

# **Strengthen the Construction of Technological Innovation Research Platform; Ensure the Healthy Promotion of Chinese Conservation Tillage Technology**

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## **1. COMBINATION OF AGRONOMY AND FARM MACHINERY USE**

To promote the extension of conservation tillage technology (CTT), farm machinery use must be developed firstly as well as agronomy. Agronomy includes as follows: combination of agronomy with farm machinery use; fertilizer and irrigation management; selection of crop breeds; crop cultivation and management; prevention of weed, crop diseases and pests, etc..

The history of the research and development of CTT indicated that the combination of agronomy with farm machinery use was important in China. The research and development of CTT in China goes through three stages:

First stage: Research gives priority to agronomy administrations.

Since 1970s CTT has been studied by experts major in agronomy in colleges and institutes following its introduction and development. Research on CTT peaked in the 1980s. However, experts in agronomy did not collaborate with experts in farm machinery use in developing integrated research. The completion of technological system, especially its extension was limited. From the late 1980s to the early 1990s, the research of CTT entered a low tide. The national little-tillage and no-tillage convention held in 1990 summarized the results of promoting CTT from 1970 to 1990. From then on, no more devotion has been done by the government, and the national CTT research entered a low tide.

Second stage: Research gives priority to farm machinery administrations.

Since the early 1990s, at the beginning of the Australian project carried out by China Agricultural University and Shan Xi province in 1992, a series of research projects on CTT initiated by the farm machinery departments have been carried out in China. Studies of machinery used for CTT were greatly strengthened and developed, which built up a sound basis for promoting the application of CTT. Since 2002, the Department of Agricultural Mechanization Management which is under the Ministry of Agriculture in China has activated finance items and organized technicians in the field of farm machinery use in the whole country to promote CTT in the northern regions. All these efforts showed a promising result, but in this period, few experts in agronomy participated in the work, which restricted the development of CTT systems to some extent. The promotion of CTT was affected due to the lag and correlative technologies such as prevention of weed, crop diseases and pests, soil and fertilizer management, crop cultivation and management.

Third stage: New period of integrated combination of agronomy with farm machinery use.

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With the demonstration and extension of CTT, it was necessary to combine farm machinery use with agronomy. Thus, the Chinese Ministry of Agriculture organized many experts in different fields such as farm machinery use, soil and fertilizer management, and crop protection, promotion of agronomy and technology in December 2005. This resulted into the signing of an understanding on CTT development which signaled the entry of a new period that agronomy and farm machinery use were combined closely. Experts in agronomy and farm machinery use kept on carrying out the CTT research, at the same time directing farmers on its demonstration and extension.

The Chinese Ministry of Finance provided US\$ 30 million annually to support the Department of Agricultural Mechanization Management to demonstrate and promote CTT. The close combination of agronomy and farm machinery use would have active effects on the demonstration and extension of CTT.

## **2. STRENGTHEN INNOVATION RESEARCH IN CTT**

Although the research, demonstration and extension of CTT developed rapidly under the leadership of the Department of Agricultural Mechanization Management and the collective endeavors of technicians, a great deal needs to be done in carrying out the CTT innovation research work during its extension. It is mainly attributed to the following four reasons:

- (1) In order to improve farm machinery for CTT to ensure the seeding quality, research departments and machine production companies are absolutely necessary to be partners to tackle problems, increase research efforts and produce eligibility together. In addition, it is required to make a decision in choosing big dimension machines or small ones to provide a direction to departments to make farm machinery use develop smoothly.
- (2) It is very important to study the mode of CTT regional development to form, complete and finalize the technological system which promotes CTT in different regions in China. This work requires to be strengthened urgently.
- (3) The sustainable soil nutrient management of CTT is poor not only in theory but also in technology. A lot of research work has been done in this field in foreign countries and especially by using the long-term field experiments platform, large quantities of theories and technology achievements were obtained in the fields of CTT soil quality evolution, fertilizer management, nutrient transformation, and supply mode, nutrient losses and distribution, etc. Research is ongoing in foreign countries. Compared with China, more research work is demanded in this field to form the country's own CTT systems because of the complexity and multiplicity of soils, climates and crop planting systems. This would bring bigger ecological benefits of CTT to China and promote sustainable agricultural development.
- (4) CTT research is weak in selecting crop breeds, planting and cultivation management. The theories and technological systems of China have not been built in the prevention of weed, crop diseases and pest.
- (5) The promotion mechanism of CTT still must be strengthened to be fit for the development of China.

### **3. STRENGTHEN THE STANDARD OF CTT INNOVATION RESEARCH**

The CTT innovation research plays key roles of CTT's demonstration and extension in the country. Scientific research is a highly standardized work. Firstly, an experiment requires a correct and normative design, rational treatments and rational level designs, representative fields, even fertility and repeats. All these must conform to the statistics principle. Secondly, an integrated experiment also needs scientific management, standard methods of taking samples, normative and acceptable research methods, advanced analytical instruments. Thirdly, researchers should have corresponding professional knowledge.

In recent years, good effects have been shown through the practice of CTT innovation projects which have solved many problems in technology, and have ensured the favorable demonstration and extension of CTT. However, in this period, there were some problems such as lack of regularity and inaccurate data. The main reasons were probably as follow: firstly, field experiments were not standard, which may be due to uneven fertility, no repeats, illogical design or other defects. Thus, inaccurate data were obtained which do not reflect problems or lack regularity. Secondly, methods of research were not standard and analytical instruments were outdated. Thirdly, researchers lacked professional training.

Thus, it is important to strengthen and standardize procedures during the course of CTT innovation research.

### **4. STRENGTHEN THE CONSTRUCTION OF CTT INNOVATION RESEARCH**

In order to ensure that CTT innovation research could bring more rapid and higher quality results, on one hand, it needs a team of experts in the fields of farm machinery use, agronomy and technological promotion to carry out the research work; on the other hand, it needs to build regional CTT innovation platform extended from the centre to the place by the experts to do the integrated research of technological innovation and the demonstration of standardized technology. The five advantages of building the CTT regional innovation platform are as follows:

Firstly, the platform covers varieties specific to ecological regions of China and has the characteristics of great network research.

Secondly, the research based on the platform has good scientific and standard characters, because the experts in many fields collaborated to decide on the design and arrangement of the experiments to ensure scientific procedures and standards are followed.

Thirdly, integrated research work can be done to solve a series of scientific problems by using the platform. For the specialized or cross research carried out by the experts together, the team equipped with technical knowledge, standard methods, advanced instruments and scientific research work, would ensure that the data obtained from the research is reliable.

Fourthly, the platform would be built by central administration and local governments, which can play important roles to strengthen scientific research work, make it operational, demonstrated to a wide area and managed well.

Technologies could be more easily imposed to be put into practice on the platform which could be used for research as well as an opportunity for regional demonstration of CTT. It could also be used as a training base for farmers.

As a whole, it is clear that the strengthening and development of a technological innovation platform is the key to promote CTT innovation research. In order to enhance the quality of innovation projects, demonstration and training, every effort should be made to strengthen the construction of technological innovation platform and to put it into practice as soon as possible.