

**THE “CURRENT STATUS”
of
CONSERVATION AGRICULTURE
in China**

**A Report for the
People’s Republic of China / Global
Environmental Facility (OP12) /
Asian Development Bank
“Partnership on Land Degradation in
Dryland Ecosystems”**

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**- for return comment / verification / additions from
all who supplied information, herein**

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Executive Summary

The principal goal of this report is the production of an “up to date” statement on the current status of Conservation Agriculture (CA), and related practices, in the People’s Republic of China. CA is characterized by minimum (or zero) mechanical soil disturbance, crop residue retention, permanent organic soil cover, diversified crop rotations and precise placement of all in-field traffic, applied agrochemicals and animal/crop residues. The “power” of CA arises from the in-field synergy (interplay) of the components, causing many off-farm, environmental bonuses.

This report is a first-step in producing a “common platform” of work to date on CA (its nature, geographic locations, variety, level of implementation and acceptance by farmers and the co-involvement of agribusinesses) and current constraints (both perceived and real) to these works (eg lack of compatible equipment, cost of weedicides, lack of awareness and the teaching of the new concepts). In this manner, the **way forward** can be better mapped, particularly in terms of shaping the recently funded and now operational PRC-GEF (OP12) Partnership on Land Degradation in Dryland Ecosystems; a 10 year programmatic approach to combating land degradation in the western region of China.

The setting a common platform, is vital to minimise repetition of previous works, create proactive links, and advance the mitigation of desertification, and the poverty, reduced quality of life and environmental damage that result from it.

This report is a desktop study that collated the input from various sources, and from several countries and international organisations: China, Canada and Australia; FAO, CIMMYT and ACIAR. The report by its nature is “**iterative and incremental**”; its publication will attract further input from other, important sources and these will be added in time.

Key results to date include:

- Trials on CA practices and the engineering aspects of related equipment began in 1986 (Beijing), 1987 in Tunliu (Shanxi), 1991 (Canadian funding) and 1992 (Linfen city, Shanxi – Australian (ACIAR) funding). The greatest number of trials are in Shanxi, Gansu, IMAR and Hebei.
- There is now approx. 700, 000 ha of land (in 94 counties, across 14 provinces) under CA in China (source: Prof. Gao Huanwen).
- The China Ministry of Agriculture commenced the expansion of CA demonstration sites in 2002.
- There are 3 to 4 (at least) private engineering factories in China, producing no-till equipment.
- In China, it is rapidly becoming axiomatic that CA practices are being demonstrated to be **Best Management Practice** for agriculture; more so than conventional, plough based and residue incorporation systems. CA is clearly becoming an essential component of the PRC’s agricultural production equation. Many such results have been reported.
- As one example: a 12-year trial at Linfen city (Shanxi) - has demonstrated that with CA the 12 year averages are:
 - 18.5% yield increase in wheat yield
 - 60% reduction in wind and water erosion
 - 20-30% reduction in herbicide usage
 - 19% increase in crop water use efficiency increased by 19%
 - 35% increase in organic matter
 - earthworms now 5 per m² (zero in conventional, ploughed treatment)

1. Introduction and background

a. Purpose of this report

This desktop study aims to present an “up to date” statement on the current status of Conservation Agriculture (CA), and related practices, in the People’s Republic of China and surrounding countries (with common climates, crops, farming types, etc). Within this brief, a principal goal is to:

**“collate and present the nature and extent of agriculture-based “interventions”
in terms of mitigating land degradation in general
and desertification in particular”**

In summary, CA (fully described below) is characterized by: minimum (or zero) mechanical soil disturbance, permanent organic soil cover, diversified crop rotations and precise placement of all in-field traffic and applied agrochemicals (or biological residues).

CA is currently practised on 90 million ha of lands, worldwide (Rolf Derpsch, www site) with the largest areas occurring in South and North Americas, Canada and Australia.

This report aims to:

- analyze information on CA in China to act as a **common platform** of CA works to date
- identify key practices equipment, organizations and collaborators to further promote CA
- establish networks of “key” farmers, academics and agribusinesses to activate CA in new areas of China
- identify region specific aspects of CA, particularly real and perceived constraints
- recommend policy guidelines for higher level Government / International agribusiness input/support of CA.

The collected information will be analysed in terms of such factors as:

- nature of the work
- geographic locations
- whether field trial or demonstration sites
- length of trial
- whether terminated or continuing
- level of implementation on-farm
- farmer involvement / acceptance / application
- actual and perceived constraints to adoption of new practices
- co-involvement of agribusinesses
 - o machinery design and fabrication
 - o chemical trials (fertiliser, weedicide, pesticides), etc
- farmer training
- lending and support structures to aid farmer initiatives, etc

Establishment of a common platform is important to:

- better map the way forward
- minimise repetition
- extend Best Practices to new areas

- recognise “champions” to carry-over proven methods
- establish working, proactive links between provinces, teaching Institutes and agribusinesses

b. Conventional agriculture systems in Northern China

It is impossible to generalise on agricultural systems in China, due to the wide diversity of ecological regions, elevation, soils, climate (particularly rainfall amount and periodicity) and the potential for supplemental irrigation in some areas. The SMEC report (Malcolm Douglas et al. 2004) provides an excellent summary.

However, one axiom has been a common dependency on the plough as an immediate and (apparently) cheap form of seed bed formation, stubble incorporation and weed control. However, plough – based systems are now recognised as a major cause of several environmentally damaging scenarios, including:

- erosion
 - o excess runoff and sediment transport
- soil structure decline
 - o soil compaction (ploughpans)
 - o weakened soil aggregation
- organic matter loss
 - o loss of carbon pool and sequestration
 - o weakened soil aggregation
- reduced biodiversity (notably loss of earthworms)
- excessive burning of fossil fuels (tractors).

Alternative agriculture practices to plough-based systems have been developed over the last 30 years, and are well advanced in many countries and regions of the World. These resource and environment protecting practices are grouped under the heading Conservation Agriculture.

c. Conservation Agriculture

Deforestation and land degradation, particularly desertification, are two of the major environmental issues in South- and South-East Asia. To contribute towards the effective planning and management of natural resources of the region, developing an integrated agricultural production system is necessary.

Conservation Agriculture (CA) consists of a set of concepts and practices that **in synergy**, provide a dynamic, global-wide, farm- to policy-level, practical and implementable methodology to not only mitigate the effects of land degradation and improve environmental sustainability but in many cases improve the quality and health of land. Integrated with, and commonly a direct cause of, these improvements are many social, environmental and rural sector “spillovers”, including improved and guaranteed yields, increased farm profit margins, reduced usage of fossil fuels with associate reduction in CO₂ emissions, improved soil carbon levels and carbon sequestration, lessened need for external inputs such as fertilisers, herbicides and pesticides, and decreased labour requirements. Integral to CA is both the empowerment and continuing education of farmers and their suppliers and advisors,

as well as knowledge transfer, to ensure continued and increased use of best practices to combat land degradation and improve land and social condition.

Conservation Agriculture aims to replace many conventional agricultural practices, recognising that they are major causes of land degradation. The four most important practices to be replaced, or at least modified are:

- conventional tillage, particularly the routine ploughing (inversion) and tillage (chisels, rippers, discs, harrows, etc) of soil,
- the removal and/or the incorporation of crop residues, via ploughing, cultivation, or burning,
- crop monoculture, without rotations (break crops), and the
- random in-field trafficking of field equipment, eg tractors , harvesters, trailers, etc.

Multiple benefits in terms of the land, water and the environment with strong social benefits are gained through the implementation of CA. Each of these elements is important in its own right. However, the “power” of the CA system is gained not from focussing on any one element to solve a specific limitation, but rather from the synergy (interplay) of the various elements. The key elements of CA are:

- zero (or reduced) tillage;
- careful management of residues, and the use of cover and rotation crops to maintain ground cover, increase organic carbon and soil biodiversity and minimise crop diseases;
- a balanced application of chemical inputs (only as required for improved soil quality and healthy crop and animal production), and
- precision application of all inputs, including maintaining permanent wheel tracks for all in-field equipment, and the precise application of pesticides, fertilisers and weedicides.

2. Literature review and proposed follow-up actions

Reported here is the first part of this Investigation: a “desktop study” of the nature, extent, institutions involved, problems, constraints, etc of Conservation Agriculture in China.

The materials reported here have arisen from three major sources/actions:

- discussions and a subsequent workshop following an International Workshop on Integrated Environmental Managements, 1 - 2 November 2004, Beijing, China
- responses to an email-based request to a wide range of International experts, known to be involved with CA studies in China; and also from various countries: Canada, USA, Australia, England, and International organizations: FAO, ACIAR, CIMMYT, Syngenta, Trelleborg, Case IH.
- in-depth reading and analysis of approx. 50 scientific texts gained both directly from the authors (responding to the email request) or from conference proceedings and end-of-mission reports.

It is recognized that, currently, a limitation of this report is the “Anglo-centric” nature of the papers read and reported here. Future discussions with Chinese colleagues will hopefully broaden the scope and reporting of this study to include Chinese-language contributions.

The second part of this investigation may occur in the near future, after comments have been received and incorporated into this document. This will be a “fact finding mission” where the desktop study will be “ground-truthed” by visiting many of the trial and demonstration sites, engineering works reported here, and talking with local no-till experts and farmers.

