

Making the World a Better Place: What the Agricultural-Engineering Professional Organizations Can Do in the New Century to Make Good on Their Age-Old Promise

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It was Bill Ford, Chairman and Chief Executive Officer of the Ford Motors Company, who made the remark that “A good company delivers excellent products and services, while a great one delivers excellent products and services and strives to make the world a better place.” This statement remains strikingly true when adapted to engineering professional organizations, that is, “A good *engineering professional organization* delivers excellent products and services, while a great one delivers excellent products and services and strives to make the world a better place.” But have the few national and regional agricultural-engineering professional organizations around the globe striven properly in the last century to make the world a better place?

The answer is both yes and no. It is yes as attested by the illustrious list of outstanding accomplishments of the profession in the 20th century published in 2000 by the American Society of Agricultural Engineers (ASAE) (Cuello and Huggins 2000). To wit: agricultural engineering has designed and developed technologies that ushered agricultural machineries into the farm; brought electrical power to the farm; conveyed and conserved soil and water resources on the farm; brought post-harvest operations to the farm; brought information technology to the farm; etc. The result was that the profession contributed appreciably in the significant increase in productivity of human labor on the farm, helping achieve the unprecedented spike in food production in the last century. But the answer is also no since despite – or in some cases even *because* -- of the foregoing technical accomplishments, millions of people today remain hungry and the degradation of the environment appears to have worsened. Thus, at the dawn of the 21st Century, the agricultural engineering profession faces up to the burden and the challenges of its significant and unfinished work.

Unintended Consequences

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The achievement of the agricultural engineering profession in the last century of helping raise the global food production is no doubt both laudable and incontrovertible. It is also undeniable, however, that the application, or misapplication, of agricultural-engineering technologies has contributed to inadvertent and detrimental results. These unintended harmful consequences reside within the two domains of the environmental and the social.

Environmental Consequences

First, industrialized agriculture has brought about the long-term degradation of the soil. As reported by the Institute for Food and Development Policy (Lappe et al. 1998), roughly 70% of the 5.2 billion hectares of dry lands used for agriculture around the world are in danger of being turned to deserts. It is noteworthy that more than one billion people in 135 countries depend on this land. Even in the United States, since widespread farming began in the 18th Century, roughly 30% of total land has been abandoned owing to erosion, salinization and water-logging. Indeed, fully one-third of the topsoil in the U.S. has been lost. And just as in the third world, the significant expansion of row crops for export in the early 1970s, primarily corn and soybeans, greatly accelerated soil losses. In the first three years of the export boom, soil erosion in the Corn Belt leapt 39%. Today about 90% of U.S. cropland is losing soil faster than it can rebuild, and over half of the U.S. pastureland is overgrazed and subject to high rates of erosion.

The Institute further reported that soil degradation has been identified as one of the principal reasons why a decline in agricultural yields has been observed. In Central Luzon, the Philippines, for instance, rice yields grew steadily during the 1970s, peaked in the 1980s, and have been falling gradually ever since. Long-term experiments conducted by the International Rice Research Institute (IRRI) in both Central Luzon and Laguna province confirmed these results. Similar patterns have now been observed for rice-wheat systems in India and Nepal. And where yields are not actually decreasing, the rate of growth is decelerating rapidly or leveling off, as has been documented in China, North Korea, Indonesia, Myanmar, the Philippines, Thailand, Pakistan and Sri Lanka.

Second, the liberal application of pesticides has led to the contamination of the environment and continually put at risk human health. The Institute also reported that, with global pesticide use increasing from virtually zero only 50 years ago to 4.7 billion tons a year, at least 6 people are poisoned by pesticides somewhere in the world every minute, and an estimated 220,000 die annually. In the United States nearly 2 billion pounds of pesticides are injected each year into the environment, or over 7 pounds for every American. Not surprisingly, some 300,000 U.S. farmworkers suffer pesticide-related illnesses each year. Estimates of pesticide poisonings in the third world are as high as 25 million people yearly. Worldwide, pesticides now add \$25.5 billion to farmers' costs annually.

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Social Consequences

By the 1970s, industrialized agriculture, with its technology package consisting of irrigation, agricultural machineries, new seeds, chemical fertilizers and pesticides, etc., had replaced the traditional farming practices of millions of third world farmers. Indeed, the production advances of industrialized agriculture have produced tens of millions of extra tons of grain a year, which is welcome news especially in view of the rapidly increasing world population. It should not be forgotten, however, that the global production boon in the last three decades has been realized within the confines of different social, political and economic frameworks for different countries. For each country, these frameworks defined the economic power of groups within its population, particularly their access to land and their purchasing power. Thus, if a group does not have land on which to grow food or the money to buy it, the group goes hungry regardless of how industrialized agriculture has increased food production within that population (Lappe et al. 1998). Thus, it is quite possible to have more food and yet more hunger. It is possible that people are hungry and poor, not because there is not enough rice and corn produced in the world, but because of inequalities – inequalities in access to land and in purchasing power (Lappe et al. 1998). Not surprisingly, despite three decades of rapidly expanding global food supplies, there remain an estimated 786 million hungry people in the world (Lappe et al. 1998). These observations mainly confirmed the finding of Amartya Sen, whose extensive research studies on the famines in Bangladesh, India and countries of the Sahara, had shown that “famines have occurred even when the supply of food was not significantly lower than during previous years” without famines (Sen 1981). Indeed he underscored that, “Starvation is the characteristic of some people not *having* enough food to eat. It is not the characteristic of there *being* not enough food to eat. While the latter can be a cause of the former, it is one of but many possible causes” (Sen and Dreze 1999). Amartya Sen, for his work in developmental economics, was awarded the Nobel Prize in Economics in 1998.

