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# The impact of globalisation on land use and payments for watershed services in China



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April 2006



International  
Institute for  
Environment and  
Development

**DFID** Department for  
International  
Development



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**Citation:**

Sun, Changjin and Chen Liqiao (2006) *The impact of globalisation on land use and payments for watershed services in China*. Research Center of Ecological and Environmental Economics Beijing, and International Institute for Environment and Development, London, UK.

**Developing markets for watershed protection services and improved livelihoods**

Based on evidence from a range of field sites the IIED project, 'Developing markets for watershed services and improved livelihoods' is generating debate on the potential role of markets for watershed services. Under this subset of markets for environmental services, downstream users of water compensate upstream land managers for activities that influence the quantity and quality of downstream water. The project purpose is to increase understanding of the potential role of market mechanisms in promoting the provision of watershed services for improving livelihoods in developing countries.

The project is funded by the UK Department for International Development (DFID).

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## Acronyms and abbreviations

BCAP	Biodiversity Conservation Action Plan
CCICCD	National Action Programme to Combat Desertification
CDM	Clean Development Mechanism
COP	Conference of the Parties
EU	The European Union
GATT	General Agreement on Tariffs and Trade
GDP	Gross domestic product
GMO	Genetically modified organism
IET	International Emission Trading
IIED	International Institute for Environment and Development
JI	Joint Implementation
MEAs	Multilateral environmental agreements
MFN	“Most favoured nation” status
NAPCD	National Action Programme to Combat Desertification
NEPA	National Environmental Protection Agency
ODA	Official development assistance
PES	Payments for Environmental Services
RCIO	Ramsar Convention Implementing Office
RHCS	Rural Household Contracting System
RMB	Renminbi (“People’s currency”, China)
UN	The United Nations
UNCBD	United Nations Convention on Biological Diversity
UNCCD	United Nations Convention to Combat Desertification
UNFCCC	United Nations Framework Convention on Climate Change
WTO	World Trade Organization

## Executive summary

China is the world's 4<sup>th</sup> largest country and its most populous, yet its per capita land holdings are small by world standards. Land productivity is low and land degradation serious and widespread. Since reforms were started in the late 1970s, individual land users have been able to enter into contracts with communes for the right to use a given piece of land for a fixed period of time, usually 30 years, and to benefit from any profit made from that land. Despite all this, China has the world's 6<sup>th</sup> largest economy with a real annual growth in GDP in recent years of almost 10%. It is projected in time to become the world's largest economy. This rapid economic growth, much of it due to large increases in manufacturing output, has produced a range of environmental problems. These are beginning to be addressed by the government, including through compensation payments made to farmers and others to rehabilitate degraded land. Land in China is the property of either the state or the communes.

This paper reviews the potential impacts on payments for environmental services in China of current globalisation processes. Particular attention is given to China's membership of the World Trade Organization (especially the current Doha Round of negotiations, centred on agriculture), and its involvement in major multilateral environmental agreements, specifically the United Nations Framework Convention on Climate Change and the Kyoto Protocol, the Convention on Biological Diversity, the UN Convention to Combat Desertification, and the Ramsar Convention on Wetlands.

As the world's most populous developing country, and with a rapidly growing economy, China is actively seeking closer integration into the global community. This paper addresses two main issues:

1. Will multilateral agreements on trade and the environment promote more active transactions involving payments for forest watershed environmental services in China?
2. Will these multilateral agreements promote a clearer definition of property rights over forest land and forest-derived watershed environmental services?

China has been actively engaging in globalisation since the end of the 1970s. It has changed from an isolationist, command-and-control economy to one that is increasingly based on free market principles. Entry to the WTO in December 2001 greatly increased trade between China and the rest of the world, on balance much in China's favour. The country has a comparative advantage in the production of labour-intensive manufactured goods, but is at a relative disadvantage with land-demanding agricultural products. Restructuring of the Chinese economy is producing major changes in the locus of economic activity, population distribution and land use, among others. Many people have moved from rural to urban areas in search of employment, resulting in the abandonment of farm land because the rights to use this land cannot be transferred. People are also reluctant to give up their rights to use this land, preferring to hold on to them in case of unemployment or repatriation from urban areas.

China has also participated actively in negotiating and implementing many international environmental treaties and agreements. The processes of economic and environmental globalisation have generated opportunity for China to allocate more land resources for forests and other ecological resources; has helped to relieve pressure on its environment; and has opened doors to intensified and value-added agriculture. Increased trade, particularly the import of agricultural products, is generating shocks throughout Chinese

agriculture, inducing structuring changes particularly in land use. Farmer livelihoods are being affected, but the process is also generating incentives for China to reform its land use systems. Whether the Chinese land use system will be changed to accommodate more market-based payment systems for forest environmental services and to improve on existing government-led payment systems will ultimately depend on China's own political determination to overhaul its ineffective and ambiguous land tenure system, both in agriculture and in forestry.

## 1. Introduction

An overview of the institutional arrangements in the field of watershed forest environmental services in China since the 1970s produced two main conclusions (Sun and Liqiao, 2006):

1. Payments for environmental services (PES) from forested watersheds have become increasingly prevalent in China since the 1980s.
2. Mostly, these have been led and driven by the government, i.e., forest watershed environmental services are being bought or subsidised by public fiscal resources, with rare incidences of market-based transactions.

PES mechanisms are being more widely used in China because of increasing degradation and associated scarcity of forest watershed environmental services. One reason that PES has become the dominant form of public payment is because of the widespread ambiguities in property rights for these services. Such ambiguity has originated from the unique characteristics of watershed forest environmental services. As derivatives, watershed environmental services are by-products that depend on properly functioning forests. The property rights for these services are difficult to define separately from the property rights governing the forests that produce these services. Clearly defined property rights over the forests are therefore a necessary, but not sufficient, condition for having unambiguous property rights over the resulting environmental services.

Payments, and a certain degree of coercion between the government as a buyer and millions of farmers as suppliers of forest environmental services, have the advantage of drastically reducing external transaction costs. Nevertheless, the internal transaction costs associated with such transactions are inherently high, as they tend to induce widespread rent-seeking and corrupt behaviour that damages the interests of the farmers concerned. Such transactions will not produce the intended high efficiency or widespread welfare gains expected of them. They should really be called 'governmental subsidies' rather than 'market-based transactions'.

This report explores the impacts of globalisation on payments for environmental services in China. China, as the world's most populous developing country, and with a rapidly growing economy, is actively seeking to become more closely integrated into the global community. It is now party to a range of multilateral treaties and agreements on issues such as trade and the environment, and is subject to their existing and emerging provisions and commitments. These international processes include the World Trade Organization (WTO) and the present round of negotiations (the so-called 'Doha Round'), the United Nations Convention on Biological Diversity (UNCBD), the United Nations Convention to Combat Desertification (UNCCD), the United Nations Framework Convention on Climate Change (UNFCCC), and the Convention on Wetlands (usually referred to as the 'Ramsar Convention'). Will these processes affect payments for forest watershed environmental services? What changes are likely from any impacts arising from globalisation? To answer these questions, this study will address the following two issues:

1. Will multilateral agreements on trade and the environment promote more active transactions involving payments for forest watershed environmental services in China?
2. Will these multilateral agreements promote a clearer definition of property rights over forest land and forest-derived watershed environmental services?



These two issues could have considerable and direct effects on land use in China. Land use, particularly changes in how land is allocated within the agricultural sector, could have direct impacts on environmental services and the role of payments for environmental services.

This paper is therefore divided into a further four parts:

- Chapter 2 briefly introduces the globalisation process – mainly the WTO, the Doha Round negotiations, and the major multilateral environmental agreements.
- The third chapter provides an overview of rural land use and management in China and assesses the impact of these globalisation processes on rural land management.
- In Chapter 4 the impacts of international treaties on payments for forest watershed environmental services in China are analysed further.
- Chapter 5 contains some concluding comments. Since this paper is based on a limited desk study, its findings and conclusions are necessarily preliminary and explorative.

## 2. The globalisation movement facing China

This chapter introduces the basic concept of globalisation, including both its economic and environmental dimensions, and the main related international treaties. This will provide a basic background to the global context for environmental services payments in China.

### 2.1 Economic and environmental globalisation

The advance of modern science and technology (particularly information and transport technology) has accelerated a process commonly referred to as globalisation. Even though the term 'globalisation' is widely used and referred to, there is, surprisingly, no generally accepted definition. Keohane (2000) suggests that globalisation has four main dimensions:

1. Economic globalisation, including the long distance flow of capital, information, commodities and services in the global context.
2. Environmental globalisation, including the long distance transfer of materials over the sea and in the air, which affects global environmental quality.
3. Military globalisation, namely the increasing threat of force that strengthens and extends global military connections.
4. Social and cultural globalisation, including the spread of religion, and the extension of science and technological knowledge, as well as cultural exchanges.

Globalisation, and in particular the speed of the process, is the dominant development trend of today's human society, including globalisation of the economy, public affairs, human rights, the environment, as well as laws (Zang 2005). Although globalisation has multiple dimensions, economic relations occurred earliest and form the foundation of globalisation. Together with environmental globalisation, economic integration will have the most direct impact on environmental payments. The analyses below therefore focus on these two dimensions.

- Economic globalisation intensifies economic linkages among the world's nations as the scope of market transactions for products expands from domestic and regional markets towards international ones, and resource allocations, under pressure from markets, diversify from domestic and regional scales upwards to a more global scale.
- Environmental globalisation has developed alongside global economic integration. Increased economic exchange has produced a range of transboundary and global environmental problems (Wang Jing 2002). Environmental globalisation has expanded these problems from being seen as issues affecting single countries or regions to ones of global concern.

China has been actively embracing globalisation since the end of the 1970s, including by moving from an isolationist, command-and-control economy to one increasingly based on free market principles. It successfully negotiated entry to the WTO in late 2001. Since then it has become the world's 6<sup>th</sup> largest economy, with real annual GDP growth rates between 2002 and 2004 of about 10%. The projections are that it will in time become the world's largest economy. Alongside its growing economic influence, China is also an active participant in negotiating and implementing many international environmental treaties and agreements.

