



Workshop to determine Biotechnology demands in MERCOSUR

BIOTECH – ALA-2005-017-350-1B

REGIONAL REPORT

FORESTRY CHAIN

Biotechnology Development Support Program in
MERCOSUR

European Union Cooperation – MERCOSUR

BIOTECH

CONTENTS

ABBREVIATIONS AND ACRONYMS	3
1. Work Location, Date, and Duration	3
2. Participants.....	3
3. Work Schedule	3
4. Abstracts of Subjects / Issues Presented	3
5. Conclusions.....	5
6. Annexes	7

ABBREVIATIONS

UG: Unidad de Gestión del Programa de Apoyo a las Biotecnologías en el MERCOSUR – BIOTECH (*Management Unit of Biotechnology Development Support Program in Mercosur – Biotech*)

BIOTECH: Programa de Apoyo a las Biotecnologías en el MERCOSUR – BIOTECH (*Biotechnology Development Support Program in Mercosur – Biotech*)

CADB: Comisión de Apoyo al Desarrollo de la Biotecnología (*Committee to Support Biotechnology Development*).

1. WORKSHOP LOCATION, DATE AND DURATION

COUNTRY: Argentina

DATE: April 8, 2008

WORKSHOP LOCATION: INTA, Chile 460, Ciudad Autónoma de Buenos Aires

CHAIN: Forestry

2. PARTICIPANTS

Participants: Annex 1

Institutions represented: Annex 1

Coordinator: Dr Susana Marcucci Poltri

Moderator: Lic. Gonzalo Fuentes Coiana

3. WORK SCHEDULE

Annex 2

4. ABSTRACT OF ISSUES CONSIDERED

Following the presentation of each National Workshops' outcome in care of each country's Coordinator, they proceeded with an exchange of opinions to review relative positioning and developments in different countries. Only few contributions were made at the time, and it was decided to postpone reviewing for a joint discussion.

The meeting characterized by the high coincidence of presentations regarding the need to investigate subjects in connection with Genetic Improvement, supporting particularly development of certain techniques. The agreement reached on presentations was such that it was suggested the possibility to solve the subjects at a plenary meeting but, in order to favor a wider participation from the presents, it was resolved to maintain the original methodology of work.

Moreover, the work on native species, the value added to the sub products of the chain, and resistance to different kinds of stress were established as important issues which were then grouped under the discussion of Genetic Improvement.

Then, Agr. Eng. Marcelo Regúnaga, (Annex 3) presented his paper that provides the possibility to compare the outcomes from national workshops through a list or tabulation sheet. Reviewing of such list or tabulation sheet reopens the discussion on the relative weigh of rating, and the difficulties to compare on the basis of the mathematical averages resulting from said tables. However, the work for subgroups was organized by subjects, and demands and statements submitted at conclusions of the national workshops were distributed, grouping the afternoon work activities in three thematic subgroups:

Group 1: Genetic Improvement

Group 2: Native Species

Group 3: Bioprocesses

The outcome of the groups in shown in Annex 4 enclosed hereto.

The plenary meeting considered the presentations and noted that the proposal made by Group 2 for Natives could be deemed included under the formulation proposed by Group 1 on Improvement provided it referred not only to Exotic Species. Considering this perspective it was agreed to prepare a common wording for conclusions.

The debate stressed the possibility to submit the participation of the four countries in the project assessment for consideration by the CADB, particularly emphasizing to apply a high weight criteria to the fact that any project submitted may contemplate a strong Human Resources formation and training module.

5. CONCLUSIONS

Two big subjects were defined:

1) Integration of biotechnology approaches in support of genetic improvement and conservation of forestry species

Against the high deforestation rates and the great loss of the forest genetic resources of the countries in the region, the need to increase wood quality of exotic and native species, the need to recover degraded areas, and the processes initiated by some countries in connection with the territorial alignment in a climate change scenario, the integration of biotechnology approaches in support of actions towards the genetic improvement of forest and native species conservation are considered as having a deemed interest.

Detection, selection and characterization of genotypes resistant to abiotic and biotic stress, the characterization of wood quality, **the development of neutral and functional markers** intending to these interest properties, and the **micro propagation techniques**, shall enable a quicker and more precise advance in improvement programs, and rescue of genetic resources.