That mission would aim to visit some or all of the the six provinces covered in the current PRC/GEF (OP12)/ADB project (Appendix 2).

- Xinjing Uigur Autonomous Region
- Qinghai
- Gansu
- Ningxia Hui Autonomous Region
- Inner Mongolia Autonomous Region
- Shaanxi.

a. Desk top study

The principal results of the email-based request for information are presented in Table 1. The Table presents a summary of all information received, to date and as such presents a first-cut of the essence of works on CA conducted in China, in terms of locations, treatments imposed, principal results, current status of the experiments or demonstrations and key contacts (Institutes and persons).

It is important to state that is this information is both “iterative and incremental”. In other words, by presenting the information, it is hoped that more persons will provide information, and eventually almost all of the works related to CA in China will be part of this desktop study.

Note that Table 1 does not provide all detail from every paper and report. The aim was to present the essence of the works. However, the author holds all papers and reports in the Reference list; as paper copies and some electronically, if any correspondents would like copies.

Additionally, Table 2 has been provided by Professor Gao Huanwen and presents the location and number of CA “demonstration sites”.

b. Principal results

Several key findings have already emerged from this study:

1. Trials on CA practices began in 1987 in Tunliu (Shanxi), 1991 (Canadian funding) and 1992 (Australian funding)
2. Fifteen (15) of 37 cited references (Table 1) are within the six provinces covered by the PRC/GEF (OP12)/ADB project
3. There is now approx. 700, 000 ha of land under CA (source: Prof. Gao Huanwen)
4. The China Ministry of Agriculture commenced the expansion of CA demonstration sites in 2002. Currently, these encompass 270, 000 ha in area. (Refs. 32, 33, 34). Table 2 shows 35 of the 94 counties with demonstration sites are within the six provinces covered by the PRC/GEF (OP12)/ADB project
5. There has been a large amount of works conducted in the broad area of CA. This is indicated by some simple statistics from the responses to the email requests (Tables 1 and 2):
 - a. There have been at least five (5) International countries involved: China, Australia, Canada, USA and Belgium.
 - b. In terms of numbers (), the China provinces with:
 1. Experimental trials (14); most in Shanxi, Gansu, IMAR, Hebei
 2. Demonstration sites (Table 2) (14); across 94 counties
 3. Engineering factories (4); no-till planters; ref. 23; item 21, Table 1
6. In China, as has been widely reported globally, it is rapidly becoming axiomatic that CA practices are being demonstrated to be Best Management Practice for agriculture; more so than conventional, plough based systems This is for many reason and at many levels. Many such results have been reported (Table 1). As one example a 12-year trial (Ref. 1) at Linfen city (Shanxi) has demonstrated that with CA there have been:
 - a. 18.5% yield increases of wheat
 - b. 60% reduction in wind and water erosion,
 - c. 20-30% reduction in herbicide usage
 - d. 19% increase in crop water use efficiency increased by 19%
 - e. 35% increase in organic matter
 - f. earthworms now 5 per m² (zero in conventional)

c. Other related initiatives

1. ACIAR has just commissioned David Vere (NSW, DPI) to carry out an economic impact study of ACIAR's no-tillage work in China. This work is currently underway and hopefully the key results will be included in future drafts of this Report.

2. Recently there have been interventions and involvement of the Chinese Government in CA:

- a. The recent work by Prof. Li Hongwen (Ref. 31) was supported by the China National Key Technologies R&D Project of the 10th 5-Year Plan.
- b. In May 2002, the Ministry of Agriculture held a National Conservation Tillage Convention in Shanxi province (cited in Ref. 38) – apparently to launch the demonstration sites.¹
- c. Government support is also talked about in Ref. 33, saying “..special funding was set up by financing Dept of central government to start conservation tillage project...government fully supports and pushes the development of conservation tillage..”. Again, more detail will be sought.
- d. Wang Zhicai (Director of the Agricultural Mechanisation Dept., Chinese Ministry of Agriculture) in Ref. 32 talks of building two “CA bands” - one in the Beijing-Tianjin and the other in the “China’s windy dusty area”; that eventually will contribute a total of 17 million ha in CA. He also talks of the “try out” scheme enacted by MOA to get farmers to attempt CA. Farmer training and advertisements have also been enacted.

3. CIDA have produced a 572 page Final Report of their work (mainly Hebei province) from 1997-2003. A synopsis will be included in Draft 2 of this Report.

4. The company Syngenta is present in China but mainly in the south; with only an office in Beijing.

5. Sentek (the Australian moisture probe (capacitance) company) have trials in China – and information on these will be forthcoming, and incorporated in draft 2 of this report.

6. The CCICED (Chinese Council for International Co-operation in Environmental Development) have produced a set of Policy Briefs (ref 39). Of particular reference to this current study are policy briefs:

4: “Building Partnerships with Farmer Associations”

- Farmer associations have been shown to be a vital part of implementing the widespread use of CA. This is the case in Australia (eg WANTFA and SANTFA), South and North America (CAAPAS), etc. The CCICED policy brief states that “farmer associations have a relatively low profile in China”; a matter that needs urgent addressing if widespread adoption of CA is to be achieved.

5: “Preparing for Migration off the Farm”

- A demonstrated, critical component of CA is the dramatically reduced requirements for “manpower” – both in terms of hours and effort. This has been found at all farm levels from hoe-based systems in Malawi to large, open-range farms in USA and Australia. Hence if, as the policy brief predicts, the incidence of farm-living persons earning a large proportion of income from “off –farm work” (“85% of China households had at least one person working off-farm”) then the implementation of CA will support this; the same (or more) yield and

¹ PLEASE:: Prof. Li Hongwen and Prof. Gao Huanwen can you provide some more details ?

profit can be gained with less workers, and reduced effort from these workers.

6: “Raising Productivity on the Farm: Ag. Research, Extension and Water Management”

- The policy brief voices concern “about China’s (agriculture) extension service”; the extension service apparently having “collapsed” during the 1990’s. This is of great concern in terms of implementing CA. Conservation Agriculture, particularly in the early years, relies heavily on extension staff who carry-over ideas between regions and farms, and support farmers in their new practices, and are constantly on-hand to aid and assist, perhaps even with some small, simple trial work. The re-building of the China Agriculture extension service will be imperative to achieving widespread adoption of CA.

11: “Environment and Rural Development”

- This brief describes the environmental damage that has accrued from the “building up of China’s food capacity” from the 1980’s. This includes “soil erosion, degradation of grasslands, salinity, ineffective river basin management, depletion of groundwater, etc.” The widespread adoption of Conservation Agriculture can be a most vital element in stopping and even reversing this environmental damage, as demonstrated over the last 30 years in countries such as Brazil and Argentina where no-till and cover crops are widely accepted. As one example, the retention of crop residues and year-long 100% soil cover from combinations of commercial crops (for profit) and cover crops (to protect the soil surface in the “off-season”) have dramatic off-farm impacts in such areas as:

- soil erosion,
- river and dam water quality,
- dam life (reduced saltation),
- improved water use efficiency (more water penetrates the soil and is available to plants) hence less demand on ground water for supplementary irrigation,
- increased carbon sequestration as soil organic matter levels rise,
- reduced usage of fossil fuels and CO₂ production (from no-till),
- etc

The Chinese agricultural environment can improve markedly with the implementation of CA.

Table 1 Summary detail of Experimental, Engineering and Demonstration activities on the topic of Conservation Agriculture, China

Note:: PRC/GEF (OP12)/ADB “project provinces” **highlighted**

	Province/County/Town latitude & longitude	Duration of study Funding agency	Field activities, major findings	Contact person/principal officer; publications
1.	Linfen City, Shanxi Province	12 years (first crop in 1992) ACIAR (Univ. Qld) with CAU and Shanxi Farm Machinery Bureau	1) Rain-fed; 1.2 ha plots; trts: no till (NT), chopped straw; subsoiler, chopped straw; conventional (conv.) being mouldboard plough. Yields up by 18.5%, herbicide usage down 20-30%, runoff & wind erosion down 60%, water use efficiency (WUE) up 19%; OM up 35%, e'worms – 5/m ² (0 in m'board). 2) Developed: to match 15-18hp small tractor – (i) 2BMF-4D maize planter (by CAU) – can handle very heavy crop residues and (ii) 2BBMFY-4D wheat narrow point openers	Dr Jeff Tullberg (Australia); Prof H.W. Gao (CAU). Refs: (see reference list below): (1),
2.	Dingxi, Gansu Province	First sown March 2002 ACIAR (NSW Dept. Agriculture) with Gansu Ag. Univ	Wheat and field pea sown; trts: conv. no straw, conv. incorp. straw, NT with straw (NTS), NT no straw, conv with plastic mulch (PM), NT with PM. Yield of wheat and pea greatest in NTS; crusting led to poor emergence and low yields with plastic. Greatest fallow water storage and WUE under NTS.	gauhgb@hotmail.com . Ref: (2).
3.	Dingxing County, Hebei Province (39° 21'N)	No dates given CAU	Corn sown; trts: NT, subsoiling, harrow, mouldboard (conv.), each with 0, 50 and 100% residue cover of the first three. Yields not trt affected, better water storage and less water use with NT trts, bulk density (BD) more with NT, root growth and crop dry matter better	Ref: (3)