## 2.2 The World Trade Organization

### 2.2.1 Structure and functioning of the World Trade Organization

The WTO provides an important framework mechanism for dealing with multiple international trade relationships. The proposal to establish an International Trade Organization (ITO) was first made at the Bretton Woods Conference in July 1944. It was envisaged that the ITO would be set up in parallel with the International Bank for Reconstruction and Development (later to become the World Bank) and the International Monetary Fund to provide a framework of governance in global “money-finance-trade” relationships. The UN Conference on Trade and Employment held in Havana in 1947 approved a charter for the ITO but the organisation was never actually set up because of opposition from the United States of America. Instead, the General Agreement on Tariffs and Trade (GATT), which had been created at the Bretton Woods Conference and signed into force in 1947, became the dominant multilateral forum for negotiating reductions in trade barriers and the resolution of trade disputes. On 1<sup>st</sup> January 1995, the WTO formally replaced GATT as the primary global institution responsible for managing international trade.

The mission of WTO, like that of its predecessor organisation GATT, is to increase trade between nations, standardise trade relations, and address trade-related disputes by organising periodic multilateral negotiations, all with the aim of trade liberalisation and more efficient resource allocations. It is underpinned by five principles. These are that the trading system should be:

1. Non-discriminatory – in that a country should not discriminate between its trading partners (the “most favoured nation” or MFN provision) or between its own and other countries’ products, services or people (the so-called “national treatment” provision).
2. Freer – with trade barriers being removed through negotiation.
3. Predictable – so that foreign companies, investors and governments can be assured that trade barriers (including both tariff and non-tariff barriers) will not be raised arbitrarily.
4. More competitive – by discouraging practices designed to gain market share unfairly, such as providing export subsidies or dumping products on world markets at below cost.
5. More beneficial for less developed countries – by allowing them greater flexibility, special privileges, and more time to adjust to changes in trading conditions (WTO 2005).

The goal of the WTO is therefore to improve the welfare of the people in its member countries by helping trade to flow as freely as possible, so long as there are no undesirable side effects (WTO 2005).

To achieve its purpose of promoting and facilitating free trade, the WTO has five main functions:

- A. Organise the implementation of the various treaties and agreements under the jurisdiction of the WTO, and take active measures to reach the goals of these treaties and agreements, as well as providing organisational guarantees for the execution and operation of miscellaneous trade agreements that do not fall under the “one basket” agreement, such as the Agreement on Governmental Procurement, and the Agreement on Civil Aviation Trade.

- B. Provide a platform of negotiations for its members to address relevant treaty and agreement-related affairs. It also provides a venue and a draft framework for multilateral trade negotiations of member states.
- C. Settle trade disputes amongst member states and manage trade dispute settlement agreements related to the WTO.
- D. Regularly audit trade policies and legislations of member states.
- E. Coordinate relationships with the IMF and World Bank and other international economic organisations in order to ensure coherence and consistency of global economic decisions, and to prevent policy conflicts.

Eight rounds of multilateral trade negotiations were carried out under the framework of GATT prior to the formation of the WTO. Following its establishment, the WTO was scheduled to begin a new round of multilateral trade negotiations, the Millennium Round, at the third Ministerial Conference held in Seattle in November 1999 but sharp disagreement among member states on the key issues, together with disruptions caused by anti-globalisation protestors, led to the talks being suspended. The main intended outcome of the meeting – to establish the future work programme for multilateral trade negotiations – was not achieved and no resolutions were adopted. Following this, the previously mandated negotiations on agriculture and services were begun, while the prospects for reaching consensus on a new round of multilateral trade negotiations were explored at both the political and technical level. These formed the foundation for negotiations and discussions at the next Ministerial Conference held in Doha, the capital of Qatar, in November 2001.

## **2.2.2 The Doha Round**

The new round of multilateral trade negotiations was launched at the fourth Ministerial Conference held in Doha. It has been called the Doha Development Agenda or, in brief, the Doha Round. Eight fields of negotiations were set out for this round: agriculture; market access for non-agricultural (i.e. industrial) products; the liberalisation of services; intellectual property rights; trade and environment; trade and development; disputes settlement; and the WTO rules on anti-dumping, export subsidies, and countervailing measures – including fisheries subsidies, and regional trade agreements.

The Doha Round was originally scheduled to end by 1<sup>st</sup> January 2005, but the fifth Ministerial Conference, held in Cancún, Mexico, in September of 2003, failed to produce results. Members became deadlocked on agriculture and related issues, thereby stalling the Doha Round negotiations. In March 2004, emergency consultations were held among member states in Geneva. No breakthroughs were made despite a common willingness to move forward on the negotiations and reach a framework agreement by the middle of the year. On 16<sup>th</sup> July 2004, the draft framework agreement of the Doha Round was published, with a final framework agreement being reached two weeks later after intensive consultations and extended periods of non-stop negotiation among trade representatives from member states. At the core of the negotiations was agriculture, with developed country members committing themselves to eventually abolish all export subsidies, drastically reduce domestic support, and improve access to their markets. Based on this framework, consultations continued on the actual modalities and content of agreements on such issues as the percentage reduction in agricultural tariffs and subsidies; the way in which these reductions will be calculated; criteria for allowable domestic support for agriculture; deadlines for implementation; and transitional arrangements – all with the eventual aim of concluding the Doha Round negotiations.

Resolving the issues surrounding agriculture is the key to settling the other issues in the Doha Round. Progress has been slowed by differences among developed countries on questions of reductions in domestic farm subsidies, phasing out export subsidies, and improving market access for agricultural commodities. Attempts to link commitments on these issues to progress on reductions in tariffs on industrial goods and the opening up of markets for services have been resisted by developing countries. The USA, as a country with a comparative advantage in agricultural production, actively proposes free trade for agricultural produces. Proposed measures include the drastic reduction of domestic subsidies and the complete removal of export subsidies, as well as reducing tariffs and narrowing tariff differences amongst member states. Nevertheless, members that are at a comparatively disadvantage in agriculture, such as the EU, Switzerland, Norway, Japan and South Korea, want to keep their strong protection and support for agriculture. They propose tariffs reductions and domestic subsidies for agriculture in accordance with the Uruguay Round model, while granting member states flexibility and standardised export credit practices.

Most developing country members emphasise the serious imbalances in export competition and the need for development among developing country members. They propose linking tariff reductions with reductions in domestic subsidies, as well as granting special and differentiated treatment for developing member states. Eastern European (as well as new members) emphasise the special difficulties they face with their economies in transition, and the wide-ranging commitments they made in seeking WTO entry. Together with new members, they are also looking for special and favourable treatment to support the transition of their economies.

China joined the WTO in December 2001, immediately following the fourth Ministerial Conference held in Doha. Since then, China has been a prominent member of the G-20 group of major developing countries, alongside India, Brazil and South Africa. As such, China has sought to stake out the middle ground between the USA and EU positions on market access, arguing for deeper cuts in subsidies than offered by the EU but not as deep as proposed by the USA. China and India have also been instrumental among a group of developing countries in calling for, and getting, issues of investment, competition and transparency in government procurement dropped from ongoing negotiations on the Doha Round. This was their price for moving ahead on discussions on trade facilitation, once substantial progress had been made on resolving the issues of agriculture.

China has also faced challenges to some of its export sectors, notably textiles and clothing. When the Agreement on Textiles and Clothing ended on 1<sup>st</sup> January 2005, China's massive textile and clothing manufacturing industries had increased access to global markets, forcing down prices and threatening to swamp domestic producers and small global competitors. China has been reluctant to support calls from some developing countries for the institution of adjustment mechanisms to cushion these countries against the shock of greatly reduced textile and clothing exports. China, together with India, argued against any further work on textiles by the WTO Goods Council on the grounds that trade in textiles and clothing had been successfully liberalised. Meanwhile, various countries and groupings, notably the USA, Turkey and the EU, have taken specific measures, including imposing quotas that limit the rate of growth in imports in various lines of textiles and clothing from China, to protect their domestic markets and industries.

## 2.3 Multilateral environmental agreements<sup>1</sup>

Environmental globalisation is produced as a development of economic globalisation. The symbol of environmental globalisation is the drawing up, signing and ratification of various treaties, agreements and protocols in environmental protection and development that aim to protect facets of the global environment. Eleven of the main multilateral environmental agreements are listed below (Table 1). Those that are most important to forest issues are the UN Convention to Combat Desertification, the Convention on Biological Diversity (CBD), the Convention on Wetlands, and the Kyoto Protocol of the UN Framework Convention on Climate Change. All four treaties directly concern the protection, restoration and reconstruction of forests.

**Table 2: Eleven major multilateral environmental treaties (Sources: Wang Jing 2002; State Environmental Protection Administration of China)**

No.	Treaty name	Date of agreement	Date of ratification
1	Convention on Wetlands of International Importance Especially as Waterfowl Habitat	Feb. 1971	Dec. 1975
2	Convention Concerning the Protection of the World Cultural and Natural Heritage	Sept. 1972	Dec. 1975
3	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	March 1973	July 1975
4	Convention on the Conservation of Migratory Species of Wild Animals (CMS)	June 1979	
5	United Nations Convention on the Law of the Sea (UNCLOS)	Dec. 1982	Nov.1994
6	Vienna Convention for the Protection of the Ozone Layer	March 1985	Sep.1988
7	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	March 1989	
8	UN Framework Convention on Climate Change (UNFCCC)	May 1992	March 1994
9	Convention on Biological Diversity (CBD)	May 1992	Dec.1993
10	United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and /or Desertification, Particularly in Africa (UNCCD)	June 1994	Dec. 1996
11	Stockholm Convention on Persistent Organic Pollutants	May 2001	May 2004

### 2.3.1 The Convention on Biological Diversity

The Convention on Biological Diversity (CBD) was opened for signature by states or by regional organisations for economic integration at the 1992 Rio Earth Summit. It came into force on December 29, 1993. The CBD has three main objectives: the conservation of biological diversity; the sustainable use of its components; and the fair and equitable sharing of the benefits from the use of genetic resources – including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding. The

<sup>1</sup> Much of this sub-section is based on material found in Wang Jing (2002).

Convention respects the sovereign right of states, under international law, to exploit their resources in accordance with their own environmental policies, but also recognises the responsibility of states to ensure that activities within their jurisdiction or control do not damage the environment of other states or of areas beyond their national control.

