RESOURCE

Engineering & Technology for a Sustainable World

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Engineering for a Sustainable Tomorrow

We can take considerable pride that as agricultural and biological engineers we have improved the quality of life that people enjoy around the world. It was 100 years ago on Dec. 27, 1907, that 18 men met at the University of Wisconsin in Madison to organize the American Society of Agricultural Engineers. Although there were other engineering societies at the time, none of them focused on agriculture and biological materials; they all dealt with the inorganic. § At that time, it took 40 percent of the nation's labor force to provide food for the people. Today it takes only 2 percent. It is no wonder the National Academy of Engineering ranked agricultural mechanization as one of the top 10 engineering achievements of the last century. § The opportunities that resulted from improved farm productivity and a reduction in on-farm manpower (and literal horsepower) unleashed on the nation mind power in measures previously unknown. The result has been advancements in every field of human endeavor from the fine arts to medical science to space travel, at a pace and scale unimaginable a century ago. Such progress obscures the early achievements of agricultural mechanization — the elimination of back- and spirit-breaking farm drudgery and widespread hunger. As Nobel laureate Norman Borlaug would say, "The good old days … they were terrible!" § There is no shortage of 21st century challenges for engineering in agricultural, food, and biological systems as we endeavor to secure the necessities of life: safe and abundant food and water, a healthy environment, fiber and timber for clothing and shelter, and renewable energy sources that also recycle carbon from biomass. Of key importance in these and other impending challenges is sustainability. Any proposed solutions must be able to sustain themselves in a way that conserves our natural resources. That is a concept most of us involved with engineering for organic materials embraced long before we pursued our engineering degrees. § Possessing an understanding of the biological world and a firm grasp of engineering principles, agricultural and biological engineers are uniquely qualified to accomplish these goals. Providing a growing world population with the necessities of life by using sustainable solutions will indeed be our challenge for the 21st century.

2006-2007 ASABE President Charles E. Sukup

Charles E. Sukup

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Ten Agricultural and Biological Engineering Achievements that Changed the World

The 20th century marked the completion of the Industrial Revolution and the emergence of the Information Revolution. In the past 100 years, agricultural and biological engineering has traversed the world's shifting technological landscapes developing and growing as a discipline and profession.

While the Industrial Revolution drew people away from the farms and into the factories during the 18th and 19th centuries, transforming many agricultural-based societies into industrial societies, it was mainly during the first half of the past 100 years that the reverse task of ushering the Industrial Revolution onto the farms became fully realized. With the advent of computers in the mid-1940s, later spawning the Information Revolution, industrial societies found themselves being redesigned into information societies, propelling the further evolution of mechanized agriculture into information-based agriculture.

THE ROLES PLAYED BY AGRICULTURAL AND BIOLOGICAL ENGINEERS HAVE BEEN SIGNIFICANT.

Agricultural and biological engineers have played a significant role during the past 100 years. Agricultural mechanization has replaced much of the human and animal power needed for farming tasks in developed nations and is now transforming agriculture in many developing countries. Agricultural productivity for both food and fibers has increased dramatically over the past 100 years. The technological advancements during that time have been astonishing.

The accomplishments of agricultural and biological engineering in the last 100 years deserve recognition and celebration. It is hoped that these 10 achievements that changed the world will inspire among agricultural and biological engineers enormous pride in their monumental contributions to society, and the aspiration to fully and responsibly usher the agricultural industry into the next century.

Development of the Agricultural Tractor

1

Agricultural engineers have been intimately involved in the development of the agricultural tractor and associated implements. Agricultural engineers working in industry made great contributions in the evolution of tractor design to the technically sophisticated machines of today. Land-grant universities, the Nebraska Tractor Test Laboratory, and the USDA's National Soil Dynamics Laboratory provided unbiased results on tractor operation, safety, performance, and traction to farmers and manufacturers.

The move from horse to tractor power had a profound impact on the farm. ***(Photo courtesy of the Canada Agriculture Museum)***

Tractors have changed tremendously over the years with more power, heated and air conditioned cabs with stereos, power shift transmissions, front wheel assist, guidance systems, infinitely variable transmissions, and computers. Fewer farmers will continue to farm more land. Sophisticated equipment will be pulled by tractors with high horsepower to get the job done efficiently. Tractors will be needed to do tasks independently allowing the farmer to concentrate on other parts of his business while he sits in the cab – his business office on wheels. One day we may see tractors pulling machines with no operator, however, the farmer may be reluctant to give up complete control of his machine. He will still feel a need to monitor the tractor and its towed processor across the field.

Thomas D. Ogle
Vermeer Manufacturing Co.

Rural Electrification

The electrification of rural America brought electrical energy and all of its successful applications to the farmstead. This enabled the switch from animal and human power to mechanical and electrical power. Rural electrification opened up a myriad of possibilities for the farm, which today are considered standard features. A few examples include on-farm storage and processing of agricultural products, mechanical milking of cows, refrigerated bulk storage of milk prior to transport to central processing centers, room heating and air conditioning, and use of electronic automatic control systems for many kinds of farm operations.

Rural electrification enabled the switch from animal and human power to mechanical and electrical power. *(Photo courtesy of the New Deal Network)*

2

Our profession has been at the core of contributing to electrification and the use of electrical energy since the very beginning of the profession. Agricultural engineers were particularly adept at researching, adapting, and demonstrating new technologies. Landmark demonstration projects by agricultural engineers, like the Redwing Project in Minnesota that demonstrated the first successful rural distribution line in 1923, established the knowledge base for successful rural electrification.

Today our profession works for the continued safe and efficient application of electrical power and now electronics in food, agricultural, and biological systems. With increased opportunities for involvement in the production of electrical energy through solar, wind, and biomass; novel ways to use electrical energy for process and control; and the continued need for safety and efficiency, we can continue the tradition of contribution so ably demonstrated by our predecessors.

Robert J. Gustafson, P.E.
Associate Dean and Professor
The Ohio State University

Self-Propelled Combine

3

One of the most versatile of farm machines, the combine harvests a diverse range of crops, handling dry fragile crops such as flax, tall rugged crops such as corn (maize), and stringy crops often flattened to the ground such as rice. Combines are most often associated with harvesting small grains, such as wheat, barley, rye, and oats, on relatively level ground where they were first used. With the development of self-leveling combines and cleaning system geometry and air flow, combines can harvest crops on rolling hills or even steep slopes. With available tire, track, and powered rear-wheel options, they have no difficulty going through heavy mud. They can chop, spread, or drop straw into windrows. Although large, many combines are loaded on trucks in minutes for transport to another field that may be hundreds of miles away. A modern self-propelled combine with a single operator can harvest 100 times what was achievable 100 years ago, long before self-propelled combines were developed.

This Massey-Harris Model 20 self-propelled combine is on display at Henry Ford Museum, Dearborn, Mich.

In the mid-1920s, about 1,000 Gleaner Combines were built to mount on Fordson tractors, but production soon ended. During the 1930s, agricultural engineers in several companies developed prototype self-propelled combines. Only Massey-Harris was able to obtain approval from War Production Boards in the early 1940s for the steel to build self-propelled combines. The "Harvest Brigade" of these custom combines in the central plains of the United States and Canada greatly influenced agriculture.

Today, agricultural and biological engineers are developing combines for more efficient harvest, better grain quality, improved and safer operator environment, and better electronics for automating combine functions and monitoring performance.

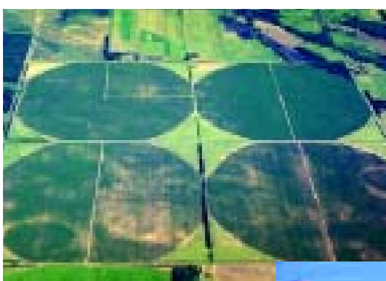
Leroy K. Pickett, P.E.
Combine Development and Safety Engineer, Retired
Case New Holland

Center Pivot for Irrigation

Frank Zybach, a tenant farmer and inventor living near Strasburg, Colo., received a patent for a "Self-Propelled Sprinkling Irrigating Apparatus" on July 22, 1952. The device used mobile towers to continuously move a pipeline in a circle around a pivot. Water was supplied through the pivot and distributed by sprinklers on the pipeline. Zybach formed a partnership in 1953 with A. E. Trowbridge, an entrepreneur-businessman, to manufacture center pivots in Columbus, Neb. In 1954 manufacturing rights were sold to Valley Manufacturing, which initiated a worldwide industry including several manufacturers.

The center pivot was the first system capable of automatically, efficiently, and uniformly irrigating a variety of crops, soils, sloping terrains, and field sizes. Agricultural and biological engineers have improved the safety, efficiency, and dependability of the original design.

The center pivot has become the most widely used method of sprinkler irrigation. Center pivots have contributed to a dependable, high quality, food and fiber supply through efficient use of soil and water, transforming agricultural production throughout the world.



Above: Four center pivot irrigation systems have created circular field patterns. Right: A center pivot irrigation system.

Center pivots, through their ability to apply uniform and relatively low amounts of water, opened vast tracts of land in the Midwest to productive and economically viable crop production. Today, with the introduction of precision application technology, these systems continue to support much of the Midwest irrigated acreage, applying water efficiently while maintaining environmental resources.

Edward C. Martin
Professor and Irrigation Specialist
University of Arizona

International Harvester Cotton Picker

The first attempt to develop a mechanical cotton picker to replace manual labor was in 1850 in Tennessee by S. S. Rembert and Jebediah Prescott. The next significant invention followed in 1889 by Angus Campbell who founded the Price Campbell Cotton Picker Corp. Little progress ensued, however, until International Harvester purchased the Price-Campbell patents in 1924. The period from 1924 through 1939 brought out experimental machines that showed significant improvements over the Price-Campbell invention. In 1943, International Harvester produced the first dozen of its commercial cotton pickers. In 1948, International Harvester's Memphis Works came on line with the industry's first mass-produced cotton picker, the M-12-H. Two important consequences of the development of the mechanical cotton picker were the reduced need for farm labor and the end of sharecropping.

"Old Red," the nation's first commercially workable mechanical cotton picker, was the predecessor to the modern cotton harvesting equipment shown here.

As cotton harvest went from 2 percent machine versus 98 percent hand-harvested in 1947 to virtually 100 percent machine-harvested in 1972, agricultural engineers were involved in inventing new machines and redesigning ginning systems to transport, process, and preserve the quality of the cotton that was being harvested at rapidly increasing rates.

Today the mechanical cotton picker is one of the central technologies that has significantly reduced the number of man hours to produce one bale of cotton. While the basic operating principles introduced in the original picker remain in use today, cotton harvesting technology is still being researched by agricultural engineers in an effort to improve productivity and better preserve the fiber quality of U.S. cotton. The cotton picker is here to stay, now and for the foreseeable future.

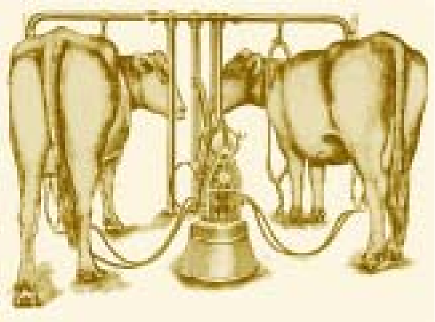
S. Ed Hughs, P.E.
Research Leader
USDA-ARS

Milking Machine

6

The development of the milking machine in the early 1900s dramatically improved the labor efficiency of collecting milk. The result was a significant increase in the average number of cows that could be milked by a single laborer and increased farm income. The development of the milking machine also made possible the creation of specialized farms where the main income was derived from milk sales. The engineering design of the milking machine required understanding of both the mechanical requirements of the machine as well as the biological requirements or constraints of the cow.

