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Ministry of Agriculture of the People's Republic of China

International Seminar on Enhancing Extension of Conservation Agriculture Techniques in Asia and the Pacific

Zhengzhou, China, 24–26 October 2007

CONCLUSIONS AND RECOMMENDATIONS

An *International Seminar on Enhancing the Extension of Conservation Agriculture Techniques in Asia and the Pacific* was held in Zhengzhou, capital of Henan Province of China from 24 – 26 October 2007. The United Nations Asian and Pacific Centre for Agricultural Engineering and Machinery (APCAEM) and the Ministry of Agriculture (MOA) of the People's Republic of China co-sponsored the Seminar, in close collaboration with China Agricultural University and the local government of the host country. More than 120 experts/researchers, policy makers, extension specialists and entrepreneurs from the Ministries of Agriculture, agricultural research institutes, academia and universities, agricultural machinery management, extension services, enterprises and the private sector from 11 select member countries and international organizations including China, Democratic People's Republic of Korea, Inida, Nepal, Pakistan, Republic of Korea, Vietnam, Australia, Canada, and Food and Agriculture Organization (FAO) participated in the event. H.E. Mr. Zhang Baowen, Vice Minister of Agriculture of China, attended the closing session of the Seminar and delivered closing remarks.

82 papers were submitted and 32 of them were presented at the Seminar. Focusing on the four thematic topics, Environmental Implications for CA, CA Techniques and Machinery, Application and Extension Service of CA, and the Strategy and Policy for the Development of CA, the participants shared experience and advancement in promoting CA techniques, reviewed the current status of the region, analyzed the economic and environmental benefits and exchanged ideas on how to enhance the application of this generic farming system in the member countries in the Asian and Pacific region.

Field visits to the demonstration of CA machinery and equipment developed in China were arranged by the MOA and the local Government of Henan Province of China.

During the concluding session, the participants focused on policy recommendations, strategies and programme formulations for promoting the extension of CA techniques in the developing member countries in the region. The conclusions

and recommendations are summarized as below:

1. Rationale

As a viable alternative of conventional/traditional agriculture which is mainly characterised by intensive tillage, increased use of inputs and straw burning, Conservation Agriculture (CA) is an integrated land management practice of available soil for agrarian uses, altering its composition, structure and natural biodiversity as little as possible and protecting it from degradation processes. CA aims to pursue more sustainable agriculture and rural development through the application of three major principles: minimal/no soil disturbance (zero/minimum tillage or direct seeding), permanent soil cover (no residue burning) and crop rotations.

Zero/minimum tillage aims to enhance and sustain farm production and productivity by conserving and improving soil, water and biological resources by maintaining a permanent or semi-permanent organic soil cover to protect the soil from sun, rain and wind. Crop residues should not be burnt because it will result in pollution and loss of organic matter. Well-balanced crop rotations can neutralize many of the possibly negative aspects of no-tillage, such as pest build-up, as they increase the diversity of favorable insects and organisms that can help maintain checks on the spread and impact of pests and diseases which will in the long term result in a reduced use of agrochemicals. Fertilizer efficiency will also be improved with CA as a result of better soil health and reduced losses from leaching and erosion.

After several decades of experiments, CA is proved adaptable to different climate and soil conditions, as well as different agrarian systems.

2. Potential Benefits

CA can bring socio-economic benefits to farmers and ecological/environmental benefits such as climate change mitigation. According to the presentations of the experts, potential benefits offered by CA can be summarized as follows:

Economic benefits:

(1) Increased economic profit with decreasing inputs of labour, operation time, farm power and fuel consumption
(2) Timely planting of crops
(3) Improved long-term productivity and more stable yields

Ecological and environmental benefits:

(4) Reduced soil erosion by wind and rainwater
(5) Increased organic matter and improved soil fertility/health
(6) Recharge of the aquifers through improved water infiltration
(7) Decreased soil compaction
(8) Reduced air pollution through reduced release of carbon gases and nitrous oxides
(9) Increased carbon sequestration
(10) More micro biota and improved biodiversity
(11) Reduced occurrence of dust storms

Social benefits:

(12) Mindset change of farmers from conventional agriculture towards scientific farming.

Drawbacks and problems which can be observed in some cases of introducing CA are not necessarily inherent characteristics of CA but often the outcomes of some missing elements in the cropping system or simply a result of inexperience during the learning phase.

3. Major Thematic Points Presented by the Experts

The thematic contributions of the experts include:

(1) Environmet related issues

- Dust storms result mainly from exposed farmland and hence one of the major solutions is to be found on farmland.
- CA combining several resource conserving technologies is the best option for combining highly productive agriculture with environmental sustainability and without the need for compromises. It is a "win-win" strategy.
- Emission reductions as significant contribution to mitigate climate change are possible with CA.
- Soil erosion also leads to pollution and waste of inputs and can be reduced with CA.
- Nitrogen fertilizer efficiency is particularly important because unused nitrogen is a major input to greenhouse gas (GHG) emissions and/or the pollution of water resources.
- CA in China and South Asia provides the same environmental, economic and social benefits as observed in other parts of the world with a long term CA history.

(2) Technology related issues

- Functional equipment is a key factor and under steady development in China. There are still some shortcomings, particularly in the handling of heavy residue with minimum soil disturbance for wheat seeding.
- Research has to be ongoing to observe and optimize the new agricultural system, particularly for the dynamics of pests, diseases and weeds.
- Different technical areas have to work closely together, such as engineering and agronomy.
- The frequently mentioned need for regular deep loosening of the soil (every 5 years) has to be verified – it appears to be a recommendation from tillage based systems or a result of compaction created by random traffic.