To achieve the objectives of the CBD, a number of general and specific measures are set out to guide the contracting parties. The general measures include developing national strategies, plans or programmes for conserving biodiversity and using its components sustainably (or adapting existing strategies, plans or programmes accordingly), and integrating – as far as is possible and appropriate – the conservation and sustainable use of biodiversity into relevant sectoral and cross-sectoral policies, plans and programmes. Specific measures include guidelines on identification and monitoring of biodiversity; measures for *in situ* and *ex situ* conservation; considerations on the sustainable use of the components of biological diversity; access to genetic resources; access to and transfer of technology; and injunctions on handling biotechnology and the distribution of its benefits. Other specific guidelines in support of these measures include the provision, where appropriate, of incentives for conservation and sustainable use; research and training; public education and awareness; exchange of information; technical and scientific cooperation; and impact assessment and minimising the adverse impacts of projects.

One major product of the CBD has been the formulation and adoption of a protocol on biosafety. The Cartagena Protocol on Biosafety, which came into force on September 11, 2003, focuses specifically on the transboundary movement of living organisms that have been modified as a result of modern biotechnology. The objective of the Protocol is:

“To contribute to ensuring an adequate level of protection in the field of the safe transfer, handling and use of living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity, taking also into account risks to human health, and specifically focusing on transboundary movements.” (CBD 2005).

China signed the CBD on June 11, 1992 and formally ratified it on January 5, 1993. It has also signed, approved and become a Party to the Cartagena Protocol on Biosafety. In accordance with the provisions of the CBD, China developed a Biodiversity Conservation Action Plan (BCAP) in 1994 under the aegis of the National Environmental Protection Agency (NEPA 1994). The overall objective is to set in place, as soon as possible, measures for avoiding further damage to China’s natural environment and biodiversity resources, and, over the long term, establish measures for mitigating or reversing the damage already done. This general objective is underpinned by seven specific objectives and action plans: improving basic research on biodiversity in China; improving the national network of nature reserves and other protected areas; conserving wild species that are significant for biodiversity; conserving genetic resources related to crops and domestic livestock; paying attention to *in situ* conservation needs outside nature reserves; establishing a nationwide information and monitoring network for biodiversity conservation; and coordinating biodiversity conservation and sustainable development.

Among the proposed actions in support of *in situ* conservation outside of protected areas are the adoption of forestry practices that are consistent with the goals of biodiversity conservation (including through the restoration of forests by natural regeneration and planting mixed-species forests to increase product diversity and enhance the stability of ecosystems, and by fostering land conservation measures to avoid water and wind erosion). The conversion of grasslands and wetlands is also prohibited or strictly controlled so as to protect the ecological services provided by these systems (including recharge of ground water, flood control, pollution abatement, and the maintenance of biodiversity). One of the

proposed priority projects included in the BCAP is the testing of models to ascertain the feasibility of integrating biodiversity conservation with the economic development efforts of people living in areas adjoining nature reserves. One of the possible models proposed for testing is the payment of compensation (in the form of tax rebates, for example) to villagers for helping to conserve the biodiversity value of a reserve (NEPA 1994).

### **2.3.2 The Convention to Combat Desertification**

The UN Convention to Combat Desertification (UNCCD) was adopted in Paris in June 1994 and entered into force on December 26, 1996. By September 2005, 191 countries or organisations for regional economic integration had ratified the Convention. The Convention aims to contribute to achieving sustainable development in countries experiencing serious drought or desertification (or both) by promoting an integrated approach to combating desertification and mitigating the effects of drought through a combination of effective action at all levels and supportive international partnerships (UNCCD 2006). To realise this objective requires a joint focus on improving the productivity of land, and rehabilitating, conserving and sustainably managing land and water resources, to improve living conditions, particularly at the community level.

Whilst the Convention refers specifically to the problems of desertification and drought in Africa, it is designed to address these problems in all affected regions of the world by setting out guidelines and arrangements for effective implementation in five regional annexes to the Convention. These annexes, covering Africa, Asia, Latin America and the Caribbean, the Northern Mediterranean, and Central and Eastern Europe, take into account the particular conditions of each region. In accordance with these guidelines, affected countries are developing and implementing action programmes centred on bottom-up approaches that emphasise community participation and the creation of an enabling environment designed to help the people themselves reverse degradation. Governments have a responsibility to create this enabling environment through such measures as decentralising authority, improving land tenure systems, empowering rural people (especially women), and allowing non-governmental organisations the opportunity to prepare and implement the action programmes. These need to be flexible, to allow for changes in circumstances, and fully integrated with other national policies for sustainable development. A major challenge is mobilising the resources (funds, appropriate technologies, knowledge and skills) needed to support such initiatives, especially in less developed countries, and to ensure that the funds are channelled to where they will have most effect.

China signed the Convention on October 14, 1994 and ratified it on February 18, 1997. By 1996, China had formulated its National Action Programme to Combat Desertification (CCICCD 1996). China's strategic objectives to combat desertification are split into three phases, in line with the time schedule of China's *National Economic and Social Development Plan*. In the first phase (1996-2000) the objective was to slow down the rate of desertification and thereby improve the ecosystems in some regions, and increase people's standards of living. This objective is accompanied by various quantitative targets to be achieved during this period (Table 2). The objective for the second phase (2001-2010) is to further improve ecological conditions in some regions, and greatly improve people's lives. This objective is also accompanied by quantitative targets. The objective of the third phase (2011-2050) is to bring nearly all desertified land under control and to rehabilitate fully the ecosystems and economic development in desertified areas. The total area of natural reserves, set to expand to 68.68 million ha in the second phase, will be expanded further to 91.35 million ha in the third phase.



In a report to the UNCCD (CCICCD 2002), the Chinese government summarised the measures that it has taken to implement the provisions of the Convention in line with its National Action Plan. Among the measures are efforts to perfect policies to mobilise people from every walk of life to participate in combating desertification, including the auctioning of barren land, contracting out the management of rangelands, the use of tax incentives to encourage environmental protection (including the conversion of farmland to forests and grassland in western China), and the payment of compensation for maintaining forests in a state whereby they continue to provide useful environmental services ('ecological forests').

**Table 2: Quantitative targets for land rehabilitation set for Phases I and II of China's National Action Programme (CCICCD 1996)**

Action	1996-2000	2001-2010
	(million ha)	(million ha)
Rehabilitation of wind-eroded land	3.18	7.45
Control of water erosion of land	4.3	5.7
Re-vegetation of degraded steppe, desert steppe and rangelands	12.15	34.0
Treatment of salinized land	2.0	4.0
Establishment of forest plantations	6.90	6.69
Total area of nature reserves	not stated	68.68

### 2.3.3 The Convention on Wetlands

The Convention on Wetlands of International Importance Especially as Waterfowl Habitat (usually shortened to the Convention on Wetlands, or the 'Ramsar Convention') was signed in Ramsar, Iran, on February 2, 1971. The Convention is an intergovernmental treaty that provides the framework for national action and international cooperation on the conservation and wise use of wetlands and their resources. It aims to stop ongoing and future encroachment of, and damage to, wetlands; establish their basic ecological role as well as their economic, cultural, scientific and entertainment values; encourage wise utilisation of global wetland resources; and promote international cooperation. At the 8<sup>th</sup> Conference of Parties to the Ramsar Convention, the members endorsed the mission of the Convention to be "the conservation and wise use of all wetlands through local, regional and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world" (Ramsar 2002).

The principal clauses of the Convention focus on the designation, conservation and management of wetlands, particularly as habitat for waterfowl, and on the research, data and information exchange, and training in wetland management, needed to support this. Wetlands are selected for the Ramsar List on the basis of their international importance in terms of ecology, botany, zoology, limnology or hydrology, giving particular recognition to wetlands that are important to waterfowl in any season. Contracting parties undertake to develop plans to protect listed wetlands and promote their rational use through measures such as environmental impact assessment, control of overuse, developing environmental management plans for the participation of citizens, and the designation and establishment of nature reserves. At present, there are 152 Contracting Parties to the Convention. Each Contracting Party is obliged to designate at least one wetland for inclusion in the Ramsar List of Wetlands of International Importance. There is currently a total of 1,606 designated wetland sites, covering 140 million hectares.

China joined the Convention on July 31, 1992 and has so far designated 30 wetlands with a total area of 2,937,481 ha as Ramsar sites. Overall, there are 473 wetland nature reserves in China. At the 9<sup>th</sup> Conference of Parties, held in 2005, China reported that central and local governments have provided 20 million RMB (USD 2.4 million) to improve various capacities at designated Ramsar sites, focusing on monitoring and evaluation, education, and public awareness. It has also been enhancing capacity in wetland conservation, management and research, including through hosting two recent international workshops – on peatlands (as potential carbon sinks) and on mountain and high altitude wetlands. It is expanding inter-agency cooperation and co-ordination but still faces a considerable challenge in balancing ecosystem conservation with economic development. Studies are being undertaken to value the economic benefits and functions of some Ramsar sites, as well as on the adverse impacts of agriculture subsidies or incentives on water resources and in wetlands in the middle and lower reaches of the Yangtze River. The government is encouraging the private sector to apply the “wise use principle” in activities and investments in wetlands – for example, private investments to establish wetland parks in some cities. A mechanism for encouraging private sector involvement in wetland conservation is specified in the National Wetland Conservation Guidelines. The Chinese government is currently planning legislation for a wetland ecological benefit compensation mechanism and a wetland loss compensation system (RCIO 2005).

### **2.3.4 The United Nations Framework Convention on Climate Change**

The United Nations Framework Convention on Climate Change (UNFCCC) was adopted at the United Nations Headquarters in May 1992, and opened for signing at the Rio Earth Summit a month later. To date, 189 countries and regional economic integration organisations have ratified the Convention, including China, which signed on June 11, 1992. The Convention entered into force on March 21, 1994. Its aim is to maintain the concentration of greenhouse gases at a level that that would prevent dangerous human-induced interference with the climate system. To ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner, such a level should be attained within a timeframe that can allow ecosystems to adapt naturally to climate change (UNFCCC 1992). In terms of the Convention, ‘greenhouse gases’ encompass all atmospheric gases – natural and anthropogenic – that absorb and re-emit infrared radiation, other than those controlled by the Montreal Protocol on Substances that Deplete the Ozone Layer.