Prioritizations:

1) Biotic stress: notwithstanding it is necessary to avail of a set of basic situations which are pending solution, such as a register of tolerant genotypes, and also a precise characterization of pathogens variability, these thematic units should be considered under any project that could enable moving forward in these prior studies, to cope with the advance of certain diseases, already present in some regions, and to extend in future to others, such as rust.

2) Abiotic stress (drought, salinity, cold): the constant increase of degraded areas for different reasons accompanied by a salinity increase process that cover wide areas in the countries of the region, in a climatic change scenario, require detection, conservation and characterization of exotic germoplasm as native that may provide new sources to stress resistance.

2) Vegetative propagation using in Vitro cultivation techniques (organogenesis, embryogenesis): a great scale generation of improved individuals, selected from advanced improved programs or of native individuals of domesticated species or in the process of domestication, require developing these massive multiplication methodologies.

3) Wood quality: approached for wood density, this is a most useful characteristic for industry, and is a key aspect of any improvement program. The studies advanced in the genome projects developed in some model

species, shall provide comparative genomic / post genomic tools to make progress in this direction.

2) Bioprocesses:

Production of microorganisms and enzymes (recombinant or native) associated with different production uses and transformation of the forestry chain.

Associated particularly with management and waste valuation, taking into consideration the importance of the integrated forest harvest, and all phases in the agro-industrial chain towards improving productivity, in an intent to decrease the environmental impact and ensure the sustainability of processes involved. In turn, bioprocesses include several products that may be also obtained or derived from the same process, for instance, biomaterials may be also obtained in the stage/tranche of obtaining biofuels.

Prioritizations:

Microorganisms in industrial processes:

1) Biofuels: the subject of biofuels from forest biomass or forest waste (production of lignocellulosic ethanol) has turned a regional interest subject, intending among other purposes to reduce the use of traditional oil derived fuels while contributing to a decrease in greenhouse gas emissions. It appears the necessity to diversify and strengthen the sustainability of carbohydrate sources that shall be used in bacterial fermentation.

2) Biomaterials: microorganisms for environment uses:

3) Biofertilizers:

4) Bioremediation: through bioremediator microorganisms and bioremediator forest species at different stages in the chain.

6. ANNEXES

ANNEX 1

COUNTRY	NAME	INSTITUTION
ARGENTINA	Martín Marco	INTA
	Leonardo Gallo	INTA
	Susana Marcucci	INTA
	Walter Abedini	CEPROVE
	Carlos Gioia	CIEF
	Germán Raute	CIEF
	Juan Paul	CIEF
	Sandra Sharry	REDBIO
	Esteban Borodowski	SAGPyA- Forestal
Brazil	Shinitiro Oda	Suzano Papel e Celulose
	Leonardo Dutra	EMBRAPA FLORESTAS
	Paulo Péret	CGBS/MCT
PARAGUAY	César Cardozo	Universidad de Asunción
	Marcos Noguera	INFONA
	María Lis García	Universidad de Asunción
	Manuel Enciso	Universidad de Asunción
	Juan Vera	CAVALLANO Hnos.
	Nora Dubie	FEPAMA
URUGUAY	Patricia Saenz Méndez	Facultad de Química
	Elena Beyhaut	Facultad de Ciencias
	Mary Lopretti	LATU
	Zohra Bennadji	INIA
	José García de León	Forestal Oriental
	Heraldo Yannuzzi	PROFODES
UNIDAD DE GESTIÓN (UG)	Inés Dorrego	Asistente Técnica
	Marcelo Regúnaga	Asistente Internacional
CADB	Gabriela Ciocca	Punto Focal Argentino
	Rosa Cristaldo	CADB Paraguay
	Fabián Capdevielle	Secretario Ejecutivo

IV. METHODOLOGY

The Seminar is basically organized in three stages:

1. Presentations for each country.
2. Review and prioritization of demands at regional level.
3. Development and explanation of prioritized demands.

In the first place the contents and work schedule for each stage, and then the technical resources required to those effects are explained below.

IV.1 Presentations for each country.