Machine milking became widely deployed on dairy farms in the early part of the 20th century. First generation milking machines focused on the milking act itself and doubled the productivity of farm workers. Subsequent advances by agricultural and biological engineers moved beyond basic milking to bring mechanization and automation in milk handling, cooling and storage, cow handling, automated milking unit removal, and data management systems. These developments allowed another doubling of labor efficiency on dairy farms over the past 50 years.



Early milking machine. ***(Photo courtesy of C.H. Wendel and Krause Publications)***

Machine milking is a classic biological engineering problem. Its success depends upon applying engineering research and design to mechanical, electrical, and fluid dynamics aspects of the machine as well as physiological and biomechanical aspects of the animal and biochemical aspects of the milk. Agricultural and biological engineers will be at the leading edge of the next 100 years of machine milking research and development. Robotic machine components will further improve labor efficiency and biosensors will monitor milk quality, food safety, and animal health. The development of information management systems to process data from a modern milking machine installation will lead to continuing increases in labor productivity, improvements in product quality and traceability, greater energy efficiency, and reduced environmental impact.

Douglas J. Reinemann
Professor
University of Wisconsin-Madison

Conservation Tillage

7

Conservation tillage requires that residue from the previous crop be left on the soil surface. Studies were conducted to verify the significant soil erosion benefits of crop residue on the soil surface; to achieve successful means of maintaining surface crop residue during reduced tillage, planting, and/or chemical application operations; and to design and produce commercially viable equipment for conservation tillage such as the chisel plow, till planter, and no-till planter. Conservation tillage prevents major dust storms and the severe loss of topsoils through rill and gully erosion. Agricultural and biological engineers provided the primary forces that molded conservation tillage into the success it is today.

Conservation tillage prevents major dust storms that moved across the land during the Dust Bowl. ***(Photos courtesy of NRCS-USDA)***

Agricultural and biological engineers helped develop the knowledge that formed the basis for conservation tillage and led in developing the cultural practices and equipment that have made conservation tillage a success. Thanks to that effort, a revolution in tillage occurred – a revolution that resulted in adoption of more sustainable, energy efficient, and profitable crop production practices. Though conservation tillage has been very successful, all crop production is not yet sustainable. Reaching sustainability will require improved equipment and even more effective and efficient practices in order to grow the food, feed, fiber, and meet the energy needs of the world's people while maintaining the soil and water resources necessary to do so. An opportunity for agricultural and biological engineers remains.

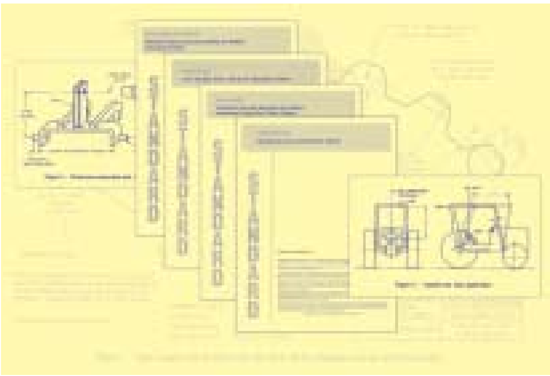
Young soybean plants thrive in the residue of a wheat crop. This no-till farming practice provides protection from soil erosion and helps retain moisture.

Donald C. Erbach
National Program Leader, Retired
USDA-ARS

ASAE Standardization Procedure

8

The ASABE standardization procedure was developed in 1910 with these objectives: 1) to provide interchangeability between similarly functional products and systems manufac-



tured by two or more organizations, thus improving compatibility, safety, and performance for users; 2) to reduce the variety of components required to serve an industry, thus improving availability and economy; 3) to improve personal safety during operation of equipment and application of products and materials; 4) to establish performance criteria for products, materials, or systems; 5) to provide a common basis for testing, analyzing, describing, or informing regarding the performance and characteristics of products, methods, materials, or systems; 6) to provide design data in readily available form; 7) to develop a sound basis for codes, education, and legislation, and to promote uniformity of practice; 8) to provide a technical basis for international standardization; and 9) to increase efficiency of engineering effort in design, development, and production. The Cooperative Standards Program continues to promote the Society's objective to advance the theory and practice of engineering in agricultural, food, and biological systems.

ASAE and ASABE Standards promulgated by our professional society through the Cooperative Standards Program have had a huge impact on the productivity, efficiency, and safety of North American agriculture, as well as agriculture around the world. Agricultural and biological engineers continue to support harmonization of standards worldwide and the development of International Standards through ISO. How fortunate that our economy is supported by an extensive system of voluntary, consensus standards as opposed to complete federal and state regulation of every aspect of every industry. "Hats off" to ASABE members for more than 90 years of standardization service to agriculture and supporting industries.

Russell H. Hahn, P.E.
Director of Standards, Retired
ASABE

Rubber Tires on Tractors

9

Early tractors were massive and expensive. Their steel lug wheels gave poor traction and a rough ride. Lugs were prohibited on many roads. In 1926, Hoyle Pounds modified a Fordson tractor with zero-pressure truck tires on special rims to improve performance on sandy soils in Florida. A successful business resulted. In 1929, Hessel Roorda equipped Farmall tractors with low-pressure rubber tires to pick corn in muddy fields in Iowa. Farmers discovered they performed well in all conditions. In 1932, Allis-Chalmers, urged by Tractor Division Manager Harry Merritt, supplied a farmer with a Model U tractor with Firestone aircraft rubber tires at low pressure. This system operated unmodified for eight years. Farm magazine ads in 1934 quoted several university reports citing that as much as a third less fuel and a fourth more work with low pressure rubber tires resulted when compared to steel lugs. No new tractors in 1930 had rubber tires; by 1940, most did.

Harvey S. Firestone, with his son Leonard, enjoyed the comfort and speed of a rubber-tired tractor. He launched a successful program to put the American farmer on rubber. *(Photo courtesy of Firestone)*

Rubber tires turned a harsh riding steel-wheeled tractor into a road friendly, smooth riding machine that pulled and traveled well both in and out of the field.

Kenneth N. Brodbeck, P.E.
Firestone Tire Engineer
Firestone Farm Tires

The development of rubber tires was a key factor in the evolution of the modern tractor providing enhanced traction performance, compatibility with paved roads for transport, improved ride, and faster field and road travel speeds. Improvements in these same areas will be required to allow full utilization of the higher powered tractors of the future.

David W. Smith, P.E.
Research Engineer, Retired
Deere & Company

Refrigerated On-Farm Milk Storage

10

The development of mechanical refrigeration equipment for use on dairy farms made significant improvements in both the quality and safety of raw milk supply. Refrigerated storage of milk on farms greatly decreased bacterial growth, reducing the risk of pathogens in the milk supply as well as improving the quality and prolonging the shelf life of dairy products. Mechanical refrigeration systems allowed dairy farms to produce more milk per farm since the cooling capacity was no longer limited by the availability of cool ground water. These systems also allowed more efficient collection of milk from farms since dairy milk trucks could now collect milk every other day instead of the daily collection that had been required before mechanical refrigeration became available. As a result, refrigerated on-farm milk storage resulted in both increased farm income and improved public health security.

Modern closed milk cooling tanks offer dairy farmers advanced cleaning and controlling technology to store and cool milk. Correct cooling retains milk quality and commands higher prices from the dairy. *(Photo courtesy of DeLaval, Inc.)*

Now that fluid milk can be shipped farther, farms and regions have switched from butter, cream, or cheese production to fluid milk supply. Today, in-line cooling allows milk to be instantly cooled and loaded directly in milk transport trailers and sent on its way to far off markets a few hours after it leaves the cow. Farms near population centers are returning to on-farm processing using automated equipment to produce bottled milk, cheese, and other value added specialty items. Farms may one day use reverse osmosis to remove water from milk solids resulting in a more concentrated and easily shipped product.

Robert E. Graves, P.E.
Professor
The Pennsylvania State University

The Profession Takes Center Stage

In February 2000, the agricultural and biological engineering profession shared the limelight with other engineering societies in Washington, D.C., when agricultural mechanization was named among the 20 Greatest Engineering Achievements of the 20th Century by the National Academy of Engineering (NAE).

Ranked seventh on the NAE list, agricultural mechanization stood alongside other engineering accomplishments such as the television, automobiles, computers, safe and abundant water supply, and – receiving the top citation – electrification. ASAE President Larry Huggins credited agricultural engineers' effort to mechanize agriculture with dramatic changes in farm productivity and labor. He also noted that it was a tremendous honor for the work done by agricultural and biological engineers to be recognized by the NAE.

As the Society looks forward to the next 100 years, ASABE members can take tremendous pride in their profession and the significant influence they have had on the quality of life that people enjoy throughout the world. The agricultural and biological engineering profession has achieved many successes during the past 100 years. Building on that past, the future of the profession is full of promise, exciting new challenges, new ideas, enhanced technologies, and even greater innovations and achievements. Our members *do* make a difference in the world, and the world salutes you!

Abraham Lincoln, in an address to the Wisconsin State Agricultural Society in 1859, said this about agriculture:

"No other human occupation opens so wide a field for the profitable and agreeable combination of labor with cultivated thought as agriculture. I know of nothing so pleasant to the mind as the discovery of anything which is at once new and valuable — nothing which so lightens and sweetens toil as the hopeful pursuit of such discovery. And how vast, and how varied a field is agriculture for such discovery."

The agricultural and biological engineering profession has much to look forward to in the years ahead. Building upon a solid and firm foundation, the future of ASABE is in the capable hands of its members who with their knowledge, expertise, dedication, and imagination can influence and help change the world one discovery at a time!

Editor's Note:

This centennial feature is based in part on the series, *Outstanding Agricultural Engineering Achievements of the 20th Century,* coordinated and written by ASABE members Joel Cuello and Larry Huggins. The six-part series, printed in *Resource* magazine in 2000, highlighted top outstanding achievements submitted by the Steering Committees of ASABE's Technical Divisions.

Challenges for the 21st Century

With a legacy of turning ideas into action, members forecast sustainability savvy and fascinating future technology

In the years ahead, intriguing and exciting work for agricultural and biological engineers will include the development and refinement of locally adapted agro-industrial ecosystems. One of the great challenges for this century is to develop agro-industrial ecosystems that mimic natural ecosystems, are fully recycling with closed resource loops and no wastes, and are based on renewable energy. This may include refining eco-composite materials for cars, planes, and buildings; biofuel production from wastes; solar applications from simple integral solar water heaters to preheat water to sophisticated concentrating collectors to make process steam; streamside buffers to capture fertilizer and chemicals; and very diverse agroforestry and mixed cropping systems that minimize pest problems and are self-fertilizing. One of the key challenges is improving energy input:output for the food system from the current low of 10:1 to 1:10.

The future can be bright and assured if we take steps now to improve sustainability in production, processing, and distribution. This might begin with an ASABE effort to develop a workable set of sustainability indicators for agriculture with published charts of trends over time. What isn't measured isn't managed!

David Bainbridge, Marshall Goldsmith School of Management, Alliant International University, San Diego, Calif.

Despite three generations of building a society on individualism, which spawned isolation of people, suburban sprawl, and rampant energy consumption, the United States has seemingly returned to its "roots," rebuilding cities from the inside out. Neighborhoods are again the basic social unit of society. Although population density has increased, today, social problems are on the decrease.

A surprising result of the rediscovery of the neighborhood has been a resurgence of "small" with respect to the food delivery chain: small farms providing locally grown food to open-air markets and mom-and-pop groceries. Community supported agriculture has flourished in every region, even providing customers fresh greens throughout winter, thanks to indoor growing-space innovations of biological and agricultural engineers. People using technology have overcome health, economic, and transportation issues of recycling nutrients from household, municipal, and farm wastes.

