

PILOT CASE STUDIES OF SELECTED SYSTEM PRIORITIES

Prepared for the Ex-Co Ad Hoc Committee on Funding System Priorities

By Alliance Deputy Executive

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Background - TOR & Process: The Ex-Co Ad Hoc Committee on Funding System Priorities has asked, through the Director of the CGIAR, that the Alliance Centers undertake case studies of four of the System Priorities. In consultation with the Chief Alliance Officer, the Chair of the Alliance Executive requested the Alliance Deputy Executive (ADE) to undertake the pilot case studies contained in this paper.

The priorities selected for study by the Ad Hoc Committee include:

1C: Promoting conservation of indigenous livestock

3A Increasing income from fruits and vegetables

4B Sustaining and managing aquatic ecosystems

5D Improving research and development options to reduce rural poverty and vulnerability

The Ad Hoc Committee asked the case studies to cover the following topics:

- a) the coherence of research activities;
- b) possible gaps, duplications, and overlaps;
- c) key developmental value of research activities;
- d) origin of funding.

All Alliance Centers with reported investment in each of the priorities were invited to participate in the study and provide the needed information while a coordinator for each case study was charged with pulling together the information and drafting the analysis (1C ILRI; 3A ICRISAT; 4B World Fish; 5D IFPRI).

This paper will first provide a brief executive summary of some of the major issues and findings emerging from this study, followed by the complete studies for each of the priorities.

Summary - Key Findings:

1. Investment by System Priority: Currently available information on research activities or investment by system priorities is only approximate and is not yet a sound basis for decision making. The Science Council (SC) has to be cautioned against using this information as an accounting framework. While the Alliance prepared this information at the request of the SC to provide us all with a first approximation of investment in the system priorities, more importantly the Alliance is using this information as a baseline for a process to seek self organization around the implementation of the priorities.

Since the priorities were adopted by the CGIAR only in AGM 2005, the MTPs prepared for review by the SC by June 2006 could not reasonably have been expected to radically restructure research agenda and organization around the system priorities, nor did the SC guidelines to the Alliance on the preparation of the MTPs clearly lay out any such expectation. In addition, the system priorities at this point are themselves broad thematic research areas rather than a clearly prioritized detailed research agenda. Since the SC has not yet worked through the current general priorities to a more specific research agenda, and is presumably leaving that to the implementation phase, again it is not reasonable to expect that the Center MTPs 2007-2009 would have fully incorporated the implementation of the system priorities.

Consequently, the fact remains that historically the centers have neither been organized thematically nor financially by the system priorities, and the full meaning of the priorities has not yet been sufficiently internalized to completely eliminate different judgments about which lines of research properly correspond to which priorities. For example, it is not clear that Generation CP research to develop new low cost methods for pyramiding genes in cassava actually corresponds to the research agenda anticipated by the Science Council (SC) under priority 5D-research on options to reduce rural poverty and vulnerability. Other examples of possible discrepancies between center understandings of the priorities and the SC's original intent could be cited.

Efforts are being made between the ADE and the Science Council to improve consistency in reporting by centers on investment by priority and this will be taken up at a meeting between the ADE and SC members before AGM06. In the meantime, although the estimates for 2007 may be indicative of some broad patterns, current data have to be treated with some caution. However, even more important than improving financial tracking of investment by priority, is for the Alliance to better self-organize its work around the priorities. Various processes are underway towards this end, among them the development and implementation of Alliance MTPs for Africa and ongoing work in the ADE as tabled with the SC in July.

2. Overlaps and Duplication: All four case studies find little or no evidence of significant overlaps or duplication in research. Although there is a widespread impression in some circles of frequent overlaps or duplication in research among centers, at least for these four priorities, the evidence does not support such a view. Specific research themes and ecologies differ substantially in center research for a single priority. As the Alliance

moves forward to organize its agenda more explicitly around the System Priorities, certainly there will be opportunities to take advantage of best practice research approaches from other centers working on a similar issue but in a different crop and different ecology. Likewise, there should be opportunities for some further specialization and division of labor, as well as opportunities for enhancing cross center critical mass for dealing with some issues by combining efforts. Nonetheless, there is little reason to expect that widespread or significant overlaps prevail.

