Consultations Toward Defining Priorities for the CGIAR
A preliminary report submitted by iSC to AGM 2003

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I. CGIAR priorities

At the request of the Group at AGM 2002, the iSC engaged into an update of the System's priorities with a 5 to 10 years time horizon. The CGIAR's priorities are guided by the Vision and Strategy that was adopted at the 2000 mid-term meeting of stakeholders in Dresden. This document identified seven planks that set broad guidelines for priority setting. Important guidelines established by these planks are:

- Priority given to poverty and hunger reduction, both rural and urban.
- Adopting a regional approach to research planning and implementation.
- Pursuing partnerships in implementing its mandate.

The selected priorities must correspond to the CGIAR's five logframe outputs:

- Output 1: Germplasm collection, conservation, and characterization.
- Output 2: Germplasm improvement.
- Output 3: Sustainable production systems and integrated natural resource management (INRM).
- Output 4: Socio-economics and policy research.
- Output 5: Strengthening NARS and other rural institutions.

Priorities chosen need to reflect what the CGIAR can do best, based on its comparative advantages, including through extensive partnerships, and on efficiency criteria in reaching objectives.

II. Previous approach to setting priorities and strategies

- The approach used by the Technical Advisory Committee to set priorities consisted in a congruence analysis with an optimum budget allocation derived from application of a normative formula embodying a number of criteria meant to achieve CGIAR objectives. Optimum resource allocation was established across commodities, sectors, and regions for:
    - 19 crops plus livestock, forestry, and fisheries.
    - Five geographical regions.
- Optimum budget allocations were determined on the basis of:
    - The share of the activity and region in the total value of production.
    - Modifiers to these shares to account for considerations such as poverty, the participation of women, new scientific opportunities, alternative sources of research, and probability of success.
- Over time, this approach has become increasingly incomplete due to the growing diversity of activities in the CGIAR, such as basic science, natural resource management, research on water, policy and socio-economics, research management, training, etc. Clearly, allocating

budget based on production value does not work well when priorities increasingly address issues that do not involve production of goods and services valued in the market place.

- The approach followed for the 2003 priority setting exercise complements the traditional congruence analysis with a broad consultation on priorities with stakeholders and scientists. We describe this process in what follows.

III. Toward a consultative approach to priority setting

The consultative approach is part of a process of priority setting that will also include face-to-face meetings between SC, CGIAR managers, and CGIAR scientists. This process is yet to be completed. We report here on the three successive steps that have been followed in the consultation.

(1) Preparatory phase

As background information for participants to the consultation, the following materials were posted on the iSC webpage:

- An updated and expanded data base for congruence analysis, including new FAO projections for 2020 and initial availability of poverty maps.
- Regional priorities established by GFAR and by regional and sub-regional organizations.
- Priorities established for the Millenium Development Goals and for international conventions and agreements.
- Position papers prepared by experts on poverty, natural resources, policy, science, regions, and Center programs at the request of iSC.

(2) Identification of critical issues by stakeholders

Step 1A: Stakeholder panels consultation (April-May 2003)

- Five stakeholder panels were organized for Global, SS-Africa, Asia, CWANA, and Latin America, each led by a coordinator with recognized expertise in the area.
- Panel membership consisted in over 20 members per panel, selected in consultation with GFAR, Centers, CGIAR leadership, and stakeholders.
- Panels included representatives of NARI, government ministries, universities, Centers, NGOs, producers organizations, private sector firms, regional agricultural research organizations, international development organizations, regional development banks, foundations, and donors.
- Electronic consultations by these panels was managed by RIMISP, a Chilean NGO.
- The desired outcome of Step 1A was establishment of a list of critical issues and knowledge gaps to be addressed via research by the CGIAR and its partners. Results from Step 1A are available under the form of five panel reports, including an attempt at ranking each panel's recommendations by order of "criticality" (see RIMISP website).

Step 1B: Stakeholders open consultation (May-June 2003)

- For Step 1B, the lists of critical issues prepared by the panels of stakeholders in Step 1A were clarified, completed, and unified into a single list of activities by output (Appendix). These lists were posted on the internet for an open consultation managed by RIMISP. Calls on participation reached more than 8,000 people and organizations including all CGIAR scientists, as many NARI scientists as possible, NGOs and GROs, the private sector, international donors, etc. Thanks to RIMISP's extensive worldwide contacts with NGOs and farmers organizations, 20% of participants were members of these types of organizations.
- Interested stakeholders were invited to prioritize the list of issues and add to it as seen fit. We received 628 complete answers during the period May 26-June 13, 2003. A complete analysis of the data is available on the iSC website.

(3) Identification of projects and resource allocation by scientists

Step 2A: Thematic panels of scientists (last week of September 2003)

Three thematic panels of scientists were appointed, each with over 70 members, as follows:
Thematic panel 1: Germplasm conservation and improvement (Outputs 1 and 2).
Thematic panel 2: Farming systems and INRM (Output 3).
Thematic panel 3: Socio-economics, policy, and institutional strengthening (Outputs 4 and 5).

The panels were composed of 40% CGIAR scientists and 60% scientists from NARS and the North. Each panel was led by a distinguished non-CGIAR scientist and a CGIAR scientist working as a team, with the non-CGIAR scientist as chair. Panel members were carefully selected to give a broad representation of disciplines and institutions.

The task of thematic panels was to:
(1) Receive the list of activities established by stakeholder consultations in Step 1A (same as the list that was submitted to the open consultation in Step 1B).
(2) Establish a list of sub-activities (titles) within each activity representing new research projects or research projects in need of significant expansion (doubling as a benchmark).
(3) Identify the expected output from investing in a sub-activity.
(4) Provide an estimated annual cost to conduct the proposed project over a 5-10 years horizon. Costs were arrived at on the basis of counting the number of full time equivalent internationally-recruited scientists (FTE) needed to implement the project. FTEs were fully budgeted (salary, benefits, equipment, and local supporting team) and categorized into three types as follows:
FTE1 = scientist with computer equipment (e.g., social scientist) = $250,000/year.
FTE2 = scientist with dry laboratory (e.g., agronomist, NRM scientist) = $350,000/year.
FTE3 = scientist with wet laboratory (e.g., geneticists, breeders) = $450,000/year.
Costs were based on CGIAR accounting data.

This list of sub-activities by outputs is given in Appendix.

Step 2B: Regional panels of scientists (first week of October 2003)

The same scientists that worked in the thematic panels were redistributed into five regional panels (Global, Asia, CWANA, SS-Africa, and Latin America). The task of the regional panels was to:

(1) Receive the list of sub-activities identified by the regional panels: titles, expected outputs, and estimated annual costs.
(2) Allocate a given incremental annual budget for the region across sub-activities. The given budgets were as follows:

SS-Africa	$45 million
Asia	$30 million
CWANA	$30 million
Latin America	$30 million
Global	$25 million

Relatively high figures were meant to account for the fact that regions may in fact not have to absorb the full cost of research undertakings as they can be shared with other regions if they deliver international public goods. In any case, the budget figure is only used to induce making options among competing projects.
(3) Arrive through successive voting rounds at a selection of projects for the region not exceeding the allocated budget.

IV. Main results from stakeholders open consultation (Step 1B)

Priorities expressed by respondents inevitably reflect their personal backgrounds and particular interests. Survey outcomes, measured as averages, are affected by the relative importance of different categories of respondents in the total number of respondents. It is consequently important to (1)

characterize who responded, (2) provide results by category of respondents, and (3) use regression analysis to control for the effect of the other types of respondents in the survey on the score assigned by each particular category of respondent.

By region of expertise, we obtained a relatively small share of respondents form CWANA (7%), and a large share from LA (33%). By institution, there was good representation of the CGIAR (28%), NGO/private sector (20%), NARI (17.8%), and universities (15%). Special efforts to mobilize NGOs and the private sector were consequently successful. Among types of jobs, researchers dominate with 51% of respondents, followed by administrators and managers (25%), and extensionists and project managers (16%). Regarding discipline, two groups dominate: crop specialists (35%) and social science (32%). Finally, 71% of the respondents have their residence in the South compared to 29% in the North, showing again success in reaching participants from or located in developing countries.

Results from the open stakeholder consultation indicate the types of issues stakeholders would like to see the CGIAR address. They have to be used with some caution due to:

1) The non-random character of the list of stakeholders invited to participate and the self-selection process of respondents

We correct for this by using a regression analysis of scores as a function of respondents' regional expertise, type of institution, type of job, discipline, and residence in North or South. Predicted scores then become conditional on the combination of features of a particular category of respondents. We defined a base respondent as, for each region separately, a person who "works at the CGIAR * is a scientist * is a crop specialist * lives in the South."

Choice of a base respondent is arbitrary. The results given allow to calculate scores for any combination of characteristics that define a respondent.

2) Scores represent a degree of "criticality" assigned by a respondent to an issue

Scores do not represent dollars. Hence, caution must be exercised when comparing the allocation of points (percentage scores) to the current dollar budget allocations (across outputs and across commodities for germplasm improvement, the only two breakdowns for which we have data on current budget allocations). However, when discrepancies between percentage scores and budget allocations are large, they do convey a message that indicates desire by respondents for adjustments in current budget allocations.

CGIAR budget allocation across logframe outputs: actual and desired

Percentage allocations across outputs	Average respondent scores (desired)	Base respondent scores (desired)	Actual CGIAR budget allocation (2002)	Discrepancy: Desired average respondent – Actual allocation	Discrepancy: Desired base respondent – Actual allocation
Germplasm collection, conservation, and characterization	16	20	10	6	10
Germplasm improvement	16	22	18	- 2	4
Sustainable production systems and NRM	29	24	34	- 5	- 10
Policy and socio-economic research	19	14	16	3	- 2
Strengthening NARS and other rural institutions	21	21	22	- 1	- 1

CGIAR budget allocation across logframe outputs by region: actual and desired

Base respondent scores by region	Germplasm conservation	Germplasm improvement	Sustainable production systems	Policy and socio-economics	Improving institutions
Global	20	24	25	12	20
Asia	20	22	25	14	19
CWANA	21	23	22	13	21
SS Africa	20	18	24	16	23
Latin America	18	22	24	15	22
Average desired	**20**	**22**	**24**	**14**	**21**
Actual CGIAR	**10**	**18**	**34**	**16**	**22**

CGIAR budget allocation to germplasm improvement research by commodity: actual and desired

Germplasm improvement by commodity	Average respondent scores (desired)	Base respondent scores (desired)	Actual budget allocation (2002)	Discrepancy: Desired average respondent – Actual allocation	Discrepancy: Desired base respondent – Actual allocation
Cereals	24	28	67	- 43	- 39
Roots and tubers	17	17	19	- 2	- 2
High value and cash crops	16	13	6	10	12
Tree crops	14	11	1	13	13
Livestock	14	12	7	7	7
Fisheries	11	10	1	10	8
Other	5		0	5	
Total	100	95	100		

CGIAR budget allocation to germplasm research by commodity and region: actual and desired

Base respondent scores by region	Cereals	Roots and tubers	High value & cash crops	Tree crops	Livestock	Fisheries
Global	31	17	16	14	12	11
Asia	29	18	18	12	13	9
CWANA	33	11	16	15	18	7
SS Africa	21	21	19	17	13	10
Latin America	27	19	19	14	13	8
Average desired	**28**	**17**	**13**	**11**	**12**	**10**
Actual	**67**	**19**	**6**	**1**	**7**	**1**

Remembering that these scores were given by different groups of individuals, each specialized in the corresponding region, it is quite remarkable that so much consistency was achieved.