Although small farms provide a large portion of our produce, large-scale operations in less densely populated areas continue to supply the bulk of grains and fiber commodities. Continued improvements to tillage systems and planting/harvesting technologies have facilitated high production rates of food and fiber on prime farm land, leaving ecologically sensitive lands in perennials. Advancements in control and filtration of artificial subsurface drainage/subirrigation systems have halved the loss of nutrients from row-cropped agriculture. **All of these present benefits are being captured by engineers with a vision for utilizing the cost-free elements of solar radiation, precipitation, and soil in the most efficient manner to meet the food, water, fiber, and energy needs of today's and tomorrow's generation.**

Gary W. Feyereisen, P.E., USDA-ARS Pasture Systems & Watershed Management Research Unit, University Park, Penn.

Eco-engineeering is the future of ASABE. Fifty years ago, farming in the developed world was still a relatively small-scale enterprise conducted by family farms that were largely self-sufficient. The positive link between agriculture and local ecosystems was fundamentally strong, as farmers relied on traditional methods with few external inputs.

Since agriculture became an industry, the natural harmony between farming and the environment has been severely eroded. Like other major industries, agriculture now has significant problems of waste byproducts disposal due to the massive use of inorganic fertilizers and pesticides and the intensive concentration of livestock operations. Along with higher farm output comes the potential for environmental degradation from nitrogen and phosphorus leachate and animal waste runoff, while farmers are using more resources – water, energy, and minerals – than ever before.

There are also major ecological impacts being exerted on farming by a rapidly changing planet. Continued development and urbanization are reducing the amount of land available for farming. Deforestation and increased carbon emissions are producing global climate changes that have far-reaching consequences for agriculture.

The future will likely include limits on greenhouse gas emissions and stricter regulations for protecting air, soil, and water quality. **To remain viable, agriculture must revert to a more holistic cycle where resources are conserved and the ecological balance between farming and the environment is well managed for sustainability.** In the future, farmers will realize new revenue from a diverse portfolio of biodiversity protection, carbon sequestration, water conservation, and renewable energy

What they were saying …

At ASAE's 25th year, Raymond Olney, editor of *Agricultural Engineering,* penned silver-anniversary words for the November 1932 issue. With "Agricultural Engineering's Future," subtitled "A viewpoint, which is reassuring and sound," Olney offered a stirring challenge for troubled times and affirmed that his colleagues' essential skills were needed for the future:

"With trade still faltering, employment low, winter and Congress coming on; with assorted sound, half-sound, and fanatical economic and social schemes being urged, heard, and in some cases tried; with engineering on trial before the public; with every employed agricultural engineer striving to justify his continued employment, it is urgent that agricultural engineers take every opportunity to clarify their views and those of the public on the economic and social significance of their work.

"Whatever heights of welfare and civilization a people are to reach above a mere existence, can therefore only be reached by efficient farming and the workers it releases to produce other goods and services, comforts, and conveniences. The application of engineering to agriculture is one of the chief means of achieving high efficiency.

"It is true that we are in a unique situation today with greater physical mastery over the resources and conditions of nature than we know how to use for our individual and collective welfare. Undoubtedly new principles of application, new techniques of control of this physical capacity must be put in effect. New philosophies of material welfare in relation to civilization, of the direction of human efforts, are implied … but the minds, which have developed the means to human efficiency to dominance of material things, will make that dominance a means to progress. Agricultural engineers will assist in harnessing that physical capacity and will share in the resulting progress."

1932

In the July 1957 issue of *Agricultural Engineering,* observing the Society's 50th year, editor Harold E. Pinches typified his era as turbulent and uncertain. He emphasized agricultural engineers' challenges in "Tomorrow's Agricultural Engineers – Their Opportunities":

"Agricultural engineers must design machinery and develop methods to keep up with changing concepts as to how soils should be handled involving reduction of soil compaction; they must remake the microtopography of farm fields to eliminate small fields, improve drainage and erosion control, and increase efficiency of operations; they must mechanize more phases of more crops; they must integrate harvesting, field handling, and certain first steps to market, e.g., sorting, packaging, and conditioning for shipment as means of reducing costs and getting a better product to consumers; and they must finish the job of rural electrification and give sufficient attention to solar energy.

"Tomorrow's engineers should become increasingly perceptive of, and responsive to, changes foreshadowed by scientific and economic developments. Research in farm machinery will be a necessary part of bringing many of the results of plant breeding and plant introduction into use as practical farm crops. Farm structure may be expected to change quite radically as the full implications of findings from research into the physiological requirements of animals are incorporated into farm buildings. An increase, perhaps an accelerating increase, in problems of applying energy in new ways is to be expected.

"All of this means that the agricultural engineer of the future must be trained more deeply in the physical sciences, math, and basic engineering. He must be so trained and conditioned in his thinking that he will quickly see and readily follow the implications of research and developments in biological science and economics."

1957

production. Ultimately, farming will be viewed by society as the cornerstone of our dynamic ecosystems. Agricultural and biological engineers will play a crucial role in this evolving scenario.

Ann C. Wilkie, University of Florida-IFAS, Gainesville, Fla.

A major impact of future technology on vegetable growers will be the opportunity to mechanize many production operations that now require large amounts of hand labor. **The vegetable industry will have to mechanize harvesting and other operations, or it will move off shore for inexpensive, available labor.**

From the standpoint of national interest and security, major questions need to be answered when considering shifting our source of major food items, such as vegetables, from domestic producers to off-shore producers. Food safety could be an issue with produce produced off shore.

A potential solution to this problem is mechanization of harvesting and other practices. Crops such as lettuce that are direct seeded are usually over seeded and then hand thinned after the stand is established. With the sensing and control systems that exist today it is not unreasonable to expect that this operation can be mechanized in the near future. Automatic transplanters have had only limited success but machines now entering the market will automate this process. Robotic weeding machines are under development and will replace hand weeding in vegetable cops.

These and other future technologies will eventually bring the same benefits of mechanization to vegetable crops that machines such as the cotton picker, self-propelled combine, and automatic hay baler have brought to other crops.

John Inman, P.E., University of California Cooperative Extension Emeritus, Salinas, Calif.

As our horizons have broadened, we see that our responsibility is not limited to our community or state but to the nation and the world. We will make a difference by finding ways to use renewable resources in place of limited ones and to improve efficiency without sacrificing the environment. Wind power, hydropower, and solar power all offer clean alternatives for the future. Conservation practices on the land keep the rich soil in place for continued high productivity. Flood control structures limit the damages so that efforts can be directed to improvements rather than repairs.

"There's enough to go around" must replace "I want it all!" Living in recognition of our biological and agricultural world gives us a sense of wonder for the miracle of life and growth. It humbles me to realize I am one speck on a huge planet, no more entitled to my heart's desire than anyone else. **We must strive to live simply – and model as such – so that others may simply live.**

Sonia Maassel Jacobsen, P.E., USDA-NRCS, Roseville, Minn.

Seeking solutions for a sustainable world? I see many ways that agricultural and biological engineers can further assist in providing the answers. For the past two decades we have been experimenting with the principles of precision agriculture with some success, the principal driver being seen as economic with improved production together with some savings in resource inputs. **The future drivers of change, however, will be the need for greater environmental protection in the reduction of nitrous oxide and leachates and reduced fuel and fertilizer use while optimizing the biological outputs.**

Dick Godwin, Cranfield University, Bedfordshire, England, U.K.

As the explicit role of agriculture expands to provide energy, materials, carbon sequestration, and species habitat (humans included), as well as other emerging and even unforeseen functions, the role of agricultural and biological engineers will become more explicit in the stewardship of natural resources, particularly water, which are essential to agriculture.

The availability of water for irrigation is almost universally declining where intensive irrigation has been developed. Agriculture, especially irrigated agriculture, will nonetheless continue to experience unprecedented demands not only for food and fiber production, but also for its new role in equitable distribution of water to vast areas, and novel approaches to integrated watershed management are now beginning to resolve conflicts that have spanned generations. Desalinization and utilization of effluent and other degraded water are emerging as new potential water resources.

As the available water, not only for crop production but for all needs, increasingly declines, there will be an unprecedented need for new information about its distribution, condition, quality, flux, and interaction with natural and man-made systems. Such information is a prerequisite for any level of water resources stewardship, and this applies to scales from within individual fields to entire watersheds, even to continents.

The role of agricultural and biological engineers will become more explicit in the stewardship of natural resources, particularly water, which are essential to agriculture.

supplying energy crops for a worldwide population that is increasing both in size and in industrialization. **Once again, we are challenged to do more with less.**

Achievable water-use efficiencies remain untapped to their fullest potential, and opportunities abound for new innovations. At the farm level, examples include improvements in crop varieties, tillage practices, rainfall utilization, land grading, irrigation delivery systems, and evapotranspiration-based irrigation scheduling. Site-specific (precision) farming is just now becoming operationally feasible and commercially adopted; GPS-guided planting implements have enabled better utilization of near-surface soil water that otherwise may have been lost to evaporation. Beyond the farm, canal and reservoir automation have improved the timing and

Solutions aimed at significantly improving future irrigation efficiencies will involve implementing various technologies including remote sensing, agrometeorology, crop and plant models, hydrologic and climate change models, soil water measurement, GPS, GIS-based spatially distributed information, and wireless technology, just to name a few.

Enabling better water resource stewardship is just one role that agricultural and biological engineers will play in the forthcoming century. **Because water is basic to all life, the impact of ensuring enough for all species will be incalculable.**

Paul D. Colaizzi, USDA-ARS, Bushland, Texas

On ASAE's Diamond Anniversary, President Robert H. Tweedy focused on "Engineering and Future Issues" in *Agricultural Engineering*, July 1982:

"What changes are affecting agribusiness and thus the agricultural engineer and his professional society, ASAE, today? To answer this, we must understand the role of agricultural engineers in our economy. Engineers manage resources for economically significant results. Engineers working in the food and fiber chain are agricultural engineers. A partial list of changes concerning them and impacting ASAE ...

- Sophisticated management inputs
- Energy uncertainty
- Protection of the natural environment
- Improving product reliability
- Encroaching government
- Accountability of institutions
- Role of the family farmer
- Emphasis on low-cost food
- Growth of Third World agriculture
- Water supply, quality, and use
- Land supply, conservation, and use
- Productivity of production ag
- Efficiency of post-harvest ag
- More technology transfer in the future:
  - The soil conservation issue will increase. Fresh ideas are needed to advance adoption of good practices.
  - We are nearing the end of an era of dramatic crop-yield increases through breeding and fertilization advances. Attention must focus on harvest, storage, and processing efficiencies. The promise of genetic engineering is yet to be realized.
  - Researchers and the farm equipment industry must effectively serve both the large and small farmer – or lose markets to overseas competitors.
  - Ag engineers must become pre-active during legislative development rather than reactive after drafting.
  - Pesticides and pesticide residues are suspected of reducing crop yields and lowering quality of surface and underground water supplies."

1982

"When ASAE is 100!" ventures the headline on the now yellowed newsprint of *Within ASAE* from February 1986. The article reviews a Winter Meeting in Chicago more than 20 years ago and speculates on the centennial of the Society:

A presentation by U.S. Secretary of Agriculture John R. Block, "Planning for the Next Generation," set the stage for speakers Walter Vogel, then Executive Vice President for Deere & Co., and Kenneth Nielsen, President of Farmland Industries.

Each speaker underscored the risk of prophesizing, but there was general agreement that agricultural and biological engineering technology must exist for the world as a whole to produce enough food for future generations. Block predicted the nation would move toward a market-oriented program with increased international trade.