The Seminar evolves from a presentation for the country, to be based upon the appropriate National Workshop Report. This presentation shall include three parts: i) part one **not to exceed five minutes** with general data for the chain intending to evidence its importance within the country; ii) part two **not to exceed other five minutes** to explain problems, opportunities or characteristics of the chain that were determinant to define its biotechnology development priorities; and iii) part three **not to exceed 15 minutes** to present and support the priority list defined by the country at the National Workshop. Consequently, the lapse of time for this presentation shall total **25 minutes**, and other additional 5 minutes shall be available to clarify any doubts and respond to questions, which makes a 30 minute total for each country.

The presentation shall be in charge of the National Technical Coordinator for each country and chain

IV.2 Prioritization of demands at regional level.

This subject shall be presented by a member of the International Technical Assistance of the Biotech Program. Presentation shall be based on a double-entry matrix showing biotechnology development priorities defined by country, and the appropriate ratings assigned to each National Workshops.

This matrix, together with the relevant explanations of the case shall be submitted to consideration by the Plenary that shall provide a space for a general exchange of opinions to adjust it and define up to six biotechnology development priority areas for the region.

As for prioritization, the method used shall be that of cards where each country's delegation shall act as a whole.

The list of the six prioritized subjects shall be the principal output of this Plenary.

IV.3 Development and explanation of prioritized demands.

This task shall be done through three sub-groups consisting about eight persons each, where all countries present shall be represented. Each group shall be assigned two prioritized subjects, and shall be requested to write a text in support, and as explanation thereto.

Each group shall use a laptop and a FC (*papelografo*) to record the text drafted by the group for adoption later in Plenary.

Once the work by subgroups is completed, their conclusions are presented to the plenary where conclusions are finally adjusted and validated.

ANNEX 3

Forestry chain. Prioritization, impact and feasibility average of technology demands for the four countries

Presentation by Eng. Agr. Marcelo Regúnaga

Biotechnology subjects and applications	ARGENTINA			PARAGUAY			URUGUAY			BRAZIL		
	Prior	Feas	Impac	Prior	Feas	Impac	Prior	Feas	Impac	Prior	Feas	Impac
GENETIC IMPROVEMENT	5						4,5	4,17	4,5	5	5	5
Quality (Mol. Markers, Genomics, Micropropagation, Genetic change)	5	5	4							5	5	5
Productivity (early selec assisted by molecular markers, micropropagation-embryogenesis)				4	1	4	4	4	4			
Wood properties							3,5	4	4			
Lignina quantity and quality				3,45								
Abiotic Stress Resistance (Molecular markers, Genomics, Micropropagation)	3,65	4	4,5				4,5	3,5	4	4	3	4
Drought tolerance.				3,65								
Salinity tolerance				3,5								
Extreme temperature tolerance				2,7								
Contamination tolerance				3,5								
Biotic Stress Resistance (Molecular markers, Genomics, Micropropagation)	3,5	3	4				4	3,5	4	5	5	4
Insect resistance				4,7	1	4						
Virus resistance				3,1								
Fungi resistance				3,9								
Genetic Variability Studies (Molecular markers, Genomics, and Post-genomic)	2,7	3	5									
Germoplasm conservation and characterization (exotics and natives)										5	4	4
Herbicide tolerance				4,1	1	4				2	2	1
Modification of flowering				2,05						3	1	3
PROPAGATION OF ELITE GENOTYPES	4,3											
Culture of vegetal cells				3,8	3	3				2	4	2
Microprop. trees of commercial interest	3,8	5	4	4,85	3	3	5	5	5	2	4	2
Bireactores – Scaling up	5	3	5							2	1	2

