COMPETE Seminar Mexico

organised in the framework of the COMPETE WP4
on South-South Cooperation

1 – 7 March 2009

Mexico City, Valle del Mezquital, Morelos, Mexico

SUMMARY REPORT

COMPETE is co-funded by the European Commission in the 6th Framework Programme – Specific Measures in Support of International Cooperation (INCO-CT-2006-032448).

Participants of the COMPETE Seminar in Mexico

Seminar organisation:

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Seminar Objectives

The COMPETE Seminar in Mexico aimed to foster South-South cooperation between partners from Africa, Latin America and Asia highlighting best practices as well as their replication potential in Africa.

This Seminar included field visits to remarkable agricultural sites in central Mexico, and served to establish cooperation contacts with researchers in the field of plant conservation and biofuel feedstock.

All presentations held at the COMPETE Seminar in Mexico (see agenda in Annex 1) are available at the COMPETE project website ***www.compete-bioafrica.net***.

DAY 1 – COMPETE Field Visit Mexico – 2nd March 2009

The COMPETE Field Trip to Mexico, organized by the partner Universidad Nacional Autónoma de México (UNAM), took place from the 2nd to the 6th March 2009. Participants, mainly from African countries, were: Rainer Janssen, Rocío A. Díaz-Chávez, Fiona Lambe, Patricia Tella, Greg Austin, Francis Yamba, Touria Dafrallah, Kingiri Senelwa, Estomih Sawe, Helen Watson, Donald Kgathi, Gavin Fraser, Grant Ballard-Tremeer, Michael Madjera, Kaysara Khatun, Mariella Croda, Marcelina Andrea Mataveia, Liliana da C. Rebelo. Omar Masera, Emilio de los Ríos, Gustavo Best, Alfredo Fuentes and Manuela Prehn were present as organizers.

During the first day, Dr. Caballero, Head of UNAM's Botanical Garden and Herbarium, Dr. Omar Masera, from the CIECO UNAM, Dr. Gustavo Best from REMBIO, and Dr. Rainer Janssen welcomed the COMPETE field trip participants and visitors. After the welcome and general explanation of the aim of the trip, Dr Caballero guided a tour to the botanical garden and national herbarium. The tour gave an overview of the diversity of plant resources available in different climates and soil conditions found in Mexican landscapes, in particular semi arid and arid ecosystem plants.

Two presentations concluded the morning program, the first by MC. Jaime Jimenez about the diversity of genus Jatropha species in Mexico, the second on the potential of various plant species from the arid and semi arid regions of Northern Mexico to produce biofuels.

The afternoon session was devoted to expose the evolution of human population in the Valley of Mexico, the environmental changes it produced and various aspects of water management as an introduction to the visit on Tuesday of the remnants of the Xochimilco lake and the visit on Friday to the Valle del Mezquital. The first afternoon session included presentations by Antrop Jose Antonio Rojas Loa, (INAH) and Dr. Ramón Dominguez (II UNAM).

Historical map of Tenochtítlán, the capital of the Aztec empire

DAY 2 – COMPETE Field Visit Mexico – 3rd March 2009

Visit to the Chinampas at the lake of Xochimilco

The valley of Mexico, a land locked basin of approximately 7000 km^2, where Mexico City, one of the largest cities of the world, spreads today, has been inhabited since prehistoric times. At the time of arrival of the Spanish conquerors, during the early sixteenth century, Tenochtítlán, the capital of the Aztec empire, was the largest city in the new world.

It is evident that for urban development to take place not only an ample food supply is needed, but also a system to handle wastes and recycle excreta to avoid the risk of epidemics. An ample food supply implies an efficient soil fertility management method. These two conditions were met in the Valley of Mexico with an agricultural system called “Chinampas” developed in its lacustrine environment.

