Sino-Italian Cooperation Program
Environmental Training Community
中-意合作计划
环境培训园地

newsletter
工作通讯

Desertification
沙漠化

09

Italian Ministry
for the Environment, Land and Sea

VIU
Venice
International
University

Italian Ministry for the Environment, Land and Sea
意大利环境领土与海洋部
Via Cristoforo Colombo, 44
00147 Rome Italy

Venice International University
TEN Center, Thematic Environmental Networks
威尼斯国际大学
Isola di San Servolo
30100 Venice Italy
Tel. 电话 +39 041 2719525-524
Fax 传真 +39 041 2719510
ten@univiu.org

Sino-Italian Cooperation Program for Environmental Protection
中国 – 意大利环境保护合作项目管理办公室
Program Management Office, Beijing
北京项目管理办公室
Oriental Kenzo-Office Building Room 25 a-d
48 Dongzhimen Waidajie,
100027 Beijing, P.R.China
中国北京市东直门外大街48
号东方银座写字楼25 a-d
房间 邮编: 100027
Tel. 电话 0086-10-51600666, 84476610
Fax 传真 0086-10-84476455
newsletter@sicppmo.org
info@sicppmo.org

Program Management Office, Shanghai
上海项目管理办公室
Room 1901-1906,
The Center, 989, Changle Rd.
Shanghai, 200031 P.R. China
上海市长乐路989号世纪商贸广场1901-1906室
中意环保项目上海办公室
Tel. 电话 021 61104860
Fax 传真 021 61104861
info@sicppmo.org

AGRINNOVA

Editorial Board
Corrado Clini,
Italian Ministry for the Environment, Land and Sea
Ignazio Musu,
TEN Center, Venice International University
Maria Lodovica Gullino,
Agroinnova, University of Turin

Edited by
TEN Center
Thematic Environmental Networks,
Venice International University
Italian Ministry for the Environment, Land and Sea

Project coordination
Alessandra Fornetti
Gianluca Ghiara
Ilda Mannino

Graphic design
peppe clemente, studio cheste venezia

Cover and On Focus photos
Andrea Penisto

English proofreading
Felicity Menadue

Chinese translation
Mike Peng, Beijing

Contributions by
Marco Acutis, Selina Angelini, Stefano Bocchi, Lisa Botter, Nevio Capodagli, Mauro Centritto, Eleonora Chinellato, Lorenza Fasolo, Alessandra Fornetti, Gianluca Ghiara, Maria Lodovica Gullino, Wang Junhou, Ilda Mannino, Giuseppe Scarascia Mugnozza, Denise Tonolo, Alessandro Vallerani, Venanzio Vallerani, Francesca Zennaro.

Editorial

Maria Lodovica Gullino, University of Turin

China's agriculture faces grave challenges from both global economic integration and global changes in the natural environment. It is a developing country with a population increasing at a fast rate; nearly 15 million people annually, within 9.6 x 10^6 Km^2 of land. In order to meet the food requirements of its large population, increasing food production has long been the priority of the Chinese government.

China is now trying to develop scientific methods for evaluating the sustainable capability of its agricultural lands and deal with the issues of regional differences and imbalance in levels of agricultural development in order to devise strategies to achieve the goal of sustainable development across the country. Among the progress made in the field of sustainable development in agriculture in recent years, it is worth mentioning energy development in rural areas popularizing clean and renewable energies adoption; good progress in prevention and control of rural pollution from non-point sources; progress in protecting wild agricultural plants; progress in prevention and control of harmful alien species.

However, a set of interacting trends is making it really difficult to convert conventional agricultural production patterns into sustainable ones. Among others, scarcer land (the total acreage of cultivated land is expected to decrease from 122 million hectares in 2005 to 120 million in 2010) and abundant labor motivate farmers to maximize land productivity through the intensive use of variable inputs, in particular fertilizers, pesticides and water. On the other hand, according to data given by the State Forestry Administration of China, in northern and western regions desertification is advancing at a rate of 10,400 km^2 every year, with sandy lands increasing at a rate of 3,436 km^2. In China up to now, desertification has affected 27.4% of the national territory, while "sandy-field" land covers almost 18% of the country. Desertification is affecting about 400 million people.

China's current exploitation of land and water resources is, in some cases, beyond sustainable levels. The cultivation of steep hillsides is causing massive sedimentation loss estimated at over 2 billion tons per year, decreasing productivity in areas losing topsoil, reducing water storage capacity in reservoirs, and increasing the likelihood of floods. Agricultural practices, both crop cultivation and animal husbandry on sensitive arid grasslands, are partly to blame for the desertification of these areas. In the North China Plain, the groundwater table is falling rapidly in some areas and several surface-water sources are periodically drying up before reaching the sea.

The focus, published in this issue, introduces the successful experiences in combating desertification and the progress achieved in China over the past years within the framework of a solid partnership between Italy and China in the environmental field.

European Parliament Suggests Leniency on Air Pollution Caps for Trucks

The European Parliament's Environment Committee has voted in favor of slightly watering down limits on nitrogen oxide emissions from trucks and buses, saying too tough a target would simply make it harder for them to cut their CO_2 emissions.
The proposed regulation for so-called 'Euro 6' standards for exhaust emissions from heavy vehicles should set a cap on nitrogen oxide (NO_x) at 500 mg/kWh, rather than at 400 mg/kWh as initially suggested by the Commission; this would represent a 75% reduction compared to the Euro 5 standards due to be introduced in 2009.
The European Parliament also agreed with the Commission that emissions of particularly harmful particulate matter should be limited to 10 mg/kWh and, what's more, according to MEPs (Members of the European Parliament), more stringent targets would be counterproductive as they would probably lead to an increase in CO_2 emissions, contradicting Europe's goal of cutting CO_2 emissions by at least 20% before 2020.
Moreover, the Euro standards are to be used as part of a new EU strategy for 'greening' road transport. Indeed, the Commission proposal foresees a revision of the current EU directive on tolls for trucks to allow national governments to include pollution costs in their toll tariffs (but pollution costs would be based only on the vehicles' Euro emissions class type

and not on their CO_2 emissions).
MEPs also said the new Euro 6 standards should come into effect from the start of 2014; this would mean they would be applied in parallel to Euro 5 and Euro 6 standards for passenger cars, which are due to be introduced in 2009 and 2014 respectively.

Parliament Adopts Stricter Rules for Food Additives

The European Parliament has rejected firm bans on colorings, in favor of stronger labeling systems, although these new rules will not cover GMO additives.
Apart from simplifying and clarifying existing rules, the new measures, under the control of the European Food Safety Authority (EFSA), aim to ensure that consumers are better informed as to whether the smoky taste of a food is naturally produced or due to the presence of artificial flavorings; to contribute to the free movement of food in the EU 27 and guarantee high standards of consumer protection for all.
Parliament's final report on food additives underlines that sweeteners, colorings, antioxidants, emulsifiers, gelling agents and packaging gases can only be authorized if they are safe for consumers and if there is a technological need for their use.
Moreover, the parliament stressed that a food additive can only be authorized if it is safe to use, if there is a technological need for its use and if its use does not mislead the consumer; finally, MEPs agreed that foods containing some of those colourings must, in addition to the traditional E number, carry a label stating that the product may have an adverse effect on

the attention and behavior of children. The new legislation also sets stricter rules on the level of toxins in certain food ingredients with flavoring properties such as herbs and spices. A flavoring shall be deemed natural only if 95% of its element is of natural origin; this is a slightly stricter limit than the 90% proposed by the European Commission.

EU 'Green Transport' Plans to Ignore CO_2

Despite the bloc's ambitious goal to slash greenhouse gas emissions by 20% by 2020, Commission proposals due to be unveiled would effectively prohibit governments from including the cost of CO_2 emitted by road transport in their toll tariffs.
The EU's first attempt at addressing the wide range of negative 'external effects' produced by transport was in 1993, when it put forward a directive enabling countries to introduce tolls on motorways in order to finance the cost of infrastructure deterioration caused by heavy road vehicles.
The proposals will be part of a broad package on 'greening transport', which will include a general communication on 'greening transport', a proposal for a review of the EU directive and a 'strategy for the internalization of external costs' for each transport mode.
The review of the EU directive aims to enable governments to charge truck drivers for the costs they impose in terms of congestion, noise and air pollution. Member states would not be obliged to impose such taxes but could choose to do so for vehicles weighing more than 3.5 tons, on any part of their road network, as of January 2012. Charges would be capped at maximum levels and would have to vary according to the time of day, the distance travelled and the vehicle's Euro emissions class type – which takes into account the amount of NO_x and poisonous particulate matter emitted. Tolls with barriers would no longer be permitted and the collection of charges would have to be based on an electronic system so as to avoid any hindrance to the free flow of traffic (although there would be a transition period up until January 2014). The Commission will propose that revenue generated by external cost charges be earmarked to go towards measures aimed at reducing road transport pollution, energy performance of vehicles and developing alternative infrastructure. Governments would nevertheless remain free to allocate revenue raised through infrastructure charges as they choose.

European Parliament Endorsed EU Global Green Energy Fund

More than euro 100 million is set to flow into a new Global Energy Efficiency and Renewable Energy Fund (GEEREF), which the commission hopes will generate up to euro 1 billion in risk capital for green energy projects in developing states.
Parliament's support in promoting the EU Global Fund is an important signal to developing countries that will face very significant challenges relating to energy and climate change over the coming decades. The fund's objective is to mobilize the large-scale public and private financing needed for pilot projects in renewable energy and clean technology projects, particularly in developing states.
The European Commission hopes it will

act as an incentive for private capital financing by offering suitable risk sharing and co-funding options for various commercial and non-commercial investors with a global investment mandate.
The European Commission estimates that initial capital costs are three to seven times higher for investment in renewables than for conventional energies such as coal and gas. Financing problems also plague the development of renewable energies within the EU, which has set itself the target of producing 20% of its energy from renewable sources by 2020.
The EU will contribute euro 80 million to the fund by 2010, with a euro 15 million 'kick-start' contribution scheduled for 2008. Lending institutions like the World Bank and the European Investment Bank will also contribute to the fund, with euro 100 million in total initial funding expected from commercial and public sources.

Electronics Makers Want Incentives to 'Green' Product Lines

Following the fact that Europe's electronics and electrical engineering industries informed about the possibility of making big cuts to EU CO_2 emissions (especially through improved energy efficiency) and the expressed need to receive investment incentives and greater certainty on exemptions to emissions rules, the EU has

worked out a new directive as part of a Commission initiative designed to foster innovation in the electronics and electrical engineering industries, within the context of the EU's efforts to reduce greenhouse gas (GHG) emissions.
The Commission presented new action plans on a Sustainable Industrial Policy (SIP) and on Sustainable Consumption and Production (SCP). The SCP action plan will include a proposal to extend the EU's Eco-Design Requirements for Energy-Using Products Directive to all energy-related products.
Unfortunately, the industry is concerned these measures may not go far enough, especially because the Commission does not want to specify which sectors could receive special exemptions to EU CO_2 emissions restrictions until after the finalization of international climate change negotiations in December 2009. The risk is that this indefinity as to how the EU directive will impact on the electronic sectors subject to it, and how the EU intends to ensure that its major trading parties adopt similar policies, could create, in the near future, a climate of uncertainty - the direct consequence being a decrease in EU investment in this important economical sector.