What are some of the most informative results deriving from the consultation that should be taken into account as we proceed with Step 2?

1) Some large discrepancies exist between desired and actual allocations to outputs

As the tables above show, there are large discrepancies between the scores of the average respondent or of the base CGIAR scientist and the actual allocation, and this across all regions. Largest discrepancies are:

Under-investment in germplasm conservation and characterization.

Over-investment in sustainable production systems and INRM.

Current investments in germplasm improvement, socio-economics and policy research, and strengthening institutions are near desired levels.

2) Some very large discrepancies exist between desired and actual allocations to germplasm improvement by commodities

As shown in the tables above:

There is a large over-investment in germplasm improvement for cereals.

There are under-investments in germplasm improvement for tree crops, high value and cash crops, fisheries, and livestock.

Roots and tubers are at the desired level.

3) Highest demands for investment by activities within each output

According to the base respondent, the activities that received the largest demands for attention by output are:

1. Germplasm conservation: Ex-situ conservation (31% of scores assigned to the corresponding output).
2. Germplasm improvement:
   - Commodities: Cereals (28% of scores assigned to commodities).
   - Objectives: Abiotic stress (30% of scores assigned to objectives).
   - Location: Unfavorable agricultural lands (60% of scores between favorable and unfavorable lands).
3. Sustainable farming systems:
   - Type of farming system: Crops production system (30% of score assigned to types of farming systems).
   - Strategies for farming systems: IPM and IDM (27% of scores assigned to strategies).
4. Policy and socio-economic research: impact assessment (11% of scores assigned to the corresponding output) and markets for inputs and outputs (10%).
5. Strengthening institutions: Training and capacity building of NARS (29% of scores assigned to the corresponding output).

4) Priorities not well identified for policy and socio-economic research

The output which has the relatively flatter scores profile is policy and socio-economic research. In this case, scores are quite evenly distributed across activities. This may indicate either that all proposed activities are important, or that the categories reflect a substantial degree of overlap.

5) Opinions differ quite widely by discipline

Origins of discrepancies with the base respondent lie mainly in differences in disciplines. This may reflect better information about one's own discipline, and/or vested interests. Working with interdisciplinary panels is thus important. Keeping track of the disciplinary background of respondents in interpreting answers is also important.

V. Main results from scientists consultation (Step 2)

Consultation with scientists is now complete in terms of quantitative results, but not in terms of gathering from participants lessons learned both in terms of research priorities and future implementation of a participatory priority-setting methodology. Hence, results presented here are only <u>preliminary</u> and may be revised and re-interpreted as further information comes in.

Results can be analyzed at three levels:

1. Recommended allocations across CGIAR logframe outputs.
2. Major themes cutting across regions
3. Regional priorities.

1. Recommended allocations across CGIAR logframe outputs.

CGIAR budget allocation across logframe outputs by region: actual and desired

Budget by output and by region: % allocation		Germplasm conservation	Germplasm improvement	Sustainable systems and INRM	Socio-economics and policy	Enhancing institutions	Cross-cutting sub-activities	Total budget	Total budget allocated (US$k/year)
CWANA	Step 1B	21	23	22	13	21	0	100	
	Step 2	14	24	28	15	19	0	100	30265
LA	Step 1B	18	22	24	15	22	0	100	
	Step 2	19	10	29	24	18	0	100	29830
SSA	Step 1B	20	18	24	16	23	0	100	
	Step 2	19	20	23	16	21	2	100	47960
Asia	Step 1B	20	22	25	14	19	0	100	
	Step 2	12	27	32	11	17	0	100	30230
Global	Step 1B	20	24	25	12	20	0	100	
	Step 2	23	17	17	27	16	0	100	24590
All regions	Step 1B	20	22	24	14	21	0	100	
	Step 2	17	20	26	18	19	1	100	162875
CGIAR	Actual	10	18	34	16	22		100	

The main lessons from this result are the following:

i) There is a great degree of consistency between stakeholder (Step 1B) and scientist (Step 2) recommendations. This may come from the fact that scientists were informed of stakeholders' demands in Step 1B.

ii) Three outputs currently receive an allocation that is in balance with the desired allocation of additional resources. They are:

Germplasm improvement
Socio-economics and policy
Enhancing institutions.

Consistent with Step 1B, two outputs have current budget allocations that differ from a desired allocation of additional resources. They are:

Germplasm conservation that would deserve a 73% increase in resource allocation compared to present expenditure levels.

Sustainable systems and INRM that would receive 23% less resources compared to current allocation.

iii) Regional panels give more importance to research on sustainable systems and INRM (23 to 32% of additional resources depending on the region) than the global panel (17%). This is consistent with the observation that benefits of research on farming systems and natural resources are relatively more locally specific and appreciated. This suggests that disaggregating further at the sub-regional level may give greater weight to research on systems and NRM than when prioritized at the regional level.

iv) Among the CGIAR's five outputs, sustainable production systems and INRM is the category that consistently receives the largest share of additional resources in all four regions.

2. Major themes cutting across regions

There are several themes that clearly dominate the suggested research agenda across regions and give interesting leads for major research efforts. We retain here the sub-activities selected by three panels or more. By outputs, they are the following:

Output 1: Germplasm conservation and characterization

i) Ex-situ conservation of annual and perennial crops for marginal environments.
Expected output: New collections of marginal environment species.

Rationale: There are many indigenous rainfed crops that lie outside the CGIAR mandate. We will likely be looking at some of these as the bases for new crop alternatives to fit marginal environments. We need collections. (Sub-activity 1.16).

ii) In-situ conservation of crop systems for marginal environments, paying particular attention to water use efficiency.
Expected output: In-situ benchmark sites that combine germplasm/biodiversity conservation with appropriate cropping systems research.
Rationale: In-situ collections are by their nature production systems. The foci should be on economically sustainable production systems employing the world's best economic answers for specific problems. (Sub-activity 2.4).

iii) Ex-situ conservation of crop wild relatives.
Expected outputs: (1) collections of wild relatives expanded; (2) better understanding of their reproductive biology, conservation methods, etc.; (3) materials characterized and evaluated.
Rationales: Wild species are greatly under-represented in collections around the world, CGIAR and others. Given the potential contribution of wild relatives to crop improvement, this represents an area of considerable promise. However, many are very difficult to conserve and much more needs to be known about their biology (especially reproductive biology) and optimum ex-situ conservation methods. This is also an important area of research to enable proper risk assessment to be undertaken for release of intensively bred varieties, by GM and other methods, to assess the likelihood of transfer of deleterious genes. A knowledge of wild relatives and their distribution is required. (Sub-activity 1.10).

iv) Identify important "orphan" food or economic crops in regions, and initiate germplasm conservation of these crops.
Expected outputs: New specialized germplasm collections of regionally important crops, held in established CGIAR or NARS genebanks. (Sub-activity 1.13).

v) Study of gene flows.
Expected outputs: (1) information on gene flows generated - crop-crop and crop-wild species - especially in context of centers of biodiversity; (2) cost-effective methods to manage/control gene flows developed; (3) cost-effective methods to enhance gene flows developed.
Rationales: The control of gene flows is very important in the context of maintaining genetic integrity. This is particularly important where GM crops are grown. While the study of gene flow is important in all crops that have even the smallest extent of out-crossing, it is obviously of greatest importance in crops that have a larger out-crossing percentage. Among the CGIAR crops, this would mean giving special attention to maize (already being done), certain millets, and to some extent sorghum, most pulses (especially pigeon pea and faba bean), various roots and tubers (especially where there is a potential for introgression with wild species in centers of bio-diversity) and a number of forages. (Sub-activity 8.1).

Output 2: Germplasm improvement

i) Application of comparative genomics from CGIAR crops to improve vegetable and perennial crops important to NARS.
Expected outputs: Increase the body of knowledge of less-researched ("orphan") crops; improved lines and populations; breeding strategies for fruit and other perennial crops.
Rationales: Focus on vegetable and fruit crops which are important in the diet as well as source of livelihood/cash crops to people in the humid, sub-humid tropics. Maximize spill-over effects from comparative genomics work being done/will be done in mandate crops of the CGIAR. (Sub-activity 3.3).

ii) Use of wild species and other exotic gene pools as sources of novel alleles for adaptation.
Expected output: (1) Consolidated knowledge of the limits to crossability; (2) protocols for wide-crossing; (3) non-adapted populations from wide-crosses as allele sources for sustainable plant breeding that broadens the genetic base; (4) breeders lines.
Rationales: Cereal crops and their wild relatives have similar gene content but a wide range of abilities to tolerate stress conditions. Understanding the molecular basis of tolerance to drought or flooding in crops

that are particularly suited to these environments could be used to improve the crops that are not, particularly by wide-crossing. This may be regarded as an old approach, however CGIAR Centers are not using wide-crossing as extensively as they should do. There are only a few examples in a couple of mandate crops to date. Tremendous potential with MAS. Methods are known but they need to be tailored to each of the species under CGIAR mandate. (Sub-activity 7.2).

iii) Drought resistance: comparative genetics of drought tolerance across cereals, across legumes, and across roots and tubers.
Desired outputs: (1) Comparative genetics and QTL approaches to traits such as short duration life cycle and water use efficiency, leading to (2) enhanced understanding of the physiology, biochemistry and genetics of drought tolerance; (3) new drought tolerant breeders' lines in all crops; (4) key isolated genes for use in transgenic breeding and as selectable markers.
Rationales: There is considerable work on drought already being done in the CGIAR. However, the topic is so important that considerable further resources are required. The research effort on drought needs to be at least doubled, partly to: (1) maintain an adequate public sector effort relative to that mounted by the private sector; (2) accommodate within the CGIAR system the various schools of thought about drought research, rather than backing only one or two to avoid making the wrong choice, to allow healthy competition, and to allow synergy to develop among the approaches as they realize that they will need each others outputs; (3) make sure that the easier breeding objectives, such as short duration combined with seedling vigor, are pursued in as many crops, varieties and target environments as possible with all speed; (4) allow centers to interact across crops to take advantage of comparative genomics and comparative physiology; (5) allow centers to interact with ARIs and NARES on a collaborative rather than competitive basis. At present, there is too little money being pursued by too many people. The current water depletion worldwide together with the inset of global warming make improved water use the key target. (Sub-activity 10.1).