With the foregoing thesis, the Institute for Food and Development Policy concluded that “introducing any new agricultural technology into a social system stacked in favor of the rich and against the poor – without addressing the social questions of access to the technology’s benefits – will, over time, lead to an even greater concentration of rewards from agriculture” (Lappe et al. 1998). As a corollary, it is evident that the application of agricultural-engineering technologies -- given a social framework that heavily limits access to such technologies in favor of the rich -- can very well contribute to *more*, not less, global poverty and hunger. Thus, for the application of agricultural engineering technologies to achieve its desired goal and not the unintended opposite result, the social framework within which the technologies are being introduced cannot be overlooked, but must be deliberately factored into consideration.

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Delivering An Age-Old Promise: Two Approaches

How then do the Agricultural Engineering professional organizations around the world deliver their age-old promise of development – of helping end global hunger and poverty? Clearly the first step is by recognizing and taking responsibility for the fact that their current model of operation is defective and severely inadequate. This current model, the Partial or Narrow Approach (Figure 1), has its almost exclusive focus on technical progress, and presumes that its products and services will always have “good” effects on the customers when released in the open market. (The customers here are individuals, organizations or nations.) With this model, new technologies are continually churned out, but how these technologies actually affect the customers who live within real-world economic, social and political arrangements is conveniently overlooked. This, of course, is both unrealistic and naïve. The market behaves independently of the social values of its participants, and is motivated by profit. “Most businesspeople are upright citizens; but that does not change the fact that business is conducted for private gain and not for the public benefit” (Soros 2000). Thus, only the privileged ones with purchasing power are able to avail of the benefits of the technology products that are released through the market. The open market inevitably widens pre-existing inequalities.

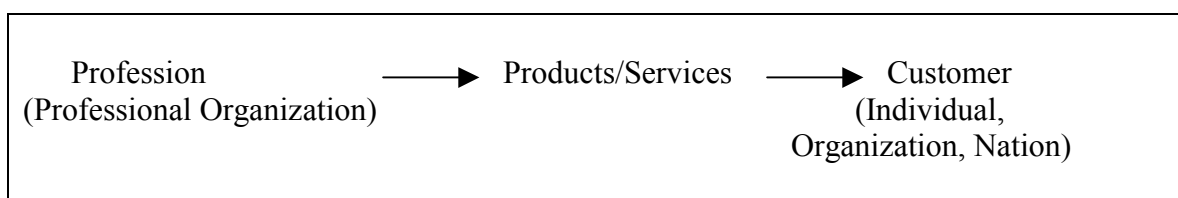


FIGURE 1. The Partial or Narrow Approach, with narrow focus on achieving technical progress.

With what is known now from the last century, it is no longer enough for the agricultural-engineering professional organizations to assume that their technology products will automatically accomplish their intended beneficial ends for their customers. Indeed, the use of these technology products could very well result in the opposite of what is intended to happen – harming, instead of benefiting, the customers. It thus is imperative for the agricultural-engineering professional organizations to rework their model of operation for two reasons: (1) by virtue of their ethical responsibility -- being accountable for their technology products and ensuring that indeed they use “their knowledge and skill for the enhancement of human welfare,” which is the first fundamental principle of the Code of Ethics of Engineers; and, (2) by virtue of their economic responsibility – being faithful to provide total customer care, ensuring that their intended customers (individuals, organizations, nations) actually receive the full value or benefits of their technology products.

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It is high time and also just that the agricultural-engineering professional organizations adopt a comprehensive approach as their new model of operation. The Comprehensive Approach (Figure 2), instead of being narrowly and exclusively focused on technical progress, aims to achieve technical progress in the deliberate service of development. In essence, the comprehensive approach demands two principal requirements from the agricultural-engineering professional organizations: (1) for them to become keenly aware of the long-term effects of their technology products and services on their customers; and, (2) for them to mediate and have a say on how their products and services are used by individuals, organizations and nations to produce the intended beneficial, and not the opposite detrimental, effects.