3. Research Gaps: Some research gaps are explicitly identified, especially in conservation of indigenous livestock and management of aquatic ecosystems. However, while these case studies relying on a desk study of information from center MTPs can point out some major gaps, more detailed analysis of the intent of the priorities, and of the scope and scale of research to address these, would be required to provide more specific and prioritized identification of gaps.

The SC has signaled its intent to seek estimates on minimum levels of investment needed for each priority, and to some extent this may be seen as a tool to identify gaps. Information on research costs are, of course, useful, but this would be a patently insufficient approach to identifying gaps without a parallel effort to make some estimates of potential returns to investment in the system priorities. Gaps can not be identified through costs alone; benefits also need to be taken into account. While estimates of benefits from the different priorities is not without significant methodological difficulties, simply excluding expected benefits from consideration, as seems to have been the case so far, can not be a sound approach to decision making. Somehow, the system has to find a way to grasp this nettle in order to be able to effectively and rationally implement the priorities.

4. Coherence: Coherence is probably both more easily attained and observed in priorities of interest to a relatively restricted number of centers as illustrated by 1C & 4B. For other priorities, organizing system research around priorities provides a potential opportunity for centers working in similar areas to come together, with appropriate partners, to more systematically share methods and further enhance a coherent research agenda around the priority. It would not be expected that Alliance research that to date has been essentially planned on a decentralized level by each center would spontaneously result in a fully coherent strategy around priorities that had not been explicitly identified at the time that most of the research agenda had been initiated. As noted above, it would not be reasonable to have had such an expectation of center MTPs prepared scarcely months from the adoption of the priorities by the CGIAR. In this context, the degree of coherent coverage of the priorities is almost surprisingly good. Nonetheless, insuring even greater coherence now that the priorities have been endorsed by the CGIAR and identifying gaps by priorities should be formally undertaken by the Alliance.

To take advantage of this opportunity, work on the MTPs for Africa has advanced from the planning to the implementation phase and the intent of the ADE is to take further steps to initiate an exercise to enhance coherence around priorities at its November 2006

meeting. Such an exercise might need to consider coherence among system priorities. For example, operationally many centers have associated into a single research program work in conservation of genetic resources, genetic improvement for abiotic stresses, genetic improvement for nutritional quality and policy research on linking farmers to the seed market, combining all this related research into an integrated and coherent programmatic whole. While it is presumably not the intent of the system priorities to disassemble such coherent integration of research efforts, nonetheless if in the implementation process the system priorities are treated too much as stand alone entities (e.g. as a suite of parallel challenge or system wide programs), then there could be risk of reducing the coherence of system research.

5. Developmental Value of Priorities: There is clear developmental value described for each of the system priorities considered in the case studies. The SC certainly deserves credit for guiding the system to a set of priorities that so strongly and so consistently aligns with important development objectives.

6. Implementation: Implementation of the priorities is not an explicit part of the TOR of this study so it is not considered in detail here. It is clear, though, that the implementation process will require some considerable effort over a period of time. First, the priorities are currently at the level of general thematic areas within which an extremely broad set of activities could be undertaken. The priorities themselves need closer specification and linkage to more specific undertakings. This will certainly be an essential part of the implementation process over the next year or so. Second, some sense of the relative weights for investment among the priorities would seem to be essential. At the moment different priorities have different levels of investment. While this is quite right as a general principle, for the system to effectively implement the priorities some guidance or consensus on the relative importance of the different priorities is needed. Mechanisms for dealing with this issue seem not to have yet been identified.

Finally, in response to a welcomed and appreciated invitation from the SC to the Alliance to make an input to the design of the implementation process, the ADE forwarded to the Science Council on July 13 some deliberations on the way forward to implement the priorities, but has not received recognition or response from the SC. Without insisting that the ADE July 13 propositions are necessarily the only or even the best way forward to implementation, it is not constructive that this response has been overlooked. The ADE, under the leadership of the AE, AB and CAO, remains eager for engagement with the SC on implementation of the priorities.