EU to Limit Energy Use of Electronics on Stand-by

A range of electrical devices in the EU will in future be required to use significantly less energy when idle or in stand-by mode. The rules are expected to be endorsed by Parliament later this year and would take effect as of 2010.
Computers, televisions, printers and similar devices should, by 2010, consume no more than one or two watts when on stand-by. From 2013, that level should then be lowered even further to 0.5 or maximum one watt.
The rules, proposed by the Commission in its regulation to reduce the energy consumption of electrical appliances used

in homes and offices, were approved in a special regulatory committee composed of member-state representatives. The regulation was formed as part of the EU's implementation of the 2005 EU Eco-Design of Energy-Using Products Directive.
The electricity savings produced by the lower watt levels would prevent up to 14 million tons of CO_2 from entering the atmosphere, according to Commission calculations.
Energy efficiency improvements are widely considered to be one of the most effective ways of reducing the energy intensity and environmental impact of economic activity in the EU and this measure to cut energy losses from equipment on stand-by was long overdue and represents a clear, if small, first step toward greener products in Europe.

EU Proposes New Policy Regarding 'Green Products' and Labeling Requirements

The EU is looking for ways to decrease the environmental impact of industrial activity, product manufacturing and consumption patterns; for this reason the Commission has adopted long-awaited proposals to expand the scope of existing 'eco' design and labeling requirements to all products that impact on energy consumption; the Commission's strategy is based on a combination of voluntary and binding measures designed to mitigate the energy use and environmental impact of products.
The mainstay of current EU efforts to reduce the environmental impact of consumer goods is the 2005 Eco-Design Requirements for Energy-Using Products, which sets out requirements on energy use for popular products that consume energy, such as hairdryers, computers, fridges and office equipment.
In addition, there is a range of existing instruments, policy areas and regulations that develop and control the broader issue of sustainable consumption and production.
This broad package of measures contains action plans on Sustainable Consumption and Production (SCP) and on a Sustainable Industrial Policy (SIP), including a proposal to revise and expand the scope of the EU directive to all energy-related products; a widened scope for the use of labels that detail the energy use or impact of products; new public procurement rules to favor the uptake of 'green' products; a revision and expansion of the EU's Ecolabel for food and drink products and, finally, a revision of the voluntary eco-management and audit scheme.

Desertification and Sandification in China

Wang Junhou, Academy of Forest Inventory & Planning, State Forestry Administration

China is one of the countries with the largest area of heavy losses from desertification and sandification in the world. Desertification and sandification have become a serious hidden problem which threatens territorial safety, ecological security and sustainable development and impedes the prosperity of the Chinese nation. However, the Chinese government and its people have paid great attention to combating desertification and sandification since the founding of People's Republic of China, and the State Council has taken a series of measures and established principles and policies to combat desertification, achieving great results. The monitoring of desertification and sandification has been carried out three times nationwide since 1994, by the State Forestry Administration and the People's Republic of China. The results and the data of the inventory have played a fundamental, contributive role in decision-making with regard to the country's ecological improvement and field desertification combat work.

Status Quo of Desertified and Sandified Land in China to the Year 2004

Desertified Land

The land suffering desertification nationwide is 2.6362 million Km², taking up 27.46% of the territory, located in 498 counties (banners and county-level municipalities) in 18 provinces (autonomous regions, municipalities directly under the leadership of the central government) including Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Shandong, Henan, Hainan, Sichuan, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang.

Status Quo of the Distribution of Desertification in Different Climatic Zones

The area of desertified land in arid, semi-arid and sub-humid arid regions is 1.15 million Km², 971,800 Km² and 514,400 Km², taking up 43.62%, 36.86% and 19.52% of total desertified land area respectively.

Status Quo of the Types of Desertification

Wind-eroded desertification, water-eroded desertification, salinization and freeze-thawing desertification cover 1.8394 million Km², 259,300 Km², 173,800 Km² and 363,700 Km², amounting to 69.77%, 9.84%, 6.59% and 13.80% of the total desertified land area respectively.

Status Quo of the Degree of Desertification

Lightly desertified land, moderately desertified land, extremely desertified land and severely desertified land respectively cover 631,100 Km², 985,300 Km², 433,400 Km² and 586,400 Km², taking up 23.94%, 37.38%, 16.44% and 22.24% of the total area of desertified land respectively.

Status Quo of the Distribution of Desertification in Various Provinces (Autonomous Regions)

Desertification in the country is mainly located in Xinjiang, Inner Mongolia, Tibet, Gansu, Qinghai, Shaanxi, Ningxia and Hebei provinces (autonomous regions) and the area of desertified land in these 8 provinces is, respectively, 1.0716 million Km², 622,400 Km², 433,500 Km², 193,500 Km², 191,700 Km², 29,900 Km², 29,700 Km² and 23,200 Km², taking up 98.45% of the total desertified land area. The area of desertified land in the other 10 provinces and autonomous regions only amounts to 1.55% of the total.

Sandified Land

The area of sandified land is 1.7397 million Km², taking up 18.12% of the total, distributed in 889 counties (banners and districts), in 30 provinces (autonomous

regions and municipalities directly under the central government), except Shanghai, Taiwan, Hong Kong and Macao Special Administrative Regions.

Status Quo of the Types of Sandification.
The area of shifting sand dunes (sandy land) is 411, 600 Km^2, taking up 23.66% of the total area of sandified land; while the area of semi-fixed sand dunes (sandy land) is 178,800 Km^2, taking up 10.28%; the area of fixed sand dunes (sandy land) is 274,700 Km^2, taking up 15.79%; the area of the Gobi Desert is 662,300 Km^2, taking up 38.07%; the area of Aeolian inferior land (monadnock) is 64,800 Km^2, taking up 3.73%; the area of sandified arable land is 46,300 Km^2, taking up 2.66%; the area of sandy patch land is 101,100 Km^2, taking up 5.81%; the area of non-biological program sandy land is 96 Km^2.

Status Quo of the Distritution of Sandification in Various Provinces (Autonomous Regions).
Sandified lands are mainly distributed in eight provinces, including Xinjiang: 746,300 Km^2, Inner Mongolia: 415,900 Km^2, Tibet: 216,800 Km^2, Qinghai: 125,600 Km^2, Gansu: 120,300 Km^2, Hebei 24,000 Km^2, Shaanxi: 14,300 Km^2, and Ningxia: 11,800 Km^2.
The area of sandy land in these provinces takes up 96.28% of the total sandy land area in the country, while the area of sandy land in the other 22 provinces (autonomous regions and municipalities directly under the central government) accounts for 3.72% of the total.

Status Quo of Land Most Vulnerable to Sandification in China to the Year 2004

The land most vulnerable to sandification is a kind of degraded land at a critical stage between sandification and non-sandification, due to over-utilization or water shortage. Though it is not sandy land, yet it is most vulnerable to sandification.
The area of land most vulnerable to sandification in the country is 318,600 Km^2, accounting for 3.32% of the country's territory, mainly distributed in four provinces (autonomous regions). These include Inner Mongolia: with an area of 180,800 Km^2, Xinjiang: 48,000 Km^2, Qinghai: 42,000 Km^2, and Gansu: 25,800 Km^2, taking up 93.13% of the total area of land most vulnerable to sandification in the country.
In terms of land use type, the land most vulnerable to sandification is mainly used for grassland (68%). Arable land accounts for 23% and land used for other purposes accounts for 9%.

Dynamic Changes in Desertification and Sandification

Since the 1950_s, the situation of desertification and sandification in China has gradually gone from expanding to becoming relatively steady, and the present situation is taking a turn for the better. Desertification and sandification changes mainly occur in Mu Us sandland, Hunshandake sandland, Horqin sandland, Hulunber sandland, Nenjiangjiang sandland and in regions of agro-pasture ecotone. Other areas are relatively stable.

Dynamic Changes in Desertified Land

From the 1950_s to the 1990_s, desertification in China got worse and desertified land expanded. In the 1990_s, each year 10.400 Km^2 of land became desert. However, with the new century the status has changed. From 1999 to 2004 the national desertified land area has decreased by 33,673 Km^2, or 7,585 Km^2 per year. Following are the dynamic changes in desertified land during the years 1999 to 2004:
1. Dynamic changes in terms of different desertification types: compared with 1999, the area of desertified land caused by wind erosion decreased by 33,673 Km^2, that of desertified land caused by water erosion decreased by 5,525 Km^2, while that of desertified land caused by salinization increased by 930 Km^2.
2. Dynamic changes in terms of desertification degree: compared with 1999, the area of lightly desertified land increased by 90,700 Km^2, that of moderately desertified land increased by 117,300 Km^2, while that of extremely desertified land decreased by 131,700 Km^2 and that of severely desertified land decreased by 114,200 Km^2.
3. Dynamic changes in desertification in major provinces (autonomous regions, municipalities directly under the central government): compared with 1999, the area of desertified land in 16 provinces (autonomous regions, municipalities directly under the central government) has decreased, among which that of Inner Mongolia, Xinjiang, Hebei, Ningxia, Gansu, Shaanxi, Liaoning, Jilin and Shanxi reduced by 16,059 Km^2, 14,226 Km^2, 4,029 Km^2, 2,329 Km^2, 1,900 Km^2, 1,257 Km^2, 772 Km^2, 231 Km^2 and 149 Km^2 respectively.

Dynamic Changes in Sandified Land

The sandification situation is very similar to that of desertification in China. In the 1960_s it expanded by 1,560 Km^2 per year, in the 1970s by 2,100 Km^2, in the 1980_s by 2,460 Km^2, and in the 1990_s by 3,436 Km^2.

At the beginning of the new century, however, sandified land reduced by 1,283 Km².
Results from the period 1999 to 2004 are: the national sandified land area has had a net decrease of 6,416 Km², with an annual drop of 1,283 Km² compared with the sandified land area within the same monitoring scope in 1999.
1. Dynamic changes in different types of sandified land: compared with 1999, the area of shifting and semi-fixed sand dunes (sandy land) reduced by 15,651 Km² and 23,098 Km² respectively, while that of fixed sand dunes (sandy land) increased by 33,265 Km².
2. Dynamic changes in sandified land in major provinces and autonomous regions: compared with 1999, the area of sandified land in 27 provinces (autonomous regions, municipalities) has decreased; among them Inner Mongolia, Hebei, Gansu, Shanxi, Shandong, Sichuan, Ningxia, Jiangsu and Shaanxi decreased by 4,882 Km², 959 Km², 836 Km², 782 Km², 380 Km², 375 Km², 254 Km², 227 Km² and 208 Km² respectively.

The Major Regions where Dynamic Changes in Desertification and Sandification have Occurred

Compared with 1999, the regions where the dynamic changes of desertification and sandification have occurred could be classified into the following four types:
1. Regions where the situation has gotten better and is continuously improving, including Horqin Sandy Land, Ningxia Plain and the south edge of Mu Us Sandy Land. These regions represent areas with gradually decreasing sandified land areas, increased vegetation and a further improved ecological situation.