The Parties to the Convention are committed to preparing and making available to the Conference of the Parties (COP), periodic national inventories of anthropogenic (human-induced) emissions by sources, and removals by sinks, of all greenhouse gases, using agreed comparable methodologies. They undertake to draw up and implement national and, where appropriate, regional programmes of measures to mitigate climate change by dealing with anthropogenic emissions of greenhouse gases by sources, and their removals by sinks. Allowance should also be made for adequate adaptation to climate change. Other commitments include promoting and cooperating in the development, application and transfer of technologies, practices and processes that can control, reduce or prevent anthropogenic emissions of greenhouse gases in all relevant sectors, including energy, transport, industry, agriculture, forestry and waste management. There are also responsibilities to further the sustainable management of biological and other sinks and reservoirs of greenhouse gases, and to promote and cooperate in their conservation and enhancement. The parties undertake to cooperate in preparing to adapt to the impacts of climate change; developing and elaborating appropriate and integrated plans for coastal zone management, water resources and agriculture; and protecting and rehabilitating areas that are affected by drought, desertification, and floods, particularly in Africa. In all of this,

account has to be taken of the common but differentiated responsibilities of the different Parties to the Convention, and their specific national and regional development priorities, objectives and circumstances.

One major product of the UNFCCC has been the Kyoto Protocol, which is intended to give effect to a number of these commitments. Following more than two years of intensive negotiations, the Kyoto Protocol was adopted at the 3rd Conference of Parties to the UNFCCC held in Tokyo, Japan, in December 1997. The Protocol commits Annex I Parties (a list of 41 of the economically most developed countries and regional economic integration organisations recorded in Annex I of the UNFCCC) to individual, legally-binding targets to limit or reduce their greenhouse gas emissions by at least 5% of their 1990 levels in the commitment period 2008-2012. The individual targets for Annex I Parties are listed in Annex B to the Protocol. The Protocol entered into force on February 15, 2005, following Russia's ratification of it, which meant that at least 55 Parties to the Convention, and a sufficient number of Annex I Parties to account for at least 55% of the total carbon dioxide emissions by Annex I Parties in 1990, had ratified, accepted, approved or acceded to the Protocol. So far, 163 countries have ratified the Protocol, excluding Australia, Croatia and the United States of America among the Annex I countries to the Convention. Only those Parties to the Convention that are also Parties to the Protocol (by virtue of having ratified it) are bound by its commitments.

In comparison to other international environmental treaties, the breakthrough in this convention is that the Protocol to the Convention has established a market-based "cooperation mechanism". Since the effect of reducing greenhouse gas emissions is identical across the global, the international community is motivated to arrange for emission reduction activities in places with the least cost of emission reductions. Based on this consideration, the Kyoto Protocol makes provision for three cooperative emission reduction mechanisms, namely Joint Implementation (JI), the Clean Development Mechanism (CDM), and International Emission Trading (IET). It is expected that a global market for carbon emission trading of close to one billion tons will be established in the coming decade based on these mechanisms (Wang 2003).

- JI allows Annex I countries to cooperate with each other for the purpose of reducing emissions.
- CDM allows Annex I countries to implement energy or forestry projects to reduce or offset emissions in developing countries, thereby allowing the Annex I countries to claim a part of their quantified emission limitation and reduction commitments from these projects and so fulfil their obligations in emission control while also assisting sustainable development in developing countries.
- IET allows those Annex I countries with lower costs in emission reduction to trade their credits with others.

In the JI and CDM, Annex 1 countries can implement projects involving changes in land use practices, including forest carbon sequestration, to achieve the goal of emission reductions and the enhancement of sinks. While the CDM is limited to afforestation and reforestation, the JI includes forest management activities.

China signed the Kyoto Protocol on May 29, 1998, and effectively ratified it with a letter of approval submitted on August 30, 2002. For the purposes of the UNFCCC and the Kyoto Protocol, China is a non-Annex I Party, and therefore has no commitments under the Protocol to reduce emissions by a statutory amount by 2012. This is a matter of some concern internationally as China now ranks 2<sup>nd</sup> internationally in terms of its greenhouse gas

emissions (UNFCCC 2005). China can contribute to reducing atmospheric levels of CO<sub>2</sub> through the CDM, particularly in serving as a sink for carbon dioxide in areas being reforested or afforested.

## **2.4. Summary comments**

Globalisation is an irreversible trend in today's world, and it covers multiple layers. Economic globalisation is the basis of globalisation, and environmental globalisation has gained significance in today's increasingly integrated world.

WTO is the symbol and also the tool of economic globalisation. WTO manages global economic order by making a series of rules and regulations on international trade. Member states must adhere to WTO rules and regulations and act accordingly.

The development of environmental conventions is also a major tool to solving global environmental problems. Even though the various environmental protection conventions do not maintain coercion or legal power over member states, they have provided the basic principles to commonly recognised international environmental laws, and have often become standards for domestic environmental laws in member states.

There is no doubt that the aforementioned globalisation process and the various major international environmental agreements will have an impact on the role of markets in resource allocations inside China, and further impact upon the PES for forest watershed environmental services.

### 3. Impacts of globalisation on land use in China

Rural land use systems determine the quantity and quality of watershed environmental services. In this chapter we describe rural land use and rural land management systems in China, and analyse the potential impacts on them of China's accession to the WTO, the Doha Round negotiations, and the various multilateral environmental agreements.

#### 3.1 Rural land use and management status in China

In China, the term 'rural lands' refers to lands collectively owned by farmers as well as those owned by the state but managed by rural collectives. Legally, all these lands are the property of a commune, local government, or the state. From the start of the reform era (1978 onwards), the introduction of the household contracting system (see sub-section 3.3.1) has helped to develop the private use of rural lands, a process of privatisation of land use rights that has greatly promoted productivity. This system of collective and state ownership of land coupled with private land use rights is the foundation of current land use in China. Land use rights are nonetheless not ownership rights, and they are time-bound and subject to administrative restrictions. This has generated many problems (Wang 2004), such as people's unwillingness to invest much in the development of the land, or to conserve its essential productivity. For the sake of land conservation in a populous country, the state has adopted many measures to protect farmland, forests and grasslands, generating further restrictions on rural land use.

#### 3.2 China's land resource characteristics<sup>2</sup>

China has 9.598 million km<sup>2</sup> in total land area, making it the world's 4<sup>th</sup> largest country after the Russian Federation (17.098 million km<sup>2</sup>), Canada (9.9985 million km<sup>2</sup>) and the USA (9.629 million km<sup>2</sup>).<sup>3</sup> However, land per capita in China is merely 0.74 ha, or 1/3 of the world average, a striking characteristics for such a large land and population. Per capita farmland in China is 0.1 ha, per capita forestland is 0.19 ha, and per capita grassland is 0.22 ha. These are all substantially lower than the world average, indicating the severe population pressures on land and natural resources in China.

**Table 3: Basic features of Chinese land (Source: Ministry of Land Resources 1996)**

Type of land	Area (million km <sup>2</sup> )	Share of total land area (%)
Farmland	1.30	13.7
Gardens	0.10	1.1
Forestland	2.28	23.9
Grassland	2.66	28.0
Transportation lands	0.05	0.6
Residential and industrial lands	0.24	2.5
Inland water area (lakes, dams, wetlands)	0.40	4.4
Undeveloped land and unclassified land	2.57	25.8

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<sup>2</sup> Taken from data found at China Agenda 21 Administration Center website.

<sup>3</sup> Data found at <http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/>

Land productivity is low and land degradation is serious. Because of the unique geology and soils of many areas, particularly the widespread occurrence of loess, Chinese environments in many localities are fragile. For instance, western China is generally dry, windy and has high incidences of sand storms and soil erosion. Southern China, while humid, is susceptible to flooding (Liu and Diamond 2005). In addition, huge population pressures and the high intensity of human activity have resulted in high levels of environmental disturbance. It is estimated that losses due to environmental degradation were equivalent to 2.3% of annual GDP in 2002; more importantly there is a trend towards increasing loss through environmental degradation (Zhou 2003). The high rate of urbanisation is also creating a unique set of environmental challenges for China. These include pollution, waste disposal, land conversion, and the demand for water (Liu and Diamond 2005).

### **3.3 Major policies and institutions affecting rural land use and management in China**

The Chinese government manages rural lands through a series of laws and regulations. Apart from the Constitution, these are the *Land Management Act*, the *Rural Land Contracting Act*, the *Forest Act* and the *Grassland Act*, as well as other administrative statutes and regulations. This legislation is relevant to two fundamental features of Chinese rural land use systems: the household contracting system and basic land protection.

#### **3.3.1 The Rural Household Contracting System**

The land tenure system is the cornerstone of any rural society. Prior to the reform era, a system of common property – the commune system – was practised in China. All land and resources were owned by collectives, which carried out the production and distribution activities. This system hindered rural economic development and agricultural growth (Han 2002). From the start of the reform era in 1978, collective land ownership was gradually replaced by contracts with rural households. Under this system, households are the basic contracting party with rural collectives, with the contracting households being granted land use rights for a fixed period of time (usually 30 years). These contracting rights are generally granted equitably to individual households, such that each household is entitled a piece of land and therefore has some basic means for survival. This reform of the rural land system was an initiative proposed and pioneered by farmers (Wei 2002), and later adopted by the authorities as government policy (Zhu 2005). In 2003, the Chinese government began formally implementing the Rural Land Contracting Law, thereby providing a legal basis to the household contracting system (Chen 2003).

The Rural Household Contracting System (RHCS) is characterised by the following features (Wang 2004):

- Rural lands are still owned by collectives.
- The ownership and use rights of rural lands are separated, with rural households taking up land use rights.
- Households are the basic units of management.
- There is relatively clear definition of use rights.

Most land use rights are allocated to individual households equally according to household size. In essence, this system is one of public ownership and private usage.

The RHCS that was being practised in the farming sector was quickly adopted in forest and grassland management. In 1981 the central government executed the so-called “Three-fix” Policy to stabilise forest tenure, and give households responsibility for managing hills and forests. By 1984, the policy was implemented in 75% of the counties and 80% of the townships in the nine provinces of southern China. But the policy was implemented in a hurry and with many imperfections. For example, there were no contracts for many of the arrangements. The change in tree tenure resulted in illegal logging and loss of forests. Subsequently, at many localities the contracted rights were rescinded, seriously damaging the credibility of government-led tenure changes (Xu and Wu 2004). In 1984, this arrangement of public ownership and private contracts was pursued in the grassland areas of the country.