The name chinampa derived from the nahuatl word “chinamitl” which means reed fence or hedge, designates a square plot surrounded by water in at least 3 sides. The plot was made by limiting an area on the lake with reed fences and adding mud from the shallow lake, till the land emerged from the lake’s surface. Then willows were planted to hold the borders of the field.

Chinampas allowed an intensive agriculture. Fertility is managed by periodically adding mud rich in organic matter from the sediments of the lake bottom. The periodic removal of sediments and the aquatic plants growing in the lake’s surface allowed water treatment and maintained a natural equilibrium. The lake produced an ample population of crustaceans and fish that complemented the diet. The water weeds and insect larvae were used as fowl feed. The aquatic fauna attracted migratory birds.

During the dry season the chinampas are irrigated with lake water. The mild winters allow continuous cropping throughout the year, land use intensity is increased by producing crop seedlings in a small plot and transplanting. The seedlings are grown, by preparing a seed bed, consisting of a 5 cm layer of mud exposed to the sun to dry. When it is almost dry, it is cut in squares 5 cm wide and long. A seed is planted in the center of each block, called chapin, the seedling develops during the initial phase of the crop to be transplanted later.

Chapin with seedlings

The chinampas have been cropped continuously during centuries. By the end of the 19 th century the system still provided most of the vegetables and horticultural crops needed for the 541,000 inhabitants of Mexico City. The COMPETE group visited the portions of chinampas that survive today in which ornamental plants and other crops remain profitable. It was explained by Dr Cecilia Vanegas from the Ecophysiology Department of UNAM's Institute of Ecology that the accumulation of heavy metals and other elements has modified the usual practice of fertility management as the utilization of lake sludge has consequences on the innocuity of food crops grown. Nevertheless this agricultural system, that allowed the region to become an urban center is still practiced today, despite the population of Mexico City has grown from 1,776,000 in 1940 to 22 million today. The Chinampa area is now a natural reserve which still produces many local crops to prepare delicacies, with local plants such as Capulín Prunus mexicana, white zapote Casimiroa edulis a native avocado among the most important.

DAY 3 – COMPETE Field Visit Mexico – 4th March 2009

Visit to the CEPROBI

The Centro de Desarrollo de Productos Bióticos (CEPROBI), a public institution located in the region of Morelos, is a postgraduate studies and research center from the National Polythecnique Institute (IEP).

At CEPROBI, Dr. Jorge Martinez Herrera is conducting research on non toxic Jatropha varieties, which have been collected in various parts of Mexico. The COMPETE group visited the Jatropha plantations and experimental plots of CEPROBI.

Jatropha curcas experimental plot at CEPROBI

During the afternoon the group visited the sugar factory “Ingenio Emiliano Zapata”, also located in Morelos. The sugar factory started operations in 1937 and much of the machinery dates back to that period. The factory Zacatepec as well as the Mexican sugar industry in general is facing a difficult situation, inherited from a long history of state intervention and a period of scarce capital and very high interest rates. Due to this problematic framework the sugar mills were not well maintained, so most of the equipment today is obsolete. Under these conditions biofuel production is not feasible, so that in Zacatepec ethanol production was terminated in 1999.

The visit showed the consequences of an extreme farmer support policy. It became clear that the viability of the Mexican sugar industry as a whole is at stake, even though sugar is Mexico’s largest agricultural industry. Sugar cane is the fifth largest cultivated crop, supplying raw material to over 60 mills located in 15 of the country’s poorest 35 states. The sugar industry accounts for more than 300,000 jobs, including cane cutters, seasonal field workers, and factory workers. Consequently, over 2.2 million people depend on the Mexican sugar industry for a living. There are 158,000 cane growers with an average of about 4 hectares per grower, delivering about 300 tons of cane. This compares to Queensland, Australia where output is about the same but the number of growers is 6,500 working with an average of 85 hectares. This comparison demonstrates the current inefficiency of the Mexican industry. It is not the lack of mobility or alternative employment that keep people growing sugarcane, but some social advantages they receive as cane growers (social security access) that retain a large number of growers with very small plots.