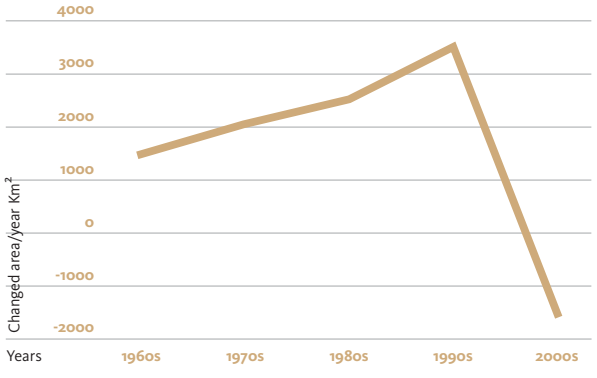


Fig. 1 The Dynamic Changes of Sandified Land

2. Regions where desertification and sandification were expanding and are now getting better, including Otindag Sandy Land and the Bashang region of Hebei. Through the implementation of the Desertification Combat Program in Wind/Sand Source Areas Affecting Beijing and Tianjin, the tendency toward sandification expansion in these two areas has been contained, the vegetation remarkably rehabilitated and the ecological situation significantly improved.
3. Regions where desertification and sandification were expanding dramatically and are now slowing down, including the lower reaches of both the Tarim and Heihe rivers. Through water delivery and treatment, which was urgently needed, the vegetation of part of the two areas has begun to recover. The tendency toward vegetation degradation and oasis shrinkage has been mitigated to a certain extent, though there is still a long way to go before a complete recovery is achieved.
4. Regions where desertification and sandification were expanding and are still expanding, including the Minqin Oasis of Gansu, the head sources of the three major rivers and the Shouqu area of the Yellow River. Due to the impact brought about by both irrational use of resources and drought, the sandified land in these areas is still expanding and the ecological situation is further deteriorating.

The Overall Situation of Desertification and Sandification

In general, desertification and sandification have now been remarkably improved, shifting from a situation of "more destruction than control" at the end of the 1990_s, to the present situation of "a stalemate in control and destruction". The tendency of the overall expansion of desertification and sandification has been initially contained, yet in part of the areas, desertification and sandification are still expanding. However, considering the national situation in China, we must clearly recognize that the overall state of land desertification and sandification is still very serious.
1. The present achievements are only the initial stage of success. The vegetation created through controlling measures has only just entered the initial recovery phase; annual herbal plants still account for a large proportion of the vegetation, plant stability is weak, the ecological situation is still fragile and it will take a long time to regenerate the stability of the plants.
2. The task of combating desertification is still arduous. There are presently 1.74 million Km² of sandified land

in China (accounting for 18.1% of the total land area) and there are another 320,000 Km² of land with a visible sandification tendency (equal to the area of Yunnan province), which could easily become sandified land if not properly protected or utilized.
3. Combating desertification is becoming more and more difficult. In the past decades, combating desertification was a matter of "controlling easy areas prior to difficult areas", and "emergent areas prior to the other areas". Therefore, the sandified land that had relatively better conditions and was easier to combat has been brought under control, or at least initial control. As desertification combat measures push forward, the conditions of the uncontrolled and controllable sandified land in need of treatment are becoming worse and worse. It is more and more difficult to fight against this sandified land and the funding needed per unit is growing higher and higher as well.
4. There are still various human-driven factors leading to the expansion of sandification. Driven by economic interests, the activities that cause the deterioration of vegetation in sandy areas have not been completely stopped. "Five Abusive Activities" such as over-grazing and over-cultivation continue, to a certain degree, in some areas.

Factors Contributing to Dynamic Changes in Desertification and Sandification

The overall trend of desertification and sandification has been brought under initial control. This can be attributed to the great attention paid by the central government, the adoption of various effective policies and measures, the down-to-earth implementation by local government at all levels and the arduous effort made by the broad population.
1. Since the beginning of the 21st century, the country has been implementing a number of programs and projects related to sandification prevention and control, such as the Six Key Forestry Programs, the grassland protection and development program, water and soil conservation projects and comprehensive control projects along inland rivers. Since 2001, the annual area of sandy land brought under control has reached 1.92 million ha, which has played a significant role in the overall improvement of sandified land.
2. The policies and legal system, based on the key legal instrumentation in the *Law on Combating Desertification*, have been established. Ever since 2000, the state has enacted laws and regulations, such as the *Law on Combating Desertification*, *Regulations on the Evaluation of Environmental Effects* and *Regulations on the Implementation of Forest Law*. It has also revised the *Grassland Law*, issued *A Decision on Such Issues as Prohibiting Nostoc flagelliforme Collection and Distribution and Stopping Indiscriminate Poaching on Licorice Root and Corchorus capsularis*, and promulgated a series of policies and measures favorable for both farmers and sand control, which guarantee successful sand prevention and control.
3. Adherence to the principle of "combating desertification and sandification according to scientific sand technologies". Following natural laws, adopting biological, agronomical and project-based measures, as well as combining artificial rehabilitation with human-promoted natural restoration, to comprehensively prevent sandification according to local conditions. In addition, to promote the application of over 100 existing technologies and models.
4. Above normal rainfall has benefited vegetation restoration. In recent years, rainfall has been 30-50% higher in dry areas in northwest China. It has stabilized and improved the natural vegetation restoration and the artificial rehabilitation.

Countermoves and Measures against Desertification and Sandification

To firmly implement the National Plan on Preventing and Controlling Sandification.

To bring the tasks stipulated in the plan into effect, set forth annual objectives and carry out monitoring and examination regularly, so as to ensure its success.

To strictly implement key programs on desertification and sandification prevention control.

To put the "responsibility system" into effect, optimize the standard system, attach importance to project quality, strictly utilize funds, carry out strict inspections and examinations and strengthen the protection and management of project achievements, ensuring the steady development of projects.

To innovate systems and mechanisms.

To apply taxation incentive policies featuring less tax and fees, as well as land utilization policies clearly defining land tenure, and issue a benefit distribution policy that allows people who invest and control to reap the benefits, so as to mobilize the enthusiasm of the whole society.

To strengthen desertification and sandification control according to law.

To intensify the efforts of law enforcement, improve the level of law enforcement, promote the methods of prohibiting reclamation, grazing and firewood collection, and putting a stop to these destructive cases while prevention efforts are underway. Laws must be observed and strictly enforced and violators must be brought to justice.

To rely on scientific and technological achievements.

To popularize and apply practical technologies and models for sandification prevention and control, strengthen demonstration and technique training, increase the content of science and technology and improve the quality of development.

To establish comprehensive demonstration sites for sandification prevention and control.

To explore policies, measures, technical models and management systems for desertification and sandification prevention and control, and establish a new structure for sandification prevention and control which promotes the overall development via site development.

To improve desertification monitoring and early-warning systems.

To promote capacity building of monitoring agencies and teams, perfect the desertification monitoring system, carry out follow-up monitoring on key programs and evaluate the effects by scientific means.

To strengthen the international exchange and cooperation and strive for international assistance and the introduction of overseas advantage technologies.

To pay attention to and improve partnership building and international cooperation in combating desertification especially with the introduction of overseas advantage technologies and international finance for combating and controlling desertification.

References

1. Zhu Lieke, 2005, Dynamics of Desertification and Sandification in China, *China Agriculture Press*, pp. 14-19.
2. Wang Junhou, 2007, The Brief Analysis on The National Sandified Land Trend Change Since 1960s in China, *Forest Resources Management*, pp. 19-23.

Desertification, Water and Development

Marco Acutis and **Stefano Bocchi,** Department of Crop Science, University of Milan

Desertification is the process of land degradation, resulting from human factors such as poor irrigation practices, deforestation, overgrazing, poverty, political instability and environmental change (IFAD - International Fund for Agricultural Development). More than 1 billion people in over 110 countries in the world are now threatened by the problem. CIA (Central Investigation Agency) considers desertification a key point in environmental safety in 67 out of 261 countries. Dryland ecosystems are more vulnerable either to over-exploitation/inappropriate land use or climate change. Sub-Saharan Africa, where 66% of the land is desert or dryland, is at particular risk. Desertification effects could be amplified by climate change, as stressed by the United Nations Framework Convention on Climate Change: "countries with arid and semi-arid areas or areas liable to floods, drought and desertification (...) are particularly vulnerable to the adverse effects of climate change". Desertification is also made worse by overgrazing and slash and burn, and by unsuitable cropping techniques that do not preserve organic soil matter or reduce water losses, and by a low quality of water and soil due to salinization. For a more complete and deeper comprehension of the phenomenon of desertification, a broad analysis is required, including within the context several aspects such as sustainable development, food security, climate change, biodiversity (biodiversity issue is often identified with tropical rain forests, but dryland ecosystems also contain a rich biota, most important food crops and species providing drugs, resins, waxes, oils and other commercial products), water and energy use and socio-economic factors (UNCCD).
Agriculture is still the sector requiring the highest percentage of the total water availability (Figure 1). Imbalances between availability and demand, the degradation of groundwater and surface water quality, intersectoral competition, interregional and international conflicts, all contribute to water scarcity and desertification; this is the reason why the appropriate approach to water and desertification issues requires interdisciplinarity, intersectoral (sectors of activities of the human life), multiscale and integrated analysis. (Figure 2)
In broad terms, we can first consider that water scarcity and soil degradation are an issue of poverty: unclean water and lack of sanitation are the destiny of poor people, children and families primarily. One out of five people in the developing world lacks access to sufficient clean water (a suggested minimum of 20 litres/day), while water use in Europe and the United States of America ranges between 200 and 600 litres/day.
The poor pay more, as demonstrated by a report of the United Nations Development Programme: people in the slums of developing countries typically pay 5-10 times more per unit of water than do people with access to piped water (UNDP, 2004).
On a global scale, there are several examples of positive

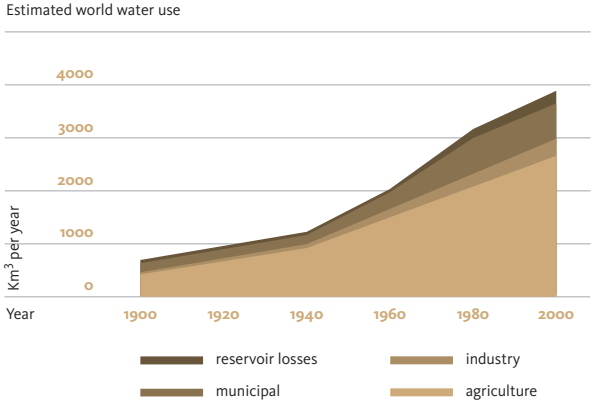
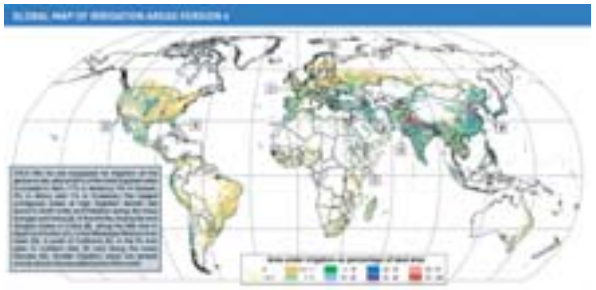