### 3.3.2 The basic land protection system

While pursuing the privatisation of land use rights, the Chinese government has also adopted a strict protection policy to conserve lands. These policies cover farmland (farm protection policies); forest lands (the *Policy on Forest Protection and Development*); and grasslands (grassland protection policies).

China currently has a total of 1.3 million km<sup>2</sup> of land that can be used for farming, which includes newly reclaimed lands, fallow lands, and land suitable for agro-forestry. Relative to its population size, China has a scarcity of farmland, with only 0.10 ha per capita. Furthermore, the per capita farmland area in the more fertile farming regions is much less than that in other regions of the country.

Due to the low per capita area of farmland and the political considerations of food self-sufficiency, China has opted for a strict protection policy over farmland. According to the *Land Management Act* and its implementation regulations, farmland protection includes the following:

- A. Governmental responsibility in farmland protection: governments at various levels shall assume responsibility and take proper measures to protect farmland; improve land quality; raise land productivity; combat desertification, salinity and soil erosion; and stop behaviour that leaves land uncultivated or that is harmful to the land.
- B. Development land use principle: land use by the state and local governments for non-agricultural developments shall strive to save lands, and use barren lands instead of farmland whenever possible, and use lower grade lands instead of higher grade lands whenever possible.
- C. The approval of land use changes: when farmland is being rented or contracted for management, the use and contracting rights shall be restricted; when farmland is converted to non-farming use, the change has to be approved by county or higher level governments.

Protecting and developing forest resources to improve the environment is yet another key policy that affects land use and management practices in China. The Forest Law of China has a few clauses that represent this policy.

- Clause 8: forests shall be logged according to quota, and the state encourages tree planting and forest closure to enlarge forest coverage.
- Clause 15: the use rights to forests for timber and fuelwood forests are allowed to be transferred, or can be used as capital in joint ventures. However forested land cannot be converted to non-forestry uses.

- Clause 18: efforts shall be taken to reduce or avoid claiming forest lands for geological surveys, mining, and other infrastructural development; in the case of an absolute need for forest clearance, approval shall be sought and secured from county level governments or above, and forest restoration fees shall be paid before such clearing is done.
- Clause 23: forest clearance for farming, stone mining, soil mining, sand mining, and other forest clearing actions is forbidden. Fuelwood collection and grazing in young forests and special purpose forests are also forbidden.
- Clause 26: various local governments shall develop plans to plant trees and take effective actions suited to local conditions to expand the forest area in their jurisdictions.

Overall, grasslands are not as strictly protected as farmland and forest lands. However, the *Grassland Act of China* still has many clauses on grasslands protection.

- Clause 4: governments at all levels shall strengthen the management of grassland protection, development and use, and incorporate grassland protection and use into national economic and social development plans.
- Clause 38: clearance of grasslands in mining and infrastructural development shall be avoided or minimal; in the case of absolute need, such clearance shall be approved by provincial governments.
- Clause 39: clearing of collective grasslands in infrastructural development shall be compensated according to China Land Management Law; and the contracting parties to state owned grasslands shall be compensated according to relevant State Council Regulations when clearance of such grasslands is done in developmental projects.
- Clause 42: the state shall pursue a protection policy for major grasslands. Key grazing lands, man-made grasslands, restored grasslands, grass seedling bases, as well as conserved wildlife habitats, shall be classified as major grasslands.
- Clause 46: conversion of grasslands is strictly prohibited. Degraded grasslands shall be restored gradually according to plan.

### **3.3.3 The advantages and disadvantages of Chinese rural land policies<sup>4</sup>**

The Rural Households Contracting System has been commonly regarded as the most effective rural land reform in China (Du and Li 2003). Some of the major achievements under this system include the following:

- It has helped to provide social stability.
- Farmers were greatly motivated to raise land productivity and invest in farming.
- The allocation of rural agricultural resources was made more efficient.
- Farmers were given more freedom in their decision-making.
- Private contracting of land use rights has solved the problems of “free riding” and monitoring which were prevalent when land was managed communally.
- It has contributed to agricultural and national economic growth.

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<sup>4</sup> Based on material drawn from Zhang Liang and Chen Yun (2004).



The land protection policy has also had some success in protecting rural farming and forest lands from being claimed by rapid urbanisation and in preventing environmental damage to rural lands.

This land use system also has some major drawbacks. Land tenure arrangements in China have been designed by a limited number of professionals rather than through natural evolution from widespread social participation and interactions. Laws are made mainly for the ease of government management rather than for protecting private properties and autonomy. Also, priority is given to the social security function of rural land distribution so equality instead of efficiency is considered most important. This has damaged economic efficiency.

Various problems have also emerged in practice. First, the small scale of household operations has resulted in low levels of production per household. Contracting rights to farmland were distributed to individual households according to family population size. This has resulted in small parcels of lands per household. Family farms in the north have some 20 mu (1.3 ha) per households, whereas households in the south have only 4-5 mu (0.27-0.33 ha), or even as little as 1-2 mu (0.07-0.13 ha: 1 mu = 1/15 ha). Further relocation in 2003 has resulted in more fragmentation of farmland (Liu Fengqing 2003). Although the law allows land use rights to be transferred, the lack of operational guidelines has prevented actual transactions from occurring (Zhu 2005). The fragmentation of land rights and small scale of land management has excluded some sectors of Chinese agriculture from professional and larger-scale operations that can benefit from economies of scale, with the result that land productivity is low. Users of forest lands and grasslands faced the same type of problems. Fragmentation of forest lands is more harmful to large-scale forestry operations (Xu and Wu 2004). The fragmentation of grassland use rights has restricted the rotation of grazing and resulted in overgrazing and grassland desertification (Ai 2003).

Secondly, the rural land property rights are inadequate (Xu 2004). In theory, rural collectives have all the legal rights to own, use, and dispose of lands under their ownership. The Constitution stipulates that farmer collectives enjoy land property rights to rural lands. In reality, however, rural collectives cannot fully exercise land rights due to some serious legal restrictions. The basic idea of these laws is that no organisation or individual can sell and transfer land property rights, nor can they rent or use land as collateral. In contrast, the state can lay claim to collective lands, which has allowed various interest groups to encroach on collective rural lands in the name of the state.

Third, the periodic redistribution of use rights among the collective, caused by population changes, creates insecurity among rural households with contracted land use rights. This prevents rural contracting households from making long term investments in their contracted lands.

Finally, there is a lack of rural land transfer and a rural social security system. According to the Ministry of Agriculture, there are some 75 million farmers working in cities as migratory laborers. The contracted farmland these people have back at their rural homes cannot be transferred to other households due to the lack of a legal framework protecting the transfer of such land use rights, as well as the lack of social security for these migratory workers, causing them to hold onto these lands as security against future unemployment. This has resulted in poor management of these farmlands with, in many cases, the land simply lying fallow. This explains the paradox of land scarcity coexisting alongside valuable but under-utilised or fallow farmland in China.

### **3.4 The impact of WTO entry and the Doha Round on rural land use and management in China**

Accession to the WTO is a symbol of China's integration into the international community; its impacts are far-reaching, long-term and profound. It is widely believed that, for a large agricultural nation with low agricultural productivity like China, entry into the WTO will generate enormous impacts on its agriculture and deeply affect rural land use and management. The Doha Round, itself being a round of multilateral trade negotiations under the WTO, focuses centrally on agricultural issues. The outcome of the Doha Round negotiations will therefore also have an enormous impact on agricultural and other rural land use and management in China.

#### **3.4.1 Impacts of accession to the WTO: direct agricultural trade<sup>5</sup>**

The impact of WTO entry will be chiefly felt in relation to two key aspects. One is related to the direct export and import trade of agricultural products, and the other is associated with the indirect changes in Chinese institutions resulting from the WTO entry.

Increased trade, particularly the import of agricultural products, will generate shocks throughout Chinese agriculture, inducing structuring changes – particularly in land use. This is conceivably the major impact on land use in China of its WTO accession. China made four major commitments on agriculture in its WTO entry agreements (Gao 2004):

A. Reductions in import tariffs on agricultural products (Table 5).

**Table 4: Tariff rate reduction in agricultural products (Source: Chinese WTO legal entry document 2001s)**

<b>Products</b>	<b>1999 actual import tariff (%)</b>	<b>Tariff rates after WTO entry (%)</b>
All agricultural products	21.4	16.8
Major agricultural products	30.8	14.7

B. Gradually increase the market quotas for grain, cotton and sugar and related key agricultural products during the phase-in period, and pursue tariff quota management on key agricultural products (Tables 5 and 6).

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<sup>5</sup> Based on material in Ke Bingsheng 2005.

**Table 5: Tariff quota on key agricultural products (Source: Chinese WTO legal entry document 2001s)**

Products	Beginning quota volume (10,000 tons)	Final quota volume (10,000 tons)	Tariff rate for in-quota imports (%)	Tariff rate for over-quota imports (%)		Phase in period from 2000
				MFN*	Common	
Wheat	788	963.6	Range 1-10	71	180 or 130	2004
Corn	518	720	Range 1-10	28 or 56 or 71	180 or 130	2004
Rice	332	532	Range 1-9	22 or 56 or 71	180 or 130 or 70	2004
Soy oil	211.8	358.7			190	
Rapeseed oil	73.9	124.3	9	52.4	170	2005
Palm oil	210	316.8			60	
Cotton	78	89.4	1	54.4	125	2004
Sugar	168	194.5	20	65.9	125	

\* MFN = "most favoured nation"

C. Refrain from subsidising domestic agriculture – China is allowed to maintain 8.5% of trade distorting subsidies to domestic agriculture (this is slightly lower than 10% allowed for all developing countries but higher than the 5% allowed for developed countries); and subsidies in poor regions are not allowed to exceed 8.5%.

D. Abolish all export subsidies on agricultural products.

China has strictly adhered to these commitments since it joined the WTO in 2001. In terms of agricultural tariff reduction, the arithmetic average of tariff rates for 977 agricultural products has been reduced to 15%. In 2004, the weighted average tariff rate for Chinese agricultural imports was less than 8%. This is significantly lower than that of developing countries and closer to that of developed countries.

