

## NATIONAL PLANT BREEDING SURVEY

The objective of this survey is to develop a plant breeding and associated biotechnology country profile to provide decision makers with the means to strengthen national programme capacity to respond to needs and priorities on sustainable use of Plant Genetic Resources for Food and Agriculture (PGRFA). **If required** the information provided will be managed as confidential and individual breeding programmes data will not be disclosed. In such case only country average will be presented and discussed in published reports.

This survey intends to cover the period 1985-2005 using mainly five-year interval data, but if information is available for every single year or only for years different than the ones indicated, it should be included.

### General information

Name of organization surveyed: \_\_\_\_\_

Address: \_\_\_\_\_

Tel: \_\_\_\_\_

Website: \_\_\_\_\_

Director: \_\_\_\_\_

Focal point for the survey: \_\_\_\_\_

1) What kind of organization are you representing?

- Public sector (research institution)
- Public sector (university)
- Private company
- Non-governmental organization
- Other (explain) \_\_\_\_\_

2) Since when has your organization been involved in:

Plant breeding \_\_\_\_\_ (mm/yyyy)

Plant biotechnology \_\_\_\_\_ (mm/yyyy)

If there was change in name or structure of the organization, please consider the full period length.

3) Number, age range and educational level of scientists of your organization involved in plant breeding and biotechnology in the period 1985 to 2005. This information should be reported in Full Time Equivalent (FTE<sup>1</sup>) to allow capturing the activities of scientists who work only part-time in plant breeding and/or biotechnology (see the definition of FTE in the definitions section). If there are plant breeders or biotechnologists working in administrative positions they must be included in the table.

### Plant breeding

Obs: this information may be completed on crop and/or crops-group basis by replicating the table.

Year	1985	1990	1995	2000	2005				
Education level / Age range	All ages	All ages	All ages	All ages	20-29	30-39	40-49	=> 50	Not known
B.Sc.									
M.Sc.									
Ph.D.									

### Plant biotechnology

Year	1985	1990	1995	2000	2005				
Education level / Age range	All ages	All ages	All ages	All ages	20-29	30-39	40-49	=> 50	Not known
B.Sc.									
M.Sc.									
Ph.D.									

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<sup>1</sup> See definition in the glossary.

4) Please indicate your organization's total budget and the proportion that was allocated to plant breeding activities in the period 1985 to 2005 (please use current local currency, do not transform to US\$ or any other currency). Please indicate if the budget includes salaries. If there is no data for the specified years, but they are available for other years, please include the information and specify the year it refers to.

<b>Financial resources</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>	<b>2005</b>
Total research budget					
Plant breeding					
% <sup>1</sup>					

<sup>1</sup> In cases where there is no breakdown by activities, use the percentage line to provide an idea of the allocation for plant breeding.

5) Considering the total organization's resource allocation (human and financial) for plant breeding activities what would be the percentage distribution by crops and/or crops-group? Each column should sum to 100%. **Always specify crop(s) for the crop groups.**

<b>Crops/Crop groups</b>	<b>Specify crop(s)</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>	<b>2005</b>
Wheat	---					
Rice	---					
Maize	---					
Sorghum and Millet						
Others small grains						
Oilseeds						
Fiber crops						
Roots and Tubers						
Forages						
Others grain legumes						
Vegetables and Fruits						
Miscellaneous						
<b>Total</b>		<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

5a) For each crop or crops-group bred, indicate by placing a “X” in the space in the column, the type of breeding activity your organization is carrying out.