			with NT.	
4.	near Luoyang, Henan Province	Commenced September 2001. Sino-Belgium cooperation program; Chinese Academy of Agricultural Sciences; Flemish Interuniversity Council	Lab and field rainfall simulations on winter wheat; trts: conv. (ploughed), reduced till, NT and subsoiling. Almost zero runoff and soil loss and better infiltration with NT	Ref: (4)
5.	Jingshang, Shouyang county, Shanxi province (113° 12'E 37° 45'N)	Commenced 1998; run for 5 years ACIAR project LWR2/96/143	Plots : 20m long, 5.6 m wide. Trts: NT with residue and no compaction; same but compacted; surface till with residue not compacted; same but compacted; conv. (mouldboard); NT without cover and compacted. Runoff in each of 5 yrs always least (average 50% less) with NT + residue and not compacted	Ref: (5)
6.	Tunliu and Shouyang, Shanxi province (Tunliu: 113°E 36°N) (Shouyang: 112°E 37°N)	Tunliu: 4 years; 1987 – 1990 Shouyang: 4 years; 1992 - 1995	Spring corn (1 crop a yr regime) Trts: Tunliu (T) - conv. (mouldboard), NT, conv and incorp. straw; Shouyang (S) – conv., NT keep corn stalk, NT mulch corn stalk, min till (MT), MT mulch corn before seed emergence, same but mulch after emergence, subsoiling + retain corn stalk. Better water storage with NT and MT; NT decreased ET in S but increased ET in T; stubble incorp. increased yield up to 26%. NT yields down in wet years.	Ref: (6)
7.	Fengning Bashang, Hebei province	One-off (?) experiment; March-April 2002	Dust analysis. Trts: conv (m'board to 20cm), NT with residue cover, same but harrowed (disced). Large plots (200 m x 200 m). Up to 75% less wind erosion with both NT trts, relative to conv.	Get title page
8.	Hohhot Inner Mongolian Autonomous Region	Commence 1999; new design 2002 – tested in Spring 2002.	1999: provide Canadian small seeder (Fabro); drawbar, 34 kw	Ref: 8, 9

	(IMAR)	Further developments - fro testing in 2004 Canadian International Development Agency (CIDA) IMAR	tractor needed; i-changeable disc and hoe openers; too large and complex 2002: seeder re-designed for 18kw tractor, 3-point linkage, knife an disc openers, adaptable for many crops – min and NT, 20 and 40 cm rows. Performance compared with commercial 2BM-5 NT seeder 2004: further refinements for NT and min till sowing – under test.	
9.	Wenniute Qi county, Chifen city, IMAR (117° 49'E - 120° 43'E 42° 26'N - 43° 25'N) Chenbaerhue Qi county, Hulunbeier Meng region, IMAR (118° 22'E - 121° 10'E 48° 43'N - 50° 10'N)	Commenced 2001 “Inner Mongolia sustainable agricultural and animal development experiment and demonstration project”	Wenniute Qi county, Chifen city (small scale NT demonstration site). Average farm size: 2 ha. Chenbaerhue Qi county, Hulunbeier Meng; large scale demonstration sites (see Table ?) from Brant's NT-manual	Brant Kirychuk Ref: 10
10.	Wheat: Chen Huang village near Linfen city, Shanxi province Maize: near Zhongai township, Shouyang province (site name: Hoshyan)	Commenced 1993 ACIAR CAU Shanxi Agricultural Machinery Bureau “Conservation / Zone Tillage Research for Dryland Farming” “...to optimise sustainable rainfed grain production in semi arid areas by the development and assessment of conservation tillage equipment and systems, using a combination of Chinese and Australian technology”	ACIAR project 9209 Machinery development with local modifications central – spear point opener for wheat (initially from Australia) and locally constructed single disc opener for maize (5 made and now used). 4 years of filed trials: 1) Wheat: 53 x 200 m trial; 7 trts with 3 reps. Trts: NT into standing stubble, NT after stubble pressed, as before with additional crop residue (manually applied), subsoiler (standing stubble), as before with stubble chopped, as before with additional stubble, conv (deep plough and harrow). 2) Maize: 35 x 120 m trial; 7 trts	J. Tullberg Professor H.W. Gao Ref: 11

			(as above) Yields in NT better by 3- 15% both crops. Runoff with rain decreased in NT, particularly with controlled traffic. Priority was local farmer input; explains “adoption of reduced till...retention of crop residue over large areas of maize...in Shanxi”	
11.	Sites as in 10., above	Commenced 1996 to 2003 “Sustainable Mechanised Dryland Grain Production”	ACIAR project 96/143 Treatments of previous project (10., above) replicated and continued for a further 5 years; 3 summer and 4 winter crops. 10 year average yield increases with NT (rel. conv) - maize: 18%, wheat: 15%. Dry years – yiled increases greater. Water infiltration was a max of 94% of rainfall under NT, residues retained and uncompacted (from wheels). NT equipments pioneered are now locally, commercially available; “some hundreds”.	Ref: 12.
12.	Dingxi county, Zhangye, Gansu Xifeng county, Qingyang, Gansu	Commenced 1999 to end 2004 “Improving the Productivity and Sustainability of Rainfed Farming Systems for the Western Loess Plateau of Gansu Province”	ACIAR project LWR2/1999/094 Dingxi – drier; spring wheat; Gansu Ag. Univ. Xifeng – more rain; winter wheat; Gansu Grassland Ecological Res. Inst. Main themes: research (NT, machinery dev., legumes in rotations) and farmer capacity building Trts: NT and 2 with cultivation; trial has 4 years duration	Bill Bellotti (NSW Australia) Prof. Nan Zhi Biao (Lanzhou, Gansu) Ref: 13.
13.	Ningxia Inner Mongolia Henan	Proposed project by CIMMYT – 2004 onwards: Conservation Agriculture for the Dryland	Adapt principles and practices of CA to sites in two pilot communities in each of four	Pat Wall; CIMMYT Professor H.Gao; CAU Ref: 14

	Shandong	Areas of the Yellow River Basin: Increasing the productivity, sustainability, equity and water use efficiency of dry-land agriculture, while protecting down stream water users. CN228,	Provinces in the moist/drylands of: Henan, Shandong, Ningxia and Inner Mongolia	
14.	Dehui, Jilin province (44° 21'N 148° 15'E)	Commenced 2001 Three years of yield data Tillage trial on “typical;” black soil in NE China	Trts: mouldboard, ridge till, zone till and NT; one Kinze planter and all rest locally fabricated NT has good moisture storage, seed germination and early growth; equal or better yields; production costs with NT less. Challenge: harvesting corn, leaving residues	Zhang Xiaoping China Academy of Sciences, Changchun, Jilin & Dr. Yang, Xueming Agriculture and Agri-Food Canada
15.	Yancheng (near Dongtai, north of Shanghai), Jangsu province	Commenced ? “Methods of handling excessive straw with CA and improved machinery”	FAO-based Technical Co-operation project (TCP) With CA and NT, particularly, - how to manage residues with time. Imported Brazilian NT seeders (Vence Tudo) brand	Mr Zhou Xiang, Yancheng Dr Theo Friedrich (FAO, Rome)
16.	The Songnun plain in the Northeast provinces of: Liaoning, Jilin, Heilongjiang and IMAR	Proposed FAO – TCP “Conservation Agriculture for Sustainable Crop Production on Black Soils in Northeast China	To import CA to develop the current system into a sustainable and resource- and input-saving CA system, including reduced and zero tillage chemical weed control and crop rotations; maximise residue retention; reduce operational costs and save energy; utilise local manufacturers of farm machinery (Changchun) for CA equipment.	Dr Yang Xueming Agriculture and Agri-Food, Canada Dr Theo Friedrich (FAO, Rome) Ref:
17.	Inner Mongolia Autonomous Region (IMAR)	Commenced ? Now complete. Five year “Sustainable Agriculture” project	Capacity building between Canada and China aimed at promoting environmentally sustainable agriculture practices in the IMAR via better forage-based livestock performance and conservation tillage technology.	Gerry Luciuk Agriculture and Agri-Food, Canada Ref: http://www.agr.gc.ca/pfra/international_e.htm
18.	Hebei province	Commenced 1991 to 1996; run for 12 yrs Now in 2 nd phase: 1996-2003 “Hebei Dryland project”	Aims to improve rural well-being via sustainable and profitable agriculture; hebei Lowland Plain	Dr Chi Chang Agriculture and Agri-Food, Canada