Vogel cited scientific developments in the transfer of genetic components of plant and animal cells between unrelated species as a revolutionary trend. He reported that at least one chemical company planned to field test genetically engineered soil bacteria that produce a naturally occurring insecticide capable of protecting plant roots against soil-dwelling insects. He predicted that "farming practices in the 21st century are likely to be as different from today's as today's are from the pre-tractor, pre-chemical era." Animals and plants, he said, are certain to be healthier and higher in protein; and developing and centrally planned economies are likely to be interested in having their agricultural systems leap-frog the usual evolutionary process through use of biotechnology.

Nielsen acknowledged the continued successes in agriculture through better farming methods, fertilizer, and pesticides, and he predicted that technology would provide for future food requirements. He called for an *Agriculture 2007* that would preserve the best land for food production and shelter fragile lands for proper uses, at the same time making farm export promotion and market expansion a major national policy.

Bio-based industries are increasingly becoming essential to our nation's manufacturing base. Beyond food, feed, and fiber, agricultural and biological engineers are called upon to design and produce environmentally benign manufactured products as well as biologically-based energy and transportation fuels. This is being driven by a number of factors, including population growth and the increasing demand for energy.

ASABE members are well poised to make a difference. Waste streams are increasingly becoming viewed not as materials in need of disposal, but rather as biological resources that can be reused, recycled, or reprocessed into valuable products or even energy. These approaches to waste management align with many of our discipline's areas of expertise and hold the potential for increasing the probability of meeting the goals of industrial ecology, namely, that of developing and operating sustainable systems.

Industrial ecology, in a broad sense, focuses on the interactions between industrial systems and the environment. A primary goal of this field is to transform the inherent, traditional character of manufacturing systems which have typically produced output that has consisted of either finished products or waste materials. Modern industries are beginning to respond to the need for change due, in part, to increased environmental regulations as well as operational economics and are starting to recognize the benefits of systems where waste streams can be reused as energy feedstocks or as input streams for other products or processes. Reducing the amount of waste-exiting industrial facilities can help to reduce the impact on the environment, and thus can help close the ecological loop.

Kurt Rosenstrater, USDA-ARS, Northern Grain Insect Research Laboratory, Brookings, S.D.

Especially now, at the onset of the Society's century mark and as a world society, we are facing enormous pressures to protect natural resources and, at the same time, meet growing demands for agricultural products. Biological and agricultural engineers, trained to provide assistance to farmers on strategies that can help keep production costs low and protect air and water quality, are more important now than ever. As we apply more pressure to our ecosystems, they must be more carefully managed.

With training in agricultural and biological engineering, I have the technical and biological background to understand how intensive agriculture affects ecosystems and what needs to be done to protect ecosystems from pollution often associated with intensive production. I have the skills needed to work with a diverse group of stakeholders where air and water quality are impacted by animal agriculture to identify technologies and practices that can help farmers capture manure nutrients for use as fertilizer and prevent nutrient losses to air and water resources.

I would encourage anyone interested in a career applying science and engineering principals to protecting our natural resources to consider a degree in biological/agricultural engineering. The programs are challenging, but worth every bit of trouble. **There is nothing like getting paid to do work you love.**

Kristen Hughes, Chesepeake Bay Foundation, Richmond, Va.

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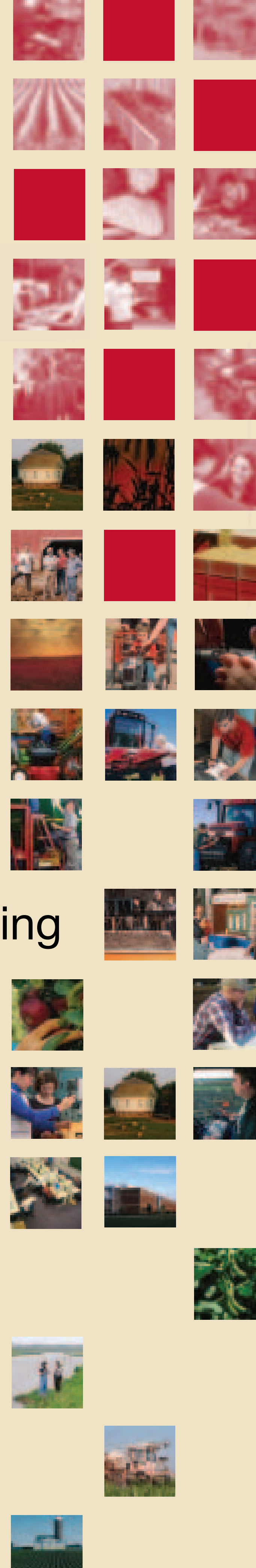

SOIL & WATER RESOURCE ENGINEERING

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Agricultural and Biological Engineering

Integrating life and engineering for the enhancement of complex living systems.

FOOD & BIOPROCESS ENGINEERING

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1304 W. Pennsylvania Avenue
Urbana, Illinois 61801
Telephone: (217) 333-3570
Fax: (217) 244-0323
Email: ag-bioeng@uiuc.edu
http://www.ag-bioeng.uiuc.edu

A Passion for Invention

Keen interest in new technology and creative applications of existing technology remain a Society hallmark

The AE50 award is a fitting testimony to engineers and their co-workers who harness and manage resources and talent in new, often complicated, designs and manufacturing ventures.

At the onset of the centennial year, a panel of experts studied all past recipients of AE50 awards since the program's inception in 1986. Ten products, representative of a high caliber of innovation with proven market acceptance, were selected for the Society's "anniversary spotlight." The process of narrowing to 10 was arduous – and at times, thought the judges, nearly impossible.

The AE50 application specifies that entries must "have potential for broad impact on its area or industries served by agricultural, food, and biological systems engineering."

In combing through the past 20 years of winners, the panel looked for products that had an impact in the marketplace and had, in addition, realized their potential. While many past winners accomplished this, panelists scoured winning products for a representative AE50 sampling that historically illustrates the ingenuity engineers and others must use to develop products that save producers time, costs, and labor while improving user safety.

The honored 10 products featured here were described and pictured in past *Resource* issues. We are delighted to showcase them again as they were first introduced. As well, we salute the hundreds of past winners of the annual AE50 competitions. All strived for excellence.

The AE50 How it all began ...

"A Forum for New Developments" ...

In June 1984, *Agricultural Engineering* included "A Forum for New Developments" in a special issue on technology. Twenty-five techniques, advances, inventions, and innovations were placed in the publication's spotlight. Showcased items were drawn from product information solicited by the Society and screened by a panel of experts.

From this focus on identifying innovative technology, in 1986 the AE50 was born, christened, and its intent described: "Acceptance in the marketplace is the highest accolade any new agricultural product can receive. But for innovative developments in the last 12 months, a singular honor is to be named one of the year's *Agricultural Engineering 50* outstanding innovations in product or systems technology."

Product nominations poured in and vied for coveted spots among *AE's TOP 50*. A panel of engineers/judges was enlisted to review – but this time for an official salute. The first AE50s were bestowed on "applications intended for principle use in the production, processing, research, storage, packaging, or transportation of agricultural products."

1986

Infrared Temperature Sensor
Everest Interscience, Inc.

The Model 4000 is used to measure the crop canopy temperature and determine optimum irrigation scheduling at that time. The infrared-thermometry-based system helps to optimize irrigation scheduling and improve crop yields enabling fast, real-time measurements of crop water stress in the field.

"This unit has led us to a variety of instruments that can be used in research and on the farm to determine the stress of individual leaves or portions thereof and the stress of a crop canopy. Our newest Model 4000.4ZL, smaller in size than the original, performs with the same accuracy and repeatability.

"Electronic advances, such as the reduction in size of the electronic components and surface mount technology, has led to a smaller and more compact design with all the electronics and optics included in one housing. Not only did the Model 4000 lead to instrumentation for agronomic research but also to the first Tympanic medical thermometer, commonly known as the 'ear thermometer.' "

Marilyn M. Everest, Vice President
International Sales and Marketing
Everest Interscience, Tucson, Ariz.

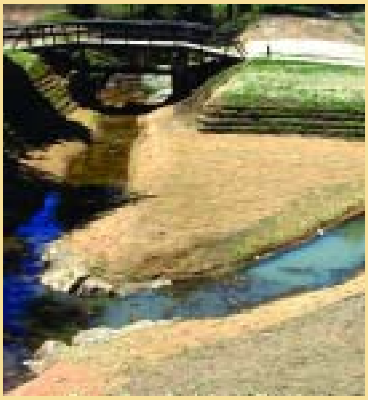
1986

100% Biodegradable Erosion Control Blankets
North American Green

Photodegradable netting and biodegradable straw are teamed to control erosion and conserve moisture on newly seeded sloped and ditches. The natural materials, uniformly dispersed across a 6-ft width, are "stitched into a thin layer" that fosters vegetative growth. The 83-ft-long blanket can be rolled for handling and transport.

"The BioNet Series products have been used extensively in wetland restoration, bioengineering projects, environmentally sensitive areas, shaded areas and stream banks, and shoreline applications, all with guaranteed natural success of the projects.

"Today, we offer four different blankets within the group as well as several other totally biodegradable



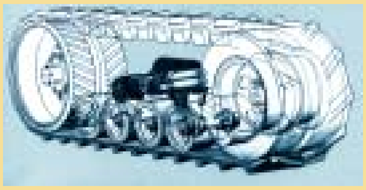
products, introduced since our award in 1986. We are proud that BioNet products were selected as a Top10 Product in the Green Build Industry for 2005."

Lynne M. Finney, Marketing Manager
North American Green
Erosion Control Products
Evansville, Ind.

1987

Cleat-Lined Belts
Caterpillar, Inc.

Flexible rubber belts replace hinged steel grousers as traction devices on a new agricultural tractor. Each traction belt is friction driven by a set of dual rubber-clad drive wheels. The Mobil-trac system is featured on a 270-hp tractor.



"We were working with the steel-track system for high power ag tractors in the mid and late '70s; then, and into the next decade, came cleat-lined belts. Our machine research group had recognized that a track system, fundamentally, is more efficient in getting power to the ground and would produce less soil compaction. This has been proven time and time again, and the benefits in fuel efficiency were realized as the belts hit the market. Today that remains a global issue: getting the best results with the least amount of fuel.

"Farmers, focused on productivity and efficiency, immediately saw and reaped the benefits of the belts. The belt track ag tractors are no longer manufactured by Caterpillar but by AGCO. Increased use of belt tracks are now being seen in construction-project machines, particularly for soft ground conditions.

"It is really very complimentary that the ASABE selected the belt track system for this recognition. I am retiring very soon, and working on belt track products is one of my career high points that I look back on with satisfaction."

Paul Corcoran, Engineering Manager
Caterpillar, Inc.
Peoria, Ill.

1987

ColorSort®
Key Technology, Inc.

Employing an innovative opto-mecharo-in-line optical inspection, the ColorSort® system performs handling, vision, computer, human interface, and defect-removal components, which allow viewing of a moving product stream from several angles with multiple spectral response. The system reduces dependence on manual labor, increases processor flexibility, and enhances end-product quality.

"Key Technology's ColorSort® was used by food processors who processed and packaged a wide variety of products including fruits, vegetables, and nuts. It reduced labor costs, increased plant throughput, and improved overall product consistency and quality.

"In 1991 ColorSort®II was introduced, which provided customers with a smaller machine, capable of handling larger capacities and more types of product and offering improved reliability. By the end of its era five years later, there were nearly 180 ColorSort®II systems in the field.