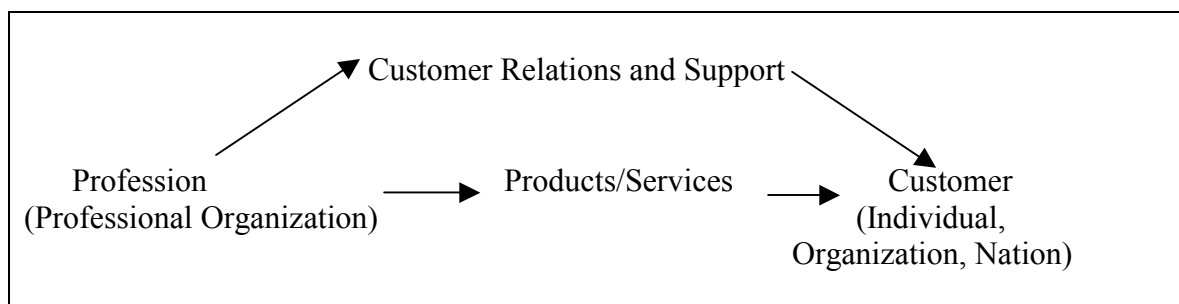


FIGURE 2. The Comprehensive Approach, with focus on achieving technical progress in the deliberate service of development.

The Comprehensive Approach has the following four main thrusts for mediation in the service of development:

1. Monitor and document actual and unforeseen effects of Agricultural-Engineering technology products and packages over time in developed and developing countries;
2. Recommend a comprehensive “best-usage” scenario for an Agricultural-Engineering technology product or package addressing specific needs in developed or developing country. A comprehensive “best-usage” scenario incorporates economic, social, political and cultural factors;
3. Develop specific technology products within the context of a high-level development objective. Example of a specific high-level development objective is how to make life in the rural areas more attractive to help stem urban migration in developing countries. Possible technology may include those applicable toward low-cost housing, water supply and irrigation, etc.; and,

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4. Submit position statements, technical briefings, letters of regulatory comments, and testimonies as needed to pertinent national and international governing bodies and grant agencies relating to the comprehensive “best-usage” of Agricultural-Engineering technology products and packages.

Implementing A Comprehensive Approach

Working out the Comprehensive Approach to enable the Agricultural-Engineering professional organizations to deliver their age-old promise of development to the world must be tackled in the level of the professional organization. This is not meant to be tackled in the level of the individual agricultural engineer. The individual agricultural engineer cannot and should not be allowed to agonize about how the use of the technology products or package that he or she is designing could exacerbate inequities through the open market. Such tendency of the market can only be addressed in the policy level, which must be mediated in the professional-organization level. This is the level at which the social responsibility of the profession is appropriately carried out, and where the collective will and conscience of the profession should be duly expressed and enforced.

The American Society of Agricultural Engineers should charge its Committee for Issues Management and Social Action to carry out the four main thrusts of the Comprehensive Approach. Similarly, each agricultural-engineering professional organization around the globe should establish and put to work a similar committee if one is not in existence yet. Then, the International Commission of Agricultural Engineering (CIGR) should serve as overall global facilitator and mediator, orchestrating the efforts of the various agricultural-engineering professional organizations, especially pertaining to the level of nations. CIGR perhaps should establish its own policy-making House of Delegates, akin to that of the American Medical Association, to consist of representatives from the CIGR member organizations for the purpose of adopting global resolutions in behalf of the profession. In carrying out the major thrusts of the Comprehensive Approach, CIGR should be proactive to engage in continual dialogue such pertinent development institutions as the Asian Development Bank, the World Bank, the Food and Agricultural Organization of the United Nations, etc.

This enterprise will for sure necessitate that the Agricultural-Engineering profession, in the appropriate level of its professional organizations, seek the cooperation of experts from other fields, such as economists, sociologists, development policy-makers, etc. What an excellent way for the profession to demonstrate to its members – both professional and pre-professional – that their contributions do not exist in a vacuum, but become part of larger complex solutions whose success depends on their cooperating and working together with other experts.

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The profession also stands to benefit significantly from this enterprise, including: (1) completeness or thoroughness of the profession's service to its customers; (2) meaningful accomplishment of the ethical and economic missions of the profession, shunning ambiguous and romantic lip service; (3) greater visibility for the profession; (4) excellent real-world and global education and exposure for members of the profession; and, (5) more thorough documentation of the positive and negative effects of the products and services offered by the profession and its members over time in the individual, organization and national levels.

Toward A Great Engineering Profession

On hindsight, perhaps it was neither possible nor advisable for the agricultural-engineering professional organizations to work out the Comprehensive Approach during the last century since: (1) the profession was going through its maturation period; (2) the complex dynamics between technical progress and development were just starting to become manifest; and (3) the necessary interdependence among ostensibly discrete and unrelated disciplines in formulating comprehensive solutions to development problems was only starting to become evident. Today at the beginning of 21st Century, however, a much better understanding of the complex relationships between technical progress and development has emerged, with the grounded realization that a narrow focus on technical progress alone does not necessarily or directly translate to development. What is more, the profession has achieved a robust maturity that it is now ready to cooperate with other disciplines in working out meaningful and effective solutions. The various agricultural-engineering professional organizations around the globe, together with CIGR, are very well-positioned today to choose and practice the Comprehensive Approach. It is this that will determine by the end of another hundred years whether the agricultural engineering profession will have become a great engineering profession, or merely a good one.

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