Output 3: Sustainable production systems and integrated natural resource management

i) Integrated crop management (water, nutrient, pest, weed, etc.) in varying environments, and GxE.
Expected outputs: Water saving/risk aversion, ecologically friendly integrated pest management, enhanced productivity and tolerance to abiotic stresses, improved livelihood, yield stabilization.
Note: Involvement of plant breeders, water management, policy experts is needed to solve the site specific problems in less-favored areas. (Sub-activity 1.2).

ii) Increased water use efficiency: Scale effect on water use efficiency and conjunctive use.
Expected outputs: Increased water productivity at all scales (field, farm, system, and beyond) (Sub-activity 12.3). This is complemented by the following projects:
Land use and cropping system design for optimum water productivity. (Sub-activity 12.1).
Managing deficit irrigation (Sub-activity 12.4).

iii) Vegetables and fruit production in urban and peri-urban production systems.
Expected outputs: income generation and improved nutrition. (Sub-activity 6.3).

Output 4: Socio-economics and policy research.

i) Marketing innovations to link farmers to markets.
Expected outputs: i) Pro-poor marketing institutions developed. Analysis and identification of viable niche markets to promote rural livelihoods and genetic diversity, e.g., fair trade coffee, certified production, appellation of origin; ii) Search for effective practices for small-scale farmers to easily access the market, including organizing a cooperative village system for providing value-added and consumer oriented products to the market; iii) Strategic options for developing countries; iv) Impacts of possible scenarios on poor farmers.
Note: Promoting genetic diversity and livelihoods of poor producers calls for new approaches. Countries and rural communities are interested in niche markets as a way to capture high value, but need more information on the potentials, and what it would take to make them work. (Sub-activity 2.3).

ii) Policies and institutions to facilitate poor people's access to natural resources, especially land and water. There are two sub-areas: designing water supply systems so they serve multiple uses (currently they are usually designed for single purposes like domestic or irrigation); and policies and institutions that will effectively support scaling up and out of known micro-technologies such as rainwater harvesting, soil fertility measures, micro-irrigation, etc.
Expected outputs: i) assessing the bundles of rights (use, control) of poor people to land, water, and other key natural resources, disaggregated by gender; ii) identifying links between rights to resources, agricultural production, and welfare/poverty, including adoption of technologies; iii) identifying technological options to enhance the access to land and water, or make best use of the resources that the poor do have available, e.g., through drip or micro-irrigation; iv) identifying policies that will recognize, support, and enhance the natural capital assets of women and the poor.
Note: These are very under-studied areas, but they hold considerable promise for achieving CGIAR goals. Assets are fundamental to reducing poverty, and land and water resources are the most important assets for agricultural production. (Sub-activity 5.8).

Output 5: Strengthening NARS and other rural institutions.

i) Strengthening NARS capacity to deal with emerging issues in markets, trade policy, the environment, and biotechnology, including intellectual property rights (IPR) and biosafety issues, among others.
Expected outputs: i) Plan for building capacity of NARS to conduct and apply biosafety-related research; ii) analyzing the impact of new intellectual property (IP) rules on the effectiveness of NARS; iii) developing and implementing appropriate IP-management systems. Develop new forms of collaboration, increase the possibility of integrating research plans, and improve the impact of such research. (Sub-activity 1.2).

ii) Strengthening NARS capacity in strategic analysis and priority setting.
Expected output: 1) Prioritizing subjects and targets for training and capacity building of NARS; 2)Strengthening collaboration works between CGIAR centers and NARS in order to make it more effective in accelerating dissemination of achievement of R&D conducted in the centers. (Sub-activity 1.3).

iii) Empowerment of farmers organizations: adjustment to the new agriculture.
Expected outputs: Development of methodology for integrated farming systems research with participatory approach to i) reduce the bias against small-scale farmers, ii) access to technology and innovations, and provision of inputs, iv) overcome market failures, and v) reduce risk bearing. (Sub-activity 2.5).

iv) Public-private partnerships: Optimizing partnerships in technology development and institutional governance.
Expected outputs: Strategy of public-private partnership on the basis of profitability for the private, and prioritizing R&D subjects to be conducted with the partnership. i) Development of a private constituency for research on public-private partnerships; ii) further development of agri-chain concepts for developing countries; iii) making an inventory and analysis of existing public-private partnerships; iv) designing policies governance and management approaches towards effective and transparent partnerships; v) pilot implementation of public-private partnerships in selected countries. (Sub-activity 3.1).

3. Regional priorities

Regional priorities established through this consultative process used as a starting point the priorities established by the region itself trough its own regional organizations (see iSC webpage). The priorities identified are to be looked at as complementary information to that provided by the regions. The main contribution of the present exercise is in providing consistency across regions by working with a unified set of activities and sub-activities.

(1) Asia

The Asia panel called attention on the following aspects of CGIAR research for the region:
a) Focus on marginal environments, in particular:

2.4. In-situ conservation of crop systems for marginal environments, paying particular attention to water use efficiency.

1.16. Ex-situ conservation of annual and perennial crops for marginal environments.

10.4. Comparative genetics of acid soil tolerance and the ability to acquire nutrient phosphorus from poorly soluble sources.

b) Focus on public goods, in particular:

1.8. Development of a rational global system of ex-situ conservation.

8.1. Study of gene flows.

c) Focus on commodities beyond rice, reflecting concerns with agro-biodiversity as well as diet diversification, in particular:

3.6. Resistance to aflatoxin contamination in groundnuts.

Cotton, orphan crops, minor crops, fisheries, horticultural crops.

d) Focus on integrated crop management in varying environments (water, nutrient, pest, weeds, etc.) (1.12)

e) Concerns with agrochemical pollution (12.6) and its health hazards, giving priority to research on botanical pesticides and similar innovations.

f) Focus on poverty, which reflected in priority to:

5.8. Access by poor people to natural resources, especially land and water.

2.3. Linking farmers to markets.

g) Focus on the search for new partnerships indicated by priorities to:

2.5. Farmers organizations and their adjustment to the new agriculture.

3.1. Optimizing partnerships in technology development and institutional governance.

(2) CWANA

Priorities established here come in complement to a particularly comprehensive regional priority setting exercise undertaken by ICARDA, AARINENA, and CAC in 2001/2. Priorities established here stress the following:

a) Focus conservation efforts on wild relatives (1.10, 2.1), marginal environments, and forage grasses and forage legumes (2.4).

b) Focus on abiotic resistance: comparative genetics of drought tolerance across cereals, legumes, and roots and tubers (10.1) and salinity tolerance.

c) Focus on sustainable use of rangelands (2.1) and integrated crop management in varying environments (water, nutrient, pest, weeds, etc.) (1.2).

d) Focus on the role of policies and institutions to enhance the adoption of new technologies (6.5) and for sustainable natural resource management (5.5).

e) Strengthening of NARS' capacity in social analysis (1.5).

f) Strengthening of local government institutions and farmers organizations (2.1).

g) Marketing innovations to link farmers to markets (2.3 in output 4 and 2.2 in output 5).

(3) Sub-Saharan Africa

The Africa panel achieved a great deal of unanimity in its first round of voting. The panel operated under a less binding resource constraint (in accordance with current CGIAR priority to Africa), resulting in selection of a relatively larger number of projects.

a) Focus on conservation of germplasm/biodiversity in marginal environments: This is seen in priority given to:

1.16. Ex-situ conservation of annual and perennial crops for marginal environments,

4.3. Conservation through community forest management in the semi-arid region.

b) Focus on conservation of forage grasses and forage legumes (1.14) and of crops wild relatives (1.10).

c) Focus on roots and tubers:

2.4. Institutional mechanisms for germplasm distribution of roots and tubers.

2.1. Improving cassava to the point where it moves beyond a security crop to a cash crop for income generation.

d) Focus on yield losses due to parasitic weeds in cereals: comparative genetics of host plant resistance to Striga especially across maize, sorghum and pearl millet (1.12)

e) Focus on agroforestry

4.3. Agroforestry systems for food, fuel, and fodder (4.3)

f) Focus on livestock:

5.1. Genetics of indigenous livestock breeds

6.1. Landless livestock dairy production

2.7. Scaling-up of indigenous knowledge on veterinary medicine.

g) Focus on integrated farming systems, including soil nutrient management, ecologically friendly IPM, weed control, and water management. Participants have stressed the importance of holistic, participatory approaches, based on comprehensive local diagnostics of constraints and opportunities (1.2).

h) Focus on markets and policies

2.3 in Output 4 and 2.2 in Output 5. Marketing innovations to link farmers to markets

5.5. Incentive policies and strategies for sustainable NRM

12.3. Strengthening linkages between policy research and policy formulation.

2.3 (Output 5). Impact on the rural poor of developed and developing country trade policies and WTO agreements.

i) Focus on people and their organizations

2.4. Links between agricultural research and empowerment of women and other marginalized groups.

j) Focus on strengthening NARS in the region

1.2. Strengthening NARS capacity to deal with emerging issues in markets, trade policy, the environment, and biotechnology, including intellectual property rights and biosafety issues.

1.5. Strengthening NARS capacity in social analysis.

(4) Latin America

a) The Latin America panel sent a clear message regarding the need for greater efforts in ex-situ conservation for neglected and underutilized species (1.3) and for important orphan food or economic crops in the region (1.13), and for in-situ conservation of crop systems for marginal environments (2.4), with particular attention to water use efficiency. Stress in conservation is thus on the neglected species and environments.

b) Focus on the use of alternative sources of genes, using wild species and other exotic gene pools as sources of novel alleles for adaptation (7.2).

c) Focus on institutional arrangements

7.2 (Output 1). Beyond CBD and IT: Developing national and regional legislative and regulatory options to maximize the benefits flowing to the country/region while respecting obligations under international treaties.

7.1 (Output 2). Reach System-wide agreements on IPR arrangements relating to CGIAR improved germplasm.

d) Focus on water use efficiency (12.3)

e) Focus on the private sector, agroindustry, and market development. This is seen in the following recommendations:

3.2. Public and private roles in the supply of technology, technology exchange and upgrading.

3.3 (Output 5): Institutional mechanisms for understanding technological demands from the private sector.

4.1. Policies for the promotion of rural agroindustries.

2.3. Marketing innovations to link farmers to markets.

f) Seek new models for agricultural research

1.2. Strengthening NARS capacity to deal with emerging issues

1.5. Strengthening NARS capacity in social analysis.

g) Seek new approaches for rural development and increase the benefits the rural poor can derive from research and technological change

2.5. Empowerment of farmers organizations to help them adjust to the new agriculture

8.1 (Output 4): Seek new approaches to rural development, focusing on spatial aspects and the promotion of territorial competitiveness.

