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6. TRENDS AND RESEARCH NEEDS FOR THE DEVELOPMENT OF INTEGRATED FARMING SYSTEMS IN CHINA

Because integrated farming systems have demonstrated great advantages, i.e. full use of natural resources, intensifying nutrient cycling, rising the efficiency of industrial input, producing higher and more diversified products to meet the ever increasing needs of the people, providing a higher income for farmers and more opportunities for employment of surplus rural labour, as well as preserving environmental quality, it has developed very fast in different regions of China. However, integrated farming is by no means perfected. There are certain constraints which restrict its speedy development. These include:

1. Integrated farming is a more complex system and less understood than monocultures. Any experimental designs involve complex relationships between components. It is a difficult task to develop models in selected experimental stations where appropriate land, funds, and specialists are available;
2. Because of the lack of well organized extension services in the village, many successful models are usually practiced in limited areas;
3. The uncertain market prices and the shortage of processing and semi-processing facilities may cause serious problems. Farmers sometimes experience heavy losses;
4. Pest, disease and pollution problems have not yet been solved in integrated farming systems;
5. The policy and infrastructure for the implementation of integrated farming systems have not been sufficiently developed.

For further improvement and development of the existing farming systems in China, scientists suggest the following points which, to some extent, already reflect the general trend of development of integrated farming systems in China.

- 1) Refinement of the concepts and principles of ecological farming systems; integrated farming is not a simple combination of some new conventional agriculture technologies with traditional experiences, but is rather a feat engineering, based on ecologico-economical principles, integrating many components in space and time. The holistic concept, systematical approach, the rule of energy and matter flux throughout the food chain of an ecosystem, the principle of ecological niches, the diversity and stability of

the ecosystem, the environmental consequences and economic effects etc. should be particularly considered.

- 2) The performance of an integrated survey and comprehensive appraisal of different ecological farming patterns as the basis for a scientific classification system, the creation of optimized designs and the identification of suitable conditions for implementation. Based on the integrated survey, the geographical information system should be established.
- 3) The performance of in-depth studies on the structure and function of different types of ecological farming systems. Although some excellent work has been done on some specific types of integrated farming systems, most of the information obtained so far is experiential and based on traditional practices. The moderation of traditional knowledge and quantitation of integrated agricultural practices has always been a difficult task because of their inherent complexity. However, efforts have been made to conduct comprehensive studies using the quantitative approach and modelling methods. These pioneers have the honour of taking the lead in formulating a hypothesis, the evaluation of which, though, will have to wait for the allocation of adequate experimental resources. Long-term ecological research (LTER) on carefully selected sites could play a very important role.
- 4) The refinement of methods for assessing the integrated economical-ecological and social effects of the different types of ecological farming systems. Dynamic system analysis will be a useful tool in this respect.
- 5) The improvement of the technological systems used in ecological farming. These include the optimum combination of components in time and space, selection and genetic improvement of species of trees, shrubs, cereal crops, fodder species and domestic animals; through breeding, genetic engineering, tissue culture, and grafting. The improved quality of species should include characteristics such as high productivity, broader adaptation, greater stress tolerance, multiple uses and others. The method of cultivation is also the topic of study.
- 6) The determination of appropriate infrastructure and organization form to enable implementation of the ecological systems. Rural reforms should always take the requirement of integrated farming into consideration. Some special enterprises aimed at the development of agroforestry and ecological farming systems have been established jointly by academic and development organizations.
- 7) A major limit on the implementation of integrated farming system is a lack of trained personnel. Training is required at four levels: decision maker,

professional, technical and user level.

- At the decision maker level there is a need to rise the awareness of the integrated farming system in achieving the goal for sustainable development and make the appropriate policies for its successful implementation.
- At the professional level there is a need both for specialists who are able to make detailed studies, surveys, and designs for specific practices, and for generalists with a broad grasp of the theory and practices and with understanding of the various disciplines involved in agroforestry.
- At the technical level there is need for a combination of institutional training and in-service training. In-service training enables the technicians to rapidly acquire essential practical knowledge and technology used in agroforestry.
- At the user level, adequate support for farmers, pastoralists, fishermen, loggers, plantation operators and other land and water users is necessary if they are to implement the techniques of multi-sectorial production. To be successful, extension services must take great pains to explain the need, purpose and expected results of any measures they recommended. Demonstration will be most important for convincing the community at large of the value of such measures.

8) International cooperation, starting from exchange of information and personnel to jointly sponsored workshops and training courses research and development projects have been increasingly supported. Many countries and international organizations such as FAO, UNDP, UNEP, UNESCO, UNU, IUFRO and ICRAF, etc. have expressed their great interest in supporting and collaborating in this field.