Case Study System Priority 1C : Conservation of Indigenous Livestock

A) Summary of Center Involvement in MTPs 2007-2009

Table 1 Center investment in SP1C --- What, Where and With Whom

Center	Budget	Type	Environment	Collaborations
ICARDA	JICA in-kind contribution	phenotypic characterization and genetic selections of small ruminants in the dry areas	Non tropical dry areas	National partners in CWANA, ILRI, IPGRI, SGRP and JICA
IFPRI	743,000	policy and economic valuation	Global	ILRI, IPGRI
ILRI	4,746,000	molecular and phenotypic characterization leading to knowledge on genetic diversity, gene discovery, conservation and use,	Global	Universities (BOKU, Dublin, Goettingen, Hohenheim, Iowa State, Liverpool, Manchester, New England (Australia)), INRA, USDA, ICARDA, IFPRI, IPGRI, SGRP, FAO and NARs
IPGRI and SGRP	856,000	coordination with global processes and agendas, policy, socio-economic valuation, conservation and use strategies, knowledge and information management systems	Global	ICARDA, ILRI, IFPRI, FAO

Table 2: Key Center Specializations in Livestock species, environments and disciplines

Center	Livestock Species	Key Environments	Research Disciplines
ICARDA	Small ruminants: Sheep & goats	Non-tropical dry areas	Small ruminant phenotypic characterization and breeding
IFPRI	Generic	Global	Policy and Economic Valuation
ILRI	Cattle, Sheep, Goats, Chickens, Yaks	Global	Molecular Biology and Genomics, Animal Breeding, Markets, Evolution of Livestock Production Systems, Economic valuation, Knowledge management and Information, Conservation strategies
IPGRI and SGRP	Generic	Global	Coordination with global agendas and processes, policy, legal and institutional issues, conservation strategies, status,trends and valuation of diversity, knowledge management and information;

Table 3 Center investment in SP 3A, --- Sources of major funds

Center	Budget	Funding Sources
ICARDA	JICA in-kind contribution	JICA, Japan
IFPRI	743,000	
ILRI	4,746,000	Unrestricted donors; Austria, China, India, European Union, Germany, Global Environment Facility (UNEP and UNDP), USAID, USDA, Wellcome Trust
IPGRI and SGRP	856,000	Restricted donors to SGRP (World Bank, Switzerland, Canada, Japan, Norway, Sweden, Rockefeller Fdtn.)

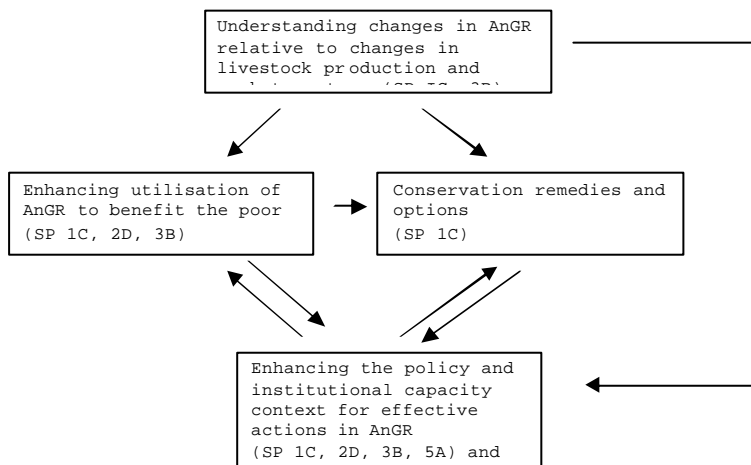
The Coherence of Research Activities

System Priority 1C, focusing on the conservation and use of indigenous livestock, was setup to address a number of global problems. These include: a rapid loss of livestock diversity and poor knowledge of the value of local breeds and strategies for maintaining and using them, including weak human and institutional capacity and poor policies. Within this SP, three specific goals were identified:

1. Molecular and phenotypic characterization of indigenous livestock (including an analysis of relatedness)
2. Influence the establishment of policies that support exchange, use, development and conservation of livestock diversity
3. *In situ* and *ex situ* conservation options are assessed and identified

In May 2006, members of the Science Council, ILRI, ICARDA, IPGRI/SGRP and FAO (Animal Division (AGA) and the Commission on Genetic Resources for Food and Agriculture) met to develop a framework plan for Animal and Fish (SP1D) genetic resources. A series of four linked outputs were proposed for the animal genetic resources framework plan (Figure 1). These outputs also have strong linkages with SPs 2D and 3B.