Over the last 40 years the Mexican sugar industry has experienced a progression of government interventions, motivated to provide inexpensive sugar to consumers, but resulting in bankruptcy and technological stagnation. The mandated marketing prices forced mill operators to postpone maintenance and depend upon government-supported loans for operating expenses. Eventually, the debts exceeded the mills asset values forcing the mills into government ownership. Instead of annually exporting half a million tons of sugar, Mexico became a substantial importer.

In the evening at the hacienda Vista Hermosa, Dr. Alfredo Martinez from the Biotechnology research institute, presented his work on cellulosic ethanol production.

COMPETE group visiting the sugar factory “Ingenio Emiliano Zapata”

DAY 4 – COMPETE Field Visit Mexico – 5th March 2009

On Thursday the group returned to Mexico City visiting downtown Cuernavaca and the National Anthropology Museum at Chapultepec.

DAY 5 – COMPETE Field Visit Mexico – 6th March 2009

Visit to the Valle del Mezquital (prosopis valley)

Urban expansion and population growth in the Valley of Mexico has always been linked to hydraulic works. The first hydraulic work was a dike to separate salted waters of the Texcoco Lake from fresh water of the other lakes during the rainy season. This dike was constructed before the Spanish conquest. As population expanded during colonial times, a waterway was opened to drain the lakes and make more land available to build or farm and to cope with periodic floods. At the beginning of the 20th century, a second waterway was opened to expand the water extraction capacity. These waterways transport run off and waste waters to the Mexquital valley where since then it is used for irrigation.

The Mexquital valley is a semi arid valley in the state of Hidalgo situated 60 km north of Mexico City. It is formed by three plains of different altitude separated by mountain chains. The north plain lies at 1700 to 1850 meters above sea level, the central plain at 1900 meters above sea level, and the southern plain at 1950 m above sea level. The valleys are home to the Otomi ethnic group with a population of 495,000 inhabitants, most of them involved in agriculture. There are two irrigation districts. The "Distrito 03 Tula" y Distrito 100 Alfajayucan" both of them use waste water for irrigation. The irrigated area amounts to 83, 000 ha (see table 1). Waste water irrigation started with the completion in 1903 of the canal de Tequisquiac, together with the "Tajo de Nochistongo" constructed years before, drains runoff and sewage from Mexico City to the Mezquital valley.

Table 1: Irrigation data for the Valle del Mezquital, 1993-94

IRRIGATION SYSTEM	IRRIGATED ÁREA (HA) 1	ÁREA UNDER CULTURE[2]	USERS	WATER VOLUME (106 m^3/a)	PRODUCTIÓN VALUE (MILLION US$)
Distrito 03 (Tula)	45,214	55,258	27,894	1,148	73
Distrito 100 (Alfajayucan)	32,118	22,380	17,018	651	24.3
Unidades privadas	5,375	5,450	4,000	96	0
TOTAL	**82,707**	**83,088**	**48,912**	**1,895**	**97.3**

1. Irrigated area refers to area with irrigation infrastructure .
2. Area under crops includes areas with more than a culture in the year

Source: Comisión Nacional del Agua (CNA), Distritos de riego, Mixquiahuala, Hidalgo, México, 1995.

Most of this waste water receives no treatment until the 1960s. Sedimentation in water ways and storage period in reservoirs provided treatment and allowed the water to be used without mayor health risk to produce vegetables. But the growth of Mexico City's population has increased the organic and chemical load which resulted in health problems. To avoid health hazards the cropping pattern changed from vegetables to alfalfa and maize. The dissolved organic matter in irrigation water enhances fertility and the irrigation districts are on average more productive per area than other similar lands (see table 2).