"In 1995, Key introduced a significant technological advance called Tegra®, which replaced the ColorSort® optical sorting systems. The electronics and software that made up the vision system of Tegra took sorting a generation beyond ColorSort® by identifying shape defects in addition to color defects. The Company still offers its Tegra sorters to customers around the world, and its sorting product line also includes Optyx® sorting systems, which offer laser technology to detect foreign material and defects.

"Twenty years after the AE50 award, Key continues to develop process automation innovations and sorting technology advancements."

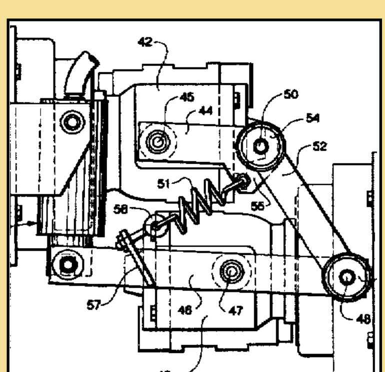
Anita Funk
Corporate Communications Manager
Key Technology, Inc.
Walla Walla, Wash.

1995

On-the-Go Two-Speed Shift
New Holland North America

The on-the-go two-speed shift gives operators of the New Holland Super Boom™ skid-steer loader (Model Lx885) the ability to shift from high to low range with fingertip control by touching a switch on the right-hand operator handle, activating the hydraulics which control the system even at the loader's 12-mph top speed.

"Prior to this invention, one of the large New Holland Skid Steer Loader models had a manually controlled linkage to shift from low to high speed. This invention replaced the manually controlled linkage with an electric switch to shift the linkage hydraulically. The switch was placed on the ground drive control handle thus allowing on-the-go shifting between low and high speed. The feature was well accepted in the market place and has been a popular option.



"This design was in use on larger New Holland skid steer loaders until October 2004. After that, the design was changed by integrating the two-speed shifting into the hydrostatic drive motors."

Dave Heitmann, Engineering Manager
CNH America LLC
New Holland, Penn.

1996

Perfection Milk Meter
BouMatic

This milk meter is an accurate, compact, full-flow milk meter designed for individual cow milk production recording. It is an integral part of the automatic detacher, which removes the milking cluster from the cow. The meter contains only one moving component and has no wearing parts, designed for ease of service and for clean-in-place washing.

" ... A REPRESENTATIVE SAMPLING THAT ILLUSTRATES THE INGENUITY ENGINEERS AND OTHERS USED TO DEVELOP PRODUCTS THAT SAVE PRODUCERS TIME, COSTS, AND LABOR WHILE IMPROVING USER SAFETY."

"Since its development in 1996, BouMatic's Perfection 3000 Milk Meter has remained unchallenged as the most accurate milk meter in the dairy industry and has helped secure BouMatic's position as a leader in high performance dairy equipment design and development.

"The feature-rich Perfection 3000 Milk Meter operates on vacuum and atmospheric air rather than a motor. It has just one moving part, thus maintenance is reduced. It is compact, yet its large output will keep up with the highest producing cows. It measures milk yield, milk conductivity, provides a fast, accurate milk sample and it measures the duration of milkings to help monitor parlor throughput.

"The unrivaled Perfection 3000 Milk Meter remains a key component of BouMatic's current dairy herd management system."

John R. Mansavage
Marketing Communications Director
BouMatic
Madison, Wis.

1998

Sand-Manure Separator
McLanahan Corporation

Separating 90 percent of bedding sand from manure before it is added to long-term storage, this separator facilitates environmentally sound application methods employing techniques from the aggregate processing and wastewater treatment industries.

"McLanahan Ag Systems Division has received two AE50s: one in 1998 and one in 1999. Each of the machines are 'very much' still on the market and actively being sold worldwide. There are about 100 Sand-Manure Separator Systems (1998 AE50) and 50 Stall Filler units (1999 AE50) in operation. Both have significantly affected dairy design and management. The Separators continue to have the most impact since these systems make it possible for dairy producers to bed cows on sand while at the same time use advanced manure treatment systems such as anaerobic digesters. In addition

to producing a near sand-free manure discharge, the system produces sand clean enough to recycle as bedding."

Andrew W. Wedel, Division Manager
McLanahan Corp.
Hollidaysburg, Penn.

2002

HarvestForm™
John Deere Harvester Works

As alternatives to the petroleum-based SMC and RIM materials for styling panels, a portion of the petroleum-based polymer in HarvestForm™ is replaced by a soybean- and corn-based polymer. Using renewable resources expands the markets for farmers while performing the same as traditional materials, as well as providing advantages over steel styling. Panels can be painted with an automotive-like finish; rust and denting are eliminated; and part count, weight, and assembly variation are reduced.

"The use of HarvestForm started in production in 2001 with the 50-series combines and continues today with the 60-series.

"Since that time, tractor hoods for the 5000- and 9000-series tractors now use HarvestForm™ SMC materials, as do other products in the agricultural equipment industry.

"This ground-breaking project with the United Soybean Board, John Deere, and its suppliers was initiated to demonstrate the commercial viability of materials based on renewable resources."

Jay H. Olson
Polymers Technology Manager
Materials Engineering
Deere & Co. Corporate Engineering
John Deere Technology Center, Moline, Ill.

2003

Techmark Pocket IRD
Techmark, Inc.

The Techmark Pocket-IRD Handheld interface software and hardware allows for the automatic synchronization of impact data and location from the IRD and provides instant viewing of the data. Immediate feedback on location and intensity of impacts allows users to quickly identify and correct produce-handling equipment. Data can be uploaded from a flash memory card to a PC. Verbal and written notes can be added.

"The Techmark Pocket IRD Handheld kit has simplified the analysis of post-harvest produce handling equipment by identifying the damage potential to various fruits and vegetables quickly and efficiently. It is currently being marketed in an updated version."

Todd Forbush, Engineer

"Since the IRD Handheld's inception in 2002, our customer base has grown from local U.S. produce growers and packers to worldwide distribution in the produce pndustry. Sales of the IRD Handheld have tripled and requests for information are coming from all corners of the globe."

Bob McGill, Inside Sales/Marketing
IRD & IRD Handheld Division
Techmark, Inc.
Lansing, Mich.

2004

Impellicone
CDS - John Blue Co.

Impellicone is a flow-dividing manifold that evenly distributes an hydrous ammonia (NH_3) to multiple rows across an applicator. It is a self-powered unit that uses an impeller-shaped needle to evenly mix and distribute the two phases (liquid and gas) of NH_3 to multiple outlets. It allows the user to operate across a broad range of applications rates and the ability to block ports according to machine size with no sacrifice in accuracy.

"The Impellicone was a collaborative research project between Iowa State University and CDS-John Blue Co. The final design for market hit the target and has been very successful surpassing all original volume expectations as a result of is quick acceptance by Original Equipment Manufacturers and after-market distribution.

"The Impellicone continues to yield excellent performance and is offered for sale with no plans for change."

Kent Jones
Director of Engineering
CDS-John Blue Company
Huntsville, Ala.

Number of ASABE members by country

Country	Members
Albania	1
Argentina	18
Australia	79
Austria	5
Bahamas	1
Bahrain	1
Bangladesh	4
Belgium	19
Belize	1
Benin	1
Botswana	2
Brazil	48
Brunei	1
Cameroon	2
Canada	824
Chile	4
Colombia	8
Costa Rica	5
Cote d'Ivoire	1
Croatia	1
Cyprus	2
Czech Republic	2
Denmark	17
Ecuador	3
Egypt	20
El Salvador	1
Ethiopia	1
Finland	11
France	17
Germany	40
Ghana	12
Greece	13
Grenada	1
Guatemala	1
Guyana	1
Honduras	2
Hungary	7
India	104
Indonesia	12
Iran	10
Ireland	18
Israel	23
Italy	46
Jamaica	1
Japan	132
Jordan	3
Kenya	5
Laos	1
Latvia	3
Lebanon	7
Lithuania	2
Luxembourg	1
Malawi	1
Malaysia	32
Mexico	26
Moldova	1
Mongolia	2
Morocco	1
Mozambique	1
Nepal	3
Netherlands	28
New Guinea	1
New Zealand	20
Nicaragua	1
Nigeria	89
North Korea	1
Norway	4
Oman	5
Pakistan	11
Panama	1
Peoples Republic of China	62
Peru	7
Philippines	12
Poland	9
Portugal	11
Russia	1
Saudi Arabia	10
Senegal	1
Serbia and Montenegro	1
Sierra Leone	1
Singapore	1
Slovak	3
Slovenia	1
South Africa	22
South Korea	60
Spain	41
Sri Lanka	4
Sudan	2
Swaziland	3
Sweden	11
Switzerland	1
Syria	3
Taiwan	36
Tanzania	2
Thailand	16
Trinidad and Tobago	5
Turkey	24
Uganda	8
Ukraine	1
United Arab Emirates	4
United Kingdom	38
Uruguay	2
United States	6,798
Vietnam	4
Yemen	1
Zimbabwe	4

Where We Live

AFTER 100 YEARS, ASABE MEMBERSHIP

SPANS THE GLOBE IN 107 COUNTRIES

Standing the Test of Time

Looking Ahead to the Next 100 Years

What will the next 100 years hold for ASABE and its members? How will things be different in 2107? What will be the role of agricultural and biological engineers? Will ASABE still be going strong? Will the profession survive?

The next 100 years will bring remarkable advances in biology and technology as ASABE and its members move forward into the Society's second century. Innovative technologies emerging during this time will affect virtually all aspects of society. Given the ever-increasing reliance on technology, it will be important for engineering and technology capabilities to keep pace with scientific advances.

Numerous challenges will face agricultural and biological engineers in the next 100 years. These challenges include feeding a growing world population, managing natural resources, providing safe food, and increasing renewable energy sources.

The next 100 years will also offer great promise and an exciting time for the profession and the Society in meeting these challenges. The process of innovation will require well-educated agricultural and biological engineers along with high-level research to provide the impetus for future product innovations.

Several ASABE members and others take a futuristic look into the role agricultural and biological engineers, as well as ASABE, will play in the next 100 years.

According to Nobel Peace Laureate **NORMAN BORLAUG** and his associate, **CHRISTOPHER DOWSWELL**, biotechnology will provide great benefits in meeting future food and fiber needs. Two problems they foresee in feeding the world is producing enough food and distributing that food equitably. Another challenge for the profession will be the need to develop and apply technology that increases crop yields in an economically and environmentally sustainable way.

Genetic improvement, crop management, and water resource development will provide areas for research that will impact the next 100 years. They also note that commercial adoption of transgenic crops has been one of the most rapid courses of technology diffusion in the history of agriculture.

ALEX McCALLA, former director of the Agriculture and Natural Resources Department of the World Bank, says the first challenge facing world agriculture is to produce enough food to feed the growing world population, which he states could reach 8 billion people by 2025. He notes nearly all of the population increase will be in developing countries. According to McCalla, the food production challenge ahead is not small or easy. It requires increasing the productivity of complex, low-yielding farming systems in ways that do not damage natural resources or the environment.

The second challenge is to develop technologies, policies, and institutions that contribute to unleashing agriculture's full potential as a growth engine. This will require access to both domestic and international markets.

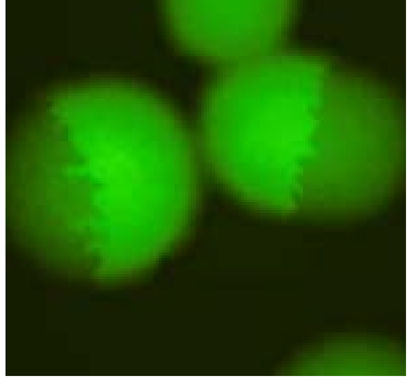
The third challenge is to create a set of technologies, incentives, and policies that encourage small-scale farmers to want to pay attention to the long-run stewardship of the natural resources they manage. Agriculture, McCalla states, uses more than 70 percent of the world's fresh water.

