Understanding the human side of technology transfer

Effective methods of disseminating new technology considering the viewpoint of farmers

THE ASIA-PACIFIC REGION has been on the forefront of generation and transfer of modern agricultural technologies. However, much still needs to be done to promote better and more effective methods of technology transfer, in order to achieve increased output and higher incomes for small-scale farmers.

Technology does not stand alone, but encompasses political, social, economic, and cultural factors that can impede the diffusion or transfer of technology. One of the major concerns in the transfer process is how to effectively disseminate new technology considering the viewpoint of farmers, particularly in addressing the questions of where, how, and what technologies are appropriate and available to them. While many farmers know the nature of their problems in the field, research and extension workers’ absence of knowledge of their socio-economic conditions stop them from adopting technologies and pursuing technological solutions to their problems.

The human factor in technology transfer

The compatibility of the transferred technology with the physical, psychological and cultural attributes of our farmers is essential. However, this aspect has not always been given the necessary attention it deserves.

This international workshop was organized to give due emphasis on the “human aspect” of the technology transfer process. The activity served as a venue for the sharing and exchange of knowledge and experiences on effective methods of technology dissemination considering the compatibility of the technology as well as the transfer process with the abilities and limitations of the farmers and their working environment. New ways to promote acceptable and efficient interaction between humans, the technology or equipment they use, and the environment in which they operate in were explored.

Innovative methods of disseminating new technology considering the human-technology-environment interaction were also presented and discussed.

The conduct of this workshop was based on the commitment of FFTC to continuously initiate and enhance the exchange of science-based knowledge and information among nations in the region, which has now become the yardstick of progress and development worldwide. During the workshop, speakers representing eight countries all over Asia shared and exchanged information, knowledge and experiences on different aspects of technology dissemination/transfer considering the viewpoint of farmers.

Technological and extension needs and concerns

What are the factors to consider in addressing farmers' technological and extension needs?

**Structural changes in global agriculture.** Emerging challenges ushered in by the structural changes in agriculture are also reshaping the structure of extension system in every nation. Some of these globalization trends include improved production amid increasing market competitiveness; demographic, social and agricultural structure changes such as farm consolidation and increasing existence of highly mechanized large farms; and the advent of information society.
Amid these structural changes in agriculture, agricultural extension worldwide faces a turning point. Technology transfer channels will now be diversified with the use of information technology (IT). Through IT, agricultural extension can be more diversified, knowledge-intensive, demand-driven, and thus more effective in meeting farmers' information needs. It can bring new information services to rural areas where farmers, as users, will have much greater control over current information channels.

Extension services will also have to be classified according to farm type, what with the advent of large-scale, highly mechanized farms against other types like middle-size, small and subsistence farms. Large and commercialized farms may have to rely on privatized extension and consulting services, since they require their technological needs are more advanced in terms of farm management and marketing strategies. This, in a way, will reduce the burden on public extension service providers. However, most small and subsistence farms in developing countries in Asia still need public extension to cater to their technological needs.

Client-oriented services will have to be provided, considering that farmers in some Asian countries are ageing and have become dominated with women. Extension workers must understand the farmers' need to improve their working condition. Farm machineries must be designed with the clients in mind, such as ageing or women farmers who are involved in specific farm works such as seeding, weed control, harvesting, cleaning, and packing.

Technological and extension concerns in terms of human factors. Technological and extension concerns in terms of human factors such as economic improvement, health, speed, efficiency variables, limitations of the farmers, as well as their working environment must be promoted. These include new ways to promote better interaction between humans, the technology or the equipment they use, and the environment in which they operate in (human-technology-environment interaction); ergonomic approach or the development of technologies that are safe to farmers, contribute to reduction of fatigue and stress, increase comfort and work satisfaction, and improve farmers' quality of life; and application/adoption of mechanisms to assess/address human factors such as farm work improvement measurement, and assessment of cultivation techniques considering psycho-social attributes.

The ergonomics approach
There is a growing evidence that agriculture exceeds other sectors or industries in terms of causing injuries and illnesses to its workers. Farmers and farm workers face some of the highest risks of work-related musculoskeletal injury and disease. However, the problem is little recognized in most developing countries, and is not currently given high prevention and research priority by the governments.

In Japan, considerable research efforts have been done to incorporate ergonomics in technology development and extension, in consideration of the safety and comfort of farm workers, particularly the

Ergonomics: Systems have been developed to continuously measure and analyze farmers' working posture in the field, such as in manual transplanting of sweet potato seedling (left) and with the use of semi-automatic sweet potato seedling transplanter (below).
ageing and women farmers. With the development and extension of ergonomic farm machineries, farmers’ physical workload has been reduced, productivity and working efficiency has been improved, and farm accidents and occupational diseases have been reduced.

Through the basic method of evaluating postural workload, work methods to reduce musculoskeletal load, and which are safer and more efficient, can be developed.

The rewards for the careful attention to ergonomics in consideration of the farmers’ condition include a more efficient production process, lower labor costs, reduced injury absences and turnover, and reduced expenditures for medical care and worker compensation as well as a reduced toll attributable to musculoskeletal injuries. With sufficient attention to the larger goals of whatever work is underway, investments in ergonomics can often pay for themselves many times over.