Obtention of clones embryogenesis techniques	4,2	4	4,5	4,6	2,5	2,5	5	5	5	2	1	2
Synthetic seed										2	1	2
DOMESTICATION OF NATIVE SPECIES	4									4	3	5
Germoplasm Bank	3,65	3,5	4,5							4	3	5
Micropropagation	3	3	3							3	2	1
Markers	4	4	5							4	4	4
MANAGEMENT AND CONSERVATION OF NATIVE RESOURCES								4	3			
Genetic diversity studies							5	4	3			
Conservation and protection				4,7	3	3	3,9	4	3			
CERTIFICATION	4											
Traceability (Molecular markers)	5	4	5							1	1	1
Genetic identification (Molec markers)	5	3	5							2	5	3
Sanitation (Mol markers, micropropagation)	5	4	5									
MOLECULAR MARKERS * GENETIC MAPS												
Characterization of pathogens				4	3	3,5				5	3	4
Identification of collections				3,45	3	3				4	5	3
Study of phylogenetic relations				3,25						1	4	1
Genetic mapping and functional genomics	4,3	4	5	2,9						5	3	4
Germoplasm characterization, identification ,diversity	5	4	4	4,3	2,5	3				3	4	2
Wood and non-timber species characteristics.				4,7	2	3						
GENÓMICA Y POST-GENÓMICA										5	3	4
Genomics, identification of natural mutants	3	4	4	2,8						5	3	4
Comparative genomics among species				3,2						2	2	4
Detection of abiotic stress tolerance genes				3,75						3	2	4
OTHER SUBJECTS AND APPLICATIONS												
Biofuels (Cellular cultures, ADN recombinant, Enzymes)							4,3	5	5	5	2	5
Biopulping							3	3,5	5,5	4	2	4
Biofertilizantes Biorefineries										5	2	5
Biological Control of pests and diseases							5	3,5	4,5			
Identification and characterization of pests / diseases				4,7	2	4						
Waste management and valuation							4,5	3,67	4			
Multi-purpose forest development							5	4	4			
Bioremediation							4	4	3,5			

Group 1: Genetic improvement

Prioritization criteria:

- ✓ Capacity available in countries that facilitate participation of institutions and enterprises in the four countries
- ✓ Incorporation of human resources oriented training activities with particular emphasis on transfer of experience among the participant countries
- ✓ Feasibility considerations to reach interesting outcomes for the productive sector in the project implementation period available
- ✓ Contribution to knowledge integration of that existing on genetic diversity and improvement of forest species in regional projects
- ✓ Impelling of efficient use of different biotechnology tools available (from in Vitro cultivation systems to developments based upon genomic and post-genomic information) as methodological support for regional projects.
- ✓ Use of installed capacities in the participant countries in highly processive scientific and technological platform areas applicable to biotechnology.

Subjects:

Integration of biotechnology approaches in support of genetic improvement, and propagation of selected genotypes in forest species

Wood quality: average rating 4.5

- density
- lignina

Abiotic stress resistance: average rating 4.75

- drought
- salinity
- cold

Disease resistance: average rating 5.0

- rating of different genotypes

In Vitro vegetative propagation: average rating 4.75

- micro propagation
- somatic embryogenesis
- other

Traceability and certification of processes in the forestry chain: interest to incorporate this subject into the Biotech-Mercosur project workshops with focus on harmonizing the processes at regional level

Group 2:

Conservation and domestication of native forest species

Considering the high rates of deforestation and the great loss of the forest genetic resources of the countries in the region, the necessity to increase the quantity of quality wood, the recovery of degraded areas, and the processes initiated in some of them in connection with the territorial alignment in a climate change scenario, the conservation and domestication of native forest species appear in priority. The definition of conservation units and of guidelines for native forest management, and the incorporation into harvest of some forest species demand the availability of molecular biotechnology, and vegetative propagation tools. To this end the *development of neutral and functional molecular markers* to determine the conservation units and the selection of genotypes abiotic and biotic stress resistant, and of *micro propagation techniques* to enable faster and more precise advances in improvement and rescue programs for genetic resources, are prioritized during the two years of this initial stage. The foregoing shall constitute the basis of knowledge and technology for development of future projects. Training of human resources through greater mobility, internships, and short training courses on subjects related to these prioritizations, are emphasized as most necessary.

Group 3: Bioprocesses

Bioprocesses of interest

Union points of methodologies:

Production of bioactive starters (microorganisms and enzymes) (recombinants or natives) associated to different production and transformation uses of the forestry chain.

APPLICATIONS

Microorganisms of biogeochemical cycles (adaptation to climate change)

Microorganisms of industrial processes:

- Biofuels
- Biopulping and biobleaching
- Microorganisms for environmental uses

PRIORITIES

- Biofuels
- Biomaterials
- Biofertilizers
- Bioremediation