(5) Global

The panel chairs note the great degree of importance attached by the Global Panel to germplasm conservation and to strengthening of NARS. They highlight the following in their conclusions:

a) Focus on valuation of CGIAR gene bank holdings (1.7): There is a high preponderance of genetic analytical and conservation sub-activities based on the CGIAR's own germplasm holdings as well as wild relatives and forest species.
b) Focus on drought resistance (10.1): The clearest priority for germplasm improvement is the study and development of drought resistant varieties in cereals, legumes, and roots and tubers.
c) Focus on water use efficiency in farming systems (12.3). They note that despite identification of drought as a priority for germplasm improvement, only six per cent of the proposed portfolio (at least under the INRM theme) is committed to water efficiency and productivity.
d) Focus on forestry (5.5) and diversification of farming systems into vegetable and fruit (6.3).
e) Potential priorities for policy and socio-economic research are scattered amongst several sub-activities. However, highest priorities were accorded to institutional mechanisms to enhance sustainable natural resource management (5.6) and mechanisms to enhance the access of poor people to natural resources (especially water and land) (5.8).
f) Assisting the development of NARS capacity, particularly with a view to policy formulation (1.2), was the most clear cut priority arising from this exercise.

VI. Lessons learned about the approach to priority setting

To be added

VII. Conclusions

To conclude, we want to first, on behalf of iSC, thank the many participants to this demanding exercise. Several participants have accompanied us willingly through the different steps of the process. We are particularly grateful to the leaders of the three thematic panels and the five regional panels for the quality of their work and the many innovations they made in the process of implementation, and to the 75 panel members who persisted in providing ideas and feedbacks all the way to the final round of scoring. We want to acknowledge the many useful suggestions that were received to improve and complement the consultative process for future use of the approach.

The objective of the consultative process was to gather suggestions from stakeholders and scientists about new research opportunities and needed major expansions of on-going activities to help the CGIAR better fulfill its mandate of sustainable poverty reduction through agricultural research. The opportunities identified and the priorities extracted for future research cannot do justice to the great diversity of undertakings in such a large and multifaceted organization as the CGIAR. Research projects not identified here may be due to faults in the approach or to the fact that they do not have a scale to make them priorities at the level of the System as a whole, globally or regionally. The may remain key components of the work of the CGIAR at the level of specific centers, environments, and constituencies.

In spite of the limitations of the approach, and of the time constraint under which it was implemented, there are several priorities that come out of the consultation in a consistent fashion. We summarize them in this conclusion.

1. Suggested reallocations of resources across outputs

Consultations with stakeholders (Step 1B) and scientists (Step 2) both reveal perceptions of current misallocations of resources across the CGIAR's five logframe outputs, specifically:

- A large under-investment in germplasm collection, conservation, and characterization.
- An over-investment in research on sustainable farming systems and NRM.
- By contrast, resource allocations to germplasm improvement, socio-economics and policy, and strengthening NARS and rural institutions are congruent with perceptions of optimality by stakeholders and scientists.

Results on farming systems and INRM need to be qualified in that (1) the framework used to classify projects by outputs tends to under-represent integrative research of the INRM type, and (2) further geographical disaggregation at the sub-regional level would likely give greater importance to systems and INRM research.

2. Suggested reallocations of resources across categories of germplasm research

If current accounting of CGIAR expenditures on germplasm research across commodities is reliable, it shows large discrepancies relative to desired allocations by stakeholders. Specifically:

- A large over-investment in germplasm research on cereals.
- An under-investment in germplasm research on tree crops, high value and cash crops, fisheries, and livestock.
- An adequate investment in germplasm research on roots and tubers.

This perspective suggests a CGIAR research portfolio that would evolve rather drastically away from the System's initial priorities, where research was largely oriented at germplasm improvement for staple foods. Current demands are for germplasm research to address a broader spectrum of commodities, focusing on the production activities of the rural poor, marginal environments, and neglected areas of research relative to private sector undertakings.

3. Consistent demands for research on specific activities between stakeholders and scientists

Among activities in the five CGIAR output categories, the following priorities were consistently singled out by both stakeholders (Step 1B) and scientists (Step 2):

- Germplasm conservation: Ex-situ conservation, conservation, and characterization of crops.
- Germplasm improvement: Research on abiotic stresses.
- Sustainable farming systems: Integrated crop production systems.
- Socio-economics and policy: Markets for inputs and outputs.
- Strengthening institutions: Training and capacity building in NARS.

4. Suggestions for cross-regional research that could assume the form of Challenge and Systemwide Programs

Consistent demands for research programs by three or more regions suggest opportunities for Challenge and Systemwide Programs with potential benefits across vast geographical areas. The following suggestions were the most consistent:

Germplasm conservation

- Ex-situ and in-situ conservation of annual and perennial crop systems for marginal environments.
- Ex-situ collection, conservation, and characterization of crop wild relatives.
- Ex-situ collection, conservation, and characterization of orphan food or economic crops.
- Study of gene flows.

Germplasm improvement

- Germplasm improvement of high value vegetable and perennial (fruit) crops.
- Seek new alleles for adaptation in wild species and exotic gene pools.
- Research on drought resistance.

Sustainable farming systems and INRM

- Integrated crop management in risky environments, including IPM, water, and soils management (holistic approaches based on integral local diagnostics).
- Increased water use efficiency.
- High value crops for urban and peri-urban production systems.

Socio-economics and policy

- Policies and institutional innovations to link farmers to markets.
- Access to natural resources, particularly land and water, for people with focus on gender differences.

Strengthening NARS and rural institutions

- Strengthening NARS capacity to deal with emerging issues and in strategic analysis and priority setting.
- Empowerment of farmers organizations to adjust to the new agriculture.
- Public-private partnerships in technology development and institutional governance.

5. Regional research priorities

Regional research priorities are set at the regional level by Regional Organizations, assisted by GFAR. A list of suggestions for research was proposed by the regional panels that serve as consistent complementary guidelines. Some of these ideas could assume the form of regional Challenge and Systemwide Programs. In general, there are recurring themes that come from regional priorities. They are:

Focus on marginal and risky environments.
Focus on conservation and use of wild relatives.
Focus on abiotic resistance, particularly drought.
Focus on high value crops and forest products.
Focus on livestock and rangelands for poor people.
Focus on public goods such as systems of ex-situ conservation and understanding of gene flows.
Focus on holistic approaches to integrated farming systems.
Focus on poor people and gender for access to assets and links to markets.
Focus on policies and institutions for the adoption of new technologies.
Focus on new partnerships with the private sector and producers organizations.
Seek new models for agricultural research.
Seek new approaches to rural development with a territorial dimension.
Strengthen NARS capacity.
Strengthen and empower producers organizations.

The wealth of suggestions received for projects initiatives provides an important repository of ideas for future research. These suggestions, only a few of which have been retained as priorities under strict regional budget constraints, are listed in the Appendix to this document.

The results presented here still need to be analyzed by category of respondent, knowing the importance of discipline in influencing stated priorities. Based on final results and comments from the Group, the Science Council will meet with Center managers and staff to finalize the CGIAR priorities as an input into discussions on research strategies.

Final results: sub-activities selected for funding by region
(See full titles in Appendix table)

Output	Sub-activities	Cost US$k/year	CWANA	LA	SSA	Asia	Global	All regions
1. Germplasm collection, conservation, and characterization								
1. Ex-situ conservation of crops	1.1 DNA marker data - Complement	1650		1				1
	1.2 Development of DNA and DNA	900					1	1
	1.3 Storage protocols for neglected and	225		1	1			2
	1.6 Viability of reproductive material in	350	1					1
	1.7 Valuation of gene bank holdings	300					1	1
	1.8 Development of a rational global	1500				1	1	2
	1.10 Conservation of crop wild relatives	950	1		1		1	3
	1.13 Identify important "orphan" food or	315		1	1	1		3
	1.14 Forage grasses and forage legumes	315	1		1			2
	1.16 Annual and perennial crops for	315		1	1	1	1	4
	1.17 Pharmaceutical Crops	315			1			1
2. In-situ conservation of crops	2.1 Conservation of wild relatives (see also	950	1		1			2
	2.4 Crop systems for marginal	600	1	1	1	1		4
	2.5 Valuation of *in situ* and on-farm	950			1			1
3. Livestock	3.1 Molecular characterisation of diversity	875		1				1
	3.2 Investigation of the genetics of	1600			1			1
4. Forestry	4.1 Eco-geographic valuation of genetic	900					1	1
	4.3 Community forest management in the	700		1	1			2
6. Microbes & insects	6.2 Characterization of, and enhanced	900			1			1
7. International agreements	7.2 Beyond CBD and IT. Developing	950	1	1				2
8. Other	8.1 Study of gene flows	800			1	1	1	3
2. Germplasm improvement								
1. Cereals	1.7 Rice genetics and breeding of durable	450				1		1
	1.9 Screening of traditional *O. glaberrima*	400			1			1
	1.12 Comparative genetics of host plant	1100	1		1			2
	1.14. Nutritional improvement: Vitamin A,	4700				0.25		0.25
2. Roots and tubers Cassava	2.1. Improving cassava to the point where	925			1			1
	2.4 Developing clean and efficient	400		1	1			2
3. High value and cash crops *Coffee*	3.3 Application of comparative genomics	450		1		1	1	3
	3.6 Improve resistance to aflatoxin	225			1	1		2
5. Livestock	5.1 The genetics of indigenous livestock	575	1		1			2
7. Other	7.1 Reach System-wide agreement on the	125		1			1	2
	7.2 Use of wild species and other exotic	1250	1	1	1			3
	7.4 Participatory farmer-breeder	1050			1	1		2
8. Yield	8.1 Efficacy of marker-assisted BC	2750				0.5		0.5
	8.2 Research on yield barriers to C3 crops	450				1		1
9. Biotic stress	9.3 Use of insect and insect pathogens as	450			1			1
	9.5 Investigation of soil and root health	450	1		1			2
10. Abiotic stress	10.1 Drought: comparative genetics of	2650	1		1		1	3
	10.4 Comparative genetics of acid soil	1850				1		1
	10.5 Salinity tolerance	1250	1			1		2
	10.7 Interspecific transfer of genes for	800		1				1
12. Other	12.2 Improved seed quality in all crops	675					1	1
13. Other regional	13.3. Participatory breding	200					1	1
3. Sustainable production systems and Natural resource management								
1. Crop production systems	1.2 Integrated crop (water, nutrient, pest,	2,325	1	1	1	1		4
	1.7 Enhance the utilisation of minor crops	450				1		1
2. Livestock production systems	2.1 Sustainable use of rangelands	3,300	1					1
	2.4 Strategic animal nutrition and feeding	3,500			1			1
	2.7 Scaling-up of indigenous knowledge on	250			1			1
	2.8 Interactions between livestock traits,	2,000		1				1
3. Integrated crop-livestock prod	3.1 Closing nutrient cycles/Management &	1,650				0.5		0.5
4. Agroforestry systems	4.3 Agrofostry for food, fuel and fodder	1,525			1			1
5. Forestry systems	5.1 Fragmentation and forest margins use	450					1	1
	5.5 Forest as providers of environ serices	525					1	1
6. Urban & peri-urban systems	6.1 Landless livestock/dairy production	1,450			1			1
	6.3 Vegetables and fruit production	1,750			1		1	2
7. Aquatic resources ststems	7.2 Integrated agric-acquaculture incld rice-	1,225				1		1
8. Other	8.1 Spatial agroecosystems analysis tools	1,050				1		1
9. IPM and IDM and SPC	9.3 Botanical pesticides formulation for the	700				1		1
11. Watershed management	11.5 Assess trade-offs between production	500					1	1
12. Water use efficiency	12.1 Land use and cropping system design	2,250	1	1				2
	12.3 Scale effect on water use efficiency	1,050		1		1	1	3
	12.4 Managing deficit irrigation	700	1			1		2
	12.6 Agrochemical pollution and its health	1,400				1		1
13. Climate change & sustainable	13.3 Design Crop systems resilient to	1,050		1				1