**Country strategies in technology transfer**

An understanding of the processes leading to the adoption of new technologies by small-scale farmers has been important to the planning and implementation of successful research and extension programs in most countries in Asia. At one level, a number of farm-household factors were typically associated with technology transfer and adoption, such as: the demographic characteristics of the farm households; size, location and tenure status of the farm; availability of cash or credit for farm investment; and access to markets for farm produce.

All these considered, country-specific technology dissemination strategies proved to be successful in catering to the needs of the farmers. Some examples of these strategies include: training and capacity building through farmers’ organizations to promote protected cultivation in Taiwan; effective dissemination method in Indonesia through technology showcase or techno-farm demonstration; improvement of the marketing system through the introduction of pre-cooling system for horticultural crops in Korea; introduction of new varieties in Malaysia through farm demonstrations, short courses, and hands-on training; participatory approaches in technology promotion and dissemination in the Philippines; effective extension through farmers’ organizations in Thailand; and the creation-diffusion approach for rice in Vietnam, which is a technical innovation.
adapted to particular biophysical condition and socio-economic situation of farm households.

**Emerging challenges**

Changes in agricultural environments and socio-demographic attributes of farmers, and consequently of farmers’ behaviors, necessitate the need to explore alternatives for agricultural extension programs in each country. These include:

- Systematic approach such as changing current distribution channels, farm consolidation, diversified extension services in view of information technology revolution (farm consulting, classifying clienteles and technology needs, distance/remote education, client-oriented extension service which take into account demographic characteristics, e.g. women and aging farmers);
- Application of ergonomics in agriculture to ensure farmers’ health and safety, in a manner that would contribute to the progress and development of agricultural industrialization in developing countries;
- Commercialization (intellectual property rights; value-added applications such as packaging, processing and trading; technology exhibition); and
- Industrialization (technology incubation and innovation mechanisms; institutional assistance to agricultural industry, funding support to agro-industry).

Agricultural extension activities of Hualien DARES, Taiwan showing various modalities and strategies such as field demonstration, dialogue with farmers, and technology exhibition.

Photos courtesy of H.S. Lin, Hualien DARES, Taiwan ROC
International Workshop on Effective Methods of Disseminating New Technology Considering the Viewpoint of Farmers

Held at the Hualien DARES, Taiwan ROC on October 17-21
Countries represented: 8 (Indonesia, Japan, Korea, Malaysia, Philippines, Taiwan ROC, Thailand, and Vietnam)
Papers presented: 15
Participants: 70
Co-sponsor: Hualien District Agricultural Research and Extension Station (Hualien DARES), Taiwan ROC

List of papers

Keynote paper
1. Ergonomics for agricultural machinery in Japan
   - Fumitake Ishikawa, Japan Agricultural Mechanization Association, Japan

Resource papers
2. Agricultural extension at the crossroad: alternatives for the future
   - Ki-Whan Chung, Korea Rural Economic Institute, Korea
3. The present status and prospects of commercialization and industrialization of agricultural technology in Taiwan
   - Y. Star Huang, Department of Science and Technology, COA, Taiwan ROC
4. Methods of measurement and evaluation for farm work improvement
   - Kyo Kobayashi, NARC, Japan
5. Assessment of cultivation techniques considering human factors
   - Tokuhiro Momonoki, FFTC, Taiwan ROC
6. From free of charge to payable service on agriculture technology transfer considering the influence of human factors
   - Hsueh-Shih Lin, Hualien DARES, Taiwan ROC
7. Assessing and improving the quality of working life of farmers with the “Fatigue Questionnaire for Farmers”
   - Chie Katayama, National Institute for Rural Engineering, Japan
8. A stepwise extension of protected cultivation with “Summer Vegetable/Winter Flower” cropping system in southern Taiwan
   - Shyh-Shyan Wang, Tainan DARES, Taiwan ROC

Country papers
9. Effective dissemination method for new technology based on the viewpoint of farmers: Case study in West Nusa Tenggara Province, Indonesia
   - Mashur, Assessment Institute for Agricultural Technology, Indonesia
10. A case study on the effect of pre-cooling system adoption in Korea
    - Hong-Bae Kim, NACF Research Institute, Korea
11. Effective methods of disseminating new technology considering the viewpoint of farmers in Malaysia
    - Dato’ Mohamad Nazli Abd. Majid, Department of Agriculture, Malaysia
12. Innovative approaches to disseminating technologies in agriculture and natural resources
    - Bessie M. Burgos, PCARRD, Philippines
13. Farmers’ organization approach: An alternative to effective extension in Thailand
    - Praderm Chumjai, Kasetsart University, Thailand
14. Adaptation of “Creation-Diffusion” approach for rice technology development and transfer on newly reclaimed acid sulfate soil
    - Thanh Phung Mai, Vietnam National Agricultural Extension Center, Vietnam
15. Technology transfer through information dissemination: FFTC in the sustainable agriculture partnership
    - Cristina Bejosano-Gloria, FFTC, Taiwan ROC

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