Except for corn and rice (and, to a lesser extent, rapeseed oil), the import quotas for most other agricultural products were largely filled (Table 7). Cotton imports were 2.21 times above the import quota due to the importance of the textile sector to the Chinese economy. These over-quota imports were also charged with the 1% tariff rate for in-quota imports. They would not have been possible if they were charged at the 40% over-quota tariff rate.

**Table 6: Chinese quota import volume for agricultural products (given in 10,000 tons) (Source: Chinese WTO legal documents and monthly customs statistics in the relevant years)**

Year	Wheat	Corn	Rice	Sugar	Cotton	Soy oil	Palm oil	Rapeseed oil
2001	74.0	4.0	29.0	120.0	11.0	7.0	152.0	5.0
2002	63.0	1.0	24.0	118.0	21.0	87.0	222.0	8.0
2003	42.0	0	26.0	78.0	95.0	188.0	233.0	15.0
2004	723.0	0	76.0	121.0	198.0	252.0	239.0	35.0
2004 (quota volume)	963.6	720.0	532.0	194.5	89.4	311.8	270.0	112.7
Quota fulfillment rate (%)	75	0	14	62	221	81	89	31

In terms of domestic subsidies, China has few 'Yellow Box' support policies in place (that is, domestic agricultural support measures that are considered likely to distort production and trade). Even according to the strictest WTO rules, total Yellow Box subsidies for grain production, superior seed, and agricultural machinery in 2004 was only about 12 billion yuan or 0.5% of total agricultural production value in China (excluding aqua-cultural products value, according to WTO rules). This is well within the 8.5% Yellow Box support allowed for China by the WTO. When the agricultural taxes collected in the same year are taken into account, net Yellow Box subsidies in China in 2004 are negative.

Three years after China joined the WTO, the shocks generated by its entry have not been as severe as originally expected, but certain trends are obvious. First, both imports and exports of agricultural products have increased significantly but imports have increased more. In 2004, agricultural products exports increased by 9.1% over the previous year whereas imports increased by 48.1%. This has turned China from being a net exporter of agricultural products to a net importer, with a negative trade balance of 4.6 billion USD in 2004 (Table 7). (If aquaculture products are excluded, in accordance with WTO rules, the net trade balance is worse, becoming – 8.4 billion USD, see Table 8).

**Table 7: Changes in agricultural product imports and exports for three years after the WTO entry (Source: The Information Center of Ministry of Agriculture 2005)**

Year	Aquaculture products included			Aquaculture products excluded		
	Exports	Imports	Trade balance	Exports	Imports	Trade balance
2001	16.07	11.84	4.23	13.42	10.50	2.92
2002	18.15	12.45	5.70	15.21	10.87	4.34
2003	21.43	18.93	2.50	18.00	17.05	0.95
2004	23.39	28.03	-4.64	16.42	24.79	-8.37

There are a number of reasons for this negative trade balance:

1. A significant reduction in import tariff rates.
2. The greater competitiveness of agricultural imports due to heavy subsidies in Western developed countries.
3. The generally low quality of China's agricultural products, making them uncompetitive in the global market.
4. Strong domestic demand has driven up prices of key agricultural products, particularly for soybeans, grain, edible oil and cotton, which in turn has stimulated imports. Quarantine measures in developed countries have also made Chinese products, particularly animal products, less competitive.

Secondly, China has a comparative advantage in products that are labour-intensive in their production, such as meat, fruits, aquaculture products, oil and sugar. Conversely, it is at a disadvantage in land-intensive products such as grain, cotton, wool and dairy products. This was expected before the country joined the WTO and has been confirmed by three years of experience. Over this period the following trends are appearing:

- The export of corn has fallen from 16.4 million tons in 2003 to 2.32 million tons in 2004.
- Wheat imports have increased from 0.45 million tons in 2003 to some 7.26 million tons in 2004.
- Dairy products imports increased significantly as well, with a negative trade balance of 0.8 billion USD in 2004.
- Vegetables are now a major export item, with a trade surplus of 3.7 billion USD in 2004.
- Fruit imports and exports both increased substantially but exports increased faster, giving a trade surplus of over 1 billion USD.

According to Qu (2002), major changes in rural land use from WTO accession can therefore be summarised as follows:

A. Switch to high value crops.

Where they have a comparative advantage, some farmers will certainly stop growing grain and switch to products that give a higher return, such as fruits, vegetables, gardening plants, aquatic products and meat. Whilst this may help generate higher rates of return, it will certainly lead to more land being used for non-grain production.

B. Increased efficiency (domestic and international competition).

Intensifying competition after WTO would prompt increases in the efficiency of agricultural production. Traditional extensive agriculture, driven mainly by resource and labour inputs, is being replaced by intensive modern agriculture driven mainly by capital and labour inputs. This intensification of investment and management would lead to improvements in product quality and productivity, raising the global competitiveness of Chinese agricultural products.

C. Rising land scarcity driven by increasing non-farming use of agricultural lands.

The WTO entry would facilitate offshore investment in China, driving development in manufacturing, construction, transportation as well as tourism industries. This would lead to further encroaching of farmland and intensifying land shortages. This would generate investment potential for agri-business, the introduction of new skills, and technology.

D. Land abandonment.

Increases in the importation of major agricultural products will reduce farmers' expected returns from domestic farming, particularly for land-intensive products. This is likely to force some farmers to look for employment in the urban sector. But the contracted land use rights that they hold cannot be transferred freely. As there is a serious lack of social security for these migratory rural farmer laborers in China, maintaining their contracted land use rights is the only real social insurance over which they have control against risks and uncertainties in their new jobs in the cities. The result is that many farmers desert their contracted lands back in their rural homes but will not give them up. This explains why there has been extensive desertion and fallowing of land, which wastes valuable land resources.

Overall, the impacts on Chinese agriculture of joining the WTO have so far been limited, though they are expected to grow as the trade in agricultural commodities intensifies. In certain product categories such as cotton, edible oil and soybeans, the impacts are already substantial and, in some cases, even severe. The livelihoods of farmers are being affected, some even being completely dislocated. Nevertheless, this may open up opportunities to restructure the patterns of land use and agricultural production in China. More marginal

lands can be reforested, and less intensive farming would reduce the need for water, fertilisation, and chemical applications and allow the rural environment more time to recover. In this respect, the shocks generated could have a positive impact on the rural environment, as long as corresponding government policies and programmes are implemented to take advantage of this opportunity. In the process, market-based mechanisms can be introduced to encourage payments for environmental services. On the other hand, the problems of lack of social security and the inability to transfer land use rights are seriously restricting the concentration of land into the hands of fewer, more efficient, producers. Instead, it is encouraging people to abandon the land and leave it fallow. This in turn is hindering the growth potential of agribusiness and the related introduction of new plant varieties, new farming technologies, and the involvement of more commercial capital.

### **3.4.2 The impact of WTO entry on rural land management institutions in China**

As indicated earlier, the Rural Household Contracting System (RHCS) fails to provide clearly-defined property rights, which are central to a properly functioning free market economy. The current land tenure system in the rural or agricultural areas of China, in which control of the land is vested in the communes, results directly from the RHCS. There are, however, emerging informal land markets that are not yet legally recognised. Although the RHCS initially resulted in a huge increase in agricultural production, the lack of clear land rights is now becoming a major constraint, especially as China moves towards more open markets. Joining the WTO will undoubtedly increase the pressure to resolve the current ambiguous status of land tenure so that land can be used as collateral and provide the incentive for farmers to make long-term investments.

The ambiguities in land property rights will hinder the growth of a market economy by limiting market transactions. In instances where there are market transactions there is the potential for rent seeking and other illegitimate behaviors that harm social equity and the long term development of a market-based economy. The increasing development of farmland for commercial and industrial uses as part of the process of industrialisation and urbanisation in China has resulted in increasing numbers of conflicts between farmers and local authorities. Again, the root cause of these conflicts lies in the ambiguities of rural land property rights, making it possible for developers to encroach on farmers' *de facto* rights.

The basic principles of the WTO are non-discrimination, transparency, free trade, and fair competition. Applying principles will promote the clear definition of property rights over land. Government officials and scholars alike have started to reflect on some of the fundamental inadequacies of Chinese land tenure arrangements and proposals are being made to improve them. These can be classified as follows (Du and Li 2003):

- Further clarify the definition of land tenure and contracted land use rights.
- Establish mechanisms for the market-based transfer of land use rights.
- Speed up the process of urbanisation and industrialisation to absorb more rural people and provide opportunities and incentives to consolidate fragmented land use rights around fewer producers.
- Establish a system of social security for rural farmers and migratory workers that will provide them with basic insurance against a loss of off-farm employment and income.

In sum, the change in the land use systems in rural China is being generated endogenously by the need for socio-economic development in China, and China's entry into the WTO is speeding up the process. The key is to develop a clearly defined system of land use rights that will facilitate market-based transactions of such rights.

### **3.4.2 The impact of the Doha Round on rural land use and management in China**

Agriculture is at the core of trade negotiations in the Doha Round, because it is the sector with the most serious price distortions in international trade. Agriculture has long been an exception in various trade agreements aimed at reducing trade protection. This is particularly the case in developed countries where mechanisms for agricultural subsidies are well established. These mechanisms help to protect domestic markets on the one hand, and reduce reliance on imported products on the other. This has raised the costs of entry for foreign agricultural products and strengthened the global competitiveness of domestic products.