Output	Sub-activities	Cost US$k/year	CWANA	LA	SSA	Asia	Global	All regions
4. Policy and socio-economic research								
1. Governance &	1.3 NARS governance and linkages with far	500	1					1
	1.6 International Science and Research Polic	1100		1				1
2. Markets for	2.3 Marketing innovations to link farmers to	500		1	1	1	1	4
	2.4 Developed and developing country trade	1,000			1	1		2
3. Institutions in support	3.1 Delopment of rural financing schemes	250	1		1			2
of competitiveness of	3.2 Public and private roles in the supply of	1,350		1				1
	3.4 Technology adoption tracer study to gatl	500	1			1		2
4. Opportunities for post-harvest	4.1 Policies for the promotion of rural agroi	1,000		1				1
	4.4 Agribusiness development and market ir	750			1			1
5. Policy and institutions	5.1Basic bioeconomic research on the impac	1,200					1	1
	5.5 Incentive policies and strategies for sust	850	1		1			2
	5.6 Institutional mechanisms to enhance sus	1,100					1	1
	5.8 Access by poor people to natural resourc	1,450	1		1	1	1	4
6. Understanding rural	6.3 Using knowledge of household livelihoc	500			1		1	2
	6.5 Policy & institutions to enhance adoptio	500	1					1
7. Poverty maps and	7.1 Poverty diagnostics and causal analysis	1,000		1				1
determinants of poverty	7.2 Enhancing poverty impacts from agricu	500	1					1
	7.3 Using poverty analysis to inform nationa	500			1			1
8. Approaches to	8.1 Spatial aspects of rural development. De	500		1				1
rural development	8.2 Rural development policies in developec	500						0
	8.3 Institutional issues in rural development	1,000						0
	8.6 Policy innovation experiments : action r	500		1				1
9. Forecast of future of food, agric	9.1 Natural resources degradation: impact o	1,100		1				1
11. Research impact assessment	11.2 Understanding technology innovation p	1,100			1		1	2
	11.3 Institutional lerning and change (ILAC	750					1	1
12. Outreach to policy	12.3 Strengthening linkages between policy	750			1			1
5. Strengthening NARS and other rural institutions								
1. Training & capacity	1.1 Comparative analysis of NARS Researc	1,450					1	1
building in NARS	1.2 Strengthening NARS capacity to deal wi	1,000	1	1	1	1	1	5
	1.3 Strenghtening NARS capacity in strateg	1,000	1		1	1	1	4
	1.4 Strengthening NARS input in policy dia	500			1			1
	1.5 Strengthening of NARS capacity in soci	500	1	1	1			3
2. Empowerment of farmers,	2.1 Strenghtening local government instituti	500	1		1	1		3
their organizations,	2.2 Marketing innovations to link farmers to	500	1		1	1		3
and communities	2.3 Developed and developing country trade	750			1			1
	2.4 Links between ag research and empower	500	1		1	1		3
	2.5 Farmers organizations: adjustment to the	750	1	1	1	1		4
3. Public-private	3.1 Optimizing partnerships in technology d	500	1	1	1	1		4
	3.3 Institutional mechanism for understandi	1,000		1				1
4. South-South collaborations;	4.1 Identifying common research problems a	500	1					1
regional and sub-regional partner	4.2 Identifying common research problems a	1,050			1			1
5. Rural and agricultural knowlec	5.1 Facilitating access, sharing and synthesi	750			1			1
6. Outreach to civil society	6.1 Public awareness and constituency build	500				1	1	2
7. Other	7.1 Conceptualize and analyze the agricultu	1,700		1				1
	7.2 Financial sustainability in NARS	1,800			1			1
6. Cross-cutting themes								
4. Information platfor	6.4 Creation and maintenance of	250			1			1
5. Impact assessment	6.5 Concerted action to develop and	750			1			1

Region's first choice
All regions priority (3 or more)

Final results: CWANA panel
(See full titles in Appendix table)

Output	Sub-activities	Cost US$k/year	% votes	Rank by output: Top 3
1. Germplasm collection, conservation, and characterization				
1. Ex-situ conservation	1.6 Viability of reproductive material in	350	50	
	1.10 Conservation of crop wild relatives	950	75	1
	1.14 Forage grasses and forage legumes	315	63	2
2. In-situ conservation	2.1 Conservation of wild relatives (see also	950	50	
	2.4 Crop systems for marginal	600	63	2
7. International agreements	7.2 Beyond CBD and IT. Developing	950	50	
2. Germplasm improvement				
1. Cereals	1.12 Comparative genetics of host plant	1100	63	
5. Livestock	5.1 The genetics of indigenous livestock	575	63	
7. Other	7.2 Use of wild species and other exotic	1250	63	
9. Biotic stress	9.5 Investigation of soil and root health	450	63	
10. Abiotic stress	10.1 Drought: comparative genetics of	2650	88	1
	10.5 Salinity tolerance	1250	75	2
3. Sustainable production systems and Natural resource management				
1. Crop production systems	1.2 Integrated crop (water, nutrient, pest,	2,325	81	2
2. Livestock production	2.1 Sustainable use of rangelands	3,300	100	1
12. Water use efficiency	12.1 Land use and cropping system design	2,250	75	
	12.4 Managing deficit irrigation	700	69	
4. Policy and socio-economic research				
1. Governance & policy	1.3 NARS governance and linkages with far	500	69	
3. Institutions in support	3.1 Delopment of rural financing schemes	250	63	
	3.4 Technology adoption tracer study to gatl	500	69	
5. Policy and institutions	5.5 Incentive policies and strategies for sust	850	75	2
	5.8 Access by poor people to natural resourc	1,450	69	
6. Rural livelihoods	6.5 Policy & institutions to enhance adoptio	500	81	1
7. Determinants of poverty	7.2 Enhancing poverty impacts from agricu	500	69	
5. Strengthening NARS and other rural institutions				
1. Training & capacity NARS	1.2 Strengthening NARS capacity to deal w	1,000	69	
	1.3 Strenghtening NARS capacity in strateg	1,000	69	
	1.5 Strengthening of NARS capacity in soci	500	81	1
2. Empowerment of farmers,	2.1 Strenghtening local government instituti	500	75	2
their organizations,	2.2 Marketing innovations to link farmers to	500	75	2
and communities	2.4 Links between ag research and empower	500	69	
	2.5 Farmers organizations: adjustment to the	750	56	
3. Public-private partnerships	3.1 Optimizing partnerships in technology d	500	75	2
4. South-South collaborations	4.1 Identifying common research problems a	500	63	

% votes = percentage of yes votes received by the sub-activity in Round 3 with 16 respondents.

Final results: Latin America panel
(See full titles in Appendix table)

Output	Sub-activities	Cost US$k/year	% votes	Rank by output: Top 3
1. Germplasm collection, conservation, and characterization				
1. Ex-situ conservation of	1.1 DNA marker data - Complement	1650	29	
	1.3 Storage protocols for neglected and	225	79	1
	1.13 Identify important "orphan" food or	315	79	1
	1.16 Annual and perennial crops for	315	29	
2. In-situ conservation	2.4 Crop systems for marginal	600	50	3
3. Livestock	3.1 Molecular characterisation of diversity	875	21	
4. Forestry	4.3 Community forest management in the	700	21	
7. International agreements	7.2 Beyond CBD and IT. Developing	950	50	3
2. Germplasm improvement				
2. Roots and tubers	2.4 Developing clean and efficient	400	36	2
3. High value and cash crops	3.3 Application of comparative genomics	450	21	
7. Other	7.1 Reach System-wide agreement on the	125	29	3
	7.2 Use of wild species and other exotic	1250	50	1
10. Abiotic stress	10.7 Interspecific transfer of genes for	800	21	
3. Sustainable production systems and Natural resource management				
1. Crop production systems	1.2 Integrated crop (water, nutrient, pest,	2,325	29	
2. Livestock production	2.8 Interactions between livestock traits,	2,000	29	
12. Water use efficiency	12.1 Land use and cropping system design	2,250	29	
	12.3 Scale effect on water use efficiency	1,050	50	1
13. Climate change	13.3 Design Crop systems resilient to	1,050	29	
4. Policy and socio-economic research				
1. Governance & policy	1.6 International Science and Research Polic	1100	21	
2. Markets	2.3 Marketing innovations to link farmers to	500	57	3
3. Institutions in support	3.2 Public and private roles in the supply of	1,350	64	1
4. Post-harvest	4.1 Policies for the promotion of rural agroi	1,000	64	1
7. Determinants of poverty	7.1 Poverty diagnostics and causal analysis	1,000	29	
8. Approaches to rural dev	8.1 Spatial aspects of rural development. De	500	50	
	8.6 Policy innovation experiments : action r	500	43	
9. Forecast of future of food, a	9.1 Natural resources degradation: impact o	1,100	36	
5. Strengthening NARS and other rural institutions				
1. Training & capacity	1.2 Strengthening NARS capacity to deal w	1,000	57	1
	1.5 Strengthening of NARS capacity in soci	500	50	2
2. Empowerment of farmers	2.5 Farmers organizations: adjustment to the	750	50	2
3. Public-private partnerships	3.1 Optimizing partnerships in technology d	500	43	
	3.3 Institutional mechanism for understandi	1,000	50	2
7. Other	7.1 Conceptualize and analyze the agricultu	1,700	50	2

Region's first round choices

% votes =

For region's first round choices, percentage of yes votes received by the sub-activity in Round 1 with 14 respondents. For region's subsequent choices, percentage of yes votes received by the sub-activity in Round 2 with 14 participants after Round 1 choices have been removed.

