RESEARCH ASPECTS

by
A. I. Magee
Member C.A.Eng.S.
Canada Department of Agriculture, Ottawa, Ont.

Major emphasis in Agricultural Engineering over the past 25 years has been in the applied phase of research. One of the reasons for this emphasis has been the expansion in the mechanized field and farmstead operations. Animal power has been replaced by machines.

Until recently, much of the work done by Agricultural Engineers could have been done by a good mechanic. However, this is no longer the case, and the Agricultural Engineering problems are more basic requiring more engineering knowledge and fundamental research.

In order to obtain various opinions, requests were sent to several Agricultural Engineers and other research workers. The following is a condensed summary of a few of the present Research Projects in Agricultural Engineering:—

Irrigation and Drainage—

Tile drains—sizes, quality, cover materials.

Drainage systems—Bogland, surface and tile.

Irrigation—efficiency, plot irrigation, pond liners, consumptive use of water.

Tillage and Seeding—

Tillage—trash conservation, deep tillage, breaking pasture sod, surface tillage.

Seeding—soil packing, machine trials, fertilizer placement.

Harvesting—

Machinery—plot forage harvester, corn combine, potato harvester.

Instrumentation and Laboratory

Apparatus—

Equipment to determine soil properties.

Instruments to evaluate plant growth.

Equipment to process cereal seeds.

Instruments to measure light.

Tillage tests and silage apparatus.

Structures—

Greenhouse investigations, design, cooling, refrigeration.

Poultry house ventilation.

Storage of vegetables.

Loose housing of cattle.

Storage building—cellular type.

Comments

These projects indicate that field machinery is not the main problem at present. Currently most projects are related to problems involving buildings, instrumentation, water use or tillage. Prairie provinces are interested in tillage methods and efficient use of water. Eastern Canada is concerned with drainage and harvesting machinery, while British Columbia is studying vegetable storage problems and buildings.

Future Problems

Future problems listed by Agricultural Engineers were many and varied. A few of the problems are mentioned to indicate the type of project that may be considered in the future.

Irrigation and Drainage—

Apply engineering principles to land conservation.

Water shed yield and ground water measurements.

Crack sealing materials for concrete canals.

Automatic control and application of irrigation water.

Land forming.

Power and Machinery—

Improve efficiency of fuel and investigate solar energy and nuclear power.

High speed tillage.

Machine carriers and improved equipment, mounting attachments.

Vegetable oils and lubricants.

Wheel motors in tractors.

Swather studies.

Once-over seedbed preparation.

Packing of seedbeds.

Determination of soil tilth.

Product Processing—

Product drying—forage, hops.

Air volume required for vegetable storage.

Ultrasonic velocity measurement on foods.

Permeability of packaging film and gasses.

Moisture losses from vegetable surfaces.

Food freezing, blast and absorption methods.

Structures—

Durability of glues at low temperature and high R.H.

Grain pressures against sloping walls.

Low cost shelter areas.

Plywood dome structures.

Stressed skin construction.

Materials Handling—

Mechanized feeding in stall barn.

Characteristics of fluids for separation of materials.

Instrumentation and Laboratory

Apparatus—

Infra-red blanching oven.

Animal behavious studies.

Internal pressure measurement in animals.

Ultrasonic fat depth measurement.

Color measurement of tomatoes and fruit.

Future trends in research projects indicate that more fundamental types of projects will be conducted. New fields of endeavour such as Product Processing and Materials Handling emphasize that the requirements of research are changing and that the Agricultural Engineers will be required to adjust the type of research project to provide answers for future problems.

The Economist and Agricultural Engineering Research

An opinion was invited from several economists across Canada regarding Agricultural Engineering Research and the part it plays in the Agricultural Program.

The following are a few of the opinions:—

A—New approach to Research (4 stages).

(i) Fundamental Research or brain storming.

(ii) Testing the physical possibilities.

(iii) Checking operation on existing enterprise.

(iv) Pilot plant to check bugs.

B—Central laboratory for fundamental engineering research with colla-

(Continued on back cover)

(Continued from page 26)

relative to these activities to warrant their inclusion in this paper.

Without adequate extension the work of education, research and to a lesser degree, industry, loses much of its value insofar as benefits to the Agriculture of Canada is concerned. Those charged with the responsibility of directing education have a heavy responsibility to assure that top calibre men are available for the field of Agricultural Engineering Extension as well as for Research and Industry.

(Continued from page 24)

Summary

In review, we find that the following programs are offered across Canada:

(1) Farm Mechanics major in College of Agriculture—offered by Macdonald College, Ontario Agricultural College, Universities of Manitoba, Saskatchewan and British Columbia.

(2) Agricultural Engineering degree in College of Engineering—offered by Universities of Saskatchewan and British Columbia.

(3) Other Engineering degrees, where the degree is other than Agricultural Engineering but the background is certainly Agriculture—Civil and Mechanical Engineering degree offered jointly by Ontario Agricultural College and University of Toronto.

(4) Industrial Agricultural major in Agriculture—offered by University of Alberta. Here the field of Industrial Engineering has been transposed to Agriculture and the course of studies has been called, tetn talvieayTH ies has been called, tentatively at least, Industrial Agriculture.

Conclusion

A reference to the Gordon Royal Commission will point out that Agricultural output is expected to expand with an accompanying decrease in farm population.

This indicates the increased importance of well-engineered farm enterprises for the future. As capital investment in farms increases, so does the responsibility of the agricultural engineer who will be increasingly called upon to advise on decisions involving outlay and layout.

As an example, a mistake in designing a ventilation system for a poultry house to hold 50 birds is less easy to detect and produces less severe repercussions than a similar mistake in a house to hold 5,000 birds.

Also, with the continuing cost price squeeze, production methods and techniques assume much greater significance.

Based upon these consideration, educational programs for the future must provide:

(1) Sound fundamentals in engineering theory and

(2) Increased appreciation of the economic factors relating to Agricultural production.

(Continued from page 25)

laboration between Sciences.

C—Determine technical inter-relationship of a farm enterprise as a production process.

D—Consider welfare of farmer as an individual in the community.

E—Other problems—Low cost buildings, feed handling, labor efficiency, farm safety and optimum investment in machines.

In an economic problem many factors are related and evaluated to obtain a practical solution. Several economists suggested that it would be desirable for Agricultural Engineers to consider the broad implications of a problem when determining the solution, in an effort to evaluate the effect on the farm enterprise.

Conclusions

While there are individual problems that can be handled by Agricultural Engineers alone, there are many more problems that should be attacked with the co-operation of other research fields. Co-operative projects will no doubt increase as research workers realize that the complete solution of a problem involves many related operations.

As a result of more co-operative research projects, the Agricultural Engineers would be able to concentrate on the basic engineering phase of research. Engineers would be expected to accept greater responsibility in pure engineering research as an integral part of a co-operative project.

CANADIAN AGRICULTURAL ENGINEERING SOCIETY