<b>Crops/Crop groups</b>	<b>Specify crop(s)</b>	<b>Making crosses</b>	<b>Evaluating segregating populations</b>	<b>Evaluating fixed lines developed by the breeding programme</b>	<b>Evaluating fixed lines introduced from other breeding programmes<sup>1</sup></b>
Wheat	---				
Rice	---				
Maize	---				
Sorghum and Millet					
Others small grains					
Oilseeds					
Fiber crops					
Roots and Tubers					
Forages					
Others grain legumes					
Vegetables and Fruits					
Miscellaneous					

<sup>1</sup> It includes lines received from international programmes (e.g. CGIAR centres) or from other national programmes

6) Taking into account the total organization's resource allocation (human and financial) for different crops and/or crops-group improvement activities, indicate percentage allocation considering the current base-year (must add to 100%). Also, in the column 'Trend', indicate what has been the tendency of resource allocation over the previous decade for the three major areas proposed (assign number **1** if it is increasing, **2** if it remains the same and **3** if it is decreasing since 1995)\*.

Crops or crop groups	Specify crop	Allocation						% must add to
		Germplasm enhancement <sup>1</sup>		Line development <sup>1</sup>		Line evaluation <sup>1</sup>		
		%	Trend	%	Trend	%	Trend	
Wheat	---							100
Rice	---							100
Maize	---							100
Sorghum and Millet								100
Others small grains								100
Oilseeds								100
Fiber crops								100
Roots and Tubers								100
Forages								100
Others grain legumes								100
Vegetables and Fruits								100
Miscellaneous								100

<sup>1</sup> See the definitions in the glossary.

\*To help with your answer we are providing the following example: in the 1990's the programme invested 10% of its total resources to "germplasm enhancement", 30% to "line development" and 60% to "line evaluation". In 2005 the investments were 10% of its resources to "germplasm enhancement", 50% to "line development" and 40% to "line evaluation". Therefore, the number indicating the trends are 2 for "germplasm enhancement", 1 for "line development" and 3 for "line evaluation". If there is an increase in one area there must be a decrease in another. It is important to understand that the amount of resources in 2005 may have increased or decreased in relation to 1995, but that does not influence the trends; the programme may have fewer resources in 2005, but out of the available resources a greater percentage will go to "line development".

7) Considering the total resources available in the organization, what is the proportion (%) going to the different research areas? Each column should sum to 100%.

<b>Research Area</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>	<b>2005</b>
Line development <sup>1</sup> and evaluation <sup>1</sup>					
Plant biotechnology <sup>1</sup>					
Germplasm enhancement <sup>1</sup>					
<b>Total allocation (%)</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

<sup>1</sup> See the definitions in the glossary.

8) Check all the biotechnology areas your organization is working on.

- Molecular characterization
- Tissue culture
- Double haploid breeding
- Marker assisted selection
- Genetic engineering
- Gene isolation
- Wild crosses
- Other (specify) \_\_\_\_\_

9) Considering the organization's breeding programme, write the average numbers managed for every crop and/or crop-group. Consider 2005 as the present base-year to provide this information.

Crop or crop group	Specify crop(s)	Activity			
		Number of crosses made <sup>1</sup>	Number of segregating populations considering all generations <sup>2</sup>	Number of trials <sup>3</sup>	Number of locations used for field trials
Wheat	---				
Rice	---				
Maize	---				
Sorghum and Millet					
Others small grains					
Oilseeds					
Fiber crops					
Roots and Tubers					
Forages					
Others grain legumes					
Vegetables and Fruits					
Miscellaneous					

<sup>1</sup> In self-pollinated crops the number of crosses refers to the number of parental combinations made and not to the number of crosses made to insure parent A by B combination.

<sup>2</sup> Please consider that a single cross may produce 100 F<sub>3</sub> segregating populations, 300 F<sub>4</sub>, and so on. The question is asking for the total number regardless of their segregating cycle.

<sup>3</sup> Please provide the sum of all trials the programme carries out, including segregating materials, observational and yield trials, as well as demonstration trials.

10) For each crop and/or crop-group, what are the main sources of germplasm used in the breeding programme of your organization? Consider 2005 as the base-year to provide this information. Please indicate the percentage obtained from each source. Each row should sum to 100%.