Final results: Sub-Saharan Africa panel
(See full titles in Appendix table)

Output	Sub-activities	Cost US$k/year	% votes	Rank by output: Top 3
1. Germplasm collection, conservation, and characterization				
1. Ex-situ conservation	1.3 Storage protocols for neglected and	225	47	
	1.10 Conservation of crop wild relatives (see	950	59	3
	1.13 Identify important "orphan" food or	315	47	
	1.14 Forage grasses and forage legumes	315	60	2
	1.16 Annual and perennial crops for marginal	315	78	(1)
	1.17 Pharmaceutical Crops	315	49	
2. In-situ conservation	2.1 Conservation of wild relatives (see also	950	33	
	2.4 Crop systems for marginal environments,	600	47	
	2.5 Valuation of *in situ* and on-farm conserved	950	33	
3. Livestock	3.2 Investigation of the genetics of resistance to	1600	53	
4. Forestry	4.3 Community forest management in the semi-	700	67	1
6. Microbes & insects	6.2 Characterization of, and enhanced access to,	900	33	
8. Other	8.1 Study of gene flows	800	34	
2. Germplasm improvement				
1. Cereals	1.9 Screening of traditional *O. glaberrima* and	400	40	
	1.12 Comparative genetics of host plant	1100	53	3
2. Roots and tubers	2.1. Improving cassava to the point where it	925	60	2
	2.4 Developing clean and efficient germplasm	400	67	1
3. High value and cash crops	3.6 Improve resistance to aflatoxin	225	47	
5. Livestock	5.1 The genetics of indigenous livestock breeds	575	53	3
7. Other	7.2 Use of wild species and other exotic gene	1250	40	
	7.4 Participatory farmer-breeder management of	1050	40	
9. Biotic stress	9.3 Use of insect and insect pathogens as sources	450	40	
	9.5 Investigation of soil and root health diseases	450	40	
10. Abiotic stress	10.1 Drought: comparative genetics of drought	2650	43	
3. Sustainable production systems and Natural resource management				
1. Crop production systems	1.2 Integrated crop (water, nutrient, pest, weed	2,325	50	
2. Livestock production systems	2.4 Strategic animal nutrition and feeding	3,500	37	
	2.7 Scaling-up of indigenous knowledge on	250	53	3
4. Agroforestry systems	4.3 Agrofostery for food, fuel and fodder	1,525	65	1
6. Urban & peri-urban systems	6.1 Landless livestock/dairy production	1,450	62	2
	6.3 Vegetables and fruit production systems	1,750	40	
4. Policy and socio-economic research				
2. Markets	2.3 Marketing innovations to link farmers to mark	500	87	1
	2.4 Developed and developing country trade polic	1,000	57	
3. Institutions in support	3.1 Delopment of rural financing schemes	250	47	
4. Post-harvest	4.4 Agribusiness development and market integra	750	52	
5. Policy and institutions	5.5 Incentive policies and strategies for sustainabl	850	67	2
	5.8 Access by poor people to natural resources, es	1,450	69	
6. Rural livelihoods	6.3 Using knowledge of household livelihood stra	500	60	
7. Determinants of poverty	7.3 Using poverty analysis to inform national and	500	50	
11. Research impact assessment	11.2 Understanding technology innovation proces	1,100	40	
12. Outreach to policymakers	12.3 Strengthening linkages between policy resea	750	67	2
5. Strengthening NARS and other rural institutions				
1. Training & capacity NARS	1.2 Strengthening NARS capacity to deal with en	1,000	62	2
	1.3 Strenghtening NARS capacity in strategic ana	1,000	43	
	1.4 Strengthening NARS input in policy dialogue	500	53	
	1.5 Strengthening of NARS capacity in social ana	500	60	3
2. Empowerment of farmers,	2.1 Strenghtening local government institutions a	500	40	
their organizations,	2.2 Marketing innovations to link farmers to mark	500	60	3
and communities	2.3 Developed and developing country trade polic	750	60	3
	2.4 Links between ag research and empowerment	500	80	1
	2.5 Farmers organizations: adjustment to the new	750	47	
3. Public-private partnerships	3.1 Optimizing partnerships in technology develc	500	32	
4. South-South collaborations	4.2 Identifying common research problems and o	1,050	36	
5. Rural and AKIS	5.1 Facilitating access, sharing and synthesis of d	750	53	
7. Other	7.2 Financial sustainability in NARS	1,800	43	
6. Cross-cutting themes				
4. Information platforms	6.4 Creation and maintenance of information and	250	43	
5. Impact assessment	6.5 Concerted action to develop and implement	750	43	

Region's first round choices

% votes = For region's first round choices, percentage of yes votes received by the sub-activity in Round 1 with 15 respondents. For region's subsequent choices, percentage of yes votes received by the sub-activity in Round 2 with 14 participants after Round 1 choices have been removed.

Final results: Asia panel
(See full titles in Appendix table)

Output	Sub-activities	Cost US$k/year	Choices	% votes	Rank by output: Top 3
1. Germplasm collection, conservation, and characterization					
1. Ex-situ conservation of crops	1.8 Development of a rational global	1500	1	25	
	1.13 Identify important "orphan" food or	315	1	33	2
	1.16 Annual and perennial crops for	315	1	25	
2. In-situ conservation	2.4 Crop systems for marginal	600	1	57	1
8. Other	8.1 Study of gene flows	800	1	27	
2. Germplasm improvement					
1. Cereals	1.7 Rice genetics and breeding of durable	450	1	33	
	1.14. Nutritional improvement: Vitamin A,	4700	0.25	32	
3. High value & cash crops	3.3 Application of comparative genomics	450	1	32	
	3.6 Improve resistance to aflatoxin	225	1	50	1
7. Other	7.4 Participatory farmer-breeder	1050	1	27	
8. Yield	8.1 Efficacy of marker-assisted BC	2750	0.5	32	
	8.2 Research on yield barriers to C3 crops	450	1	33	
10. Abiotic stress	10.4 Comparative genetics of acid soil	1850	1	28	
	10.5 Salinity tolerance	1250	1	30	
3. Sustainable production systems and Natural resource management					
1. Crop production systems	1.2 Integrated crop (water, nutrient, pest,	2,325	1	42	1
	1.7 Enhance the utilisation of minor crops	450	1	38	3
3. Integrated crop-liv.	3.1 Closing nutrient cycles/Management &	1,650	0.5	23	
7. Aquatic resources ststems	7.2 Integrated agric-acquaculture incld rice-	1,225	1	33	
8. Other	8.1 Spatial agroecosystems analysis tools	1,050	1	20	
9. IPM and IDM	9.3 Botanical pesticides formulation for the	700	1	38	3
12. Water use efficiency	12.3 Scale effect on water use efficiency	1,050	1	25	
	12.4 Managing deficit irrigation	700	1	42	1
	12.6 Agrochemical pollution and its health	1,400	1	37	3
4. Policy and socio-economic research					
2. Markets	2.3 Marketing innovations to link farmers to	500	1	35	2
	2.4 Developed and developing country trade	1,000	1	30	
3. Institutions in support	3.4 Technology adoption tracer study to gatl	500	1	30	
5. Policy and institutions	5.8 Access by poor people to natural resourc	1,450	1	37	1
5. Strengthening NARS and other rural institutions					
1. Training & capacity NARS	1.2 Strengthening NARS capacity to deal wi	1,000	1	35	2
	1.3 Strenghtening NARS capacity in strategi	1,000	1	23	
2. Empowerment of farmers,	2.1 Strenghtening local government instituti	500	1	35	2
their organizations,	2.2 Marketing innovations to link farmers to	500	1	32	
and communities	2.4 Links between ag research and empower	500	1	43	1
	2.5 Farmers organizations: adjustment to the	750	1	22	
3. Public-private partnerships	3.1 Optimizing partnerships in technology d	500	1	25	
6. Outreach to civil society	6.1 Public awareness and constituency build	500	1	22	

% votes = percentage of yes votes received by the sub-activity in Round 2 with 15 respondents.

Final results: Global panel
(See full titles in Appendix table)

Output	Sub-activities	Cost US$k/year	% votes	Rank by output: Top 3
1. Germplasm collection, conservation, and characterization				
1. Ex-situ conservation of crops	1.2 Development of DNA and DNA	900	33	
	1.7 Valuation of gene bank holdings	300	40	1
	1.8 Development of a rational global system	1500	33	
	1.10 Conservation of crop wild relatives (see	950	33	
	1.16 Annual and perennial crops for	315	33	
4. Forestry	4.1 Eco-geographic valuation of genetic	900	33	
8. Other	8.1 Study of gene flows	800	33	
2. Germplasm improvement				
3. High value & cash crops	3.3 Application of comparative genomics	450	27	
7. Other:	7.1 Reach System-wide agreement on the	125	27	
8. Abiotic stress	10.1 Drought: comparative genetics of	2650	33	1
12. Other	12.2 Improved seed quality in all crops	675	27	
13. Other regional	13.3. Participatory breeding	200	33	(1)
3. Sustainable production systems and Natural resource management				
5. Forestry systems	5.1 Fragmentation and forest margins use	450	27	
	5.5 Forest as providers of environ serices	525	40	1
6. Urban & peri-urban systems	6.3 Vegetables and fruit production systems	1,750	33	
11. Watershed management	11.5 Assess trade-offs between production	500	33	
	12.3 Scale effect on water use efficiency and	1,050	33	
4. Policy and socio-economic research				
2. Markets	2.3 Marketing innovations to link farmers to r	500	33	
5. Policy and institutions	5.1Basic bioeconomic research on the impact	1,200	33	
	5.6 Institutional mechanisms to enhance susta	1,100	47	1
	5.8 Access by poor people to natural resource	1,450	47	1
6. Rural livelihoods	6.3 Using knowledge of household livelihood	500	40	3
11. Research impact assessment	11.2 Understanding technology innovation pr	1,100	27	
	11.3 Institutional lerning and change (ILAC)	750	40	3
5. Strengthening NARS and other rural institutions				
1. Training & capacity	1.1 Comparative analysis of NARS Research	1,450	40	
building in NARS	1.2 Strengthening NARS capacity to deal witl	1,000	47	2
	1.3 Strenghtening NARS capacity in strategic	1,000	53	1
6. Outreach to civil society	6.1 Public awareness and constituency buildir	500	33	

First round choices

% votes =
For first round choices, percentage of yes votes received by the sub-activity in Round 1 with 15 respondents.
For subsequent choices, percentage of yes votes received by the sub-activity in Round 2 with 15 participants after Round 1 choices have been removed.