The Doha Round Framework Agreement calls for a gradual phasing out of export subsidies on agricultural products globally, and a reduction in import tariffs. This requires a commitment from developed countries for them eventually to abolish export subsidies, drastically reduce domestic support for agriculture, and improve conditions for the entry of other countries' products into their markets. The 6<sup>th</sup> Ministerial Conference of the WTO agreed to end export subsidies in agriculture by 2013, though this decision was reached only at the last minute and with considerable difficulty, given the reluctance of the European Union over the timeframe for change. The agreed date is conditional and the details still need to be worked out, particularly on eliminating hidden subsidies (for example in export credit arrangements). For cotton, export subsidies will be removed sooner, by the end of 2006. Cotton exports from the least-developed countries will be allowed into developed countries without any duty or quota. Trade-distorting domestic subsidies on cotton will also be cut more substantially and quickly than would otherwise normally apply under the new agreement. Once agricultural subsidies are abolished and the Doha Round agreements are strictly implemented, the competitiveness of agricultural products from developed countries will be drastically reduced. This is of great advantage to China:

- A. First, the policy distortions in agriculture in China have been weakened significantly over the past two decades of reforms; for instance, agricultural subsidies in China are actually very low, with fiscal subsidies at only 2%-3%, far less than 8.5% of the total value of agricultural production allowed for product support under the Agriculture Agreement. This has a direct impact on the competitiveness of Chinese agricultural products in the global market.
- B. Second, the overall level of protection of agriculture in China is quite low. This would allow China to increase imports of land-intensive agricultural products while expanding exports of labour-intensive agricultural products. The changes being facilitated by the WTO and the Doha Round parallel the changes already taking place in the structure of China's agriculture trade.
- C. Third, China has a comparative advantage in that it had a simple average tariff rate of about 21%, whereas many other developing countries in the WTO currently have average tariff rates of 20-50%.
- D. Fourth, China has a comparative advantage over many developed country members because these are confronted with the challenge of reducing agricultural subsidies while China faces the prospect of increasing investment in, and support for, the agricultural sector (Ren 2004).

In summary, the commitments made by China when it joined the WTO as a latecomer in 2001 to lower tariff rates on agricultural products, abolish non-tariff measures, and open up agricultural product markets, greatly exceed the requirements of the Uruguay Round Agricultural Agreement. These and other commitments, including limiting domestic agricultural subsidies, abolishing export subsidies, and standardising quarantine measures for animals and plants, have burdened China with more stringent obligations in the agricultural sector, and have put pressure on domestic food security, farmer employment, and income generation as well as rural socio-economic development. The Doha Round requires developed country members to open their markets further and to reduce subsidies. This will create a more rational and fairer competitive environment for China and generate profound positive impacts. Specifically, the Doha Round will bring two major benefits to the Chinese agricultural products trade:

- An expansion of exports of vegetables, fruits, flowers and plants, as well as animal and other products in which China has a comparative advantages.
- An easing of pressures on importing grain and other key agricultural products because high agricultural export subsidies and other unfair competitive behaviors will be restricted (anonymous author 2004).

The WTO and Doha Round agreements, if successfully concluded, will also impact Chinese domestic agriculture through effects on tax regulations, grain and cotton distribution policies, adjustments to the structure of agricultural product markets, and the integration of urban and rural development. These in turn will likely affect rural land use, management, and the environment (Ren 2004) in two main ways.

- A. First, the changes in agricultural products trade will directly lead to structural changes in land use. Growing of land-intensive products such as grain, soy and cotton will be reduced while the share of more labour-intensive products such as vegetables, fruits, flowers and plants and animal products will increase. This switch toward higher value-added land uses will inevitably raise land values, reduce the transaction costs of negotiating land use rights, and promote a clearer definition of land property rights.
- B. Second, fundamental changes to domestic agricultural policies will lead eventually to rural land tenure reforms. These reforms may not be revolutionary in the short-term, but are more likely to be the outcome of the lengthy and gradual process of developing a market-based economy. China has made great efforts in this direction for many years. Joining the WTO has given impetus to these efforts, and the Doha Round will provide a further push. Nevertheless, because the WTO and Doha Round negotiations are concerned with developing trade and freer markets, they can only affect Chinese policies on property rights over land to the extent that they promote the development of market forces that depend on the existence of clearly defined and legally protected property rights. As such, their impacts on land property rights can only be gradual, infiltrative and long term.

### **3.5 The impacts of multilateral environmental agreements on rural land use and management**

In addition to the effects of the institutions and processes of economic globalisation on land use in China, impacts are also likely to arise from China's involvement in implementing the provisions of various multilateral environmental agreements (MEAs). This forms the second part of our analysis.



The impacts of multilateral environmental agreements on rural land use and management in China are apparent at two levels. The first is at the level of management institutions: in order partly to meet the needs of international environmental treaties, China has established a series of domestic laws and regulations. The second is on an operational level: large areas of land are being restored by establishing nature reserves, ecological parks, ecological demonstration zones, and ecological reconstruction programmes. These are discussed in detail below, though it is important to recognise that there have also been growing domestic pressures to improve China's environment and better manage its natural resources. China faces enormous challenges in this regard, with widespread soil, air and water pollution, deforestation, overgrazing, grassland degradation, soil erosion and salinization, desertification, loss of croplands and wetlands, river siltation, impeded river flows, water shortages, depleted fisheries, loss of biodiversity, the spread of invasive species, and an increasing magnitude and frequency of human-induced natural disasters. These are causing serious economic losses, social conflicts, and rising health costs within China (Liu and Diamond 2005).

### 3.5.1 Domestic legal institutions

From the legal perspective, once a sovereign state has ratified an international convention its provisions should automatically become operational as part of its domestic law. This principle is followed in China: once China ratifies a convention, it becomes part of Chinese law. Nevertheless, because international conventions are phrased in general terms, it is usually necessary for countries to develop more specific domestic laws within the framework provided by the ratified international conventions. The Chinese government has done just this.

Since ratifying the UN Convention on Biological Diversity, China has drawn up a series of laws and regulations related to biological protection, and developed a system of laws in this field. These laws cover (Zhou Lan 2004):

- The protection of genetic resources: the Quarantine Law on Animal and Plants Export and Import; the Seed Law; the Biological Safety Regulations on Agricultural GMOs; and the Appraisal and Administration Measures on Agricultural GMO Biological Labeling.
- The protection of wildlife: the Wild Fauna Protection Law; the Wild Flora Protection Regulations; Implementation Regulations on Terrestrial Wild Fauna Protection; Implementation Regulations on Aquatic Wild Fauna Protection, etc.
- The conservation of ecological systems, including the *Environmental Protection Act*; the Forest Law; the Grassland Law; the Ocean Environment Protection Law; the Soil and Water Conservation Law; the Temporary Regulations on Scenic and Historic Sites; and the Nature Reserves Protection Regulations.

Subsequent to becoming a contracting party to the UN Convention to Combat Desertification, China has developed close to 20 laws and regulations related to desertification control and resource conservation. In the revised Land Management and Criminal Law, new provisions on combating desertification were also added. In particular, the Law to Prevent and Combat Desertification was passed in China as the world's first special law on desertification (Tie 2003).

After ratifying the Ramsar Convention, the Chinese government incorporated the Programme on Wetland Protection and Rational Use into China's Agenda 21, promulgated the *China Wetland Protection Action Plan*, and identified over 300 projects in China that

have global significance. A number of more local regulations and laws have also been promulgated by some local governments, e.g., the Heilongjiang Provincial Wetland Protection Regulations, the Gansu Provincial Wetland Protection Regulations, and the Boyanghu Wetland Protection Regulations in Jiangxi Province (Li 2004).

### 3.5.2 Large areas of lands protected and harnessed

In fulfilling its obligations under the Convention of Biological Diversity, China had established 2,194 nature reserves covering 148.23 million ha by the end of 2004. In area, these nature reserves cover almost 15% of the total national land area, well above the global average. In addition, China has established 18 pilot protection sites for ecological functioning and 528 demonstration sites for ecological reconstruction (Tu 2004).

**Table 8: Changes in area of nature reserves in China (Sources: pre-1999 data are from the State Forestry Administration *National Wild Fauna and its Habitat Protection Plan*; post-1999 data are from *China Statistical Yearbook 2005*).**

Year	1982	1987	1989	1991	1993	1998	2000	2001	2002	2003	2004
Area (10,000ha)	390	2,000	2,400	5,505	6,618	7,697	9,821	12,989	13,295	14,398	14,832

In fulfilling its obligations on the Wetlands Convention, China has put 40% of its wetlands under effective protection since it ratified the Convention in 1992. It has established 353 wetland nature reserves and placed 30 wetlands totaling 2,937,454 ha on the Ramsar List of Wetlands of International Importance (Yao and Dong 2005).

In fulfilling its obligations to the UN Convention to Combat Desertification, China has harnessed 3.6 million ha of desert land through various governmental projects and programmes; instituted 18 national demonstration projects showing grassland modernisation and reconstruction techniques and 43 demonstration projects showing integrated development of grasslands; established 11 nature reserves; planted or improved 1,600 ha of grasslands; and strengthened efforts to protect and restore desert lands along railways, highways or grasslands (Tie 2003).

The speed and the scale with which China is designating protected areas and is investing in the rehabilitation of degraded land are important. Over the last 30 years the situation has changed from one in which very little land was formally protected to one in which over 15% of the country is now protected.

## **4. The impacts of WTO entry and international environmental agreements on payments for watershed services in China**

This analysis has identified two processes that are having and will continue to have a major impact on the rural land use in China. These are the entry of China into the World Trade Organisation (WTO) and China's ongoing ratification and commitment to various multilateral environmental agreements. Because watershed services are determined by land use, the implication is that these processes will have a major impact on the payments for watershed services in China.

### **4.1 Impacts of WTO membership on payments for watershed services in China**

#### **4.1.1 Changes in land use and the provision of national ecological services**

Joining the WTO will effect structural changes in land use in China, the most prominent of which will be increasing imports of grain and the export of labour-intensive products (see sub-section 3.4.1). In a populous country like China, food security is an overriding national concern. For a long time, China has given top priority to grain supply, and encouraged forest clearance in order to increase farmland area and grain supply.

In seeking access to the WTO, China has committed itself to revoking non-tariff measures on grain imports and to reduce tariffs on grain imports. Tariff quotas for wheat, rice and corn will be applied during the transition period. Since some grains from China are not as competitive in price or quality as imports, it is predicted that a large fraction of some of grain varieties subject to tariff quotas will become realised imports; increasing grain imports will become an unstoppable trend. Potentially, this increase in grain imports will lead to the conversion of domestic farmland to forests. The massive Sloping Farmland Conversion Programme administered by the government in recent years is a typical example of such a development.

In the short and medium term, increasing grain imports will only have a limited role in promoting alternative land uses. This is because the Chinese government will always put food security as a top priority. While grain importing has become easier under the WTO, the Chinese government would take immediate action should there be a drastic reduction in domestic grain production. According to the 2003 *National Economic and Social Development Statistical Bulletin* published by the State Statistics Bureau, grain production in 2003 was 430 million tons, 26.4 million tons less than in 2002. This produced a market gap of 50 million tons, corresponding to a marked reduction in farmland area and the area sown with different crops. The area sown with grain in 2003 was almost 99 million ha, 4.48 million ha less than in 2002. According to the statistics of the Ministry of National Land Resources in March 2004, the national farmland area in 2002 was 1.69 million ha less than in 2001, and was reduced further by 2.53 million ha in 2003. In 1996 there was still a total of 130 million ha of farming land, but by the end of 2003 this had been reduced to 123 million ha. Against this background the state reduced the area of farmland designated for conversion to forests in 2004 nationwide.