		NOTE: in 2001: 90% of corn in Hebei (2 million ha) sown with NT; sown straight after harvest of winter wheat.	Phase 1: introduced concepts of NT (with Hebei Academy of Ag. And Forest Sci.), improve WUE and crop yields; 1993: added a socio-economic component; 1994: resource conservation and integrated pest management Phase 2: Collaborative program on protecting fragile dryland agroecosystems, with extension program for technology transfer in five provinces: Hebei, Shandong, Gansu, Shanxi and Inner Mongolia. Trial in Ningjin county (Hebei) with NT wheat: OM% increased annually – 1.37, 1.47, 1.80 (2000, 01, 02)	& George Clayton (Lacombe Research Centre, Canada) Ref: 15
19.	Yongling district on the Guanzhong plain in Shaanxi province	Commenced 2001. To 2003.	Trts: 10 variances on NT and residue retention, crop sequences with summer corn and winter wheat. 5 types of CA sowing equipment patented; NT wheat and corn planters, subsoiler NT suitable for this areas double cropping; water storage and OM increased with NT; better economic returns with NT – wheat yielded up 53%, corn by 25% compared to conv.	Prof. Qing Yang Yangling, Shaanxi Ref: 16
20.	Mashan village, Xinchun town, Hongtong county & Baishi village	Commenced 1997, patent on equipment: 2001, placed on Ministry of Ag, list of recommended conservation tillage equipment: 2003	No till zone planting into heavy residue cover developed. NT on ridges with residues applied; seeds placed in furrow (either side). Experimental areas were Mashan: 1 ha, Baishi: 1.6 ha. Trts: NT zone planter into standing maize stubble; control: maize stubble chopped then sowing with a disk rotary planter Control gave 28% yield increase	Ref 17 Ag. Mechanisation Centre, Linfen, Shanxi

			with 25% less costs and 20% less water use.	
21.	Cheghuang village, Linfen City, Shanxi	Commenced 1992	<p>Early NT trial – to assess if NT suitable in north China, especially with full wheat straw mulching, and develop suitable implements.</p> <p>One crop a yr area. Trts: NT with residues, subsoiling with residues, NT as before but harrowed, mouldboard (conv.) with no residues. Total trial area: 1.15 ha. Used a 2BMF-11 NT seeder, developed locally.</p> <p>NT reduced runoff and soil evap, hence WUE better by 19% in NT, and even greater in dry years. NT increased wheat yields by 18% and up to 24% in dry years. NT reduced production costs by up to 22%. OM under NT up by 34% and 21% in 0-10 and 10-20 cm layers, e'worms – 5/m² (0 in m'board). Water stable aggregates greatly increased under NT. The soil originally hardsetting, no longer – better sowing conditions; no clods.</p>	Ref. 18 China Agriculture University (CAU)
22.	Shouyang, Lucheng and other counties, Shanxi	Commenced 1997; now 7 yrs trial results	<p>No-till corn planters developed (2BMFY-3 and enhanced model 2BMFY-4); paired concave disks as row cleaners and narrow points as seed openers.</p> <p>Extensive use: good operation, little plugging, good plant germination (90%) and fertiliser efficiency with only slight emergence delay. Simple and reliable. Now good design for competitive market.</p>	Ref. 19 Zhansheng Han, Shanxi province Centre of Ag. Machinery, Taiyuan, Shanxi
23.	Fengning Manch county, Heibei province	Recent ?	A new method of dealing with corn stalks before NT planting; cutting a	Ref. 20 Jiang Jinlin, Gao Huanwen.

			setting the stalk to one side with narrow point NT furrow openers sowing behind. Designed for 11-14 kw tractor with 3-point linkage. One crop a year. Tests conducted in 3 fields. Excellent results	Laiyang Ag. College
24.	Shanxi and 10 other counties; Pingdu, Lingqi, Gaoping, etc	Commenced: 1998 over 2000 ha in Shanxi Also “several years of trials” in 10 counties	Development of a strip-tillage no-till drill (seeder) to combat drill plugging and lack of power. Now extensively field tested. Many positive outcomes; power hungry if residues dense.	Ref 21. Jin Chang Shanxi Provincial Centre of Ag. Machinery, Taiyuan, Shanxi
25.	9 Banners and 4 Leagues in IMAR	2001, onwards: Demonstration and extension works Now 13.3k ha planted in IMAR; corn, wheat, food grain, beans, rapeseed, forage grass	This seeder (2BM) - an “improvement” made on a Canadian Ag. Bureau seeder. Demonstrations show yield increase of up to x3; decreased costs and increased income (4 million yuan; 2001-3). 35 sets now manufactured; a recognised demonstration model of conservative farming equipment by the State Bureau of Ag and Inner Mongolia Farm Machinery Bureau.	Ref. 22 Zhao Manquan College of Mechanical and Electrical Engineering, Huhot, IMAR
26.	Various locations, including: Beijing, Hebei, etc	Not stated	Lists current no-till, commercial planters and manufacturers /suppliers: -Nong Haha machinery Ltd Co.: corn NT planter (2BQM) -Wa Fangdian Dalian; 2BQM-6 originally designed by Prof Hu Bilie et al., BAU and improved type: 2BQM6D -Shi Jiazhuang Agricultural Machinery Factory (2BFY-3) -Farming Institute, Hebei province: NT corn planter (2BYM-2) -Dalian Ag. Machine Factory (2BQM-6A)	Ref. 23
27.	Bangladesh and Nepal	1997 onwards	Devising conservation technologies	Refs. 24 and 25

			for use on “Chinese” 12-15 hp Dongfeng and Saifeng type 2 -wheel tractors – for small and resource poor farmers. Replacing conventional rotovator with a 6 row reduced/shallow till drill, called a power tiller seed drill (2BG6A). Farmer trials now showed increased yield and greatly (up to 89%) reduced planting costs with the new design. Problems remain of purchase price, weight and farmer knowledge/acceptance. Mexico trials continue.	CIMMYT Nepal and Bangladesh
28.	Note: extension of 10. and 11. ABOVE Shanxi and Shouyang expts., extended to Hebei, Inner Mongolia , Liaoning, Gansu provinces, etc Then, 2002: 94 “demonstration counties” see Table 2	1999, further extended 2002 “Chinese Ministry of Agriculture: “CT Demonstration Project”	Followed from earlier trial work. Now: 800, 000 ha of CT demonstration sites. Combination of agronomy, farmer participation and engineering (new seeders etc)	Ref. 26 China Dept. Sci and Technology Ministry of Agriculture ACIAR CAU Shanxi Farm Machinery Bureau Professor Gao
29.	Ganzhou district, Zhangye city ?? Gansu province	Not stated One season trial (?)	Irrigated area; the “oasis” areas within the Northwest Arid Area (NWAA). Trts: NT into standing wheat stubble and conv. (mouldboard) NT trt used 45% less irrigation water and NT with beds gave 5% more yield.	Ref 27 Jianmin Wu, Gansu Ag. Univ
30.	Various trial sites on the eastern plain of Henan province: Matou town, Takong county, Zhokou city; Xinxiang Fengqiu county; Shangquin Zhechong county, Liumiao township	Not stated	Trts: NT with straw crushing, same but keep whole straw, conv (mouldboard). Many sites. Soil moisture greater with NT, OM not different, maize yield increased with NT.	Ref. 28 Yu Yonchnag Mechanical and Engineering College, Henan Agric. Univ., Zhengzhou
31.	Gansu provinve : Huchi, Xifeng, Shuzhou (10 experimental plots at provincial level; 5 demonstration plots at Ministry level)	Commenced 2000 Projected: 35, 000 ha by 2005 under CA in Gansu	15 plots established to demonstrate new CA technology Now approx. 10, 000ha under CA Experimental plots: single maize	Ref. 29 Xinhui Cao Technical Extension Centre of Agricultural Mechanisation, Gansu

			<p>(Huchi), single winter wheat (Xifeng) and 3 crops in 3 years (Shuzhou)</p> <p>Locally designed equipment manufactured. Training programs run. Also local govts. encouraged to participate – experts trained.</p> <p>Trts: NT with and without stubble, conv. (mouldboard)</p> <p>Organic matter up, runoff and evaporation down with NT</p> <p>NOTE: Local Govts established fund(s) to support tillage technology R&D. Includes “allowance program” to support farmers entering CA – to motivate and extend CA technology.</p>	
32.	Inner Mongolia, Shanxi, Shaaanxi, Gangsu, Ningxia, Qinghai provinces	Not stated	<p>Presents outputs of the “863 Program” – “Special Fund from the National High-tech R&D program; project no. 2002AA2Z4121 - a new, systemised protective tillage technology</p> <p>Trts: generally retain far more residues and reduce till towards NT</p> <p>Deep fertiliser placement and herbicide use</p> <p>Developed a “complete set of multifunctional reduced tillage implements”</p>	<p>Ref. 30</p> <p>Jia Honglei</p> <p>Jilin Province, Academy of Agricultural Machinery, Changchun</p>
33.	Dingxing county, north Hebei province And demonstration sites in 45 counties	Commenced 2001	<p>With the Ministry of Science and Technology experiments in NT for annual double cropping (irrigation) began. 2 new planter designs: 2BMFS-6/12 rotary hoes ahead of seeders; 2BMD-12 wheat NT seeder</p> <p>Trts: 10 experimental trts, with each of maize into a range of densities of</p>	<p>Ref. 31</p> <p>Prof. Li Hongwen</p> <p>NOTE: this research part of the China National Key Technologies R&D Project of the 10th 5-year Plan</p>

			residues – none, chopped, subsoiled, etc. 4 demonstration trts: wheat sown into maize stubble standing, chopped, rotary hoed and deep ploughed. Soil water in maize up 6-20 mm (in 1 m) with NT; wheat 8.64 mm up in 0-30 cm layer. Maize yield up 12% with full NT and 100% residue Demo sites: at 44 of 45, NT yields better than conv. (4.4% more). Production costs also down. NT also (apparently) greatly reduced number of irrigation without yield penalty.	
33.	94 Counties and 13 provinces: Beijing, Tianjin, Shanxi, Inner Mongolia , Liaonong, Shandong, Henan, Shaanxi, Gansu, Ningxia, Qinhai, and Xinjiang.	Commenced 2002	Ministry of Ag. Commenced the expansion of CA demonstration sites from 2002 to date. 270, 000 ha under CA by 2004. NOTE: Ministry of Ag. supported the concept of “try out”. All sites monitored for differential changes (compared to conv.) CA instruments developed and used as needed. 10 yrs of data: CA reduces dust storms by 48-60%, increase yields 4-32% and reduced costs by 225-945 yuan/ha	Refs. 32, 33 & 34 Wang Zhicai Ag. Mechanisation Management Dept. Chinese Ministry of Ag.
34.	Gansu; 15 counties Xifeng, Sushou, Canyuan, Huachi, Gangu, etc	Commenced 2002	Total area of 10, 000 ha of CA demonstration sites through the province. Water storage better with NT (up 2%). In Xifeng, wheat yield up 14%. In Huachi, NT saved 75 working procedures, 120 workdays /ha, 435 RMB/ha compared to plastic mulch	Ref. 35 Shicai An, Gansu.
35.	Jingshang, Shouyang county	Commenced: 1992 (12 yr trial)	7 years data presented of runoff and	