Fig. 1 World water use trend for different activities from 1990 to 2000

relationships between a higher density of irrigation and lower poverty rates, as Lipton (2005) indicates. Only 5 percent of cropland in Africa is irrigated (Figure 2) and the region has experienced very little reduction in poverty in the 1990s (World Bank, 2000). Regions such as East Asia, the Pacific, North Africa and the Middle East with the greatest proportion of cultivated area irrigated have registered the greatest poverty reduction. Thirty to thirty-five percent of cropland in Asia is irrigated and poverty reduction in the 1970_s was mainly related to the investments in irrigation. It is erroneous to state that increasing the access of a family or a community to irrigation would directly lead to a better economic status, better life or poverty reduction. Irrigation, recovery and anti-desertification projects are operating within the context of multiple factors (biological, physical, institutional, economic, socio-cultural) that can negatively or positively affect the results. Of these, Hussain (2005) highlighted land reform as the single most important factor allowing the good performance, in terms of poverty reduction, of irrigation schemes in China and Vietnam, compared to the more skewed systems in Pakistan, Bangladesh and India (Figure 2).
Water and desertification are part of a two-way process and there is a clear need to coordinate desertification-related activities with the research efforts and response strategies inspired by those related to food/environmental security.
Effort should be dedicated to reduce the process of land and water degradation, to enhance water productivity (the volume of production per unit of water) in all sectors and at different scales as a priority, concentrating international economic resources and cooperation firstly on those areas in the world that are facing extreme physical and economic water scarcity (Figure 3).
Furthermore, protecting and restoring the ecosystems that naturally capture, filter, store and release water, such as rivers, wetlands, forests and soils, is crucial for increasing the availability of good quality water (Figure 4).
As stressed above, integration across sectors is needed, taking into account development, supply, use and demand, and placing the emphasis on people, their livelihood and the ecosystems that sustain them. It is very important to have public support for investments in agricultural water development. Governments can also play a central role in facilitating



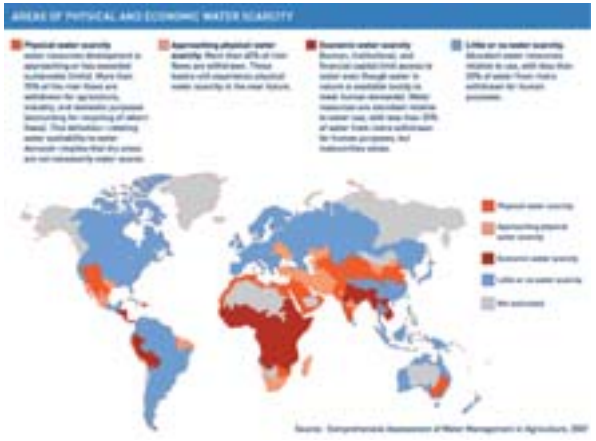


Fig.2 Irrigation in the world.
Fig.3 The geography of physical and economic water scarcity.
Fig.4 Potential of poverty reduction through water interventions.

investments in water development, assuring the up-scaling of successful innovations. Projects on water development should not be isolated but replicable, known and as widespread as possible in those environments similar to those where the project was first carried out.
Certain priorities can be viewed for future research which can certainly be related to some important issues such as crop breeding for drought-tolerance, water and soil conservation and the ability to thrive on low-quality water, but also integrated projects able to face, understand and represent the interaction between soil and water management and practices at different levels-field, system and basin. Studies are required to improve the co-management of soil and water for agriculture and the environment, and to develop appropriate pro-poor technologies and practices for improving soil and water productivity at field and system levels. Techniques to enhance efficient water use (from irrigation or from rainfall) are available, and conservative agricultural systems based on minimum tillage or sod seeding can avoid losses of organic matter from soil, reducing the need for mechanical energy. Research should also help improve tools (indicators, models etc.) to support responsible decision making for valuing the productivity of soil and water in its various uses and examining trade-offs. Research should also be participative in the initial phase; external research centres should collaborate with local partners and look for a real recovery of so-called "local knowledge". However, innovative approaches for local investments are emerging, such as the Community Driven Development Approach (CDD), applicable also on domestic water and small-scale irrigation.
Some broad conclusions can be drawn from the literature review and project analysis in order also to focus on some important points. Water and soil management, irrigation and food security are such complex issues that they require a systematic approach, as well as an intersectoral and integrated analysis, otherwise the risk of erroneous or misleading conclusions (and interventions) is high.
With investments in water resources development and in the fight against desertification, it is necessary to invest in education, extension services, information-communication technology, roads, agricultural related industries and services: integrated sector projects generally have lower costs and higher performance.
At the farm level, it is opportune to remember that irrigation water is only one of the factors or services required for improving farm productivity and income: again, a systematic approach, a great effort to strengthen the support services (especially agronomic research, extension systems and financial services) should be easily accessible. Special effort should be made in the education of the poor, upgrading firstly, their agronomic skills and then others. Credit provision, extension and access to input and other services should also be provided. Conclusively, we should not forget the importance of water development for livestock, agro-forestry, fisheries, small businesses, brick making and, last but not least, domestic water provision.

References

DFID (Department for International Development). 2002. *Better livelihoods for poor people: The role of agriculture.* Issues Paper. Consultation Document Draft A4. Rural livelihoods department. London: DFID.
Hussain, I. 2005. *Pro-poor intervention strategies in irrigated agriculture in Asia. Poverty in irrigated agriculture: Issues, lessons, options and guidelines.* Bangladesh, China, India, Indonesia, Pakistan and Vietnam. Final synthesis report. Manila: Asian Development Bank and International Water Management Institute.
IFAD. 2001. *Rural Poverty Report 2001. The challenge of ending rural poverty.* Oxford: Oxford University Press Published for the International Fund for Agricultural Development.
Lipton, M., 2005. *The family farm in a globalizing world: The role of crop science in alleviating poverty.* 2020 Vision Discussion Paper 40. Washington: International Food Policy Research Institute.
UNDP. 2004. *Water governance for poverty reduction. Key issues and the UNDP response to Millennium Development Goals.* New York: United Nations Development Programme.
World Bank. 2004. *Water resources sector strategy. Strategic directions for World Bank engagement. Internal Strategy.* Washington D.C.: The World Bank.

For more information

www.allconferences.com
www.cgiar.org
www.cia.gov/library/publications/the-world-factbook/fields/2032.html
www.fao.org
www.ifad.org
www.ifpri.org
www.iwmi.cgiar.org
www.unccd.int
www.worldbank.org

kxxi< 3/3

Optimization of Water Use by Plants in Arid Lands Facing Global Change

Mauro Centritto and **Giuseppe Scarascia Mugnozza,** Institute of Agro-Environmental & Forest Biology, National Research Council

Anthropogenic climate change is projected to include increasingly variable precipitation regimes, as well as atmospheric warming. In the north-western part of China, current global change models predict drastic larger per event rainfall inputs separated by longer dry intervals, which are expected to lower the mean and increase the variability in soil water content, compared to ambient rainfall patterns. Most aspects of the terrestrial ecosystem structure and function are vulnerable to these hydrologic changes, perhaps independent of changes in annual precipitation quantity, and important interactions with elevated temperatures and atmospheric carbon dioxide can be expected. However, our ability to forecast ecosystem responses to climate change is constrained by a lack of field studies and proxy data sets capable of projecting the long-term consequences of increased climatic variability.
There is almost no information, based on experimental approaches, from which one can predict the impact of these changes on ecosystem functioning, especially on long-term water use efficiency (WUE). In fact, the few studies on experimental manipulation of precipitation have focused their attention mainly on community dynamics and plant growth response and, to a lesser extent, on the impact of increased rainfall variability on water potential, photosynthesis and ecosystem respiration.
Drought stress is a complex syndrome, involving several climatic and edaphic factors. It is characterized by three major varying parameters: timing of occurrence, duration and intensity. The general complexity of drought problems is often aggravated under arid conditions by erratic and unpredictable rainfall and by the occurrence of high temperatures, high levels of solar radiation and low soil fertility. The resulting high variability in the nature and occurrence of drought stress and the insufficient understanding of its complexity have made it generally difficult to characterize the physiological traits required to improve plant performance during a drought, consequently limiting the use of a trait-based approach to enhance drought tolerance in plants. It is now well accepted that the complexity of the drought syndrome can only be tackled using a holistic approach, integrating physiological dissection of the resistance traits and molecular tools, together with agronomic practices that lead to better conservation and utilization of soil moisture, and matching plant species with the environment. This basic knowledge is essential to effectively combat aridity and desertification processes, and for mitigating the impact of global change. The objective of our project is to identify plant species suitable for degraded areas and study their responses to future scenarios of climatic change in terms of WUE. This is an important parameter, not only because it is related to drought resistance, but also because research on WUE represents one of the few cases where physiological, biochemical and molecular genetics research has led to improved plant cultivars with increased yield. In order to identify the key traits conferring a high WUE, while maintaining reasonably high growth potentials, a model of sequential ecophysiological and molecular responses to conditions of deficit water availability will be assessed (focusing particularly on stable isotope discrimination, carbon metabolism, transpiration, and antioxidant defence of plants). This knowledge is necessary to draw a mechanistic link between plant diversity and the variability in WUE, and adaptation to arid environments.

Target Environment

North-west China is a vast semi-arid area. These lands are mostly in the highland plateaus of East Gansu and North Shaanxi and West Shanxi. Gansu lies in

Table 1 Plausible changes in averaged surface air temperature and precipitation

		2020_s			2050_s			2080_s	
	Annual	Winter	Summer	Annual	Winter	Summer	Annual	Winter	Summer
Temperature (°C)	1.61	1.56	1.77	3.18	2.81	3.55	4.83	4.41	5.34
Precipitation (%)	1.3	3.0	-2.1	1.3	6.9	-2.3	-1.3	6.9	-4.0

the northeast of China, at the intersection of 3 large highlands, Huangtu (yellow earth) Highland, Inner Mongolia Highland and Qingzang Highland (latitude between 32°31' and 42°57' north, longitude between 92°13' and 108°46' east) bordering Sichuan, Qinghai and Shaanxi provinces, Inner Mongolia, Ningxia, Xijiang autonomous regions. Gansu covers an area of 454,000 sq km, of which 70% is plateau and hills. In the northwest of the province there is a huge desert area which covers 14.99% of the total land area in this province. According to the geographic-climatic zonation of China, the Gansu province belongs to the Zone of Temperate Grasslands, with an annual precipitation of 50-800 mm, decreasing from south-east to north-west. The arid area is climatically one of the most extreme in Central Asia. Cold winters (January daily average: -8°C), warm summers (July daily average: 26°C), large temperature fluctuations and a high water-vapour deficit throughout the year, represent a harsh environment for plant life.

