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**AGRICULTURAL PROCESS ENGINEERING  
PAST, PRESENT AND FUTURE**

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**ABSTRACT**

The paper discusses a historical review (past and present) of the American Society of Agricultural Engineers and Agricultural Process Engineering programs, and curricula development and research areas for the future.

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## HISTORICAL REVIEW OF ASAE AND AGRICULTURAL ENGINEERING PROGRAMS

- 1906-1907 Professor J. Brownlee Davidson, Head of the Department of Agricultural Engineering at Iowa State College, began correspondence with others interested in teaching "farm mechanics." The results of his efforts would be the birth of the ASAE.
- 1907 The charter meeting of ASAE was held at the University of Wisconsin, Madison in December.
- 1917 Dr. Earl A. White, a charter member of ASAE, received the first Ph.D. degree ever granted in Agricultural Engineering at Cornell University.
- 1920 "Agricultural Engineering" journal was published.
- Early 1920's The following divisions within the ASAE were formed:
1. Farm Power and Machinery, later to Power and Machinery
  2. Land Reclamation, later to Soil and Water
  3. Farm Structure, later to Structures and Environment
  4. Rural Electric, later to Electric Power and Processing
- 1920's Many Agricultural Engineering departments were established in the U.S.A. California, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, South Dakota, Tennessee, Texas, Utah, Virginia, Washington, and Wisconsin.
- Note: Before 1920, a few schools had "Farm Machinery" division within Agronomy Department, later became a separate department called "Farm Engineering."
- 1936 The National Council of Student Branches was established.
- 1950 Fifteen ECPD accredited undergraduate departments of Agricultural Engineering existed in the U.S.A. Note: Up from only three in 1943 (Iowa, Kansas and Wisconsin).
- 1954 ASAE published the first "Agricultural Engineers Yearbook."
- 1956 ASAE established Electric Power and Processing Division.
- 1957 President Dwight D. Eisenhower was made a honorary ASAE.
- 1958 ASAE revived the publication of "Transactions of the ASAE."
- 1960 Dr. Wilson B. Bell, Associate Director of the Virginia Agricultural Experiment Station gave a talk at the ASAE Southeast Region in February, 1960, which might have awakened the engineers to neglected opportunities, namely biological science areas. He stated that "Your sphere of activity is more closely intertwined with the life sciences than in that of the other branches of engineering."
- Dr. G. W. Giles, Head of the Agricultural Engineering Department, North Carolina State College, gave a talk on "Goals in Agricultural Engineering Research" at the Memphis Winter Meeting of the ASAE. He stated that "Some may say that the science of biological processes should be left to the pure scientist and that agricultural engineering should confine its

activities strictly to engineering practices...Our profession needs some fundamental law on which to base our judgements and guide our direction and pattern of growth for engineering the biological systems. The core of our profession should be built on engineering laws governing the complex processes of plants and animals. This is the thing that distinguishes agricultural engineering from other engineering professions."