	(37° 45'N 113° 12'E)		wind erosion Trts: as in 5, above. Runoff from NT with cover was 50% less than conv. Soil loss was 20% of conv.	
36.	Hohhot, Inner Mongolia	Commenced 2000	Small Canadian seeder (Fabro) brought to China for local evaluation; 34kw, drawbar construction – found to be too large and needed 3-point linkage 2002: re-designed seeder – for 18kw tractor, 3-point linkage, knives and discs for a wide range of crops, simple, easy maintain, etc. Tested spring 2003 on 0.3 ha. 2 new seeders now available, on the new design.	Ref. 36 Mark Stumborg Agriculture and Agri-food, Canada
37.	Shandong (farm of the Academy of Agricultural Science)	1998-2002 (4 crop cycles)	Irrigated trial Trts: wheat - flat planting and in-beds WUE increase 30% with beds. Yields up by 13% on beds Question: are there merits in adopting beds in dryland ?	Ref. 37 Wang Fahong Shandong Academy of Science, Jinan, Shandong

Table 2 Summary detail of the National Demonstration Counties, China. Table supplied by Professor Gao Huanwen; Total of 94 Counties

Notes:

Extension of this technology: in 2002 it became a National Project, each year 30 more counties were selected as demonstration counties, applied CT to 40, 000 mu (2666 ha) area, total 94 counties have become national demonstration counties with applied CT more than 250, 000 ha. Total area adopted CT is more than 700, 000ha at present. During the national demonstration counties, CT monitoring sites are established in 10 national demonstration counties.

Province	Year	Number of County	<i>National Demonstration Counties</i>
Beijing	2002	4	Fangshan, Daxing, Tongzhou, Changping*
	2003	1	
	2004	2	Pinggu, Yanqing
Tianjin	2002	3	Wuqing District, Baodi District*, Ninghe County
	2003	2	Ji County, Jinghai County
	2004	2	Xiqing District, Beichen District
Hebei	2002	7	Gaocheng City*, Qing County, Fengrun District, Fengning County*, Luanping County, Zhangbei County, Huolu County
	2003	3	Sanhe City, Zhao County, Reclamation Area of Hebei
	2004	4	Xinji City, Fucheng County, Linzhang County, Dacaozhuang Farm
Inner Mongolia ¹	2002	7	Keerqin District, Songshan District*, Kalaqin Banner, Keshiketeng Banner, Shangdu County, Wuchuan County*, Liangcheng County
	2003	3	Yijinhuoluo Banner, Aohan Banner, Siziwang Banner
	2004	3	Dongsheng District of Eerduosi City, Guyang County, Ningcheng County
Liaoning	2002	4	Zhangwu County, Suizhong County, Chaoyang County, Lingyuan City*
	2003	2	Faku County, Fuxin County
	2004	3	Linghai City, Beipiao City, Kangping County
Shanxi	2002	7	Lucheng City, Yaodu District, Wutai County, Pianguan County, Huaiaren County, Zuoyun County, Yanggao County*
	2003	2	Tianzhen County, Shouyang County
	2004	4	Zhangzi County, Xiaoyi County, Tunliu County, Xiyang County
Shaanxi	2002	4	Tongchuan City, Pucheng County*, Dingbian County, Shenmu County
	2003	2	Yuyang District, Heyang County
	2004	3	Bing County, Hengshan County, Fuping County
Gansu	2002	2	Xifeng District*, Gangu County
	2003	1	Suzhou District
	2004	2	Shandan County, Kongdong District

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Appendix 1

Responses to the preliminary email request:

From Julian Dumanski 7/11/2004

As to your specific request, I will refer you to a colleagues, Dr. Bernie Sonntag. In previous years, Bernie and scientists from the Lethbridge research station conducted quite a number on experiments on zero till (note again that these were zero till experiments related to production - almost nothing on environmental improvement, unfortunately). None the less, this information will be useful, I'm sure.

From Bernie Sonntag 8/11/2004

I am at this moment talking to the ADB people in China re. some potential involvement in their Land Degradation initiative. CIDA folks are running around in China right now developing their new sustainable agriculture program in several west China provinces essentially a continuation of the Inner Mongolia project managed by Gerry Luciuk (now completed), but involving more money and more provinces. Collaboration with complementary work funded through the ADB Land Degradation project and the World Bank Pastoral Development Project in Xinjiang and Gansu is envisaged - both of these projects have substantial GEF money.

More specifically on your questions. You could talk to Wayne Lindwall – now in Ottawa with Research Branch. Chi Chang was the project coordinator for the Hebei project during much of its 12 year run which included conservation tillage demos in several provinces in the later years. The project had a large impact iHebei where much of the corn is now direct seeded into wheat stubble. That project is now done, but Chi is in China now with the CIDA mission planning future work. George Clayton at the Lacombe Research Centre was heavily involved in the latter years of the Hebei project. The Inner Mongolia project also involved conservation tillage demos - Gerry can tell you about that. Research Branch folks from Indian Head and Swift Current were involved.

The technology for better land management is well known and has been demonstrated in numerous places in China. The main problems are inappropriate policies and institutions including land tenure, rural financial services, dysfunctional extension system, education in rural China, no legal framework for farmer associations, underfunded public services in rural China, etc. I'll send you some of the policy briefs we wrote recently for the Agriculture and Rural Development Task Force of CCICED. We presented these at the CCICED AGM last week. These briefs will go directly to the State Council.

From Theo Friedrich 8/11/2004

My first contact is Prof. Gao. He is involved in CA work, which is still at the level of conservation tillage, in Hebei and Shanxi Provinces. Total area probably around 300,000 ha. Gao is engineer and developing simple cheap no-till seed drills.

I am involved in a TCP project in Jangsu Province (based in Yancheng, fields near Dongtai, north of Shanghai). The origin of that project is the excess amount of straw and other residues, which are burnt and dumped into canals.

We try, with zero tillage/CA to show how to manage residues in time. We have imported Brazilian no-till seeders into that project (Vence Tudo, same as in North Korea). The e-mail contact to the project team in Yancheng is yctfz@email.com.cn (Mr. Zhou Xiang). Other contact is possible through our operations officer in the FAO Beijing office, Mr Tangren Wang (Wang.Tangren@fao.org).

Another contact we have is Mr. Xueming Yang [yangx@agr.gc.ca]. He is/was based in Canada, but is from Northern China (Jilin), promoting CA in a similar environment to Mongolia/Kazakhstan. He was instrumental in pushing a TCP request.

I also understand that SEMEATO from Brazil is already having commercial contacts in China.

I would further contact CIMMYT (Pat Wall p.wall@cgiar.org, Larry Harrington L.HARRINGTON@CGIAR.ORG, Ken Sayre k.sayre@cgiar.org). One of them mentioned CA work done in China, including potatoes, but I never followed up.

From Theo Friedrich 10/11/2004

I just opened a book which my chief had brought from the CIGR congress in Beijing. One of the Chief editors is Gao Huanwen, it is called Conservation Tillage and Sustainable Farming and seems to be the proceedings of the conservation tillage section of the conference (ask Jeff Tullberg for a copy - he was there).

Just in the introductory paper it talks about 112,000 ha in CT demonstration plots through 58 counties in China (see also the Chinese papers at ISTRO). The book could give you an idea about conservation tillage/CA in China. It also includes articles about the work of the rice wheat consortium in India/Bangladesh (i.e. what we do with bed, strip-till and no-till planting in Bangladesh).

From Bruce Carrad

the work done in individual provinces

- the nature of "interventions" - purely engineering, trials, on-farm work, etc
- country - wise...ie review all the Canadian work, then the Chinese, then the Australian....

From Bob Stewart 11/11/2004

There is some Conservation Agriculture going on in China although the term CONSERVATION AGRICULTURE is not always easily separated from NO-TILL, LIMITED TILL etc. The best way for me to answer your questions is to refer to you to some of my Chinese Friends and Colleagues that really know what is going on in their respective areas.

- Dr. Zhu Zixi is in Zhengzhou located in Henan Province that grows more wheat than any other province in China
- Dr. Liang Weili is in Heibi Province in the North China Plain and he lives in Boading;

- Dr. Li Shengxiu is in Yangling in Shaanxi Province where he is with Northwest Sci-Tech University, and
- Dr. Fan Tinglu is in Langzhou located in Gansu Province.