How can these challenges be met? McCalla offers four ways: 1) developing sustainable production systems capable of doubling output, an unprecedented challenge for agriculture and biological science; 2) putting into place domestic and international policies and institutions that do not discriminate against agriculture and that provide incentives to farmers worldwide; 3) investing in public agricultural research and building stronger partnerships with the private sector to tap the enormous potential of molecular biology; and 4) removing distortions to more free agricultural trade.

ARTHUR T. JOHNSON, P.E., University of Maryland, says innovation will follow technology. By 2050, he says, ASABE will increase in international influence. He predicts that the Society will see the first non-U.S. citizen ASABE president and that the location of ASABE headquarters will change. He also sees strong U.S. support for healthcare research, including prevention research. That is an opportunity for ASABE, he notes, to make known the impacts member activities have on human health, nutrition, and sanitation.

The world of outer space will also provide future opportunities for agricultural and biological engineers. According to **ARTHUR A. TEIXEIRA,** P.E., University of Florida, researchers are continuing to look at ways to grow crops on planet Mars. NASA is on a mission to send astronauts to Mars

Solar electric propulsion is one of the many new technologies on the horizon. ***(Photo courtesy of NASA)***



These bacteria were designed using systems biology approaches. In the future, systems biology will see an increased integration of engineers with molecular biologists to develop genetic engineering as a field grounded in design. (*Photo courtesy of Mark Riley)*

Feeding a growing world population will require the expertise of agricultural and biological engineers. *(Photo courtesy of Allen Rider)*

to establish a planetary base – a mission that would take at least three years. What do you feed astronauts during such a journey? Researchers are conducting trials to determine which crops can grow in greenhouses on Mars and hydroponically on the space shuttle, says Teixeira. NASA supports research in the field of food and agricultural engineering to help design the systems that could be used for life support and to support the astronauts on a manned mission to Mars.

ROBERT C. LANPHIER III, AGMED, Inc., says the next 100 years will encompass four areas: tractor power, chemicals, instrumentation, and genetic engineering. He predicts the future will impact six areas: waste, nutrition, growth medium, energy, water, and space. Lanphier projects that waste will be minimized and become a source of energy. He believes energy will be renewable and site-specific and that water will involve sub-surface trickle irrigation. New technologies that Lanphier sees on the horizon are genetic engineering, artificial intelligence, and solar-electric propulsion. The important change, Lanphier states, will be qualitative, not quantitative.

MARK R. RILEY, University of Arizona, predicts that developments in medicine and agriculture will go hand in hand. Where technology and life converges, issues of safety become paramount. The approaches used to address the challenges of generating food, fiber, and biological products will benefit greatly from the convergence of genetic and computational tools at the hands of broadly trained, enthusiastic, innovative, and creative engineers.

Several factors will impact agricultural and biological engineering 100 years from now, says Riley. Systems biology will connect ag systems analysis with genomic and proteomic measurements. This will entail developing engineering models about how a biological system functions at the molecular level. Biologists are looking at the pieces, he notes, but agricultural and biological engineers look at the whole, integrate the parts, and aim to make something useful.

As biology becomes a form of information technology, agriculture then becomes applied information technology. Agriculture and medicine are likely to develop in a parallel path. For example, personalized medicine, based on an individual's own genetic and phenotypic makeup, may be the foundation for the next advance in health care. Similarly, site specific organisms, such as plants, will be designed and management practices optimized specifically for a location based on soil types, light levels, water quality, climate, etc. Growing seasons will be decreased in time so that, perhaps, multiple crops per year will be feasible. Crop disease will be greatly diminished, sensitivities to inclement weather decreased, and yields increased in a more predictable manner. The just-in-time approaches used in engineering design will be better integrated into food production on a local level.

WILLIAM T. LAWSON, CNH America, predicts the next 100 years will witness a huge shift in the how and the who in regards to energy production. About 30 years ago, Brazil decided to become energy independent and recently met that goal, notes Lawson. When visiting some of the large sugar cane farms in Brazil, one gets more of an impression of visiting an oil refinery than a farm. In essence, you are visiting both, says Lawson.

Brazilian producers have the ability to produce sugar or fuel alcohol depending on the market at the moment. With a little ingenuity, the United States could also produce a large amount of renewable, sustainable energy by looking at new crops specifically grown for their energy potential.

The possibilities are also great worldwide. Only 15 percent of the arable land in South Africa is currently being used. Countries across the African continent have a similar abundance of land. Partnerships are being considered in places that have little land with those countries that have the agricultural resources to provide renewable forms of energy. In the end, says Lawson, farmers become the new oil barons. There are not many people who even thought that possible less than 10 years ago.

How cattle are fed could greatly change in the future. *(Photo courtesy of USDA-NRCS)*

Water will become an even more scarce natural resource during the next 100 years. Water management will be crucial to feeding the world's population. *(Photo courtesy of USDA-NRCS)*

People will have "chips" implanted in their bodies to monitor medical conditions. *(Photo courtesy of Allen Rider)*

JERRY L. WILLE, P.E., Curry-Wille and Associates, predicts food shortages in animal protein and other produce. These shortages will cause a rise in prices allowing producers to concentrate on quality and animal welfare instead of profit margins. Consumers will also become more demanding of quality and animal welfare causing a change in production methods.

Plant and animal agriculture will become more harmonious with human housing and the overall planet. Environments and animals will be created that do not generate odor, and livestock will be housed in the same area as people. As land space becomes a premium, this cohabitation will become a necessity, but will also provide benefits from energy conservation, food quality, housing materials, etc.

Increasing technology will allow communication with plants and animals to create desired feeds and environments. True animal welfare will be defined by the animal instead of human perception of what the animal desires. This technology will further allow plants and animals to modify the environment.

New and synthetic materials will be created from byproducts to build facilities that don't deplete natural resources and are better suited for housing. Buildings will be created from animal manure that has been converted into plastics or into facilities that biodegrade after a set life cycle. Manure will become a commodity and will also be used for crop production, energy, nutrients, and other products. All of this will be done without odor or potential pollution.

Animal feeds will be grown and produced that can be consumed without processing and won't require special storage environments, reducing costs. Feed energy within the grain will be more available and the animals will be more efficient in converting it to animal protein with less passing through the digestive system and less manure production.

Future technology will allow higher quality food, more compatibility with the surroundings, less land, less inputs, and no wasted byproducts. The old adage in the pork industry of "we use everything except the squeal" will be expanded to include manure, the metabolic heat production, and respiratory gases.

R. WAYNE SKAGGS, P.E., North Carolina State University, predicts that by 2107 many countries around the world will have already experienced severe water shortages. Estimates based on current projections of population increases and water availability indicate that a large part of the African continent, the Mideast, and Far East, including India and China, will experience severe water scarcity (less than 50 L of clean water per person per day) by the middle of this century. Such shortages are projected to affect more than 4 billion people (45 percent of world population by that time).

Water shortages in parts of nearly all countries will require development and application of efficient methods to manage water. The problem will likely be exacerbated by climate change, making shortages worse in some regions and problems of excess water more severe in others. New technologies for desalting water and the renewable energy sources to drive them will be common by 2107. Agricultural and biological engineers knowledgeable in water science and engineering with expertise in irrigation, drainage, hydrology, and water management will be in great demand through the foreseeable future.

NORMAN R. SCOTT, Cornell University, predicts the world of 2107 will include renewable energy, sustainability, and nanobiotechnology – a technology that has the potential to revolutionize agriculture and food systems. He sees a convergence of nanotechnology, biotechnology, information technology, and cognitive science dealing with neurons. Materials behave differently at the nanoscale, says Scott, because that is where the essential properties of matter are determined. Molecular manufacturing can be used to fabricate food, molecule by molecule, rather than growing it. Since food is a combination of molecules, it is conceivable that by 2107 the world will be engineering foods, molecule by molecule, by mass production to meet the nutritional needs of a hungry planet.

In addition to food production, agriculture is also a major source of natural raw materials for bioproducts and bioenergy and thus, a significant engine to drive our transition to a sustainable world, states Scott. By 2107, worldwide energy needs will be provided from a suite of renewable energy resources, principally biomass, wind, and solar, with a significant amount from hydroelectric power, predicts Scott. The biological and environmental engineer, says Scott, will be the driver of, as General Electric now states – ecomagination!

Scott also envisions sustainable communities of 50,000 persons who live, work, and play in an environment where energy requirements are met by renewable sources of wind, solar, geothermal, and biomass; where most of the population's food requirements are met; and where management of the buildings' waste minimizes the buildings' impact on the environment and implements a sustainable integrated system. The integrative and systems skills of biological and environmental engineers will be challenged and exploited to create major sustainable communities that create a new paradigm for working, living, and playing.

There will continue to be agricultural and biological engineers in the next 100 years, says **JAMES H. DOOLEY,** P.E., of Forest Concepts. He says advances in information technologies and automation of historic engineering tasks will enable a continuous shift of work from engineers to technologists and lay persons. He predicts the status of engineers will rise and fall like the tide. In his opinion, the profession and networking will become seamlessly global using the area of standards as an example. He states that global social networks will dominate local networks, and that capitalist commercial competition and free communication competition will exist. It will become a question of who pays and who benefits.

Water, energy, and technology are the key issues in the near future that will impact the next 100 years, says **ALLEN R. RIDER,** P.E., of RGC. He predicts animals won't be the only ones having ID markers; people will also have "chips" implanted in their bodies, not only to identify but also to monitor medical conditions. ASABE has a super heritage. Its members in the agricultural and biological engineering profession will help people determine how society lives.

JOEL L. CUELLO, P.E., University of Arizona, says two important developments occurring today will inexorably define the next 100 years. The first is global climate change. This change successfully adapts our consciousness to the paradigm that, even though we are divided by ideologies, culture, and politics, we are nonetheless unified globally by our communal dependence on the global resources of life – soil, water, energy, and the various biological resources and processes.

The second development is the unprecedented, and still growing, access to information and communication anywhere, any time, in any format, which successfully adapts our abilities, not only to localized sustainable engineering solutions but ultimately to the design of globally integrated sustainable engineering solutions. In addition, sustainable engineering solutions in the future can no longer afford to be part and parcel. To be workable and effective, solutions have to be globally integrated. ASABE technical divisions are already heading toward this goal. All emerging fields of study, e.g., biosensing, synthetic biology, bionanotechnology, etc., must also be working toward this same goal. Cuello says agricultural and biological engineering – the engineering profession for the global resources of life – will play a leading role in designing the globally integrated, sustainable engineering solutions that the next 100 years will demand.

OTTO J. LOEWER, P.E., University of Arkansas, predicts the next 100 years will be defined by three periods characterized by chaos, reallocation, and finally, peace and stability. These periods will be created by interactions among technology, economics, and societal values. Technology is the driving force for changes in economics. Economics is the driving force for changes in societal values. Societal values shape the driving forces for changes in technology. Thus, in the next 100 years, the changes in societal values and variance will greatly alter future investment in technological wherewithal.

Two key issues for the future, says Loewer, include substituting renewable resources for essential non-renewable resources and the possibility of irreversible environmental damage. By 2107, predicts Loewer, material prosperity will be slightly higher; environmental health will have improved; there will be less difference between developed and developing societies; and less expectations from technology. The role of the agricultural and biological engineering profession in the next 100 years will be to provide the engineering for the necessities of life: human consumables, process productivity, and environmental health. For the profession to survive and prosper, Loewer says agricultural and biological engineers must embrace a core identity that separates the profession in the engineering marketplace and makes agricultural and biological engineering relevant to solving the many problems that will confront society during the next 100 years.