Appendix Table. Titles of the sub-activities proposed by the thematic panels

Output 1: Germplasm conservation
Activities
1. Ex-situ conservation of crops
Subactivities
1.1 DNA marker data - Complement descriptor data and augment phenotypic genebank data with genotypic and
1.2 Development of DNA and DNA sequence banking technology
1.3 Storage protocols for neglected and underutilized species
1.4 Cryopreservation protocols
1.5 Application of low moisture drying as a substitute to low temperature storage of germplasm.
1.6 Viability of reproductive material in gene Banks
1.7 Valuation of gene bank holdings
1.8 Development of a rational global system of Ex Situ Conservation
1.9 Illustrated germplasm databases
1.10 Conservation of crop wild relatives (see also 1.2.1 in *in situ* and 2.7.2 in improvement section)
1.11 An *ex ante* survey of all crops to understand whether more crop species should be mandated
1.12 An initiative to collect representative accessions of economically important plants from their centres of origin
1.13 Identify important "orphan" food or economic crops in regions, and initiate germplasm conservation of these crops.
1.14 Forage grasses and forage legumes
1.15 Improvement of yield of sago palms
1.16 Annual and perennial crops for marginal environments
1.17 Pharmaceutical Crops
2. In-situ conservation of crops
2.1 Conservation of wild relatives (see also 1.1.10 in *ex situ* and 2.7.2 in improvement section)
2.2 Conduct erosion risk studies on endemisms in or around areas of mining, pipelines or other interventions like gas or oil
2.3 Dynamic gene pool management of distinct breeding populations in mega-environments
2.4 Crop systems for marginal environments, paying particular attention to water use efficiency
2.5 Valuation of *in situ* and on-farm conserved and management plant genetic resources, including the associated
3. Livestock
3.1 Molecular characterisation of diversity within and between local breed-groups in the developing world and maintenance of reference DNA samples for future studies.
3.2 Investigation of the genetics of resistance to disease and environmental stress in locally adapted breeds of livestock.
4. Forestry
4.1 Eco-geographic valuation of genetic diversity in populations of key forest species
4.2 Meta-analysis in use of forest genetic resources databases across regions
4.3 Community forest management in the semi-arid region
5. Aquatic
5.1Documenting and valuation of farmed and wild stocks of aquaculture species
5.2 Development of new candidate species for aquaculture
5.3 Use of cryopreserved milt for conservation and genetic improvement
6. Microbes & insects
6.1 Ex situ conservation of beneficial pathogens of pest arthropods
6.2 Characterization of, and enhanced access to, fungal, insect and rhizobial collections, with a view to establishing new collections of, say, entomopathogens, viruses, myccorrhizae
6.3 Ex situ conservation of beneficial arthropods for use in insect, mite, weed control
7. International agreements
7.1 Getting economically important outliers into the multilateral system for crop germplasm exchange
7.2 Beyond CBD and IT. Developing national and regional legislative and regulatory options to maximize the benefits flowing to the country/region while respecting obligations under international treaties (WTO, CBD, UPOV, IT-PGRFA etc) and developing Global Plans of Action (GPA) for Agro-Biodiversity at large
7.3 Comparative studies of the legislation, implementation mechanism and policies of various NARS on PGR (CBD,
7.4 Ensuring plant genetic resources (PGR) multilateral system ensuing from International Treaty (IT) works
8. Other: New generic areas of study
8.1 Study of gene flows
8.2 'Allele mining' software and technologies
8.3 Development of 'association genetics' as a CGIAR tool
8.4 Setting up a formal exchange programme for scientists between CGIAR and ARIs
8.5 Strategic alliances with ARIs
Output 2, Germplasm improvement
Commodities
1. Cereals:
1.1 Global virulence/pathogenicity survey of wheat rusts and breeding durable rust resistance (new activity)
1.2 Fusarium head blight (FHB) control in wheat (new activity)
1.3 Exploitation of existing translocation / addition / substitution lines in wheat
1.4Durum Wheat to replace barley
1.5 Perennial Barley for biomass

	1.6 Characterize variability across Asia, Africa and the Americas in populations of *Sclerospora graminicola* , the biggest constraint to the adoption of genetically uniform improved crop cultivars in pearl millet (*Pennisetum glaucum*) in Africa and Asia, but does not yet cause disease on this crop in the Americas
	1.7 Rice genetics and breeding of durable (field) resistance to rice blast
	1.8 Genome based study on allelopathic potential of rice
	1.9 Screening of traditional *O. glaberrima* and *O. sativa* accessions from West and Central Africa for adaptive and quality traits for deployment in cultivar development.
	1.10 Study of the population dynamics and identification of resistance genes for thee three key pathogens of rice in West Africa: rice yellow mottle virus (RYMV), bacterial leaf blight (BLB) pathogen and Rice Blast Fungus.
	1.11 Assessment of variability across Asia and Africa in populations of Striga sp.
	1.12 Comparative genetics of host plant resistance to Striga sp. across maize, sorghum and pearl millet
	1.13 Comparative genetics of host plant resistance to stem borers in cereals
	1.14. Nutritional improvement: Vitamin A, Fe, Zn content enhancement in rice and maize
2. Roots and tubers	
	2.1. Improving cassava to the point where it moves beyond a security crop to a cash crop for income generation.
	2.2. Investigate the genetics of potato late blight & screen collections for useful alleles.
	2.3 Develop resistance to bacterial wilt in potato
	2.4 Developing clean and efficient germplasm distribution systems
	2.5 Quality improvement from post harvest losses
3. High value and cash crops	
	3.1. Use of within-cultivar genetic heterogeneity to reduce the vulnerability of hybrid crop cultivars to pests and diseases
	3.2. Genetic improvement of oil content and oil quality in small-seeded annual oilseed crops, including sesame, sunflower, safflower, castor and brassicas
	3.3 Application of comparative genomics from CG crops to improve vegetable and perennial crops important to NARS
	3.4 Genomics and breeding of cotton hybrids for small-farmer income generation in the semi-arid tropics and subtropics of
	3.5 Genomics and breeding of storage pumpkins as an easily stored dietary source of beta-carotene
	3.6 Improve resistance to aflatoxin contamination in groundnut
	1.7 Increased levels of sulphur containing amino acids in chickpea and pigeonpea
4. Tree crops	
	4.1. Evaluation of molecular diversity in walnut *(Juglans regia)*
5. Livestock	
	5.1 The genetics of indigenous livestock breeds (probably with an Africa focus)
	5.2 Genetic improvement of well characterized livestock populations initiated
6. Fisheries/Aquaculture	
	6.1.Estimation of genetic variation in, and determination of prospects of selection for, disease resistance in Carp
	6.2 .Development of improved strains of the Freshwater Prawn (Macrobrachium rosembergii)
	6.3.Estimation of genetic parameters and possible identification of genes of large effect in production traits in Tilapia
7. Other	
	7.1 Reach System-wide agreement on the IPR arrangements relating to CGIAR improved germplasm (including a study of the impact of the present IP regime if necessary)
	7.2 Use of wild species and other exotic gene pools as sources of novel alleles for adaptation.
	7.3 The basis of reproductive barriers among species and within species
	7.4 Participatory farmer-breeder management of crop gene pools
	7.5 Development of 'synteny maps' for all CGIAR crop plants
	7.6 EST programmes and BAC library provision for all mandate crops
	7.7 Novel uses GM technologies to add value in farming systems
	7.8 High methionine chickpeas
Objectives	
8. Yield	
	8.1 Efficacy of marker-assisted BC procedures for yield enhancement
	8.2 Research on yield barriers to C3 crops with a view to converting C3 to C4 (e.g. for rice, wheat)
	8.3. The basis of fertility in cereals
	8.4 Comparative genomics to understand and modify photosynthate partitioning in starchy staples
9. Biotic stress	
	9.1 Pyramiding of transformation-based and conventionally-bred mechanisms for host plant resistance to Helicoverpa and other lepidopterous pests in order to extend their combined economically useful life
	9.2 Managing BT-crops in small land holdings
	9.3 Use of insect and insect pathogens as sources of novel insecticide molecules, all crops
	9.4 The genetics of 'indirect crop defence', e.g. enhancing the ability of plants to exploit natural enemies of parasites and
	9.5 Investigation of soil and root health diseases in semi arid and tropical areas (particularly of cereals, legumes)
10. Abiotic stress	
	10.1 Drought: comparative genetics of drought tolerance across cereals, across legumes, and across roots and tubers
	10.2 Comparative Genomics of Barley and Wheat
	10.3 Genetic analysis of sympatric populations of landraces and wild relatives grown in drought prone environments
	10.4 Comparative genetics of acid soil tolerance and the ability to acquire nutrient P from poorly soluble sources
	10.5 Salinity tolerance
	10.6 Water-logging tolerance in cereals other than rice, including comparative approaches
	10.7 Interspecific transfer of genes for adaptation to stress environments

	10.8 Enhanced ability to acquire poorly-soluble soil nutrients
11. Nutrients	
	11.1 Reducing grain phytate content to improve micronutrient availability, without reducing grain P content and seed
	11.2 Enhancing levels of nutritionally available iron and zinc in staple food grains
	11.3 Reducing the goitrogenic properties of pearl millet grain
12. Other	
	12.1 Improved systems for limiting outcrossing in cereals including sorghum and pearl millet
	12.2 Improved seed quality in all crops
Output 3, Systems and Strategies	
Systems	
1. Crop production systems	
	1.1 Augmenting SOM
	1.2 Integrated crop (water, nutrient, pest, weed etc) mgt in varying environements, and GxE
	1.3 Conservation tillage including cover crops
	1.5 Capturing N from BNF & gowth-promoting organisms incl diversified legume/cereal systems
	1.6 Targetting fertilizer use & weed mgt and precision farming
	1.7 Increase agro-biodiversity
	1.7 Enhance the utilisation of minor crops
	1.7 HIV/AIDS-tolerant cropping systems and techniques
2. Livestock production systems	
	2.1 Sustainable use of rangelands
	2.2 Pasture improvement
	2.3 Develop effective fodder production systems incl rotational grazing system
	2.4 Strategic animal nutrition and feeding systems (also for peri-urban holders)
	2.5 Animal waste recycling
	2.6 Effective vaccine for paracitism/animal health
	2.7 Scaling-up of indigenous knowledge on veterinary medicine
	2.8 Interactions between livestock traits, environment and production systems, (including wildlife herding)
3. Integrated crop-livestock production systems	
	3.1 Closing nutrient cycles/Management & utilization of crop, animal & household (organic) by-products
	3.2 Developing and promoting sustainable use of food-feed crops
	3.4 Conservation tillage
4. Agroforestry systems	
	4.1 The place of trees in landscapes and fields
	4.1a Trees for bio-drainage and salinity control, part. in lowlands
	4.1b Shelterbelts, erosion & trees in and around fields
	4.1c Agroforestry and biodiversity conservation and other eco-system services
	4.2 Role of trees (incl. Indigenous legumes) in soil fertility maintenance
	4.3 Agrofostry for food, fuel and fodder
	4.4 Trees for honey, silk and medicine, ecosystem service
	4.5 Domestication & mgmt of new tree crops
	4.6 Set up farmer training institutions and programs
5. Forestry systems	
	5.1 Fragmentation and forest margins use
	5.2 Secondary forest mgt.
	5.3 The place of trees in watersheds (4,1)
	5.4 Sustainable forest harvestation
	5.5 Forest as providers of environ serices incl wild-life conservation
	5.6 Develop participatory, decentralized forest monitoring and mgt. systems (incl.Riparian, dryland, etc)
6. Urban & peri-urban systems	
	6.1 Landless livestock/dairy production
	6.2 Production/marketing of small or non-conventional animals
	6.3 Vegetables and fruit production systems
	6.4 Agroforestry in urban and peri-urban belts
	6.5 Utilization of liquid and solid wastes for healthy food production/assessment of impact on public health
7. Aquatic resources ststems	
	7.1 Semi-intensive acquaculture sysems and artisanal fisheries
	7.2 Integrated agric-acquaculture incld rice-fish systems improvement
	7.3 Enhancing role of coastal aquaculture
	7.4 Rehabilitation of degraded fish habitats
	7.5 Restocking knowledge and technology
	7.6 Improved fisheries governance/Internat. fish trade & domestic food security (different issue - suggest present
8. Other	
	8.1Spatial agroecosystems analysis tools
Strategies	
9. IPM and IDM and SPC	
	9.1 Identification and opportunities to provide IPM and IDM interventions in crop and livestock
	9.2 Protection stored grain