These four represent a large portion of China where wheat is a major crop and much of the wheat in these areas is double-cropped with corn. You may wish to contact these gentlemen and they may wish to contact you with information. For them to have a clearer understanding of what is meant by Conservation Agriculture, I am enclosing for their convenience the address for the FAO website for Conservation Agriculture.
<http://www.fao.org/ag/agl/agll/prtcons.stm>

These gentlemen can either provide you with information, or can provide you with someone in their Province that can. Pepe Benites spent a couple weeks at our Workshop along with Dr. Li Shengxiu so he knows him well. Pepe and Dr. Li tentatively planned a small workshop that would have focused on Shaanxi and Gansu Provinces to look at some of the tillage practices, but this did not come to fruition.

From Larry Harrington. 12/11/2004

Des - here is the approved proposal (WORD.doc) for a project we have starting on CA in the drylands areas of the Yellow River Basin. Funding is from the Challenge Program for Water and Food. We are still negotiating the contract and the work is yet to begin. Still, this may be helpful re our plans. We very much would like to be part of any effort to pull together and learn about what others are doing in China re CA.

From Brant Kirychuk 13/11/2004

It was great to meet you and hear about your work in China. I would be happy to provide you with material related to conservation tillage that we have produced in the Sustainable Agriculture Development Project.

I am attaching a paper recently presented at the CIGR conference in Beijing. I believe it covers off in a concise way most of the questions you had regarding our experience with Conservation Tillage in China.

I will also mail you a CD which has a Conservation Tillage Manual that was developed for the project, and some conservation tillage presentations used in training.

The Conservation Tillage Component of the project was led by a number of researchers from Agriculture and Agri-Food Canada. Their contact information is as follows:

Guy Lafond
 Agriculture and Agri-Food Canada, Box 760, Indian Head, SK, S0G2K0, Canada
 email lafond@agr.gc.ca

Brian McConkey
 Agriculture and Agri-Food Canada, P.O. Box 1030, Swift Current, SK, Canada, S9H3X2
 Email: mcconkeyb@agr.gc.ca

Mark Stumborg
Agriculture and Agri-Food Canada, P.O. Box 1030, Swift Current, SK, Canada,
S9H3X2
email: stumborgm@agr.gc.ca

Chi Chang
Agriculture and Agri-Food Canada, Lethbridge Alta. Canada
Email: chang@agr.gc.ca

Guy, Brian, Mark, and Chi - If you have any information that you feel would be useful to Des please pass it on to him.

From Swee Yew Siong (Trelleborg Managing Director, SE Asia 14/11/2004

I am informed about your involvement in the Conservation Agriculture in China and is pleased to hear that we will have an opportunity to participate in this project.

For your information, today Trelleborg Wheel Systems activity in China is only in the industrial solid tyres. We have an office in Shanghai headed by Leon Li, a Chinese national. We have planned to kick off activities in the agri market next year by participating in a major farming equipment exhibition in April 2005. This exhibition will be held in Nanjing.

I look forward to supporting your project and would be pleased if you could provide us with more information so that we can discuss how to move forward from here.

From Jeff Tullberg 15/11/2004

Professor Gao was the Chinese leader of my projects from 92 to 03.

Straight conservation tillage work is finished, but new project (still under negotiation) will probably be looking at impact of permanent beds on irrigation water use in W China.

Various forms of reduced/minimum/zero tillage now widely used in NW China, based on planters developed in our project. Genuine Zero still relatively rare, but they are getting there!

ACIAR has commissioned a consultant to work out the impact in China and Australia.

And another:

There are a whole range of planters involved in this work, for different cropping systems, and tractor powers. They have been developed by Gao, Hongwen, and Han from Shanxi agricultural machinery bureau (and probably a dozen others).

Advice came from Ross Murray and myself at Gatton, and the whole process started with the delivery of the bunch of different planter components to China in 1993. This included all sorts of bits and pieces, everything from Janke tines to a Bio Blade. We subsequently supplied them with a multi-adjustable maize planter, based on components manufactured by Big Rig, in Dalby. Ross spent many hours in the field in China and Australia with the Chinese counterparts, discussing planter components and performance.

I think our most valuable contribution was to give the Chinese confidence to try different arrangements -- and work towards something simple and cheap.

And another:

We can show you where our experiments were (Linfen, Shouyang, and 1 other place of minor significance in northern Hebei). I think the Linfen controlled traffic/zero tillage experiments, and the Shouyang runoff plots are all still there.

In addition there were dozens (I think about 40 in total) "extension plots" of variable management quality, operated by local farm mechanisation bureau's. You would have to ask Gao where these are -- and I don't think he would know them all!

The New South Wales central west farmers group visited the Linfen plots -- and were duly impressed -- while travelling to the CIGR conference. They might have got to one to other places, as well.

From Christian Roth 16/11/2004

ACIAR has just commissioned David Vere (NSW DPI) to carry out an economic impact study on ACIAR's no-tillage work in China. Please contact Debbie Templeton (Templeton@aciar.gov.au) for details.

From George Clayton 18/11/2004

I have worked closely with Dr. Chi Chang on the Hebei Dryland Project. We discussed your request and determined that the appropriate sections of our Final Report submitted a year ago would likely meet your need.

There is a lot of work to do in China on Conservation Tillage and No-Till systems. Adoption is slow, but not surprising. It has taken Canada approximately 35 years to reach a 60% adoption rate on the Canadian prairies. This was a result of a good combination of research and an effective Outreach program.

Please look forward to Dr. Chi Chang's e-mail. Both Chi and I would be willing to help you in future if you find it necessary.

From Bernie Sonntag 18/11/2004

I have no involvement with anything in China as of the end of October when our Task Force reported to CCICED - just prior to your workshop. Bruce Carrad and I briefly discussed potential for involvement in the ADB/PRC/GEF activity, but no offers have surfaced to date.

The Canadians you have copied in your emails should be able to help you. All of them were involved in China at a significant level in the conservation tillage work over the last 15 yrs or so. A couple of them were just in China with CIDA folks working on implementation of the new CIDA sustainable agriculture project. The project is being managed by Agriculture and Agri-Food Canada. The project manager is Bruce Howard - howardb@agr.gc.ca

Sari Soderstrom at WB is one of the main movers in the WB Pastoral Project. She is now in Beijing.

From Chang Chi 18/11/2004 (and .pdf – saved)

It was nice to talk to you in China in October. I was with Brian Bedard's mission for CIDA Sustainable Agriculture Development Project Phase 2.

On both Dr. George Clayton and myself, I respond to your questions:

Our Centre had a CIDA Hebei Dryland project for 12 years (1991-1996 Phase I and 1996-2003 Phase II). In phase I, we already started to introduce CT to our Chinese counterpart scientists in Hebei Academy of Agriculture and Forestry Science (HAAFS). Although CT research experiments were carried in the beginning of the project, it was very difficult to convince the Chinese scientist to accept the concepts of CT. However, after two to three years, the no till corn production system is well received not only by the scientists but also by the producers. By now, 90% of corn production in Hebei province is under zero-till systems. Corn is seeded right after winter wheat harvested in Hebei. The project designed chopper and seeders work well for the corn.

Therefore, zero-tillage is widely practiced in Hebei. However, winter wheat is seeded right after corn harvested in the fall. Corn residue management is much difficult and the project designed winter wheat seeders did not perform well. Even after many versions of refinement in the 2nd phase. However, the research results of zero till winter wheat was very in encouraging. Please see attached zero till report file which is a part of the Hebei Dryland Project Phase II final report. The zero till winter wheat seeders was designed for 70-horse power of tractors used in Hebei and the proto type seeders was constructed with local steel materials. This greatly limited the functions of the seeders.

At the end of project in 2003, George and I visited an institute in Shijiazhuang, Hebei. We saw a very impressive zero till winter wheat field with corn residue. We never saw the seeder which was designed by the Bureau of Agriculture Machinery of Hebei Province. If the seeders could work as it seemed, it should be helpful for the adoption of zero till for winter wheat. The only drawback of the zero till seeding density is much lower than the conventional till winter wheat. This might be just a visual problem and not a yield problem as our report indicated. Unfortunately, our experiment did not run long enough to see real benefits on soil property changes and crop yield.

From Dr. Yang, Xueming 18/11/2004

So glad to know that you are involved in promoting conservation tillage in China. Regarding the "current level of reduced- or no-till in China", I think you must have already found some information such as from the International Ag-Engineering conference proceedings held in Beijing last month.

I do wish to do something useful in promoting conservation tillage in northeast China and did have put together a TCP proposal with help from your friend Theo Friedrich and his colleague. If you have not got this proposal and wish to have it, please let me know.

I came from that region, and I know conservation will help local farmers to fight serious soil erosion and what a drought spring and soil erosion are in that area.

Therefore, we do have established a tillage trial on a typical Black Soil in Northeast China in Fall 2001. The trial is A 4-rep RCB design with tillage as main treatment (Fall mouldboard plow, Ridge tillage, Zone tillage, and No-tillage..)

-location of trials/ farmer demonstration sites:

Dehui, Jilin Province (44°21'N 148°15'E), Soil type is Mollisols, (Based on USDA Soil Taxonomy, it is a Boroll; however, it is more like a Udoll because this soil supports good corn production.)

-personnel involved (PARTICULARLY contact details),

Zhang Xiaoping

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Dr. Yang, Xueming

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-past conferences/workshops conducted

Have held several workshops involving farmer, scientists, and administrators in surround areas.