Crops or crop groups	Specify crop(s)	Germplasm source								Total
		Local germplasm bank <sup>1</sup>	National germplasm bank	Introduction through bi or multilateral agreements	Introduction through participation in germplasm evaluation networks	CGIAR gene banks	Public organizations in industrialized country	Private sector	Farmers material	
Wheat	---									100
Rice	---									100
Maize	---									100
Sorghum and Millet										100
Others small grains										100
Oilseeds										100
Fiber crops										100
Roots and Tubers										100
Forages										100
Others grain legumes										100
Vegetables and Fruits										100
Miscellaneous										100

<sup>1</sup> This column is only to be completed by institutions which have local gene banks, in addition to the national one.

11) For the following crops and/or crops-group, indicate trends in breeding priorities for your organization from the 1980's (or more recently in case your organization did not exist at that time) to today (**HP** = high priority; **MP** = medium priority, **LP** = low priority).

Crop or crop-group	Specify crop(s)	Priorities	1980's	2005
Wheat	---	Breeding for favorable environment Breeding for resistance/tolerance to abiotic <sup>1</sup> stresses Breeding for resistance/tolerance to biotic <sup>2</sup> stresses Breeding for quality <sup>3</sup> traits		
Rice	---	Breeding for favorable environment Breeding for resistance/tolerance to abiotic <sup>1</sup> stresses Breeding for resistance/tolerance to biotic <sup>2</sup> stresses Breeding for quality <sup>3</sup> traits		
Maize	---	Breeding for favorable environment Breeding for resistance/tolerance to abiotic <sup>1</sup> stresses Breeding for resistance/tolerance to biotic <sup>2</sup> stresses Breeding for quality <sup>3</sup> traits		
Sorghum and Millet		Breeding for favorable environment Breeding for resistance/tolerance to abiotic <sup>1</sup> stresses Breeding for resistance/tolerance to biotic <sup>2</sup> stresses Breeding for quality <sup>3</sup> traits		
Other small grains		Breeding for favorable environment Breeding for resistance/tolerance to abiotic <sup>1</sup> stresses Breeding for resistance/tolerance to biotic <sup>2</sup> stresses Breeding for quality <sup>3</sup> traits		
Oilseeds		Breeding for favorable environment Breeding for resistance/tolerance to abiotic <sup>1</sup> stresses Breeding for resistance/tolerance to biotic <sup>2</sup> stresses Breeding for quality <sup>3</sup> traits		
Fiber crops		Breeding for favorable environment Breeding for resistance/tolerance to abiotic <sup>1</sup> stresses Breeding for resistance/tolerance to biotic <sup>2</sup> stresses Breeding for quality <sup>3</sup> traits		
Roots and Tubers		Breeding for favorable environment Breeding for resistance/tolerance to abiotic <sup>1</sup> stresses Breeding for resistance/tolerance to biotic <sup>2</sup> stresses Breeding for quality <sup>3</sup> traits		
Forages		Breeding for favorable environment Breeding for resistance/tolerance to abiotic <sup>1</sup> stresses Breeding for resistance/tolerance to biotic <sup>2</sup> stresses Breeding for quality <sup>3</sup> traits		
Other grain legumes		Breeding for favorable environment Breeding for resistance/tolerance to abiotic <sup>1</sup> stresses Breeding for resistance/tolerance to biotic <sup>2</sup> stresses Breeding for quality <sup>3</sup> traits		
Fruits and Vegetables		Breeding for favorable environment Breeding for resistance/tolerance to abiotic <sup>1</sup> stresses Breeding for resistance/tolerance to biotic <sup>2</sup> stresses Breeding for quality <sup>3</sup> traits		
Miscellaneous		Breeding for favorable environment Breeding for resistance/tolerance to abiotic <sup>1</sup> stresses Breeding for resistance/tolerance to biotic <sup>2</sup> stresses Breeding for quality <sup>3</sup> traits		

<sup>1</sup> Abiotic stress – drought, heat, cold, etc.

<sup>2</sup> Biotic stress – diseases, insects, etc.