9.3 Botanical pesticides formulation for the poor
9.4 Increase (agro) biodiversity (above and below-ground) for IPDM of key pests and diseases
9.5 Develop mating distruption strategies
9.6 Develop/disseminate an EWS (early warning system) on pests, mitiagations/ prophylactics, where possible
10. Soils & Integrated Nutrient Mgt Systems
10.1 SOM loss, nutrient mining and land degradation at different scales
10.2 Strategies for INM including micronutrients, biofertilizers and efficient fertilizer use
10.3 Salinity mgt. and reclamation/utilization of saline lands
10.6 Cover crop mgt.
10.4 Characterisation and better utilization of below-ground diversity, soil biology
10.5 Develop sustainability indicators
10.6 Portable information tools for extenison/DSS for INM/IPDM
11. Watershed management
11.1 Landscape analysis, land use planning and watershed mgt incl. tools to locate hotspots of unsustainability
11.2 Develop systems of stakeholder involvement/institutional design for 11,1
11.3 Land mgt. impacts on hydrology (incl land leveling)
11.4 Biodiversity conservation at watershed level
11.5 Assess trade-offs between production efficiency and ecosystem health
11.6 Optimize fish/water productivity
12. Water use efficiency
12.1 Land use and cropping system design for optimum water productivity
12.2 Develop models and DSS to intensify cropping systems
12.3 Scale effect on water use efficiency and conjunctive use
12.4 Managing deficit irrigation
12.5 Water mgt . and crop/animal health
12.6 Agrochemical pollution and its health hazards
12.7 Equitable water distribution systems
13. Climate change & sustainable production systems
13.1 Regional impact assessment on current and potential production systems
13.2 Design carbon conserving systems in forestry and agriculture
13.3 Design Crop systems resilient to climate change
13.4 Alternative efficient sources of energy
14. Other
14.6 Participatory systems diagnostics
14.7 Stakeholder mobilization in feedback and diffusion processes
Output 4: Policy and socio-economic research
1. Governance & development policy
1.1 Participation of Ministries of Agriculture in rural policy framing and formulation
1.2 National and sub-national intergovernmental relations for agriculture and rural development
1.3 NARS governance and linkages with farmers and others beneficiaries
1.4 Institutional and Governance approches to rural development
1.5 Transition policies and institutions in the rural sector toward trade and market integration in the frame of trade blocks
1.6 International Science and Research Policy Unit
2. Markets for inputs and outputs
2.1 Uncertainty of international markets, price stabilization schemes and productions responses
2.2 Seed and soil fertility input systems: Avaliability of technology and the distribution of benefits
2.3 Marketing innovations to link farmers to markets
2.4 Developed and developing country trade policies and WTO agreements: Impacts on the rural poor
3. Institutions in support of competitiveness of the rural poor
3.1 Delopment of rural financing schemes
3.2 Public and private roles in the supply of technology, technology exchange and upgrading
3.3 Production of Optimal Level of Public Goods by and for CGIAR system
3.4 Technology adoption tracer study to gather concrete information and develop an inventory about what has worked and what has not worked. Approach would be based on gender-sensitive, qualitative consultation with farmers, to develop a profile of information about why some CG-developed technologies have been adopted and others have been rejected.
3.5 Privatization Effective functioning of extension services Certification systems and payment for environmental services
3.6 The limits of technological fixes to rural poverty
4. Opportunities for post-harvest value added and processing
4.1 Policies for the promotion of rural agroindustries
4.2 Policies for integration along agrifood chains
4.3 Public and private roles in enhancing grades and quality standards
4.4 Agribusiness development and market integration
4.5 Perspective analysis on post-harvest loss in developing countries
5. Policy and institutions related to NRM and sustainable agriculture
5.1Basic bioeconomic research on the impact of trade-offs between resource-conserving and high-input technologies on agricultural competitiveness, environmental quality and territorial development
5.2 Elaborate natural resources accounting practices for agricultural development projects, so that economic analysis take into account both agricultural competitiveness an environmental quality

	5.3 Coordinate sectorial policies and institutions for sustainable rural development based on territorially available resources and knowledge, by bringing together a range of actors for creative interaction
	5.4 Develop territorial information systems that expose interested parties to the complexities of real socioeconomic systems
	5.5 Incentive policies and strategies for sustainable NRM
	5.6 Institutional mechanisms to enhance sustainable NRM at different scales
	etc).
	5.8 Access by poor people to natural resources, especially LAND AND water: there are two sub-areas--designing water supply systems so they serve multiple uses (currently they are usually designed for single purposes like domestic or irrigation); and policies and institutions that will effectively support scaling up and out of known micro-technologies (Rainwater harvesting, soil fertility measures, micro-irrigation, etc). contralled access to natural resources (inorder not to have degradation)
	5.9 Institutional and regulatory factors affecting the development of environmental service markets.
	6.1 Household management of price and climatic uncertainty risk
	6.2 Managing of uncertainty risk associated with new technologies
6. Understanding rural households livelihood strategies	
	6.3 Using knowledge of household livelihood strategies to target agricultural research investments
	6.4 Policies and institutions to enhance the resilience of household livelihood strategies
	6.5 Policy & institutions to enhance adoption of new technologies
	6.6 reforms for policy of housholds & community strategies
7. Poverty maps and determinants of poverty	
	7.1 Poverty diagnostics and causal analysis
	7.2 Enhancing poverty impacts from agricultural research investments
	7.3 Using poverty analysis to inform national and regional poverty strategies
8. Approaches to rural development	
	8.1 Spatial aspects of rural development. Developing territorial cometiveness
	8.2 Rural development policies in developed and developing countries
	8.3 Institutional issues in rural development
	8.5 Analysis of the potential for ICTs to provide relevant agricultural information to poor farmers. Development of a set of information modules on issues like pest control, soil management, market strategies, etc.
	and evaluate novel policy instruments in support of rural innovation using approaches related to impact assessment for learning and change(ILAC)
9. Forecast of future of food, agriculture, natural resources, & rural societies	
	9.1 Natural resources degradation: impact on world food production
10. Intellectual property rights and poverty reduction	
	10.1Cost/benefit analysis of alternatives IPR aspects (patent protection, PBRs, etc) on plant genetic innovations
	10.2 Analysis of existing experiences at creating public-private partnerships for the exploitation of genetic resources
	technology interventions
	11.2 Understanding technology innovation processes and impact pathways
11. Research on impact assessment and evaluation	
	11.3 Institutional lerning and change (ILAC)
	11.4 Expost impact assessment for natural resource management research
	11.5 Measuring externalities in impact studies
12. Outreach to policy makers	
	12.1 Policy dialogue seminars
	12.2 Policy brief on selected themes
	12.3 Strengthening linkages between policy research and policy formulation
13. Other	
	13.1 Identifying countries and regions that are vulnerable to man-made or natural disaster; Rebuiding agriculture and livelihoods after disaster, crisis, and relief;
	13.2 Health issues and agricultural development
	13.3 Rebuiding agriculture and livelihoods after disaster, crisis, and relief
Output 5: Strenthening NARS and other rural institutions	
1. Training & capacity building in NARS	
	1.1 Comparative analysis of NARS Research Capacity (including forestry and Nat resource related research)
	1.2 Strengthening NARS capacity to deal with emerging issues in markets, trade policy, the environment, and biotechnology, including intellectual property rights (IPR) handling, and biosafety issues, among others
	1.3 Strenghtening NARS capacity in strategic analysis and priority setting
	1.4 Strengthening NARS input in policy dialogue through partnership with policy think tanks
	1.5 Strengthening of NARS capacity in social analysis. (This could be done through workshops led by CGIAR social scientists and further enhanced with a social research grants competition for NARS scientists, as well as by strengthinging partnerships between NARs and universities with stronger social science.)
	1.6 Exploiting research spill-overs for NARS design
2. Empowerment of farmers, their organizations, and communities	
	2.1 Strenghtening local government institutions and Farmers organizations
	2.2 Marketing innovations to link farmers to markets. Enhancing the performance of livestock marketing systems and competitiveness of smallholder livestock producersOptions for expanding market opportunities for smallholder producers; Improving participation in domestic and regional markets by smallholder producers

	2.3 Developed and developing country trade policies and WTO agreements: Impacts on the rural poor. Evaluating poverty and domestic market impacts of globalisation and trade policy changes on smallholder producers;Assessing the impacts of meeting food safety and sanitary and phyto sanitary (SPS) measures on the smallholder producers
	2.4 Links between ag research and empowerment of women and other marginalized groups
	2.5 Farmers organizations: adjustment to the new agriculture
3. Public-private partnerships	
	3.1 Optimizing partnerships in technology development and institutional governance
	3.2 Private participation in institutional governance
	3.3 Institutional mechanism for understanding technological demands from the private sector
4. South-South collaborations; regional and sub-regional partnerships	
	4.1 Identifying common research problems and opportiunities
	4.2 Identifying common research problems and opportiunities
5. Rural and agricultural knowledge and information systems	
	5.1 Facilitating access, sharing and synthesis of data, analysis, best practices, and lessons learned. Linking databases
6. Outreach to civil society	
	6.1 Public awareness and constituency building
	6.2 integrate the urban areas
7. Other: Improving Agricultural Innovation Systems at the sub-national, national, sub-regional and global levels.	
	7.1 Conceptualize and analyze the agricultural innovation system at the global through national innovation sub-systems.
	7.1 Financial sustainability in NARS
Output 6: Cross-cutting sub-activities	
1.Enhancing livelihood security	
	1.1 Design integrated farming systems resilient to climate change
2. Biosecurity	
	2.1 Integrate Biotechnology, Biodiversity and biosafety
3 Peri-urban food	
	3.1 Comprehensive anaylsis and development of peri-urban food production and delivery systems