The Future is Here

In the next 100 years, technological changes will continue to revolutionize the globalization of the marketplace. With an ever-increasing population, the future will become even more challenging than the past. Agricultural and biological engineers will continue to fill crucial roles in providing a viable and sustainable agricultural future to feed the world.

As an international Society, ASABE will continue to provide a foundation for members to communicate globally to meet challenges, foster education, and advance engineering standards. In 2107, the Society will still be as dedicated to the advancement of engineering applicable to agricultural, food, and biological systems, including the environment and natural resources, as it is today.

The need for an exchange of views and techniques was a driving force behind the founding of the Society. J. B. Davidson, ASAE's first president, said in 1908:

"I am firmly convinced of the importance and need of our work; then let us devote ourselves with all zeal to promote the interests of the ASAE to aid our profession in every way possible, and to benefit the world to the greatest degree."

Those words were true then, are still true now, and will continue to stand the test of time throughout the Society's next 100 years.

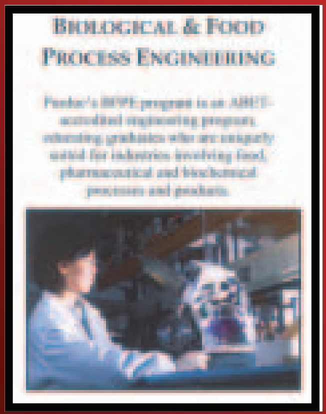
PURDUE UNIVERSITY

Agricultural & Biological ENGINEERING

Machine Systems

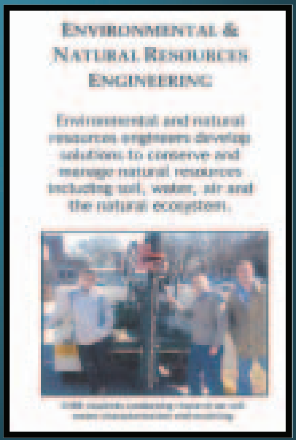
Machine Systems Engineering
Mechanical Design
Construction & Mining
Food & Fiber Production
& Processing

Biological & Food Process Engineering
Food Plant Design
Product & Process Development



Biological & Food Process

Preparing students, citizens, and industry for the future...



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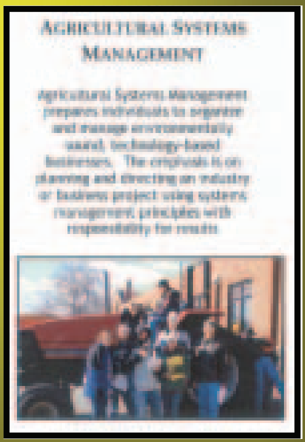


Agricultural Systems Management

Department of Agricultural & Biological Engineering
Purdue University
225 S. University Street
West Lafayette, IN 47907-2093
765 494 1172

Headlines and E-mails from 2037 and Beyond

In the year preceding the centennial, the *Resource* staff was challenged to develop the materials that revere the past, celebrate the present, and *envision what the years ahead might hold* for ag and bio engineering, the Society, and the global world at large. Intrigued by Web sites encouraging users to imbed an e-mail in cyberspace for delivery 20 or 30 years hence, we invoked the creativity and clairvoyance of ASABE membership and staff. Our quest: media headlines and/or e-mail subject lines for the year 2037. We encouraged future-gazers to "wave their wands over crystal balls" and peer into the "cauldrons of their computer screens" to decipher the decades ahead.

WIZARDRY IS HARDLY AKIN TO HIGH-TECH VISION …

… but it happened nonetheless. Like magic, scores of forward-looking headlines and subject lines appeared in our inbox – all engaging predictions of "what is to come."

David Gregor declared:

- Ag and Bio Engineers Save the World!

This headline potential for 2037 even included fantasy text about an ingenious "nano-bio" machine with world-population-control capabilities.

Marybeth Lima at Louisiana State University deemed the challenge worthy of an assignment for her BE1252 students. They didn't disappoint her (or us) with their confident, hopeful expectations for a healthier future:

- Living Artificial Limb Developed
- Human Heart Grown in Petri Dish
- AIDS Vaccine Developed
- Cancer Eradicated: End of 21st Century Plague
- Drive-through Doctors' Offices

OPTIMISM FOR A SAFER, EVER MORE INTERESTING WORLD OVERFLOWED IN PROJECTED NEWS ITEMS:

- Ozone Depletion Reversed
- Global-warming Flood Restoration and Prevention: North and South Poles' Containment Walls Construction Begins
- Hurricane Ryan the Ultimate Test: New Orleans Levees Prove their Strength
- Vehicle Programmed by Fingerprints: Car "Knows" You and Navigates Destination

SOME LAMENTED OUR CONTEST.

Allen Zimmerman echoed French critic Paul Valery: "The trouble with our times is that the future is not what it used to be." But nonetheless, Zimmerman emphasized an ever-expanding, worldwide, and continuing focus on:

- Green, Greener, Greenest

OTHERS EVEN SCOFFED.

John Cundiff quibbled, "A wise man would never write a headline or an article that 'predicts' the future, but why should that stop me? I'm one who missed getting rich on the Internet! I foresee an issue that will significantly impact rural America: the cost of transportation … rural America is most vulnerable in the years ahead. We will see:

- Benefits of Containerization Extended

"Containers filled with fertilizer and supplies will return from the field/forest filled with stored commodities. 'Returning empty' will just be too expensive."

Gene Giacomelli summarized in short order: "We all have to eat. Fresh food products will have to be produced with less energy per unit product, less water per unit product, with a high level of security, maintaining high quality, but I predict there will be:

- New 'Crops' Grown for Food and Phytochemical Byproducts of Plants: Vaccines, Nutraceuticals, and More

Giacomelli would, no doubt, agree with Joel Cuello's submission, which echoes the Society's centennial tagline – "Engineering for a Sustainable Tomorrow" – and introduces our selection of visionary winning entries below. Cuello's future-view summarizes in succinct, repetitive fashion just about all global citizens' concerns for the future of the planet:

- Top Three Burning Issues for the Next 30 Years: *Sustainability, Sustainability, Sustainability!*

AND THE WINNERS ARE …

Internal Combustion Engine Obsolete Kurt Rosenstrater

Animal Farm Governed by Intelligent Pigs Glenn Laing

Self-propelled Combine Goes on Rampage: 12,000 Acres Threshed Glenn Laing

Cyclops Robot Shepherds Livestock Jeremiah Davis

Bioengineered Plant Proven to Produce More Ethanol Per Acre than Corn, Soybeans, Sugar Cane, or Any Other Jimmy Butt

Where Have All the Glaciers Gone? Echo Casey

Navigation Satellite Fails, Young Farmers Touch Tractor Steering Wheels for First Time Rafael Garcia

Desktop Farming Results in Significant Health Benefits for Farmers Matt Kronlage

Crops Irrigated with Water Condensed from the Air Orville H. Pattison

Crops Imported from Mars Troy Davis

Crops Planted in Containers with Open-Ocean Agriculture Patrick Coco

Aquaculture Makes a Splash

Research is Key to the Future of Fish Farming

The ancient profession of fish farming, or aquaculture, has been around for 4,000 years. Now, in the 21st century, aquaculture has become one of the fastest growing areas of farming. This growth is due to increasing consumer demand for fresh, healthful fish and seafood, along with decreasing supplies of natural fish.

Aquaculture accounts for nearly 50 percent of the world's food fish, according to the Food and Agriculture Organization of the United Nations. Given projected population increases, however, the growing supply of farm-raised fish may not be sufficient to meet future demand.

The global aquaculture industry is valued at nearly $50 billion, reports the USDA-Agricultural Research Service (USDA-ARS). Most of the world's farm-raised fish are produced in Asia — 70 percent from China alone. Although U.S. production is expanding, the United States ranks only 10th in the world in aquaculture.

The aquaculture industry faces a daunting array of challenges including disease, production costs, and diminishing stocks of ocean fisheries which compels the industry to seek alternative sources of protein to feed farm-raised fish, competition for water sources requiring production systems, and practices that minimize water use. There are also concerns about water quality and discharge of wastes into the environment.

Research is the key to meeting these 21st century challenges, notes the USDA-ARS. Agricultural and biological engineers are advancing aquaculture by designing farm systems for raising fish and shellfish as well as ornamental and bait fish. Their expertise in water quality, biotechnology, machinery, natural resources, feeding and ventilation systems, and sanitation is advancing aquaculture by reducing the potential for disease, polluted discharge, and water usage.

Research in the aquaculture industry is already making a difference. A prototype recirculating production system for cultivating cool- and cold-water fish to reduce water consumption and waste discharge has been designed and built by researchers. A new catfish line with improved feed consumption and growth has been developed and released to growers.

Scientists are working to discover safe, efficient ways to convert byproducts of fish processing into nutritious components of aquacultural feed. This conversion will have the added benefit of reducing the industry's dependence on natural fisheries' stocks as sources of protein for farm-raised fish.

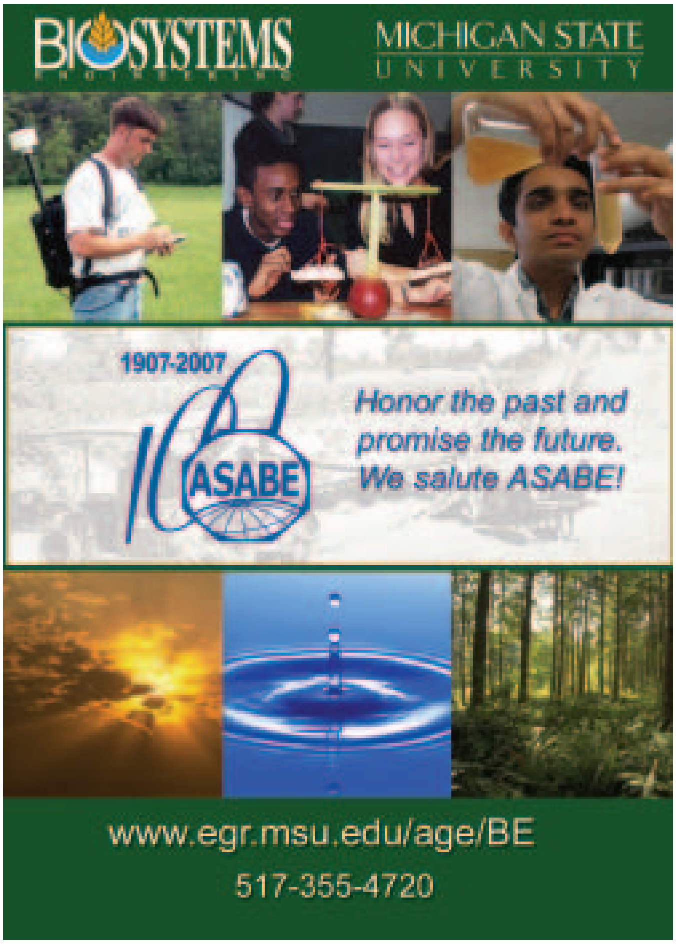
Other research is being conducted to develop genetically enhanced barley and oats as nutritious, low-polluting feed sources for rainbow trout and to genetically enhance the trout to effectively use these new feed sources. The anticipated result: new feeds that lessen dependence on fish-derived feeds and significantly reduce discharge of phosphorus, from fish manure, into the environment.

According to the USDA-ARS, aquaculture will be the most likely source of food fish in the 21st century.

With increasing seafood demand and declining capture fisheries, global aquaculture production will need to increase 500 percent by the year 2025.

With increasing seafood demand and declining capture fisheries, global aquaculture production will have to increase by 500 percent by the year 2025, to meet the projected needs of a world population of 8.5 billion.