Global Change Scenarios

Current global change models predict that increases in atmospheric concentrations of greenhouse gases from anthropogenic activities would cause drastic changes in surface temperature, precipitation and, consequently, in potential evapotranspiration in the north-western part of China. Three future time periods centred around the 2020_s, the 2050_s, and the 2080_s have been considered in the scenarios of changes in surface air temperature and precipitation relative to the baseline period of 1961-1990. It is evident from the following table that the magnitude of projected warming is considerable and could substantially impact this region (Table 1).
An increase in winter precipitation and a decrease in summer precipitation are projected. Rising temperatures may lead to a latitudinal and altitudinal migration of plants by shifting the thermal limits of vegetation and may alter ecosystem structure and productivity by both speeding up the ontogenetic development and increasing the length of the growing season. However, one of the most important consequences brought about by rising temperatures and by a decrease in summer precipitation will be higher potential evapotranspiration and an increase in drought frequency and intensity. Moreover, because the rainfall over this region is already low, severe water stress conditions leading to the expansion of deserts are quite possible with a rise in surface air temperature. Thus, the arid ecosystems of the north-western part of China are very vulnerable to climate change.

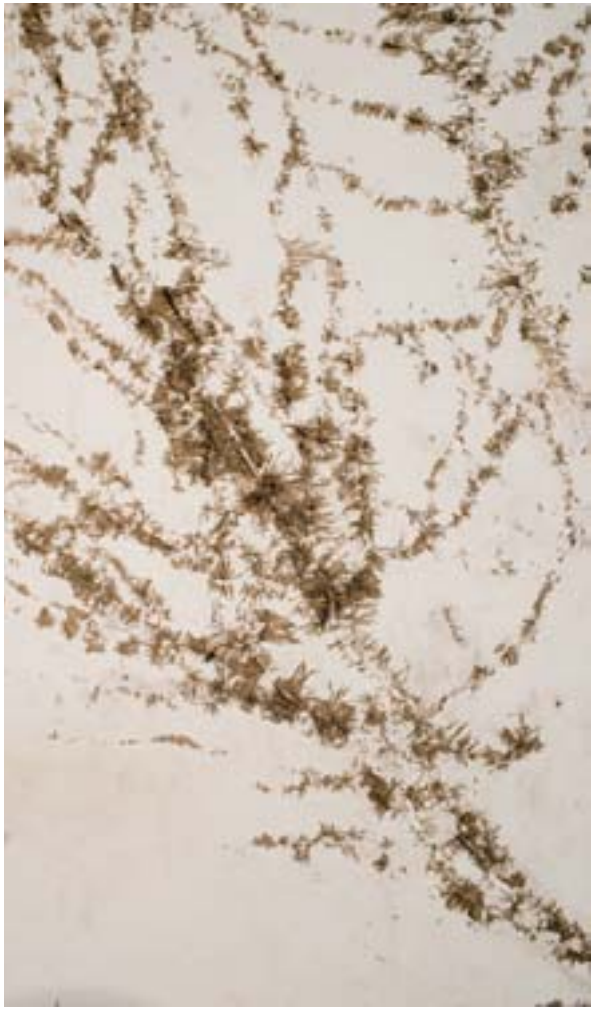
Methodological Approach

This project aims to study the structure of arid ecosystems in the Gansu province, with an ecophysiological and molecular characterisation of WUE along aridity gradients and to develop pilot systems 1) to search for and recover plant species suitable for degraded areas, 2) to study the impact of future climate change scenarios predicted for this area on the most suitable ecotypes among the species newly characterised for their high drought resistance and WUE, and 3) to test mitigation actions. A three-phase experimental approach is used in this project. The first phase regards the characterization of the plant ecosystems along aridity gradients and the screening of functional groups/species/ecotypes. Based on this first phase, field works (second phase), i.e. germoplasm collection and local field manipulation experiments, and pot experiments (third approach) will be performed on selected plant material.
A survey will be carried out on native species particularly fit to resist arid conditions, potentially making them important as alternative crop species. Recovering plant species suitable for degraded areas is a key issue in combating aridity. Thus, this study will identify the main species/ecotypes with high WUE growing in each area and help to select the ones most

appropriate for screening. The research proposed will provide information on the mechanisms that contribute to the sensitivity to change of a particular functional type within the ecosystems. Particular emphasis will be given to the assessment of long-term whole-plant WUE, using carbon isotope discrimination to screen plant species/ecotypes.
The identification of the key ecophysiological indicators of plant stress tolerance under different rainfall manipulation experiments and of drought kinetics, will facilitate the understanding of the links between molecular markers and ecophysiological traits and contribute to the comprehensive ecophysiological models for breeding programs. This work will include a broad range of functional groups/species/ecotypes under standardized pot conditions and under field conditions (rainfall manipulation and shading experiments). The assessment of the molecular component of variability in ecophysiological characters helps to establish the association between molecular markers and ecophysiological traits. These studies will include the characterization of both the antioxidant defence of plants and the gene expression patterns in response to drought.
The evaluation of appropriate agronomic techniques, including the evaluation of shading nets, fertilization and alternative water saving irrigation practices (partial root drying and regulated deficit irrigation) will be crucial to improve crop WUE and yield quality and quantity. The results obtained here will also contribute to the development of comprehensive agronomic techniques and ecophysiological models for breeding programs, as well as defining optimal environmental conditions and cropping techniques. Finally, the obtained results will be scaled by integrating modelling on a landscape level with socio-economic approaches. We plan to draw a mechanistic link between plant diversity and the variability in WUE and adaptation to arid environments, and to improve our ability to forecast ecosystem responses to climate change.
A preliminary investigation into the effects of variations in groundwater depth on the physiological response of *Elaeagnus angustifolia* (Russian olive) showed that constant access to groundwater allowed plants supplied with water at the lower soil layer to meet their water requirement (Shi *et al*. 2008). The combination of high photosynthetic capacity, high nitrogen fixing capacity and drought tolerance, and the trade-offs between photosynthesis and respiration are characteristics that help explain the ability of *E. angustifolia* to thrive in a hyperarid environment. The physiological traits of *E. angustifolia* found in this study confirm that the use of perennial phreatophytic, nitrogen fixing species that fix atmospheric nitrogen to build up soil nitrogen capital, have the significant potential to positively impact soil fertility and carbon sequestration under the environmental conditions found in the Minqin desert.

References

Shi, Z., Cheng, R., Liu, S., Sorrentino, G. and Centritto, M.(2008). Carbon assimilation, 13C and water relations of Elaeagnus angustifolia grown at two groundwater depths in the Minqin desert, China, Plant Biosystems - An International Journal. Dealing with all Aspects of Plant Biology, 142:3, 525-532.



The Vallerani System in China: an Integrated System for Combating Desertification in Respect to Biodiversity

Nevio Capodagli, Beijing PMO
Alessandro Vallerani, Senior Expert of the Vallerani System
Venanzio Vallerani, System Inventor and Project Manager

Desertification in China

According to data provided by the State Forestry Administration of China, desertification in northern and western regions of China is increasing at a rate of 10,400 km² every year, while sandy lands are increasing at a rate of 3,436 km². In China at present, desertification is affecting about 2.6362 million km² of land, or over 27.4% of the national territory, while "sandy-field" land covers almost 1.8 million km², or 18% of the national territory. The desertification problem affects about 400 million people. Despite positive efforts made by the government to slow down and control the advancing deserts, the rate of desertification and soil erosion is still a great threat. The annual economic loss due to desertification is evaluated at over 5 billion euro.[1]

This data only partially includes the loss of arable land and grassland eroded each year due to unsustainable human activity. We could argue that up until now the loss of soil fertility and the related problem of salinization is due more to human activity than to climate change. Moreover, the climate change impact on these regions is partially due to a history of intensive deforestation and excessive exploitation of natural resources. It is a fact that over 60% of actual desertification has been generated during the last decades of the 20th Century.

The introduction of intensive cultural and monocultural practices in agriculture, excessive chemical fertilization, the consequent unsustainable exploitation of water resources for irrigation and the wide diffusion of the "white pollution" phenomena have all led to heavy losses of biodiversity and fertility and hence to soil salinization and desertification.

Due to their unsustainable exploitation of pastures, the government attempted to move semi-nomadic shepherds and integrate them into small, new villages, simultaneously fencing off large areas of degraded pastures for natural recovery, whilst dedicating other areas to reforestation projects. The non-accessibility of these areas disappointed local people and occasionally led to uncooperative behavior. What is worse, these practices did not achieve the expected environmental recovery results because the man-made damages to the ecosystem required the human help and cooperation in order to recover and achieve environmental balance. More recent policies have attempted to involve local people actively in the fight against desertification, raising their awareness, improving land management quality and effectiveness, and therefore improving local economic conditions. Conventional reforestation practices for combating desertification have proved to be costly both financially and with regard to water resources. They have not been very effective in the medium and long term and have also been unpopular. In recent years, the Chinese government has devoted huge financial resources to combating desertification and is eager to find out new and more sustainable ways to achieve the task of slowing down and controlling desertification, at the same time bringing a sustainable means of development to local people. In this context, the Vallerani System attracted the attention of the State Forestry Administration of China.

The Vallerani System

The Vallerani System is a micro-catchment system for rainwater harvesting (surface runoff) aimed at restoring heavily degraded soils through afforestation and at increasing in agricultural production in arid and semi-arid regions. The micro-basins are made at a speed of about 6 km/h by one of two special types of ploughs (the Dolphin plough and the Treno plough) developed by Mr. Vallerani and designed to be driven

Table 1 Data sheet

Operational module:	Mechanized Technical Unit (MTU)
MTU Equipment:	One 180 HP tractor, equipped with the special soil working equipment (ploughs and other)
Construction and 1st utilization date:	1988, within the frame of the PIRD (Projet Integré de Réhabilitation du Damergou), District of Tanout, Zinder (Niger)
Countries in which it has been introduced:	Senegal, Burkina, Niger, Chad, Egypt, Morocco, Tunisia, Syria, Sudan, Kenya, Giordania, China
Surface treated so far:	Over 111,000 ha
Costs of intervention:	Euros 25–80 per ha
Average working capacity:	Minimum 2 ha/h or 14 ha/day (7,000 half moons or micro-basins/day or 1,500 ha/year per MTU – one machine substitutes the work of 1,000 men)
Water availability and productivity:	from 2 to 3 times higher
Cost/benefit ratio:	from 1 to 4 and more
Application:	Relevant to Sahelian region, Mediterranean basin, Middle East, China, other arid regions with average rainfall between 150 and 500 mm/year

by tractor. Rain and runoff water, fine superficial soils and organic matter are harvested and concentrated in the micro-basins producing spontaneous vegetation. Direct sowing or planting of important woody indigenous species and their protection against pasture (especially in the first years) are all part of the system. This multi-purpose technology can be used for reforestation, rangeland improvement and land cultivation (Table 1).

From an environmental point of view, the Vallerani System technology offers an effective overall solution to the major problems covered in the three UN Conventions highlighted at the Rio conference (Bio-diversity, Climate Changes and Desertification). Meeting the real needs and interests of the agricultural and rural world, the diffusion of this technology also enables the re-establishment of a sound relationship between institutions and the general population, strongly contributing to problem solving. Up to now, this technology has been successfully implemented in over 111,000 ha, particularly in the Sahelian countries. The system, named after its inventor, not only effectively reduces or eliminates the problems of water loss by 'run-off', and the associated erosion, but also offers benefits far beyond this, contributing to aquifers replenishment, soil fertility recovery, an increase in green coverage etc.