<sup>3</sup> Quality traits – texture, appearance, flavor, nutritional value or any other trait that affects raw material quality and/or finished food/feed quality.

12) How can the international community (FAO, CGIAR Centers, World Bank, IFAD, multilateral or bilateral development agencies, etc) assist your organization in increasing efficient use of PGRFA? Please rate them using the following numbers: **1** = high, **2** = medium high, **3** = medium, **4** = medium low, **5** = low priority. Leave blank where priority is lower than 5. Use all numbers from 1 to 5, each number should be used only once.

- Promoting training programmes on biotechnological tools
- Promoting training programmes on conventional breeding methods
- Helping preparing projects for funding
- Facilitating germplasm exchange
- Facilitating access to new biotechnological tools
- Strengthening national programme capacity through investments
- Other (specify) \_\_\_\_\_

13) Indicate the number of varieties released each period by your organization for each crop and/or crop-group.

Crop or crop group	Specify crop(s)	Number of varieties released <sup>1</sup>				
		1980-1984	1985-1989	1990-1994	1995-1999	2000-2004
Wheat	---					
Rice	---					
Maize	---					
Sorghum and Millet						
Others small grains						
Oilseeds						
Fiber crops						
Roots and Tubers						
Forages						
Others grain legumes						
Vegetables and Fruits						
Miscellaneous						

<sup>1</sup> If the country does not have a varietal release system in place, provide the number of varieties made available to farmers.

14) Indicate the aspects the organization considers the most limiting for the success of the plant breeding programmes. In the first column identify the ones that are currently relevant and in the second column indicate the ones important in the 1980s. Please, only write the main five and put them in order of importance, given the number "1" to the most important and "5" to the least important. Leave blank where importance is lower than 5. Use all numbers from 1 to 5, each number should be used only once.

<b>Aspects</b>	<b>2005</b>	<b>1980s</b>
Inadequate number of breeders for each crop		
Inadequate experimental fields conditions		
Inadequate access to recent literature		
Inadequate knowledge level of the general plant breeding strategies		
Limited access to international genetic resources		
Limited access to national public and/or private genetic resources		
Lack of knowledge about participatory plant breeding techniques		
Lack of knowledge about the use of molecular technique support plant breeding programmes		
Inadequate availability of laboratory infrastructure to carry out experiments using advanced plant breeding techniques		
Lack of financial resources to carry out field and laboratory experiments		
Lack of support from the international community, including organizations like Centres of the CGIAR system, FAO, etc		
Others (specify)		

## Glossary

**Biotechnology** – means any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or process for specific use (Convention on Biological Diversity, June 1992). It includes different molecular technologies such as gene manipulation and gene transfer. For this exercise tissue culture also is included.

**Plant Breeding** – research that includes any activities related to the application of plant breeding methodologies, going from germplasm enhancement (pre-breeding) to line development and evaluation.

**Full Time Equivalent (FTE)** – is the work done by a person who has any responsibility linked to plant breeding (genetic enhancement, line development, line evaluation or genetic studies) during one year (365 days). This information should not include support personal (technicians, laboratory and field workers, students, etc).

**Public sector** – any organization (national and state research organizations, universities, special funded programmes, etc) that relays on public resources to carry on their regular breeding activities.

**Private sector** – any organization that uses only private resources to carry on their regulars breeding activities.

**Scientist** – only include personal who are directly involved in plant breeding, including scientists responsible for varietal trials of introduced materials such as those from CGIAR centers, do not include other areas of expertise, field labor or technicians.

**Germplasm enhancement** – Any activity that includes: a) gene transfer via sexual or asexual means from germplasm accessions; b) increasing the frequencies of desirable genes in crop pools that will be used for developing parents or cultivars (Frey, 1996); and c) germplasm characterization.

**Line development** – Any activity of crossing and selection that has the direct purpose of developing or releasing varieties.

**Line evaluation** – Any activity of evaluating advanced breeding lines or introduced varieties with the direct purpose of releasing varieties, including on-station and on-farm evaluation.