Table .2 Crop yield in tons /ha in the Mezquital Valley 1990-92

CROP	NATIONAL MEAN	MEAN IN MEZQUITAL	IIN IRRIGATED ÁREA OF HIDALGO.	RAIN FED AGRICULTURE
Maize	3.70	5.10	3.60	1.10
Beans	1.40	1.80	1.30	0.49
Oats	4.70	3.70	3.60	1.70
Barley	10.80	22.00	15.50	13.50
Lucerne	66.30	95.50	78.80	0.00

Source: Secretaría de Agricultura y Recursos Hidráulicos (SARH), México 1994 (valores nacionales). CNA, Distritos de riego, Mixquiahuala, Hgo. México 1995 (datos del Valle del Mezquital).

Until approximately 1960, waste water received a natural treatment in its flow towards the Mezquital Valley. Settling solids sedimented in channels and natural oxygenation occurred during storage in reservoirs. But by 1980 the concentration and quality of waste water started producing health problems, as this coincided with the UN WHO Water and sanitation decade, studies where made to asses the consequences of waste water irrigation on farm workers health.

In a World Bank document Shuval et al. made a review of several experiences around the world concluding the there are both: environmental benefits and health risks associated with waste water irrigation. The fertilizing value and effect has been mentioned, the health problems associated in the Mezquital Valley have been studied by Cifuentes et al. in 1993. They studied the relation of waste water exposure and intestinal parasite and diseases among farm workers, concluding that the risk of Ascaris lumbricoides infection is much higher in the exposed group than in the control group. Children from exposed households were at higher risk of Diarrhea disease.

The visit was guided by Dr. Christina Siebe, from the UNAM's Geology Institute. The visit started at the point in which the tunnel of the "deep drainage system of Mexico City" ends and water is conducted in an open Channel to the irrigated fields. Dr. Siebe explained how the irrigation district works and the advantages and inconveniences of waste water irrigation.

The second visit was to the Endho Reservoir, which receives waste water during the rainy season and stores it for irrigation during the dry season.

End point of the drainage tunnel system of Mexico City

The third point visited was the spring of Cerro Colorado. This spring supplies several towns within the valley with drinking water. The spring flows from the water table and it has it's origin in the underground water recharges with waste water. The group had the chance of observing the fields and the general pattern of agricultural production in the irrigated land. At the last stop, in cerro Colorado, Dr. Siebe explained various issues which involve conflicts of interest among the various stakeholders for water management in the Valley of Mezquital and the Valley of Mexico.

Lecture by Prof. Christina Siebe on heavy metal accumulation in the soils of the Mezquital Valley

Annex 1: COMPETE Seminar Mexico – Agenda

SATURDAY 28th February - SUNDAY, 1st March	
Saturday/Sunday	Arrival in Mexico City **HOTEL CAMINO REAL PEDREGAL** Periférico Sur 3647 - Col. Héroes de Padierna C.P. 10700 México, D.F. Tel.: (+52) 55 54 49 36 50 www.caminoreal.com.mx
Sunday, 1st 21:00	Welcoming meeting at the hotel
MONDAY, 2nd March	
9:00	Departure from Hotel
9:20	Arrival to Botanical Garden (Biology Institute UNAM)
9:30 – 10:00	Welcoming speech: Dr. Javier Caballero, Dr. Omar Masera, Dr. Gustavo Best, Dr. Rainer Janssen
10:00 – 11:30	Visit to the Botanical Garden and Herbarium
11:30 – 12:00	Coffee-break
12:00 – 13:00	Jatropha genus in Mexico - M. en C. Jaime Jiménez Ramírez (Biology Institute – UNAM)
13:00 – 14:00	Biofuel production in arid and semi-arid lands – Dr. Alejandro Castellanos (Sonora University)
14:00 – 15:30	Luncheon - Azul y Oro (Centro Cultural Universitario)
15:45 – 16:45	Land use and population in the Mexican Valley – Antrop. José Rojas Loa (Anthropology and History National Institute)
16:45 – 17:45	Hydraulic and drainage building works in the Mexican Valley - Dr. Ramón Domínguez (Engineering Institute UNAM)