Research in the aquaculture industry will provide the key to enhancing production efficiency, sustainability, and the quality of farm-raised fish, not only for today, but for many years to come.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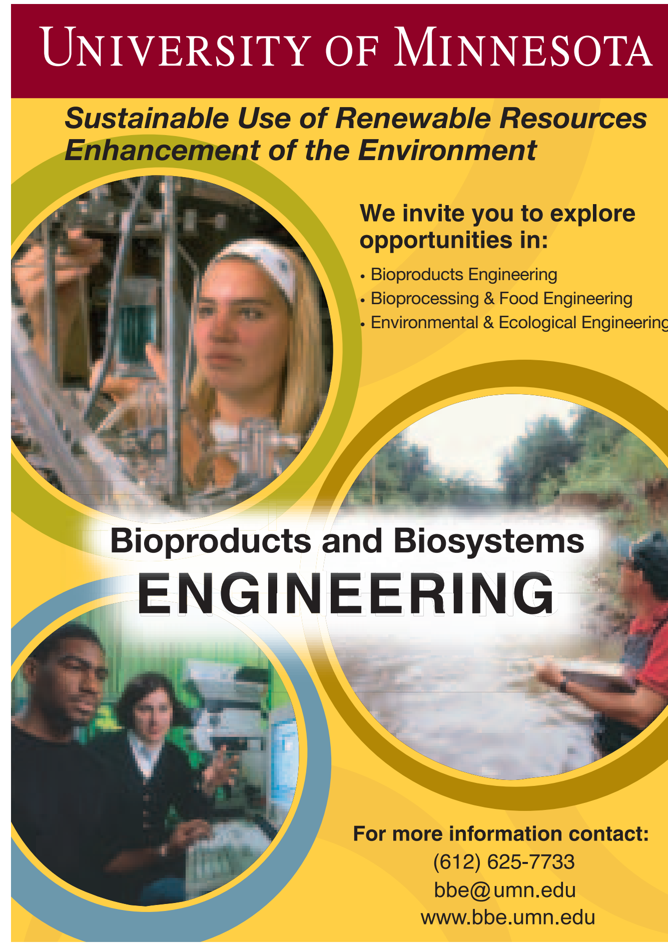
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Resource Through the Years

The Society's member magazine has seen many changes since its debut in 1920 with the title *Agricultural Engineering*. In 1994, *Agricultural Engineering* magazine and the *Within ASAE* newsletter came together in a new membership publication called *Resource: Engineering & Technology for a Sustainable World.*

In I998, a career issue called *Discover: futures in agricultural, food, and biological engineering* was published. *Explore,* an issue highlighting careers in agricultural technology and systems management, followed in 2000.

Enjoy a look back at the magazine covers through the years.

We're 100!

1907-2007

ASABE Centennial Gala Banquet

Tuesday, June 19, 2007, 7:30 p.m.

Ballroom A, Minneapolis Convention Center

Award-winning cuisine

ASABE luminaries and landmark events

Guest Speaker Harold Brock

Tickets $50*

*Crystal centennial commemoratives.

Tax and gratuities included.

Before completing your meeting registration ... reserve your place at the table. Be sure to R.S.V.P.!

While other events during the Annual International Meeting will also highlight the 100th anniversary of the Society's founding, this gala banquet promises to be the "can't-miss memory-maker" – one you won't soon forget!

Enjoy delicious fare, festive flourishes, and fête the centennial's camaraderie as you join with hundreds of other members celebrating both the past and future of the profession.

NOTE: There will be a very limited supply of additional tickets available on site. Avoid the disappointment of a "sold-out" experience, and sign up early on your meeting registration form.

For a look at the complete line up of other exciting events scheduled for the ASABE Annual International Meeting, June 17-20, 2007, see the online program and registration details at www.asabe.org.

PERSONNEL SERVICE

Resource is published eight times per year; January 1, February 15, April 1, May 15, July 1, August 15, October 1, and November 15. The deadline for ad copy to be received at ASABE is four weeks before the issue's publishing date.

Advertisements are $125 per column inch length (column width is 3.5 inches) and include free placement on the ASABE Career Center at www.asabe.org/membership/careercenter.htm. The minimum ad size is two inches — approximately 100 words — to qualify for the free online listing. Ads are posted on the Web site within three business days of final approval and remain there for 30 days. If the insertion order is for two months, the cost is $110 per column inch per insertion and includes a 60-day free Web listing.

For more details on this service, contact Pam Bakken, ASABE Personnel Service, 2950 Niles Road, St. Joseph, MI 49085-9659, USA; 269-428-6337, fax 269-429-3852, bakken@asabe.org, or visit www.asabe.org/resource/persads.html.

Department of Biosystems and Agricultural Engineering
Oklahoma State University
Assistant Professor – Bioconversion Engineer (Fermentation)
75% Research, 25% Teaching

Position Description: This individual will conduct research on fermentation processes that convert biological materials to value-added products. Initial focus will be in the conversion of biomass-generated syngas to ethanol and co-products. Additional opportunities are available in fermentation of soluble products resulting from the hydrolysis of lignocellulosic feedstocks. Establish a nationally recognized research program with internal and extramural support. Teach courses in support of the undergraduate Biosystems Engineering degree program, including the areas of bioprocessing and food processing. Actively participate in graduate courses. Work collaboratively with faculty in Biosystems and Agricultural Engineering and other units in the Division of Agricultural Sciences and Natural Resources (DASNR) and the College of Engineering, Architecture and Technology. Opportunity to contribute to an active, multidisciplinary, research and development program in biofuels and to DASNR's bio-based products initiative team.

Qualifications: Earned doctorate in Biological Engineering, Biosystems Engineering, Chemical Engineering, or a closely related engineering discipline (all requirements for the degree must have been met prior to start date). Registered Professional Engineer or eligible to pursue licensure. Expertise required in the engineering aspects of fermentation processes. Experience in the processing of biological materials and the conversion of biomass feedstocks is desirable. Candidates must have excellent speaking and writing skills, an ability to teach effectively at the undergraduate and graduate levels, and a desire to work collaboratively in an interdisciplinary environment.

Employment Conditions: Full-time, 11-month, tenure-track faculty appointment at the rank of Assistant Professor. Salary commensurate with qualifications.

Application Deadline: Screening of applications will begin June 29, 2007. Applications will be accepted until a candidate is selected for the position.

Application Process: Applications should include resume, transcripts, and a list of at least three references with complete contact information. Applications and questions should be directed to

Faculty Search – Fermentation
Dr. Ronald L. Elliott, Professor and Head
Biosystems and Agricultural Engineering Department
Oklahoma State University
111 Agricultural Hall
Stillwater, OK 74078-6016.
Phone: (405) 744-5431; Fax: (405) 744-6059;
Email: ron.elliott@okstate.edu

Oklahoma State University is an AA/EEO Employer committed to Multicultural Diversity.

Associate Research Scientist – Agricultural Modeling

Search Number: LD 670 07 007

The International Research Institute for Climate and Society (IRI) is seeking an outstanding individual with a strong background in modeling crop-climate relationships and excellent analytic skills to advance applied research and provide leadership in the application of modeling to climate risk management for agriculture and food security. The IRI is a catalyst for the creation and provision of science based outcomes that address climate risk. Our approach is based on collaborative partnerships with local, national, regional, international, public and private institutions facilitating the open exchange of ideas, information, and technology between many disciplines and regions. We work in Asia and the Pacific, Africa, Latin America and the Caribbean, to unravel problems that have frequently been discounted as unavoidable consequences of nature.

Working with a multidisciplinary team of scientists, the successful candidate will play a leading role in the development of methodology for modeling agricultural impacts of climate fluctuations; and its application to food production forecasting, decision analysis and decision support. The research will include the development of tools to support the interface between seasonal forecasts and agricultural and ecological modeling. Working with an interdisciplinary team and in coordination with the IRI Regional Programs, the successful candidate will contribute to the development and implementation of projects that apply agricultural modeling to food security early warning, weather index insurance, and agricultural decision support.

Applicants must have a Ph.D. in Agricultural Engineering, Agronomy, Agrometeorology or a related field, and at least two years of relevant postdoctoral experience. They must have a strong quantitative background that includes probability and statistical methods, dynamic and stochastic modeling techniques, and optimization. Applicants must demonstrate understanding of crop ecophysiology and management including crop-water relationships, expertise in the interpretation and application of crop simulation models, and competence in numeric programming in a computer language. Desirable qualifications include experience with analysis and stochastic generation of daily weather data, familiarity with dynamic climate models and seasonal climate forecasting, expertise in GIS applications, and experience with the integration of remote sensing data with agricultural modeling. The successful candidate must be a team player who can work collaboratively within a multidisciplinary and multicultural environment. Excellent written and oral communication skills are required. Successful experience in working in developing countries, and in developing funded projects, is desired.

Columbia University benefits accompany appointment. This position is located in Rockland County, NY at the Lamont Campus of The Earth Institute at Columbia University. Prospective candidates must apply to the Lamont-Doherty Human Resources Department via the IRI website; http://iri.columbia.edu/iri/job/index.html. You will need to provide the following information to apply: contact information; letter of application, including position reference number # LD 670 07 007 statement of career objectives; curriculum vitae; and contact information for three references. Screening of applicants will begin as soon as possible. The intended starting date is 1 July 2007. Columbia University is an Equal Opportunity and Affirmative Action Employer. Women and Minorities are encouraged to apply.

ASSISTANT EXTENSION PROFESSOR
AGRICULTURAL AND BIOLOGICAL ENGINEERING
MISSISSIPPI STATE UNIVERSITY

The department of Agricultural and Biological Engineering at Mississippi State University is seeking applicants for an Assistant Extension Professor position with an emphasis in water resources, water quality, irrigation, watersheds, drainage, nutrient and waste management, and related environmental areas. This a 12-month, non-tenure track 100% extension position. The individual will be the primary extension contact for water related and environmental issues. The individual will be responsible for developing and disseminating extension programs, publications, news releases, teaching and training materials and associated activities. This person will provide statewide educational and subject matter leadership in these areas working with individuals (youth and adult), county extension staff, groups, agencies, industry, and other extension specialists in program support and development. Specific duties and responsibilities include the following: 1) coordinate, develop, and disseminate statewide educational programs in water quality, water resources, and environmental related areas for a wide range of audiences; 2) work with clientele in the state, region and country on water related issues that are important to Mississippi; 3) develop educational materials such as fact sheets, publications, demonstration guides, lesson plans, print and video media, and other related materials for clientele use; 4) conduct in-service training for extension agents and other interested parties; 5) collaborate with other extension and research personnel by addressing water quality, supply, utilization, delivery, and application problems that are pertinent to the state; 6) work with producers, extension agents, researchers, government agencies, industry personnel and other stakeholders in areas pertaining to water resources and related areas; 7) work with other faculty members, in writing grants to obtain extramural funding to support programmatic initiatives; 8) work with youth and extension youth agents in 4-H engineering programs and contests; 9) train extension youth agents in the engineering contest areas or other related areas.

The successful candidate should have excellent communication skills, a strong background in water resources and related areas, a demonstrated record of scholarship, and evidence of the potential to secure extramural funding. A Ph.D. in Biological Engineering, Agricultural Engineering, or other related discipline is required. All but dissertation candidates will be considered. Screening will begin July 1, 2007 and continue until a suitable candidate is found. Applications consisting of a letter of interest, vita, official transcripts and three letters of reference should be submitted to:

Dr. Bill Batchelor, Professor and Head
Department of Agricultural and Biological Engineering
Box 9632
Mississippi State, MS 39762
Phone: 662-325-3280
Email: bbatchelor@abe.msstate.edu

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