The system is a new technical approach that supports the management of human and natural resources in the arid and semi-arid regions of the world.

Using specially designed ploughs, parallel lines of short trenches or micro-basins are cut into the ground along the contour lines of the terrain, into which the rainwater flows and is retained, to be absorbed gradually into the ground close to where it falls. There is little or no overflow and the problem of erosion is controlled within the area.

This agricultural system compares favorably to both rain-fed and irrigated agricultural systems; it helps to alleviate the uncertainty and the low productivity of rain-fed agriculture and the high costs and limitations of irrigated agriculture. Its application brings technical, socio-economic, sanitary and environmental advantages. Furthermore, the application of this system avoids the problem of soil salinization and actually helps improve soil quality.

To date the ploughs have been applied to the recovery of marginal lands (about 90%), which have been abandoned or never cultivated, are scarcely permeable or practically unproductive. After treatment, these areas are frequently more fertile than the cultivated ones and the productivity and yields are often much higher. In Sahelian countries the production can exceed 1,000 kg of millet/ha.

The Project in China

The project for combating drought and desertification with the Vallerani System officially began after the agreement was signed on 1st August 2005 for the development of an afforestation project in a pilot area using the Vallerani System. Balinzuo Banner, in Inner Mongolia's autonomous region, was selected as the first project site. The project is expected to take up to five years to complete. The Director General of the Italian Ministry for the Environment, Land and Sea (IMELS), Mr. Corrado Clini, and the Director General of the State Forestry Administration of China (SFA), Mr. Qu Guilin, signed the agreement. The project agreement foresees the afforestation of 1,000 ha in three years, including a CDM evaluation.

The project sites are located in different counties of the municipality of Chifeng, starting from Balinzuoqi, which was the former capital of the Liao Kingdom which about 1,000 years ago. At that time, forestscovered the whole area, but it is now suffering under the pressure of desertification. Average rainfall is about 300-400 mm/year, but in the years 2006 and 2007, when the project was implemented, it was lower than 100 mm. By end of 2007, 1988 ha of land had already been worked using the Vallerani System in the counties of Balinzuo, Aulukerqin and Balinyou (including 275 ha through transplanting and 1,333 ha through direct sowing).

The full adoption of the Vallerani System requires direct sowing of local varieties without using irrigation. Despite the trials being implemented during two years of drought, the survival rate of direct-sown plants has averaged at over 90%. The selected plants were *Caragana spp., Prunus armenaca, Xanthoceras sorbifolia Bge,* elm and larch. Because of the drought, the survival rate of transplanted larch was below 30%, whilst through direct sowing it was over 73%.

In 2008, about 500 ha of land have been worked using the Vallerani System.

After two years of project implementation, the Chinese government is very satisfied with thepreliminary results of the project, some of which can be listed as follows:

_ Great increase in the survival rate of the plants under arid conditions without irrigation;

_ Eco benefits: in one year green coverage increased by 40%, plants grew 50% higher, biodiversity increased due to seed retention in the micro-catchments;

_ Minimum impact of soil breaking through Vallerani System's ploughs (only about 13-17% of the total surface). Micro-catchments allow rainfall retention, thus reducing water run-off and evaporation, as well as soil erosion;

_ Low cost system: the cost per ha of the Vallerani System was lower than 25 euro/ha, while conventional Chinese systems cost over 90 euro/ha;

_ High-speed afforestation system: the afforestation through this system is over 50 times faster than other conventional systems and is much more flexible. It is also suitable in areas with a 10-20 degree slope.

[1] Information from Prof. Wang Junhou, Academy of Forest Inventory and Planning, State Forestry Administration of China.

References

Academy of Forestry Inventory and Planning, State Forestry Administration of China, *Work report for Sino-Italian Cooperation Project (2005-2007): Key Technology for Mechanized Rain Collection and Vegetation Recovery in Arid Region.*

www.vallerani.com

VIU training program echo from participants

This section is written by the Chinese participants in the trainings in Italy.
We hope hereby to provide the Newsletter readers with an authentic flavour
of the training experience.

Beijing Environmental Protection Bureau
Electromagnetic Pollution
Italy, 12-26 January 2008

The Sino-Italian Beijing advanced training program 'Electromagnetic Pollution' was co-organized by the Italian Ministry for the Environment, Land and Sea, Venice International University, Turin University's Agroinnova and Beijing EPB, and held in Italy from January 12-26, 2008. Focusing on electromagnetic pollution control, this training covered Italian environmental laws and regulations, lawmaking policies on electromagnetic pollution, the status quo of electromagnetic pollution management, as well as the history and surroundings of Venice, etc. A total of 21 trainees from Beijing EPB, Beijing Municipal Radiation Center, Beijing Municipal Environment Law Enforcement and Inspection Corps etc. took part in the training program.

Beijing Municipality began electromagnetic pollution control in 1980 and the Division of Radiation Security Control was set up in July 2004 in Beijing EPB. The division is responsible for nuclear radiation security, radioactivity waste management and related regulations and standards development. The subordinated Beijing Municipal Radiation Center is responsible for routine monitoring, evaluating radiation levels, developing annual reports on radiation quality, in situ monitoring activities for highly polluted stationary sites, and examining EIA from construction projects and facilities with ionization radiation (except for nuclear facilities).

In recent years, to improve the government capacity building, Beijing Municipality has endeavored to develop radiation control laws and regulations and set up a city-wide auto monitoring system. With this training, trainees not only gained greater knowledge regarding the harmful impact of electromagnetic pollution, they also attained an understanding of the lawmaking and control processes with regard to electromagnetic pollution at both urban and regional level, within Italy and Europe. This will help to improve the monitoring and control of Beijing's municipal electromagnetic pollution and therefore increase public participation.

Lectures, site visits, and discussion not only contributed to the understanding of the terms of laws and regulations, it also improved the friendship between trainees and lecturers, which will prove favorable for cooperation in the future.

Ministry of Environmental Protection
Air Quality Monitoring
Italy, 19 January - 2 February, 2008

1. The impression of the training program and the overall experience.
Because of the organization and arrangement of the university, the trainees studied and visited Rome, Venice and Turin etc. The training course provided a complete and systemic introduction to the EU environmental management system, air pollution control processes, Italian sustainable development and air pollution control, management measures and experience, and new developments regarding European environmental and health issues. After the training and study tour, we learnt about the EU environmental protection concepts, methods and measures, which led to many discussions and ideas for Chinese environmental protection work. Many trainees think that because our two countries (China and Italy) are at a different industrial developmental level, we face different air pollution control problems; however, the Italian experience and the lessons learnt provide a valuable reference for China.

2. What was learnt through the training, with an emphasis on the possibility to create links with China's specific issues through the lectures/visits.
In combination with Chinese environmental protection work, we noticed that:
_ Air pollution control should be strategically integrated.
_ Actively utilizing economic measures shifts environmental external costs to internal costs.
_ Great attention needs to be paid to the effects of vehicle pollutants.

3. What needs to be continued after this training?
With the accelerated development of Chinese cities, city vehicles continue to increase in speed and, consequently, NO_X and VOC continue to rise, which may cause ozone pollution. We have to pay attention to this issue. Therefore, we hope we will learn more on ozone and fine grained pollution control and preventative measures.

4. Suggestions for the next training program.
The air pollutant species in various areas of world have become complex. Besides, SO_2, NO_X, PM_{10}, $PM_{2.5}$, VOC and other pollutants have become the main substances to affect air quality. We suggest that the training course provides some introduction and experience on these abovementioned pollutants, as well as their control and prevention.

5. Other interesting findings through the training:
Italy has its own environmental management instruction for a complete environmental management system; as a member of the EU, Italy also needs to implement the EU management systems and regulations. We are interested to know how Italy coordinates itself with the EU, ensuring Italian environmental management runs smoothly.

Chinese Academy of Social Sciences
Waste Management
Italy, 23 February - 8 March, 2008

The Eco-Management: Strategies and Policies Training Program on Waste Management was held in Italy from 23 February – 8 March, 2008. The lecturers introduced the European solid waste management directives and the Italian environmental and solid waste management policies, with an emphasis on live waste classification, collection, selection and resource re-utilization and stabilization methods, as well as the description of hazardous waste (including medical waste) incineration, implementation methods, technical matters and management stipulations. Visits have been organised for the trainees to let them investigate plants such as waste selection, landfill, hazardous waste incineration, and waste and sewage integrated disposal in Rome, Rimini, Venice and Ravenna.

At present, China is still in the preliminary stage of live waste classification, collection and recycling, and is imperfect especially at macro-planning and function design.

The problems of setting up the respective plants for each waste disposal process doesn't only waste manpower, material resources and transportation costs, but it also causes secondary pollution to the environment indirectly. Therefore, the Italian theory of reducing waste discharge from the source is worth promoting. It is also valuable for China to take note of Italian waste management methods such as classification, collection, selection, waste recycling and waste to energy incineration. Moreover, these methods are enlightening for China's waste management, particularly in respect to sound waste management laws, regulations and policies in the EU and Italy, the government and educational advocates' strong emphasis on waste problems, and the public's high awareness and participation in waste management.

The trainees hope to learn more through comparative studies of Sino-Italian waste management in order to implement advanced management experience effectively. Additionally, quite a lot of trainees from various Chinese universities are considering using such training as a platform for setting up a cooperative bridge between Venice International University and China's colleges and universities, which will be helpful in consolidating the training results.

Of course, the trainees were also deeply impressed by the Italian natural scenery, historical culture and local customs. They were touched by its dense artistic atmosphere, shocked by the magnificent ancient architecture and amazed by Italy's profound ancient civilization.

Multilateral Environmental Agreements, MEP
Italy, May 17-31, 2008
24 participants

Following last year's training success, the newly appointed Ministry of Environmental Protection of P.R. China decided to focus once again on multilateral environmental agreements.
Participants from the previous training were especially glad to have acquired knowledge and experience helpful to their work, as many issues mentioned during lectures and site visits are common in China.
Following their suggestions, this year's course attempted to focus more on the overall environmental policy network and law implementation in both Italy and the EU, as well as examples of ongoing agreements.
The reason why the course started in Rome at the Italian Ministry for the Environment, Land and Sea, was to give the participants a general idea about what the Italian Ministry is doing about MEAs implementation, the Kyoto Protocol, and its enforcement in Italy.
In Siena, after a general overview on the EU organization and its environmental policy, the senior experts and university professors described for the delegation the main issues of the European Legal Framework for MEAs and its enforcement.
In Venice, MEAs past development and future trends were introduced, together with a general overview on how states can act together in order to achieve a common goal.
These introductory classes had the aim of preparing the background for lectures on specific existing multilateral environmental agreements: the Rotterdam and Basel conventions, dealing with the management of international trade on hazardous wastes and chemicals; the Montreal and Stockholm conventions, focused on the protection of the ozone layer and human health by phasing out or eliminating the production and use of a number of substances and POPs harmful to the environment; the conventions on biodiversity (on Biological Diversity, on International Trade in Endangered Species of Wild Fauna and Flora and on Migratory Species) aimed at safeguarding the conservation status of a natural habitat and its species.
The role of industries was highlighted through site visits, which showed how production of goods and services needs to comply with the limits imposed by environmental agreements.