In contrast, the Doha Round may not benefit the provision of watershed forest environmental services in terms of land use change to the same extent. The Doha Round would help generate a more open and equitable international market for China and enhance the overseas competitiveness of specific Chinese products, which would benefit the development of Chinese agriculture. On the one hand, the use of land for labour-intensive

products such as vegetables, fruits, flowers and plants, and animal products will probably increase. On the other hand, the pressure to import grain may be lessened. These changes could encourage the use of more land for agricultural production, and intensify land competition with forest land use.

#### **4.1.2 More clearly defined property rights over land and environmental services**

In addition to the direct land use impacts we also anticipate that accession to the WTO will facilitate a clearer definition of rural land property rights in China. This is because:

- The basic WTO principles of non-discrimination, transparency, free trade and fair competition will affect the public institutions of land management in China; and
- Intensifying international competition after accession will strengthen domestic willingness to reform in China.

These factors together should contribute to a process of clearly defining property rights over land, thus opening the way to more clearly defined rights over watershed services. Nevertheless, even if the central government becomes committed to serious rural land reforms because of intensified global competition, there will be enormous resistance from interest groups that have long benefited from the existing arrangements. Whilst this resistance may well delay the process of strengthening property rights we feel that in the long-term changes will be introduced which strengthen and clarify individual rights over rural land.

### **4.2 Impacts of multilateral environmental agreements on payments for watershed services**

#### **4.2.1 Impacts of the CBD, UNCCD and Ramsar conventions**

The first noticeable impact is that the Chinese government has increased public fiscal investment in ecological reconstruction in China in fulfillment of its obligations under these conventions. For instance, the central government has invested in six key forestry programmes that cover over 97% of Chinese counties, with a planned reforestation area of 73.3 million ha. The scale, coverage and magnitude of investment are unparalleled in Chinese history and even globally. Altogether, the scale of four of the six programmes alone will surpass that of the Nature Transformation Programme of the former Soviet Union, the US Great Prairie Forestry Programme, and the Green Dam Programme of the Five Northern African Countries combined.

The second noticeable impact is that international exchange and cooperation is being strengthened with increased foreign capital investment in China's ecological reconstruction. Since the 1980s, China has attracted and used over US\$3 billion from such international cooperation (Yin 2004).

#### **4.3.2 Impact of carbon trading on payments for watershed services**

Carbon trading in the context of the Clean Development Mechanism of the Kyoto Protocol has brought forest environmental services to the market place. It offers forestry an enormous opportunity to realise greater value for the services it provides. Even before the relevant implementation arrangements had been finalised some companies and institutions from

developed countries had started to grasp these market opportunities by initiating pilot carbon credit projects in developing countries. This activity has become more widespread since the Kyoto Protocol came into force on February 16, 2005.

Annex I countries can meet up to 20% of their emission reduction targets using carbon credits. That is, they can reduce 35 million tC annually by carbon sequestration from afforestation projects. If accounted for at US\$ 10-15 \$ a ton, developed countries would invest some US\$ 300 – 500 million in developing countries annually in afforestation projects. This is greater than the annual official development assistance (ODA) capital in forestry provided by developed countries. In addition, the Kyoto Protocol has stipulated that public funds spent on CDM from Annex I countries shall not result in reduction in the regular ODA funding. Therefore, many developing countries – particularly those from Latin America and Africa – have high hopes that carbon sequestration projects would help to bring large sums of overseas capital to forestry and community development in their countries.

- A. Opportunities for carbon trading (Wang 2003): China has a particularly good potential to develop carbon sequestration projects because it has large areas of waste lands suitable for afforestation, and an enormous ongoing afforestation and forestation programme. According to the CDM carbon credit implementation rules, only new plantings and reforestation after 1990 can qualify for CDM carbon credit projects, and the accounting of carbon storage shall begin only from 2000. Massive forestation in China began in early 1980s and starting from 1990s this effort was further expanded. Through the Three North Shelterbelt Programme, the Middle and Central Yangtze River Shelterbelt Programme, the Coastal Shelterbelt Programme and other key ecological forestry programmes, China has developed an outstanding manmade forest of 46.66 million ha, accounting for 29 % of total forests in China. This is the largest plantation forest in the world, and it accounts for 26% of the global total. In the next 50 years forest coverage rate would increase from 16.6% of today to over 26%, with a planned net increase of forest area of 90.66 million ha in China. These figures illustrate the huge potential for CDM development and financing in China.

There is another side to this story. Farmers in China have long lacked the incentive to plant trees and establish forests; one of the important reasons is that the environmental services that forests generate have not had a monetary value in the market, so farmers have had little financial revenue from them. In recent years the Chinese central government has greatly increased its support for ecological reconstruction via public finance and started to purchase forest environmental services on behalf of society at large. This is seen in the “grain for green” types of programmes such as the Sloping Farmland Conversion Programme and the Forest Ecological Benefit Compensation Fund. But public finance is limited and the process of administering such public subsidy programmes is prone to rent-seeking practices, so there is huge uncertainty in terms of sustainability. As a market-based mechanism, however, forest carbon credit projects could potentially bring sizable capital to the Chinese forestry sector to supplement or even replace public compensation funds. This could help China address the problem of paying compensation for ecological benefits, and promote market development and monetary valuation of forest ecological services, both of which would promote sustainable forestry and community development. Furthermore, these carbon sequestration projects would bring other environmental benefits such as increased vegetation cover, biodiversity conservation, soil erosion control, and improvements in land productivity.

B. Challenges in implementing forestry carbon sequestration projects: one major challenge concerns the technical issues related to setting up and maintaining carbon sequestration projects, including the measurement of baseline and additionality; the measurement and auditing of carbon storage; the unique problems associated with carbon sequestration projects such as non-permanence, leakage, and uncertainty; as well as ensuring and measuring the positive socio-economic impacts of such projects. These problems are common across the globe and a considerable amount of work is currently being done to provide guidance on these issues (e.g. Pearson, Walker and Brown 2005).

The second issue is the lack of institutional infrastructure such as: offices, legal agents, trust funds and trade platforms (e.g. trading houses, brokers, auditors and guarantors). Much of this infrastructure is imperfect or even simply absent in China. With the start of the first commitment period (2008-2012) of the Kyoto Protocol only a few years away, this lack of infrastructure could seriously jeopardise the registration of China's reforestation and afforestation projects as CDM projects.

The third challenge is the lack of secure and clearly defined property rights arrangements for land. This is a fundamental problem. As discussed earlier, most land in China is owned by the state or by collectives. Nevertheless, the tenure arrangements are not clear because there are often multiple entities that are legally entitled to exercise ownership rights over the land, and there are many ambiguities concerning the exercise of bundles of other use rights. This has resulted in disputes over land and land use. In addition, the time frame for contracts is usually short (no more than 70 years but often much shorter) and these use rights can be subject to reallocation when the contracts expire. These features are unique to China's land tenure system and are a major constraint to developing carbon sequestration projects in China.

## 5. Concluding comments

Since the early 1980s, the scarcity of watershed forest environmental services caused by widespread environmental degradation and forest loss in China, together with rising demand for environmental services driven by higher levels of income, have generated greater willingness and ability to pay for such environmental services. This has led to the development of payments for watershed services. The non-exclusiveness of the positive externalities of these services, and the ambiguities surrounding land tenure arrangements in China, have meant that up to now the government agencies have dominated such transactions. As a result, these transactions have taken the form of public fiscal subsidies over watershed forest environmental services, with only rare instances of purely market-based transactions. The transaction between the government as the buyer (using a certain degree of coercion) and tens of thousands of farmers as suppliers notionally has the advantage of lowering external transaction costs but risks having rent-seeking and other negative consequences that can compromise net gains in social welfare. These transactions are therefore not proper market-based transactions.

Will this situation change in light of the process of globalisation in which China is actively engaged? If the answer to this question is “Yes”, what will the likely changes be? Our review suggests that trade liberalisation will enable China to allocate more land for ecological restoration. The multilateral environmental agreements, even though not strongly binding, will also generally require the Chinese government to harness and protect more land. In terms of execution, accession to the WTO (including the Doha Round) will lead to further development of markets and therefore land reforms in rural China. Nevertheless, the WTO and the Doha Round negotiations are only concerned with the development of global markets and freer trade, rather than land tenure reform. They will therefore have only a limited and indirect impact on Chinese land property rights arrangements.

The multilateral environmental agreements are mostly not market based either. Their most common impact on payments for watershed forest environmental services in China will therefore mainly be to augment the willingness of the Chinese government to purchase land for conservation and restoration. This will lead to increased public fiscal investment in ecologically-sound development projects, and more active international exchange and cooperation. The Kyoto Protocol is a pioneering initiative among the multilateral environmental agreements in that it promotes the trading of carbon credits via market-based mechanisms. This holds considerable potential for China as the country has a massive existing afforestation and reforestation programme. The challenges are also real, however. Apart from a general lack of market infrastructure and technical difficulties, the ambiguities facing rural land tenure arrangements and the short time frame for collective land contracting are major constraints to market-based carbon credit trading in China.

In summary, we believe that accession to the WTO, participation in the Doha Round negotiations, and being a party to important MEAs will all stimulate more active transactions involving payments for watershed forest environmental services in China. For the time being, these transactions will continue to be led and dominated by the government. In view of these globalisation processes, it becomes urgent to clarify the definition of property rights for such environmental services as well as for the forest lands on which they depend. Nevertheless, these impacts, even though mostly market-based, are not decisive. Whether property rights over forest land and forest-derived environmental services are clarified will depend upon forces that are beyond the market and are rather unpredictable in how they will act. Therefore, while it is certain that globalisation will promote the development of markets for watershed forest environmental services in China, other institutional revolutions are needed before one can tell if such markets, developed under the influence of globalisation, will be efficient and sustainable in the Chinese context.

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