(3) Comments on Controlled Traffic Farming

- Heavy wheels should be recognized as a form of soil disturbance. Permanent bed controlled traffic minimum tillage system, known as Controlled Traffic Farming (CTF) or Permanent Raised Beds (PRB), can overcome the direct costs, subsurface degradation and system impacts of wheel ruts from random wheel traffic. This system might be seen as a second phase of CA. Some experts argued this system might be seen as a second phase of conservation tillage because conservation tillage is generally not controlled traffic farming and therefore wheels are random. CA is a synergy of all elements. Conservation

tillage is only one element of CA.

(4) CA extension related issues

- Intensive training and functional machinery are key factors for promoting CA.
- Participatory technology development and transfer and extension approaches are an important tool for the promotion of CA.
- Increased profitability of farming is the major “selling point” for CA to farmers.

4. Constraints and Development Potential

The adoption of CA technology has seen a steady increase worldwide since 1990. According to the statistics of FAO for the biannual 2004 - 2005, the total area under CA in the world is about 98.8 million ha. Approximately 83.3% of the technology is practiced in the North and South Americas, about 9% in Australia and only about 7.7% in the rest of the world, including Europe, Africa and Asia. Presentations show that there is a great potential to bring this soil conserving technology to the member countries in Asia and the Pacific.

China, as a big agricultural country, has made remarkable achievements in technology research, pilot demonstration of CA application in the medium and small land holdings. There will be substantial development in the future along with improvement of technology and policies towards CA.

The Indo-Gangetic Plains in South Asia, which include India, Pakistan, Bangladesh and Nepal, also see an encouraging situation where a more ecologically-sound management of plants, soil, water and nutrients is practiced. The main elements of zero tillage and maintaining residue cover on the soil are gaining wide acceptance.

According to the participant experts, there are still constraints and limitations towards the adoption of CA mainly owing to: availability of direct seeding machines; availability of weed protection and control methods; limited capacity in extension, training and education; lack of knowledge available to the grassroot farmers; farmers’ mentality and attitude change; and small scale landholdings in the member countries in Asia.

It is well recognized that the rapidly increasing population and decreasing arable land, particularly in the Asian and Pacific region, require more intensive human farming activities for food security. The more intensified farming practice, in turn, degrades the limited farm land and deteriorates the environment that adversely affects the poor and marginal farmers. To break such a vicious circle towards healthy agriculture development and environmental sustainability, CA is proven option as more efficient at using natural resources and having minimal adverse impacts on the environment.

5. Recommendations

To facilitate the extension of CA techniques, the full involvement of all concerned stakeholders, including farmers, researchers, technicians, extension specialists,

manufacturers, governmental officials, agronomists and NGOs, is a major prerequisite for its wider adoption.

(1) **Government Policy:** An institutional framework of government services plays a pivotal role. Governments of the member countries in Asia and the Pacific are encouraged to mainstream CA as the basis for sustainable agriculture development and climate change into their national policies, laws, investment strategies, and education and extension programmes.

(2) **Public Awareness**: Practice tells the main impediment to accelerated adoption of CA is mindset problems that favor the status quo on tillage and the fear of failure. More demonstration of pilot projects and good practices are needed to bring the change in farmers' mentality towards the adoption of CA.

(3) **Extension Service:** Establishment of an extension service mechanism is needed. Extension specialists should provide advice, in various ways including training and education on site specific knowledge. They should also study what are the specific limitations in adopting CA under local-specific conditions.

(4) **Information Sharing:** Knowledge on website, publications with adequate, practical and useful information on CA should be made available to the farmers and extension specialists. The establishment of an Asian Network on Extension of CA (ANCA) is recommended.

(5) .**Financing and Institutional Support Service:** Policy support from government, as well as support through trained extension officers and some initial financial assistance/subsidy, for example for the purchase of no-till equipment, is required to speed up the adoption of CA.

(6) **Manufacturing of Agricultural Machines:** Enhancing the research and development on manufacturing suitable direct seeding implements, straw and cover crop management equipment, and other related implements should be supported by both public and private sectors. The cost-effective and efficient direct seeding machines suitable in Asian countries, especially fitting the lower horsepower tractors, are in urgent need. Manufacturers should also consider wheel track width and wheel positioning for CTF/PBR use.

(7) **Interdisciplinary research and development:** different disciplines involved in agriculture, namely engineering and agronomy, have to work closely together in the development of technologies and methods for CA. The same accounts for monitoring and research of the impacts, such as soil compaction and its effect on fertilizer efficiency and GHG emissions. Soil scientists, engineers, agronomists, plant pathologists and other scientists have to share a common vision on the CA system and orient their work accordingly.

(8) **Enhancing knowledge exchange and cooperation:** Studies show that CDM facility of the Kyoto Protocol can be applied in agricultural sector to contribute to the reduction of GHG emissions, and sustainable agriculture development. Related

organizations need to continue their efforts in exploring further the application of the CDM particularly in CA. In this connection, the establishment of Asian Network for Extension of conservation agriculture (ANECA) is initiated with an aim to promote information sharing and cooperation among the member countries..

6. Appraisal of the Organization of the Seminar

According to an evaluation survey, high appraisals of the seminar have been received from the participants. They expressed their satisfaction with the well organization of the seminar, the high quality of the presentations which represent a variety of the state-of-the-art achievements of research and application of CA techniques. Effective support was provided by the related government officials of the host country, in particular the Ministry of Agriculture and the local government of Henan Province. The Seminar also drew much social attention. The outcome of the Seminar is useful for capacity building of the participants in addressing the extension of CA techniques in their respective agencies and countries.

The Seminar has obtained a full success particularly owing to the sincere collaboration exercised by the four parties. Each party has expanded its ability in the implementation of the project. They look for more cooperation in a broader area in future.

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