Environmental Management, SEPB
Italy, November 1-15, 2008
21 participants

The training held in November was the third one organized in 2008 in cooperation with the Shanghai Municipality Environmental Protection Bureau, and the second focused on environmental management.
As the chosen topic was really broad, the aim of the course was to present tools and practices developed to best deal with the challenges that development is putting on the environment.
The training started in Rome, at the Italian Ministry for the Environment, Land and Sea, with an introduction to the national environmental policy in Italy, focusing on the role of the Ministry, and the Italian policy at the local level.
The program continued in Siena with a general overview of the EU environmental legislation and policy and the European approach to environmental management, as well as an introduction to the agencies for environmental protection given by professors and researchers from the university.
One of the main outcomes of development is represented by a high level of traffic in the cities. Private and commercial traffic, however, need to be addressed in different ways. The case study of Interporto di Padova was presented to provide an example of how this city is trying to speed up the commercial traffic from the outskirts to the center by using non-polluting vehicles, among other means.
Thetis S.p.A. experience, both in Italy and China, instead, highlighted the different traffic management tools used in order to reduce the use of cars and the emissions into the atmosphere.
Agenda 21 and Local Agenda 21 processes were also introduced as they can be a powerful and innovative tool to promote sustainable development. Citizens' participation in the management of a city is really important, both through proposals to the governing bodies and through direct action, as in the case of waste collection. In fact, the promotion of a differentiated collection system is helpful to better manage waste disposal as its by-products can still be used, for example, as fuel to produce energy or as fertilizers in agriculture.
Other issues covered by the course dealt with environmental monitoring tools and the management of hazardous and hospital waste, both of which must be treated with special precautions in order to avoid human health problems.

Sustainable Development in Urban and Industrial Areas, TSTC

Italy, October 8-22, 2008

24 participants

Tianjin is the third largest city in China. This city is heavily industrialised and boasts one of the most important ports in northern China.

In recent years, rapid economic growth and a large population increase have caused a high level of urbanization, resulting in increased environmental pressures.

Nowadays, Tianjin Municipality is facing some crucial environmental issues such as air pollution, waste treatment, high resource consumption, traffic management and land reclamation; problems that affect the liveability of the city.

The training course on Sustainable Development in Urban and Industrial Areas, jointly organised by VIU and the Tianjin Science and Technology Committee, aimed at presenting the Italian experience and providing Chinese participants with ideas and tools to manage these problems in the best way.

A liveable and sustainable city has to guarantee good conditions for human health to ensure the vitality of present and future generations. It must deal with waste recycling in order to recover materials, and it must be competitive within the international market by adopting innovative green industrial technologies.

In Rome, the delegation visited the Institute for Atmospheric Pollution, one of the research bodies of the National Research Council, where researchers gave lectures about different methods and tools at the forefront of pollution monitoring in coastal areas, as well as on the effects of atmospheric pollution on the cultural heritage, a sensitive topic for the Tianjin Municipality.

In Venice, trainees explored topics such as waste management, by visiting the integrated waste treatment plant of VESTA S.p.A.; air quality and sustainable mobility, with a project manager of Thetis S.p.A.; energy efficiency and green industry production technologies, by talking with distinguished professors and researchers, among them a senior researcher from TEN Center, Ilda Mannino.

In Turin, the delegation was taken to the Iveco Company where some opportunities for environmental care and vehicle emission reduction were presented.

Eco-Management: Strategies and Policies, E-learning Study Tour, CASS

Italy, October 23 - November 1, 2008

14 participants

In 2007 year Venice International University, in collaboration with the Chinese Academy of Social Sciences, launched the Distance Learning Program, with the purpose of broadening the Advanced Training Program to reach a higher number of participants from more remote areas.

Due to its successful first year, the program was replicated and enlarged in 2008.

An introductory distance learning session on eco-management was held in March, with international experts broadcasting from Milan and Beijing to 320 participants spread over 8 classrooms in Beijing, Changsha, Hohhot, Lingzhi, Sanya, Taiyuan, Urumqi and Xining.

A study tour followed the distance learning session and offered 14 participants, selected among the 320 that attended the introductory session in China, the possibility to experience in practice how the EU, and in particular Italy, are dealing with the issues covered in the introductory session. For this purpose, the study tour was organised as a series of site visits and meetings with institutions working on topics such as environmental policy, sustainable mobility, sustainable urban development and planning, waste and waste water management, and sustainable agriculture throughout Italy.

In particular, the delegation in Rome had the opportunity to meet with representatives of the Italian Ministry for the Environment, Land and Sea and discuss environmental policy in our country as well as the role of the Ministry at both national and local levels.

ATAC, the Mobility Agency of the City of Rome, hosted a visit to its facilities and illustrated the mobility strategies it implements, as well as the car sharing system which aroused lively interest within the delegation.

In Venice, COSES, the Consortium for Research and Education, in charge of the development of the Venice Province Plan, illustrated how their plan was developed to promote sustainable development at a local level, with a stress on the constraints faced and the solutions proposed.

The delegation also visited ARPAV, the Veneto Region Environmental Protection Agency, in order to understand the role of this institution and its strategies in water monitoring in relation to health protection.

The role of industry in sustainable development, with its challenges and opportunities, was evident during a visit to Unindustria, the Province of Venice Industrial Association.

Moreover, the site visit to VEGA, the Venice Science and Technology Park, provided a practical example of how it is possible to redevelop brownfields and convert them into competitive areas.

Innovative plants for waste management and waste water management in the Venice and Treviso areas were also visited.

Finally, in Turin the delegation visited Agroinnova, the University of Turin Centre of Competent Sustainable Agriculture, and its facilities, where experiments and studies on the effects of climate change on plant diseases are carried out.

Capacity Building on Sustainable Development, MOST
Italy, October 25-November 8, 2008
15 participants

The course focused on experiences in most of the environmental sectors like energy, water, air quality and waste management.
The training session program started in Rome with an important introduction on environmental policy in Italy, at national and local levels, given by experts from the Italian Ministry for the Environment, Land and Sea. It then continued in Siena with a general overview of the EU's Environmental Legislation Policy, wich was given by professors and researchers from the university.
Waste management principles were discussed, since waste disposal is often a major concern for municipalities, both for its cost and possible social and environmental drawbacks. A correct approach is nonetheless possible and waste management can become an opportunity. Separate collection allows for the reuse of an increasing number of materials, the most common being paper, plastic, tins and glass, and the residual fraction after separation can provide energy if converted into fuel, as seen in the VESTA-Veritas RDF plant in Fusina, near Venice. Burning the RDF in the local thermal power plant, the waste cycle is closed and all the waste produced by the Municipality of Venice is disposed of without the need for landfilling.
Water is another issue that was covered during the course as a major problem which is attracting international attention. Preserving the limited fraction of clean freshwater available for human activities, by maintaining environmental equilibrium, is essential.
During the lectures the need for a regional approach to water management was discussed and there was a focus on water use in agriculture, since this sector has one of the highest impacts on water pollution, posing a risk to the environmental integrity of the water.
One last interesting point addressed in Turin at the closing of the course was the importance of environmental education and communication as a tool for the development of values, attitudes and skills which motivate people to work, both individually and with others, thust helping promote the sustainability of natural and social environments.

Energy Efficiency and Renewable Energy, CASS

Italy, November 8-22, 2008

42 participants

Nowadays energy comes from fossil fuels which have great importance since they can produce it in very significant amounts.
On the other hand, fossil fuel resources are drastically diminishing because of the increased demand in both industrialised and developing countries.
Moreover, this kind of resources is closely connected to the high level of greenhouse gases that pollute the air and determine climate change.
An effective use of renewable energy could address the problem of the scarcity of fossil fuels and could substantially reduce greenhouse gases and other pollutants.
The training course on Energy Efficiency and Renewable Energy, jointly organised by VIU and the Chinese Academy of Social Sciences, aimed not only at exploring the possibilities of using renewables, but also at discussing the barriers that obstruct their development.
During their stay in Italy, participants met researchers, professors and experts who presented the Italian experience in the field of renewables, as well as their practical application in public and private buildings. The training course provided the delegates with a complete overview, not only of the most common renewable energies, such as photovoltaic, wind and geothermal, but also of the less common ones such as hydrogen.
Since a global strategy needs to be developed in order to support the penetration and diffusion of renewables in the market, the course also looked at the energy efficiency policies and their promotion within the liberalised market.

Air Quality Control, BMEPB
Italy, November 15-29, 2008
20 participants

Air pollution control is an issue of major concern for Beijing Municipality also after the successful conclusion of the summer Olympic Games in August 2008.
For this reason, another course on air quality was organised in November 2008 for a delegation of 20 participants.
The lectures were designed to present some of the most interesting Italian case studies, both from the point of both view of pollution reduction and air quality monitoring and assessment.
The reduction of traffic generated pollutants, one of the major causes of air quality degradation in towns, was discussed analysing the best practices applied by the cities of Milan and Padua, where the access to the city center is regulated both for private and commercial vehicles. The choice of optimising the delivery of goods into the city center using a fleet of electric or methane fuelled vans is particularly interesting, for the reduction in the number of vehicles and of the pollutants emitted.
Considering the issue of pollution monitoring, the tasks of the Italian agencies in charge of this activity were presented, providing some insight into the available tools such as numerical models and emission inventories.
The exchange of experiences between Italy and China during the course was intense.
In Rome, during the visit to the Institute for Atmospheric Pollution of CNR (National Reserch Council), research activities carried out in cooperation with Chinese partners were presented. Moreover, the Universities of Siena and Turin organised two public seminars on the impact of the 2008 Green Olympics on air quality in the city of Beijing, during which Mr. Yu Jianhua, head of the delegation and director of the Beijing Municipal Environment Protection Monitoring Center, was invited to talk on the evolution of air quality in Beijing during and after the Olympics, describing the efforts made to improve the urban environment and the further action needed. The aim of the events was to inform the wider public on the activities of the Sino Italian Cooperation Program and to share the results obtained thanks to the project.

Forestation and Reforestation

In conjunction with the Chinese State Forestry Administration and Tuscia University, the Italian Ministry for the Environment, Land and Sea has launched a project in Inner Mongolia. The goal of the project is to fight desertification and strengthen biodiversity protection by implementing forestation and reforestation activities, using innovative technologies and providing locals, especially young people, with training.

Forestation in Inner Mongolia using the "Vallerani System"

This project, which is being carried out together with the Chinese State Forestry Administration, aims at applying the "Vallerani System" (an Italian technique to collect and optimize rain water to directly sow local bushes and trees in arid areas by using innovative ploughing machinery) in some semi-desert regions in Inner Mongolia.
The forestation project, which was launched in 2005, led to the cultivation of about 2,000 hectares of land. The results greatly interested Chinese forestry authorities, both because of the speed and the high percentage of plant growth, and the low costs of the interventions.