-equipment(s) used,

Except one Kinze No-till planter (imported from Kinze in 2002), all other equipments used are local.

-crops grown,

continuous corn and Corn and soybean rotation

-climatic considerations,

Rainfall comes simultaneously with high temperature during the growing season (June to Sept). Precipitation is about 530 mm and 60% as rainfall in June to August. Mean annual temperature is 4.5°C. Mean monthly temperature is over 15°C from April to September and over 20°C for June, July and August. The weather switches to dry for past decades, and the drought in Spring is characterized to the region. Frost-free day is about 130. Corn and soybean are major crops in the region and the region is the center of “Corn Belt” in China.

-successes, failures,

1) Compared with conventional tillage, no-till increases soil moisture content in the early growing season which results in good germination and establishment of young plant;

- 2) Similar or higher yields in no-till plots compared to that in conventional plots;
- 3) No-till increases income by reducing the production cost,
- 4) Big challenge: the harvest methods farmers using in local area make corn residues return extremely difficult. We need to develop tools can treat hand cut corn above ground remains effectively. It is really a hot spot regarding to handling corn residues.

-Length of trials, etc....

Established in Fall 2001. So, we have already got 3 year yield results and we are working on the data now, wish to publish it a Chinese Journal.

That is a brief of the tillage trial in Northeast China. If you got questions, please let me know.

From Gao Huanwen 18/11/2004

I have been involved in 12 years Conservation Tillage Research I could provided you more, but my time and energy limited. I think it may be better to introduce you some background at begining.

The CCTR (Center for Conservation Tillage Research, MOA, I am the director) has held 4 times of International Conference or Workshops of Conservation Tillage, I think from those speech or papers on the conference you can understand most of CT information. There are:

- First is "99 International workshop of Dryland Conservation Tillage", held in Beijing at 11-12 Dec.1999, 23 papers published in English.
- Second is "Mechanized Dryland and Water- Saving Farming for 21st Century", held in Beijing at 21-23 Nov.2000, 25 english papers and 30 chinese papers were published on the proceedings.
- Third is "Mechanized Conservation Tillage", held in Lanzhou of Gansu province at 17-20 July 2003, 11papers published in Chinese.
- Forth is "Conservation Tillage and Sustainable Farming", held in Beijing at 11-14 Oct. 2004, 88 papers published in English.(Jeff has Proceedings and CD disc)

In recent 10 years, more than 100 papers published on the academic journals, like "Transaction of CSAE", "Transaction of CSAM", "Journal of CAU". CSAE (Chinese Society of Agricultural Engineering), CSAM (Chinese Socioety of Agricultural Machinery), CAU (China Agricultural University). and books published, like "Conservation Tillage Technlogy and Machinery" in 2004. But most of papers are in Chinese.

Another big event is the national project "Conservation Tillage Demonstration Engineering" , executed by MOA. From1999, the research of CT got success in North of China, MOA started Demonstration and Extension this technology, in 2002 it became a National Project, each year 30 more counties were selected as demonstration counties, applied CT to 40000 mu (2666 ha) area, total 94 counties have become national demonstration counties with applied CT more than 250000 ha. Total area adopted CT is more 700000ha at present. During the national demonstration counties, CT monitoring sites are established in 10 national demonstration counties.

Also we have completed more than 6 CT projects, there are reports available. The ACIAR project has English reports.

From Liang Weili 18/11/2004

Thank you for your mail. As I am not currently involved in any project in arid or semiarid zones, I suggest you contact Dr. Prof Gao Wangsheng of China Agricultural University in Beijing (wshgao@cau.edu.cn) and Dr. Prof Huang Gaobao in Gansu Agricultural University located in Lanzhou (huanggb@gsau.edu.cn). Dr. Gao is directing a national project on conservation farming.

I currently work on water conservation and crop residue management in Hebei Plain. No-till or reduced/minimized till is part of the concerns.

I am planning a project on maximizing yield of dryland crops by soil and water conservation practices in semiarid regions in China, collaborated with Dr. Prof Gao Wangsheng and some colleagues from Australia and China. I wonder if there is a possibility to make a conjunction of these projects. Prof Gao is the Chairman of China network for Conservation Farming systems Research that was recently established. I am the Vice Chairman responsible for International exchange and cooperation. Dr. Huang is also a vice Chairman of the network and has experiences on conservation farming.

From Chang Chi 20/11/2004

I am aware that some zero till long-term research works have done by professors Gao, Tian and Chen of Agronomy Department of China Agriculture University in northern China which only one crop per year.

The CT research we have done is in an area of two crops per year. I do not know the Professor Gao mentioned in your email where his/her work is being carried out?

I also come across with zero till paddy rice work done in Guanxi. I have a Powerpoint presentation of Guanxi zero till paddy rice by Professor Xu. Unfortunately the presentation is in Chinese. However, I am contacting right to see if I can release his presentation to you and just in case you are still interested in his presentation.

From Gao Huanwen 21/11/2004

The attachments are the list of 4 international workshops or conferences.

The list of published papers and the project sites (94 counyies) need to be translated and will send to you 2 days later.

And then:: 25/11

Send you the title lists of 138 papers from our Research Center staffs and published on the China main Journals.

Second is the National Demonstration Counties, they are total 94 counties in 13 provinces.

From Zhang Hailin 23/11/2004

I am Zhang Hailin, the secretary-general of China Association of Conservation Farming System Network (CACFSN). From Professor Liang Weili, I know you. Professor Gao Wangsheng, the chairman of CACFSN, ask me to introduce something about our network, projects and our interests.

From 1978, the no-tillage research group of China Agricultural University (CAU) has begun to study the no tillage techniques in North China. Recently, conservation tillage is concerned by more and more people because of the soil degradation and other environmental problem. China's Food Security problem has also been focused by the world people's eyes. Therefore, China's government initials the project about Food Security in 2004. Fortunately, we afford the conservation tillage project and Professor Gao is the principal of the project. This project covers Northeast, North China and Changjiang middle-low reach regions. This project contents mainly include tillage techniques, the effects of conservation tillage, cover crops, the high yield cultivation management system, assessment of conservation tillage and some extension work.

In order to extend conservation tillage in China and co-operate with the international association, Professor Gao and other colleagues that interested in farming system decided to establish the conservation farming system network. CACFSN was set up in October,2004. CACFSN is a nonprofit organization under the Farming System Association, division of China Agronomy Association. The members of CACFSN are from the most of provinces of China. We hope our work would benefit for conservation farming's extension in China.

Professor Gao and I are very glad to collaborate with you and welcome you to visit our university (CAU) if convenient. I think the cooperation between us will be successful and satisfying.

From Liu Yuhua 25/11/2004

I am colleague of Prof. Zhang lifeng. Recently we have together finished some no-till experiments in semi arid region of China. Some of them are in the accessory. If you do not mind, we may contact each other and even cooperate in this field.

From Lisha Yuxia 27/11/2004

I am a post-doc at Agriculture and Agri-Food Canada, Eastern Cereal and Oilseed Research Centre at Ottawa, the same department with Mr. Brant Kirychuk, but different location. I have been here for almost a year and my major research areas include soil compaction, conservation tillage, renewable energy or biofuel, emission and fuel consumption from agriculture field operation. My supervisor is Dr. Neil McLaughlin, who is a scientist in Agriculture Canada for over 30 years.

I went back to China last October for CIGR international conference, where I met Jeff and Prof. Gao. During the conference, I was very glad to see the fast development of conservation tillage and conservation agriculture in China. I am pleased that hear that you just came back from China for presenting a "Global Position Statement on Conservation Agriculture".

I am also very interested in conservation tillage development in China, but have not find the suitable source for involvement. I hope you can position the document well

so that the implementation of conservation agriculture in China will become a key focus of the ADB/GEF/PRC program. If the program needs people with the skills like me, please advise me, because I would like to go back to Australia or China for the conservation tillage development and research in future.

I have attached a couple of conference papers related to the work I have done at Gatton for China and Australia cooperative project. Some of them will be submitted to a journal early next year. I think Prof. Gao will provide you with information and documentation on conservation tillage in China.

Two references regarding work at Gatton published at Australia Journal of Soil Research as following:

Australian Journal of Soil Research, 2001 39, page 239-247 and page 249-257.

I hope this can give you some help, if you need more information, please let me know.

From Vincent Lassagne 29/11/2004

My name is Vincent de Lassagne and I am working for CNH (Case International) in China with a focus on the import of large Case IH and New Holland equipment from USA and Europe.

Through our colleague in charge of Uzbekistan, Mr George Thomson, I understand that you currently carry on a study on the implementation of Conservative Agriculture in China and wanted to inform you that we are at your disposal to try to answer the questions you might have on the machinery aspect of that wide subject...

We have some CIH equipment working in the State Farms of Helongjiang and we will be pleased to share our experience of soil management in these farms, if of any interest to your study.

From Phil Young 1/12/2004

Yes I practice zero tillage and 100% retention of dry matter on a farm near Esperance on the south coast – with no livestock. I also work as the Technical Director on the AusAID-funded Inner Mongolia Grasslands Conservation Project which is based in NE Inner Mongolia (around Ulanhot).

The scenario described below is all too familiar and it will require a major change in policies if conservation farming is to work in China – some organic matter must be left on the surface –but at present this is all required for fuel and fodder.