- 1961 ASAE held its first session of Food Engineering (Ames, Iowa).
- 1962 The topic on "Biological Engineering" was introduced by E. H. Kidder of Michigan State University at a December 1962 Board of Directors Meeting.
- A. W. Farrall, President, ASAE, appointed R. E. Stewart (Chair), C. F. Kelly and F. J. Hassler for a special committee on Relationship of Biological Engineering to Agricultural Engineering
- 1963 Dr. Carl W. Hall reported at the Board of Directors Meeting that how the Agricultural Engineering Department faculty at Michigan State University emphasized biological engineering in talks to high school students. He commented that "this was an excellent means of attracting urban boys and girls to the curriculum offered in the Department of Agricultural Engineering."
- President A. W. Farrall's annual address at the meeting was titled "The Sixth Decade." The Sixth Decade was to him the biological age, a time when agricultural engineering urgently needed redirection. He stated that "Agricultural Engineering is unique in that it involves specifically biological and environmental factors, since it deals with engineering applied to biological matter - food, feed, natural fiber, animals and humans. Note that the unique feature, the one we have which is different from any other, is the emphasis on the biological factor."
- The report of Dr. Stewart's committee was prepared. Unfortunately, the report was not well received by ASAE members.
- 1964 Food Engineering Committee was established with H. L. Mitten and C. W. Hall as co-chairmen, and placed in the EPP Division.
- 1965 F. J. Hassler, Head of the Agricultural Engineering Department at North Carolina State University, announced its name has been changed to Biological and Agricultural Engineering Department. At later dates similar changes were made at Mississippi State University and Rutgers University.
- 1967 Food Engineering Division was established.
- 1968 ASAE implemented a major reorganizational plan.
- 1975 "Mechanization" grades of membership were adopted.
- 1982 ASAE celebrated its 75th anniversary by returning to the founding site in Madison. The theme for the anniversary year was "Food, Fiber and the Future."
- 1988 ASAE adopted a new administrative/ geographic structure. Under the Technical Council, the following six technical institutes were formed: Electrical and Electronic Systems; Food and Process Engineering; Power and Machinery; Soil and Water; Structure and Environment; and Emerging Technologies.

1990 Academic Program Administrators Committee of the ASAE prepared the report on "Undergraduate Biological Engineering Curriculum - Vision for the Future."

1993 ASAE president Douglas L. Bosworth wrote an article on Nostalgia vs. Reality in Within ASAE. In his article, Bosworth wrote "At one time, the ASAE focus was on production agriculture. We applied technology on the farm but were not involved after the products left the farm gate - and we did a great job!...But agriculture does not stop at the farm gate. We are involved in the production and processing of food, feed and fiber. Translation: the production and processing of biological materials. That is Reality!...Engineering and technology have been updated to meet the new reality. ASAE, too must change its focus and scope."

Incoming President of the ASAE, Dr. Norman R. Scott has developed goals in five areas to help the Society continue to adapt to a changing world and profession. Scott's initiative: Integrating Biological Engineering into ASAE; Engineers for Education; Engineering for Sustainable Development; Engineering Applications of Science and Technology; and Globalization of ASAE.

## AGRICULTURAL ENGINEERING PROGRAMS

### I. PAST

Power and Machinery  
Soil and Water Engineering  
Agricultural Process Engineering  
Structure and Environment

### II. PRESENT

Power and Machinery  
Soil and Water Engineering  
    - Natural Resources Engineering  
Agricultural Process Engineering  
    - Food Process Engineering  
Structure and Environment  
    - Bioenvironmental Engineering

