc equipment use, functions and cost considerations.

Accompanying the participants on the field trips were Mr. Abo-Abda, interpretor and a member of the ISU faculty Agricultural Engineering Department or the Office of International Services. The map in Appendix A describes the location of the plants toured.

FINAL WEEK

The final week of the program involved summarizing and evaluating the training received at Iowa State University and ALMACO. A reception was hosted by the staff from the Office of International Services. Attending the reception were members of the ISU Egyptian Student Association, project staff members, ISU Administration and the Egyptian participants. Dr. George C. Christensen, Vice President for Academic Affairs spoke on behalf of the University and wished the participants well in future endeavors.

Wednesday, August 6, the participants visited their last manufacturing plant, Kinze Manufacturing in Williamsburg, and then went on to Cedar Rapids (site of the oldest mosque in the U.S.) and Dubuque. In Dubuque, the participants took a riverboat ride on the Mississippi River (a fervently expressed desire from the very start of the training period) and attended the Dubuque County Fair.

Thursday, August 7, the participants were provided with an overview of the training they had received. Certificates of completion were awarded to all participants by ISU and ALMACO. ALMACO treated the participants and faculty to lunch at a popular local restaurant.

Friday, August 8, was left open for the participants to make necessary preparations for their return to Egypt. On Saturday, August 9, Herschel Weeks escorted the participants to the Des Moines Airport to catch their plane.

Summary

The Egyptian International Project sponsored by the United States Agency for International Development (USAID), administered by the Office of International Services at Iowa State University and jointly implemented by the ISU Agricultural Engineering Department and ALMACO, a manufacturer of agricultural machines officially began with the acceptance of a proposal on May 9, 1986. The stated objective of the project was to train four Egyptian participants in the field of local manufacturing processes.

The training program began with a week of orientation which exposed the participants to various aspects of American culture, Iowa agriculture and manufacturing, and the university education system.

During the subsequent weeks from May 27 to August 1, 1986, the half-days four days a week were spent in classes at Iowa State University's Agricultural Engineering Department. Instruction included skill development in the areas of welding, metals, woods and small engines. The participants received technical updating in the areas of machinery design, crop mechanization, procurement of materials, planning and scheduling in manufacturing as well as cost and value analysis.

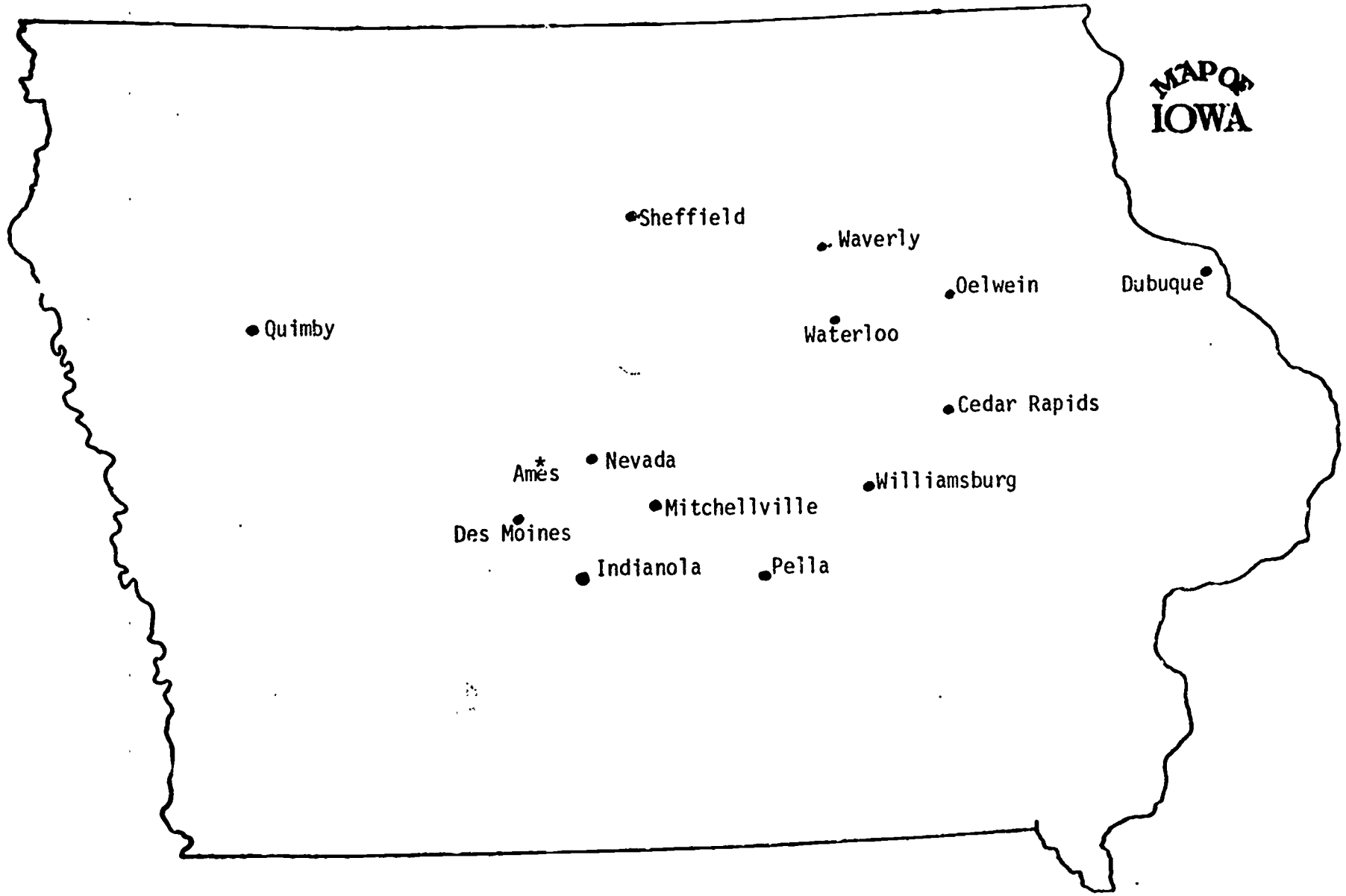
The participants were involved half days in observing and working at a local machinery manufacturing plant, ALMACO. The primary activities included an orientation and hands-on experience in various plant processes, instruction on the operation of a plot combine, design and manufacture of a machine component (a straw chopper attachment).

Field trips to twelve manufacturing plants allowed the participants to compare and contrast the methods and procedures of manufacture of agricultural equipment. The plants ranged from a small plant which is a manufacturing and training center for a tractor designed for use and manufacture in a developing country (Self-Help, Waverly, Iowa) to a multi-million dollar, state-of-the-art manufacturer of large farm equipment (John Deere - Waterloo, Iowa).

These tours provided a perspective for the ultimate adaption to local Egyptian conditions of appropriate facilities, techniques and processes for the manufacture of farm implements in Egypt upon their return.

The linkage between; education, at the university level; industry, at the manufacturing level and ; Government, at the sponsor level was essential to the success of this program. The university was able to provide up-to-date skills, by qualified instructors, in a training facility. These skills were then put to immediate use in the manufacturing stage of this program reinforcing the application and retention of those skills. The government was able to support the entire program through identification of qualified participants, logistical arrangements and financial support. This linkage is a tremendous tool to help insure success of similar programs.

APPENDIX A: MAP


MAP OF
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Ames
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