



United Nations
ESCAP

United Nations Asian and Pacific Centre for Agricultural Engineering
and Machinery (APCAEM)

International Seminar on Restructuring and Strengthening Research and Development (R&D) for Agricultural Engineering

27–28 April 2007, Beijing, China

CONCLUSIONS AND RECOMMENDATIONS

The United Nations Asian and Pacific Centre for Agricultural Engineering and Machinery (APCAEM) organized an *International Seminar on Restructuring and Strengthening the Research and Development (R&D) for Agricultural Engineering* in Beijing, China from 27 – 28 April 2007. More than 50 experts from the Ministry of Agriculture, Agricultural Research Institutes and Academia, Agricultural Machinery Associations and the Private Sector from 11 member countries participated in the Seminar. The participants reviewed the current status of R&D on Agricultural Engineering (AE) in the region, exchanged ideas on how to restructure and strengthen AE R&D in line with the rapid development of science and technology, and cater to the needs of rural farmers in the developing member countries in the Asian and Pacific region.

During the Seminar, APCAEM presented its major findings and four reports by international experts, and the current status of AE development in Select Member Countries; restructuring R&D of AE in China; a Case Study on China's Restructuring in Science and Technology System; and an Overview Report. Nine country status papers were also presented by invited experts from select member countries of Bangladesh, India, Indonesia, Pakistan, the Philippines, China, Republic of Korea, Sri Lanka, and Thailand.

During the concluding session, the participants focused on policy recommendations, strategy and programme formulations for strengthening and restructuring agricultural engineering and technology. The session noted the R&D should be environmentally friendly, sustainable and socially & economically-viable. Doing so will enable effective delivery of R&D services in poverty alleviation through rural development by the agricultural engineering and technology institutions of the region. The conclusions and recommendations are summarized as follows:

1. The majority of developing countries in the Asian and Pacific region comprise either

agriculture-based economy or agriculture-based employment sector. Farmers in either of the cases invariably rely on fragmented lands that are too small to favour the large-scale or factory-style AE-related advancement, which are tested for relatively larger farm lands. Farmers in this region are primarily characterized as “small holders” and possess very limited or no risk-bearing capacity towards ready acceptance of any newly-proposed technological shift. Lack of awareness, caused by illiteracy, further poses a barrier to extend the technological innovations to such farmers. Agricultural extension, at this point, thus assumes an important responsibility to effectively transfer new methodologies from laboratory to land/farm.

2. AE continues to play a role of prime importance in agricultural and economic development in the developing countries of the Asian and Pacific region. In its 100-year-long history, AE has experienced an evolution from traditional agricultural mechanization to agricultural and biological engineering, brought about by the impact of the advancement of science and technology. AE is not simply a technical enterprise but a holistic engineering exercise. As farming is the core foundation around which socially complex human cultures have evolved in history, AE has become a vital tool to support the world agriculture. The R&D for AE needs to be constantly restructured to cater to the rapid development of agricultural science and technology so that it can serve as an effective means to seek out solutions to ever growing population, limited natural resources and environmental degradation.
3. “One size doesn’t fit all.” Available solutions to AE-related problems in one region don’t automatically translate into the solution for other regions. In many parts of Asia, small farms remain at the centre of agricultural and rural development. One of the main causes of the low agricultural productivity in the region is the lack of appropriate machinery that caters to the needs of small-scale farms. Therefore, there is a need to direct attentive evaluation of both the problem and its available solutions in a more creative way and tailor them to meet the site-specific situations, accommodating the socio-economic profiles of the users. Also, in the field of AE, the potential of indigenous know-how that is available in respective sub-sectors of agriculture should be recognized and incorporated.
4. As the mechanization proceeds in developing countries, use of machinery in agriculture is increasing accordingly in addition to the conventional draught power. In this scenario, agro-technology and systems development should focus on the suitability to the local specific conditions, especially on the following:
 - Compact, light, low-powered, gender-sensitive and multi-purpose machines.
 - Locally-available materials should be incorporated in machines manufacturing to reduce the costs.
 - Manufacturing and designing parts must meet the standards.
 - Adequate and accessible repair and after-sale services must be ensured in order to maintain safe and efficient agricultural operation.
 - Small-size tractors, power tillers, and small farm equipments should meet the needs of small farmers—the actual users.

- Operator's safety and comfort should be considered.
 - Energy-efficient machines and environmentally friendly technology should be developed and promoted.
5. Quality and appropriateness and cost competitiveness of machinery should be examined by concerned authorities before they are delivered to farmers.
 6. Government policy is the driving force behind R&D for AE. It is increasingly noted that the already limited arable land is further decreasing with increasing population. With this trend in the region, increase in food production and supply are derived from increased agricultural productivity. These require optimizing the use of existing farmland through more efficient use of agricultural inputs and improved agronomical practices – from efficient water and fertilizer use to better protection of seeds and crops; from fuel-efficient agricultural machinery to efficient use and conservation of energy inputs to cut down on the costs of agricultural production. These are all supported by an institutional framework of government services and social relations. Recommended focus for policy makers should include food safety for the rapidly growing population and security, agricultural mechanization, postharvest technology, agricultural value addition, and renewable energy (biomass, green technology for environmental concerns). More policies to strengthen R&D for AE are encouraged through increased financial support to promote capacity building of research institutes/universities.
 7. Agricultural engineers have a vital role to play in the agricultural development process. However, the implementation of AE R&D has to be done by inviting the active participation of various concerned stakeholders (farmers, consumers, agribusiness, relevant industry, financial institutions and governments). Agricultural engineers are encouraged to become a part of the social “team” and exert influence accordingly on the organizations outside of agricultural engineering community as well as on policy makers. This should be effectively done through collecting and documenting examples of successful cases that have produced economic and social benefits.
 8. The R&D for AE needs to be more market-oriented and ready to provide solutions to end-users in timely fashion. The rural poverty reduction in the Asian developing countries depends on commercially viable activities in the agriculture.
 9. In the advent of serious threats of depleting fossil fuels, energy crisis and its unequal distribution, renewable energy sources (solar, wind, micro-hydro, biomass, biofuel, and so on) should be introduced to agricultural activities at a vast scale. Such attempts will not only reduce our dependence on fossil fuels, but also mitigate human-engineered damage to the environment.
 10. Developing nations from the region should identify its R&D priorities for AE. More tangible and specific results can be obtained by setting more concrete and specific goals. For instance, gender friendly machinery can be developed as more male farmers are moving into cities, and as a consequence more female farmers are left to handle agricultural activities and operate agricultural machines.

11. The R&D for AE should be practical enough to actually deliver increased income to farmers through cost-cutting and value-adding. AE should intensify its research towards rural-income generation methods, especially by utilizing by-products, agricultural residues and food-processing wastes.
12. Postharvest management and value-adding should be carried out to prevent losses and increase values in production and to make products available to consumers at an affordable price. This will help improve human, animal and soil health.
13. Newly proposed methodologies should be technologically feasible, socially acceptable and economically viable.
14. There is a need to strengthen the public-private partnership with increased cooperation towards problem-identification and its proposed solutions. Assistance of agricultural extension personnel could be provided at the end of suitable-technology development. In all this process, local agricultural machinery industry could be supported through industrial promotion. Coordinated R&D for AE thus should be of the focal point of the concerted efforts among the member countries.
15. Adequate awareness about developed technology should be promoted among the farmers and users of the technology through extension.
16. Ways and means for transfer of agricultural technologies among member countries should be explored. Also, the regional cooperation through international agencies, such as APCAEM, should continue in the future.

•••••