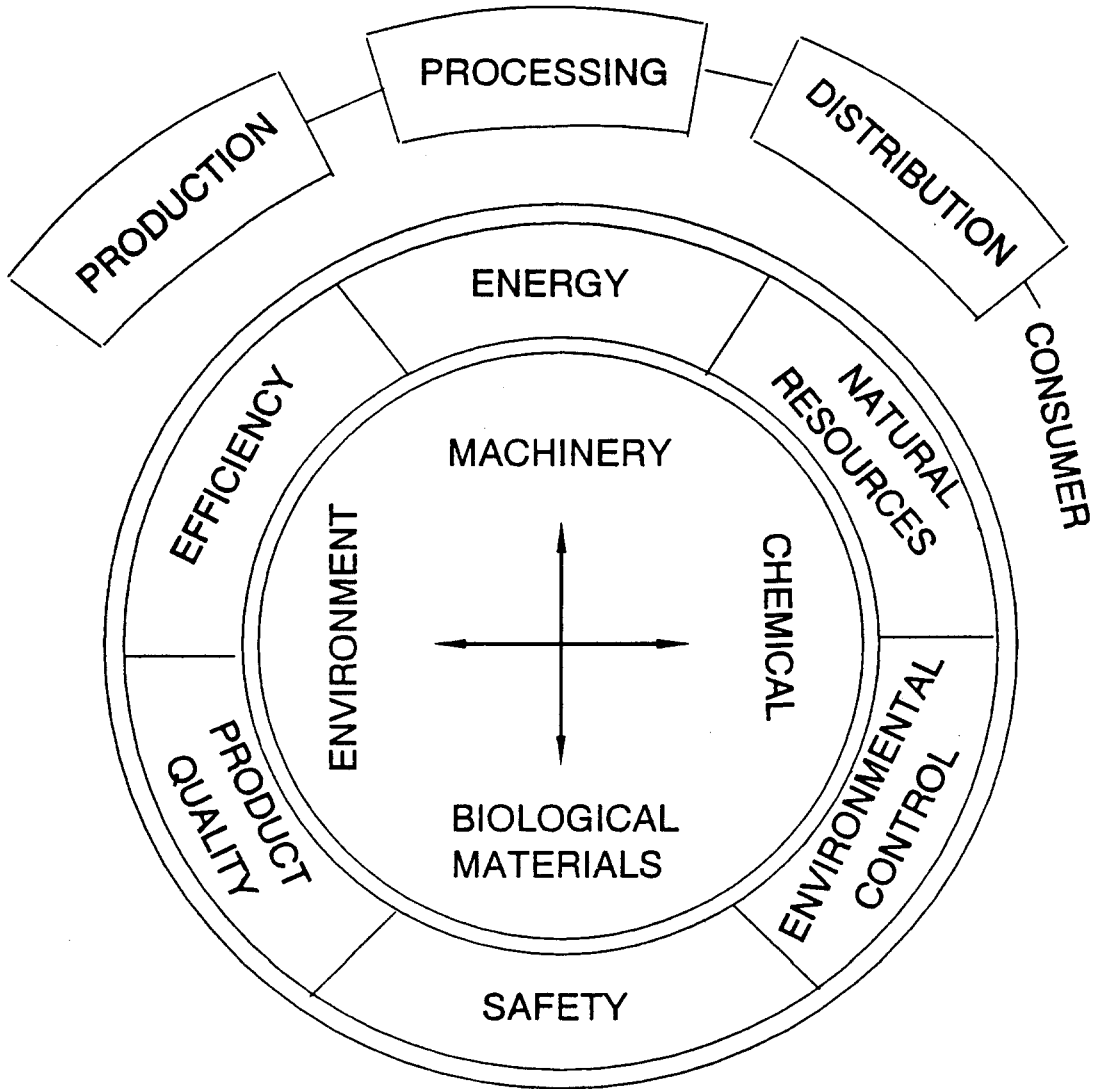
### III. FUTURE

Biological or Biosystems Engineering  
  
    Machine Systems  
    Biomaterials  
    Bioprocesses  
    Bioenvironmental  
    Natural Resources

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**ENGINEERS for the FOOD, AGRICULTURAL  
and BIO-TECHNOLOGY INDUSTRY**  
**ENGINEERS serving the largest  
and most stable INDUSTRY**

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## DEPARTMENTAL NAMES USED IN CANADA AND U.S.A.\*

Agricultural Engineering	31
Biological and Agricultural Engineering	4
Agricultural and Biological Engineering	3
Bioresource Engineering	3
Agricultural and Biosystems Engineering	2
Agricultural and Bioresource Engineering	1
Agricultural and Chemical Engineering	1
Biological and Irrigation Engineering	1
Biological Systems Engineering	1
Civil and Agricultural Engineering	1
Civil, Agricultural and Geological Engineering	1
Forest Engineering	1
Natural Resources Management and Engineering	1
Total	52