I would be pleased to keep in touch with you guys and to let you know how we go with a “trial” in Inner Mongolia where we are trying to balance livestock numbers with the available organic matter – and to also leave some for environmental protection.

And again:: 2/12/2004

Des: Malcolm will direct traffic on this & give you some more clear direction when he has some spare time, but currently he is racing to complete work by 12 Dec.

But from my side, I'd like to see a clear exposition of what has been demonstrated to successfully work and why. A list of work done to date, by whom & where and the results would be a very good start.

Do we really understand how to intervene and in in what circumstances do we understand this best? Do we have a grip on the scale issues of farming/grazing here?

To be acceptable interventions must be cheap & beneficial; there must be financial benefits as well as economic & environmental benefits that exceed the costs.

In short, what has the world tried to do in CA in China and what is its impact....?

From Fan Tinglu 5/12/2004

I am sorry for my late response to you. I spent one year with Bob Stewart in Texas from August 2003 to August 2004. I returned to China in this September. Since 1991 I have always worked on dryland agriculture of Loess Plateau in Gansu. Last month I received emails from Bob Stewart and you about the place of no-till and conservation tillage in China. Any way, I would like to send possible information on Conservation Agriculture and no-till and conservation tillage and trial sites before 20 this month. In our research area, we have three long-term (more than 22 years) experiments on fertilization, straw mulching, no till, crop rotation, and plastic mulching. All data obtained from these experiments are valuable for conservation agriculture.

On October 2004, I had a academic meeting on Conservation Agriculture in Changsha Hunan (South China). I think Conservation Agriculture is important and urgent for Loess Plateau in which soil and water erosion are serious. I would like to cooperate with you, and hope you determine our academy or my institute as a place of conservation agriculture. Thank your attention.

From Michael Stocking 6/12/2004

GOOD WORDS

baseline document for the programmatic partnership. There is only one minor point I would add to your outline is that PRC has thrown a lot of money in the past at NR-related issues. Tree planting, bench terraces and many other technologies and approaches have soaked up huge amounts of money with little apparent return, no evaluation of reasons for failure and little institutional learning. Partly this was the culture of a centrally planned economy with targets to achieve, but no procedures of verification or grass-roots learning. We can see this whole background changing fast and IEM could/should be at the forefront of spearheading a completely new approach that brings together sectors but also changes mindsets.

From Jean-Louis Allard 8/12/2004

Mike Lane forwarded your message to me.

You may find useful references on Conservation Ag in China in the Proceedings of the last ISCO conference, Brisbane July 2004 (<http://www.iscohome.org/>).

I recommend also that you look at the WOCAT databases (www.wocat.net) and WASWC (<http://www.swcc.cn/waswc/>).

Syngenta is involved in conservation farming activities in field crops along the valley of the Yang-Tse and in Southern China. I attach the translation of two newspaper cuttings and one overview paper for information.

From Zhu Zixi 10/12/2004

Attached is the information on water-saving techniques practiced in North China Plain. But it should be pointed out that deep ploughing is used only for winter wheat, no-tillage for summer corn.

From Chang Chi 14/12/2004

I am sending you 3 CDs: one Hebei Dryland Project final report, one Professor Xu's no till rice presentation and one conference proceedings of international conference on sustainable agriculture. When you receive them, please let me know. Any comments on our project and conference are welcome.

From John Lawrie 14/12/2004

Tuesday, 5 October 2004: Chengdu Inspect no-til and control traffic farming practices?

Day 18: Wednesday, 6 October 2004: We arrive in Xian at noon. Home to some of the oldest cities in human civilisation. After lunch visit Big Wild Goose Pagoda and Ancient City Walls. Post graduate student Chen Hao from Chinese Agricultural University to join us for trip back to Beijing. We go to Hui Minority Street, the Muslim Quarter for dinner. Stay at Bell Tower Hotel

Day 19: Thursday, 7 October 2004: Xian Visit the amazing Terracotta Warriors, after lunch visit the Neolithic Banpo Agricultural settlement with Yangshao culture Enjoy a sumptuous Shui Jiao (dumpling) Banquet.

Day 20: Friday, 8 October 2004: Enroute to Beijing by coach. Inspect no-til and control traffic farming practices near Linfen. Trials running since 1996 using 12 horsepower tractors (Jeff Tullbergs work) with Professor Gao Huanwen from China Agricultural University. Overnight at Pingyao ancient Hans walled city www.pytyk.com Hotel Tidnyudnkui Minfeng Bilingual

Day 26 Thursday, 14 October 2004. Bus to Shijiazhuang with other conference delates to visit conservation tillage and factory making of farm machinery. Some people can visit the Summer Palace and the old Summer Palace or final day shopping Beijing Exhibition Centre Hotel .

From Peter Buss of SENTEK (17/12/2004)

We have only recently introduces our soil water monitoring technology to China. Our technology is being trialled with the North-West Uni of Agriculture & Forestry in the Shanxi province and the China Agricultural Sciences Institute in Beijing. At this stage there is not much to report apart from an awakening interest in hydrological research, irrigation management and that we are trying to build market awareness and product credibility. I will be back in China in May 2005 to visit these trial sites (was not possible this time) and can report on the research outcomes and technology transfer process/technology adoption in more detail.

I know this is not much for now, but this is the status quo.

From Fan Tinglu

Enclosed are some possible information on conservation agriculture conducted in the past and ongoing projects. I think these researches are very limited for showing advantages of CA. It must be enhanced in the Loess Plateau if further projects or budget will be available. If you have any questions and ideas, please free contact me, and I would like to supply much information as possible as I can.

From Hongbo 21/12/2004

The default home page is in Chinese, so you need to click on the Canadian flag on the upper right corner of the page to change it into English.

Once on the English page, scroll down and you will see a section called Technical Materials. Under this section, there is a category called Integrated Crop Production Management. Under this, you will see Conservation Tillage. Click on this, you will be seeing a few documents related to CT. The two documents are in there.

From Jeff Au (6/1/2005)

Good to know that there is a big project in China on CA.

We have been working closely with the Ministry of Agriculture system in China at all level to develop the No/Minimum tillage on Maize in Yellow river delta, on Rice, Oil seed rape/wheat along Yangtze river and on rice in the southern China.

I base in Shanghai but travel to Beijing once a month. We have an office in Beijing and the address: Unit 1004, Tower W2 Oriental Plaza, No. 1 East Chang An Ave. Tel number: 010 8518 1500. Our product development manager, Dr. Heli Geng, bases in the office and his extension is 650.

You could contact him anytime.

Please let us know what is the best way to have a meeting with you to introduce our work on no-tillage in China.

And then: 7/1/2005

We have some field development works in the southern part of Shaanxi closed to Sichuan province where crop pattern is similiar to Sichuan. Rice is grown in summer, and in the rotated crop of either oil seed rape or wheat with no-tillage. The good timing for visit is from early Oct to mid Oct.

We are collaborating with China Agriculture University to do trial around Inner Mongolia to explore the the possibility of no-tillage for Maize. We did it in 2004. Since the result was not particularly promissing, and we may need to discuss further with Professor Nei, who is leading this trial to see whether we shall repeat it this year. We have less development work or in the early stage of trial in those provinces covered by Asian Dev Bank. Anyhow, once we have further information from Dr. Heli Geng with Prof Nei, we shall let you know.

Appendix 2

China provinces; the 6 “project provinces” :

From Weidong::

The six provinces covered by the Project are

1. Xinjiang Uigur Autonomous Region
2. Qinghai
3. Gansu
4. Ningxia Hui Autonomous Region
5. Inner Mongolia Autonomous Region
6. Shaanxi.



China Canada Cooperation in Agriculture (CIDA)

Detailed WWW pages:

This one::

http://www.ccag.com.cn/english/technical_info/tech_crop/tech_tillage_main_eng.htm

Main page::

http://www.ccag.com.cn/index_eng.htm

INTEGRATED CROP PRODUCTION MANAGEMENT -- conservation tillage TECHNICAL DOWNLOADS

- Direct Seeding Manual
Download: [Direct seeding manual.zip](#) (Eng, .doc, 1.4Mb)
This document provides a detailed introduction to no tillage system and direct seeding system, covering such topics as background information, principles and effects of no-till system, no tillage techniques, specialized equipment for no-till seeding system, and development of direct seeding in western Canada, etc.
- Zero-Tillage in Inner Mongolia
Download: [Zero-tillage.zip](#) (Eng, .doc, 6.9Mb)
This document provides a detailed introduction to no tillage system and direct seeding system, covering such topics as background information, principles and effects of no-till system, no tillage techniques, specialized equipment for no-till seeding system, and development of direct seeding in western Canada, etc.
- Conservation Tillage Models for Small Scale Farming: Linking the Canadian Experience to the Small Farms of Inner Mongolia Autonomous Region in China Guy Lafond, Brian McConkey, mark Stumborg
Download: [Conservation Tillage Models for Small Scale Farming](#) (Eng, .doc, 26Kb)

Seeder Design and Evaluation for Small Scale Conservation Tillage ... Mark Stumborg, Guy Lafond, Brian McConkey, Wang Chunguang, Zhao Shijie
Download: [Seeder Design and Evaluation for Small Scale Conservation Tillage](#) (Eng, .pdf, 762Kb)

Appendix 4

Respondents to email enquiry (details to be updated)

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