Monitoring Equipment for Evaluating Environmental Damages Caused by the Earthquake

Within the Program for the Environmental Recovery of Chinese Regions hit by the May 12th Earthquake, the Italian Ministry for the Environment, Land and Sea is committed to providing the Chinese Ministry of Environmental Protection with instruments, equipment and technology for the quick environmental assessment of damages caused by the earthquake.
The second phase of the project will focus on training and technical assistance. The equipment includes 14 vehicles (4x4 traction-wheels) for rapid interventions in zones hard to access, equipped with instruments for water, air and soil sampling and portable instruments for sample analysis on site. Sophisticated laboratory instruments will be also provided, in order to carry out 'in depth' analysis of all the relevant environmental parameters.

Development of Underdeveloped Areas in Western China

The People's Republic of China's 11th five-year plan set the environmental protection and sustainable development of western China's underdeveloped regions as a priority. The Sino-Italian Cooperation Program is therefore giving a central role to projects that aim at improving environmental protection, fighting desertification, and developing sustainable agriculture, sustainable transportation and renewable energies in these areas.
In particular, a photovoltaic plant was built in two remote areas in Qinghai province. A small hydroelectric plant is also being built, which aims at supplying energy to local communities that are not reached by the national electric network.

Bio-energy Project in Ningxia Province

The activities, in cooperation with the Chinese Ministry of Environmental Protection, are aimed at implementing a Biomass Project in the Zhonwei Municipality. The project is aimed at exploiting herbaceous materials, shrubs and woody plants as secondary materials considered hard to treat and recycle, from both an economical and technical point of view. Key aspects of the project include optimizing the use of the geothermic energy produced and carrying out a comprehensive study for the development of renewable energies in the district (both wind and solar energy will be considered).

Promotion and Diffusion of Renewable Energy in Tibet

This project, which is now completed, involved the creation of the Sino-Italian Renewable Energy Centre at Lhasa, which aims at:

_ designing and developing the best technological options for the use of solar energy, geothermal energy, hydroelectric energy and wind energy;
_ training Tibetan technicians;
_ promoting joint ventures between Italian companies and local companies in these fields.
Moreover, a study on the potential use of renewable sources in Tibet was completed in cooperation with Tsinghua University.

Use of Biomasses for Energy Production

From 2004, feasibility studies were conducted on the design and realization of a biomasses gasification cogeneration plant, as well as a complete biomasses combustion cogeneration plant.
The industrial project is now being completed.
Many projects that could generate emission credits are currently being implemented; specifically, the following projects are now in progress:
Landfill Gas Projects:
1. Handan landfill (Hebei): 7.1 million cubic meters landfill; 4.6 MW to be installed; 3.9 million tons of CO_2 reduction;
2. Yinchuan landfill (Ningxia): 5.3 million cubic meters landfill; 3 MW to be installed; 2.9 million tons of CO_2 reduction;
3. Haikou landfill (Guangdong): 8.7 million cubic meters landfill; 8 MW to be installed; 6.7 million tons of CO_2 reduction;
4. Tianjin landfill (Tianjin Economic Development Area): 3 million cubic meters landfill (1st module); in the pipeline.
Livestock Gas Projects:
1. Shineway pig farm (Henan): 1 MW installed; 34,000 tons of CO_2 reduction per year;
2. Cow farm in Yinchuan (Ningxia): 8,000-10,000 cows; 1 MW to be installed; 49,000 tons of CO_2 reduction per year.

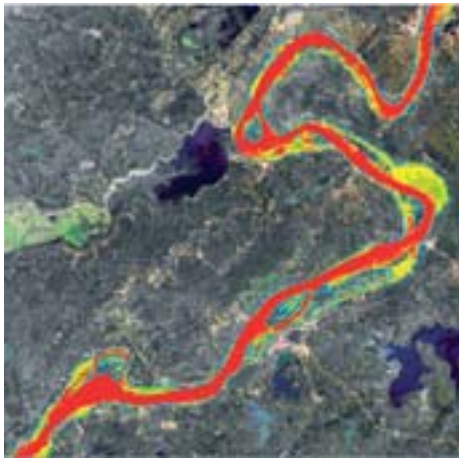
Environmental Evaluation in China's Central Provinces (Ecological Survey)

The project consists in the characterization of land and environment in six pilot

areas in central China (200,000 Km^2 in total) on the basis of the main ecological parameters, by interpreting satellite images integrated with existing data and on-site surveys.
The experts created a Geographic Information System (GIS), wich containes information related to land mapping and land covering, and the analysis of the changes in plant covering in urban and coastal areas which have occurred in the last 15 years. A thematic atlas was also created, which is the outcome of specific technical reports and studies on the surveyed areas.
The project was developed so that remote sensing techniques and technologies could be transferred from Italian to Chinese experts.
The project was concluded in May 2005.
A new project was launched with the aim of proving the applicability of remote sensing technologies in the studies on greenhouse gas emissions from water bodies, in relation to water quality. This project applies the environmental monitoring tecniques and activities which had previously been developed. To support these activities, campaigns of sampling and analysis of water bodies were carried out in selected lakes: Dalai Nur Lake (in Inner Mongolia province), Miyun Lake (in Beijing province), and Hongze Lake (Jiangsu province).

Program for GHGs Emission Reduction in the Chinese Housing Sector

IMELS, together with MOST, began a program for the reduction of GHG emissions in the Chinese housing sector. The program is formed by three projects which are strongly interconnected:
_ the development of new standards and guidelines for energy efficiency and environmental protection in the residential sector (at building design, construction and management level), with specific reference to international practices;
_ the study of GHG reduction potential in the Chinese housing sector, with specific reference to the development of Clean Development Mechanism Program of Activity, concurrently with the advancement of the practical implementation of the Kyoto Protocol;
_ the design and construction of a residential area (Energy Efficient Ecological Village-3E) that will host the families of Sate Council officers. This compound, approximately 170,000 m^2 wide, will be built as a demonstration of the previous projects, and will rise at the north-western end of Beijing. The design development has been entrusted to an Italian architecture studio and will be based on eco-compatibility principles and Italian sector-technologies.



2009 Sino-Italian Advanced Training Program on Environmental Management and Sustainable Development

A new Cooperation Agreement 2009-2011 for the implementation of Capacity Building projects has been signed by the Venice International University (VIU) and the Italian Ministry for the Environment, Land and Sea (IMELS) after the successful cooperation going on since 2003.
The past five year of cooperation has reached outstanding results in the training activity, especially in consideration of the high number of Chinese personnel trained (almost 3000), Chinese institutions and Italian companies involved, and the creation of a remarkable Euro-Asian network of stakeholders, experts and researchers for the promotion of sustainable development.
Such network has been additionally enlarged by the Distance Learning Program which, after the success of the pilot project launched in 2006, is now a milestone in the Sino-Italian Capacity Building programme thanks to its capacity to reach simultaneously several classes in remote areas of China.
The "Sustainable Development and Environmental Management" book published by Springer in 2007 (Clini, Musu, Gullino, eds.) is a significant outcome of the training activity. The volume consists of a selection of papers specifically prepared for the training program by major experts in the different fields of environmental management. It represents a unique collection as it offers a complete overview of the main topics concerned with environmental management and linked to the promotion of environmental technology for sustainable development. The edition of the book published in Chinese by Springer in 2008 and distributed in China marks another important meeting point in the Sino-Italian cooperation for fostering sustainable development.
A series of workshops focusing on the "Sino-Italian Comparative Studies on Sustainable Development" has stemmed from the cooperation with the Universities of Tongji and Tsinghua (member of VIU since 2004).
The workshops have been the occasion to confront the approaches used in Italy and China in different research projects to face key issues of sustainable development such as water, waste, urban and industrial development.
The VIU network created in the training program has strongly contributed to the success of the initiative by involving numerous Italian institutions which work in the field of environmental management.
Harvard University has recognized the VIU TEN Center as a proper platform to develop the new concept of "Sustainability Science". Since 2006, selected scientists have met yearly at VIU and at Harvard University in turn to shape the principles and the agenda of this emerging "science".
The VIU training experience has strongly contributed to the success of the Asia-Link project, "CLIMA - Euro-Asian research and training in CLImate change Management". CLIMA is a 3 year project started in 2006 and funded by the European Union. CLIMA has created a Euro-Asian network and a Master-on-line on Climate Change and Sustainable Development by developing a training programme for young researchers/professors of the 7 partner universities (including Renmin and Tsinghua Universities of China).
The VIU training activity was not only limited to China. IMELS referred to VIU for developing the "Course for Sustainability", a capacity building programme designed for participants from East European countries. Since its beginning in 2004, the course grew as to include 11 countries. In 2008, the course was specifically designed for Central Asian and Black Sea countries (Kazakhstan and Turkey as partner headquarters) whereas the original agenda of the course was adapted for participants of the Visegrad countries.
The new VIU_IMELS Cooperation Agreement is therefore the outcome of the fruitful results reached so far by the

Capacity Building project within the Sino-Italian Cooperation Program for Environmental Protection, thanks to the successful cooperation, substantial exchange of knowledge and the valuable experiences developed within the project.
In the next 3 years, we wish to continue and to further improve the Advanced Training Program with National Development and Reform Commission (NDRC) joining the program with new training courses on climate change. Among others, the promotion of environmental technological innovation, the dissemination of the role of environmental regulation and policy, the relationship between environment and industrial development are the objectives for the new year.

In 2009, The National Development and Reform Commission of China (NDRC) will join the Sino-Italian Advanced Training Program.
7 institutions will participate in the Training Program, 31 training courses (26 in Italy and 5 in China) will be organized and 922 participants from the People's Republic of China will be involved, as follow:

National Development and Reform Commission (NDRC):
2 courses; 42 participants;
Climate Change
Chinese Ministry of Environmental Protection (MEP):
5 courses; 125 participants;
Environmental Monitoring, Multilateral Environmental Agreements, Air Quality
Chinese Ministry of Science and Technology (MOST):
6 courses; 124 participants;
New & Renewable Energy, Clean Development Mechanism, Energy Efficiency, Sustainable Development
Chinese Academy of Social Sciences (CASS):
4 courses; 164 participants;
Waste, Water, Energy, Eco-building
Beijing Municipal Environmental Protection Bureau (BMEPB):
3 courses; 45 participants;
Green Cities, Air Quality, Environmental Economical Incentives Policies
Shanghai Municipal Environmental Protection Bureau (SEPB):
3 courses; 72 participants;
Environmental Impact Assessment, Environmental Friendly Cities
Tianjin Science and Technology Commission (TSTC):
3 courses; 50 participants;
Sustainable Development, Eco-cities
Distance Learning Program:
1 course; 3 study tours; 12 cities; 300 participants
Sustainable Development
The Kazakhstan Course for Sustainability:
2 sessions; 35 participants;
Sustainable Development, Natural Resources, Human Security, Environmental Safety
The Black Sea Course for Sustainability:
2 sessions, 35 participants;
Sustainable Development, Climate Change, Resource Management, Sustainable Business Practices
The Visegrad Course for Sustainability:
2 sessions; 35 participants;
Sustainable Development, Sustainable Urban Development, Climate Change, Sustainable Business Practices