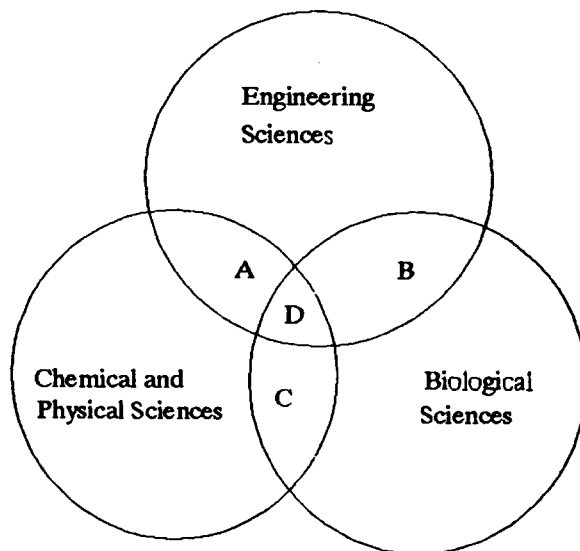
## OPTION PROGRAMS WITHIN DEPARTMENTS

General Agricultural Engineering  
Food Engineering  
Biochemical and Food Engineering  
Bioenvironmental Engineering  
Environmental Engineering  
Forest Engineering

## SUGGESTIONS FOR CURRICULUM DEVELOPMENT

- I. Chemical and Physical Sciences
- II. Biological Sciences
- III. Engineering Sciences
- IV. Applied Engineering - Biological and Agricultural
- V. Social Sciences and Humanities
- VI. Communications

\*ABET approved degree. Source: 1992 ASAE Member Roster.



Union A: Applied engineering courses based on chemical and physical sciences

Union B: Applied engineering courses based on biological sciences

Union C: Applied courses based on both biological and physical sciences

Intersect D: Applied engineering courses based on biological, physical and engineering sciences

### SUGGESTED COURSES FOR CURRICULUM

#### I. Chemical and Physical Sciences

##### Mathematics

Calculus  
 Differential Equations  
 Numerical Methods  
 Computer Science

##### Physics

Engineering Physics

##### Chemistry

Inorganic Chemistry  
 Organic Chemistry  
 Physical Chemistry

#### II. Biological Sciences

Biochemistry  
 General Biology  
 Microbiology  
 Cell Biology  
 Molecular Biology  
 Plant Physiology  
 Animal Physiology

- III. Engineering Sciences
  - Statics and Dynamics
  - Mechanics of Materials
  - Fluid Mechanics
  - Thermodynamics
  - Circuits/Electronics
  - Engineering Economics
  
- IV. Applied Engineering Courses (A)
  - Functional Analysis of Machine Components
  - Manufacturing Engineering
  - Instrumentation/Controls
  - Transport Phenomena
  
- V. Applied Engineering Courses (B)
  - Properties of Biological Materials
  - Biochemical Engineering
  - Biosystems Engineering
  - Bioseparation
  
- VI. Applied Courses (C)
  - Biomass Conversion Processes
  - Applied Biotechnology
  - Product Quality Control
  - Health and Safety
  
- VII. Applied Engineering Courses (D)
  - Design of Machines and Biosystems
  - Food Process Engineering
  - Natural Resources Engineering
  - Environmental Engineering
  
- VIII. Social Sciences and Humanities
  
- IX. Communications
  
- X. Others

**STRATEGIC AREAS OF SCIENCE AND ENGINEERING  
FOR FUTURE DEVELOPMENT**

Advanced Materials and Processing  
Manufacturing  
Biotechnology  
Environment  
High Performance Computing and Communications



## Other Areas

Agricultural Product Development and Utilization  
Design and Manufacturing of Process and Packaging  
equipment  
Instrument and Control Systems  
Process Systems for Food and Non-food Products  
Environment Control for Point and Non-point Sources

## Biotechnology

### Biomass Conversion Processes

Bio-gas and bio-fuels  
Bio-alcohol

### Bioconversion of Waste Into Value-Added Products

### Biological Deviation of Food Additives

### Bioenvironment

Bio-pesticides  
Bio-pest control  
Bio-remediation  
Waste treatment

### Biomaterials

Biopolymers  
Biosorbants  
Biosensors  
Bioadhesive

## CONCLUSIONS

Changes based on visions and future needs

Education - long term needs rather than short term needs

Demographic, social, economic and political changes

Human resources development

Advancement of science and technology

Economic development

Improvement of quality of life

Agricultural, biological and food systems

Cooperation between academic, government and industry

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