TUESDAY, 3rd March	
10:00 – 14:00	Xochimilco – Chinampas (prehispanic sustainable agricultural system, still practiced today)
14:00 – 16:00	Luncheon on the Trajinera (Xochimilco boat)
16:30 – 18:00	Visit to Xochimilco's market
WEDNESDAY, 4th March	
6:30	Departure from Hotel
9:00 - 11:30	Visit to CEPROBI (Biotic Products Development Center – Instituto Politécnico Nacional) where non toxic jatropha research is being done
12:00 – 14:30	Visit to the sugar mill Zacatepec in Morelos
14:30 – 16:30	Luncheon
17:30 – 18:30	Fuel Ethanol from Bagasse – Dr. Alfredo Martínez Jiménez (Biotechnology Institute UNAM)
	Night at: **HOTEL HACIENDA VISTA HERMOSA** Km. 7 Carr. Alpuyeca Tequesquitengo, Puente de Ixtla, Morelos Tel.: (+52) 734 345 5361 www.haciendavistahermosa.com.mx
THURSDAY, 5th March	
9:30	Departure from hotel
12:00	Arrival to hotel in Mexico City **HOTEL EMPORIO REFORMA** Av. Paseo de la Reforma 124 - Col. Juárez C.P. 06600 México, D.F. Tel.: (+52) 55 5566 7766 http://www.hotelesemporio.com/esp/idt/31/hotel-emporio-cd-de-mexico//
13:00 – 15:00	Luncheon
15:30 – 18:30	Visit to the Antropology Museum -Mexico City
20:00	Dinner at Fonda del Recuerdo
FRIDAY, 6th March	
7:00	Departure from hotel
9:00 – 14:00	Valle del Mezquital (world oldest waste water irrigation district)
14:30	Luncheon
SATURDAY, 7th March	
	Free

Annex 2: Participants of the COMPETE Seminar Mexico

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Annex 3: Research Contacts

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Annex 4: The COMPETE Project

COMPETE Objectives

The Competence Platform on Energy Crop and Agroforestry Systems for Arid and Semi-arid Ecosystems – Africa (COMPETE) will establish a **platform for policy dialogue and capacity building** and identify **pathways for the sustainable provision of bioenergy**

- to improve the quality of life and create alternative means of income for the rural population in Africa
- to aid the preservation of intact ecosystems in arid and semi-arid regions in Africa
- to enhance the equitable exchange of knowledge between EU and developing countries

COMPETE Activities

COMPETE will deliver a matrix of multi-disciplinary and cross-sectoral work-packages

- to evaluate current and future potential for the **sustainable provision of bioenergy** in Africa in comparison to existing land use patterns and technologies
- to facilitate **South-South technology and information exchange** capitalising the world-leading RD&D in bioenergy in the key countries Brazil, Mexico, India, China and Thailand
- to develop **innovative tools for the provision of financing** for national bioenergy programmes and local bioenergy projects, including: carbon credits, bilateral and multi-lateral funding instruments, and the role of international trade
- to develop **practical, targeted and efficient policy mechanisms** for the development of bioenergy systems that enhance local value-added, assist local communities and address gender inequalities
- to establish the **Competence Platform** to ensure effective dissemination and knowledge exchange inside and outside the network

COMPETE Partnership

The COMPETE partnership comprises 20 European and 23 non-European partners - 11 partners from 7 African countries, 3 regional African policy and financing bodies (African Development Bank; Food, Agriculture and Natural Resources Policy Analysis Network of Southern Africa; UEMOA - Biomass Energy Regional Program), 9 partners from Latin America and Asia - and the Food and Agriculture Organisation of the United Nations (FAO).

COMPETE Website: **www.compete-bioafrica.net**

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WP7 Coordination - Dissemination

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