Figure 1: Key outputs for livestock genetic resources and their interrelationships



This framework places livestock genetic resource conservation in two broader contexts. The first is within the broader livestock production and marketing system which is critical for understanding the role of livestock genetic resources relative to other components of a production system and also identifies the key role of market demand in influencing genetic selection. The second is to place livestock genetic resources within a broader agricultural genetic resources context. It should be noted that there are important differences in livestock genetic resources relative to plant genetic resources. Two key differences are the relative role and ease of *in situ* versus *ex situ* conservation and the international policy dynamic, since in livestock, unlike plants, geneflows are overwhelmingly from north to south.

The niche of the CGIAR system is to provide public good research results for international application. In this regard, it has an important role in:

- molecular and phenotypic characterization and gene discovery with ARI and large NARS;
- targeting and future forecasting of genetic resource hot spots for conservation and use decision making by FAO and governments
- methods for assessing drivers of change and needs/value for conservation
- strategies and methods for *in situ* conservation and use including practical breeding strategies with national partners and community based groups;
- assessing and identifying *ex situ* options with international, ARI and NARS partners;
- and providing research evidence for international agreements, policies and actions to FAO and intergovernmental processes.

Possible Gaps, Duplications and Overlaps

Given the limited resources devoted to livestock genetic resources relative to the research needs identified, there are multiple gaps and essentially no duplications and overlaps between different Centres in the identified CGIAR agenda. Duplication and overlap issues, when they exist, are more likely to be in coordination between the FAO, ARIs and national partners rather than within the system. SGRP plans to put a greater emphasis in the area of animal genetic resources to improve linkages between CGIAR research efforts and the international conservation agenda.

At a global level, ILRI in collaboration with ARI and NARS partners provide research information on characterisation into the overall global effort to understand threats to livestock diversity coordinated by FAO. This work has been helpful in identifying centres of origin of different livestock species but is insufficient to give a detailed picture of what livestock genotypes and phenotypes are under threat and should be a priority for conservation or how system changes are linked to changes in livestock diversity to improve targeting and future foresight to guide current and future conservation efforts. ILRI has been working with a number of ARIs on genetic diversity studies. There has been good collaboration and sharing of information between the different parties but variations in molecular characterization methods often preclude the combining of information effectively. Some NARS, particularly larger ones, want to build their capacity in characterization and targeting conservation efforts of their indigenous livestock resources. ILRI has recently begun working with China and India in that regard. This will be an important area of coordination in both the ESA and WCA regional MTPs but conservation of livestock genetic resources is not an important feature of the SSA-CP. Understanding the rate of genetic changes in targeting of conservation efforts within a broader livestock systems evolution context is an important area to be addressed in the near future. Coordination and improvement of knowledge management and information systems will be important as more actors and information become available.

The identification of key genotypes of value within indigenous livestock has enormous potential. The recent and on-going work in sequencing different livestock species followed up by functional genomic applications will speed this process. Within the CGIAR, ILRI has been involved in agreements with international consortia working on livestock genomics for different species. Within its own labs, ILRI has done considerable work on selection and gene discovery for disease resistance for trypanosomiasis in cattle and helminthosis in sheep. The relative role of CGIAR centres relative to other actors in gene discovery can be reviewed from time-to-time but at present the focus on traits for the most important diseases affecting poor livestock keepers

in vulnerable environments seems reasonable. Important linkages with ARIs and others on gene discovery will be important so that maximum benefits can be derived from this work, even beyond genetic improvement to vaccine and drug development.

Methods for phenotypic characterisation and selection remain critical for evaluating production traits. ICARDA has been focusing on phenotypic production traits in small ruminants in CWANA with NARS partners and it will continue to expand coverage of this work to countries where characterization has not yet been conducted. ICARDA plans to include a molecular characterization component to this work in collaboration with ILRI. While understanding breed improvement is important, there is a major gap at present in translating this knowledge to the management of practical breeding schemes for resource-poor farmers to make sure they have access to improved genotypes. ILRI and ICARDA are both expanding their individual and collaborative efforts in this regard, focusing on method development for application by NARS and other groups and how this can be linked to the scaling out of practical breeding programmes for poor livestock keepers. The focus of this work will be in harsher environments where indigenous animal resources will remain the key strategy for vulnerable livestock producers.

There are enormous gaps in information on conservation strategies for livestock relative to plants. *In situ* conservation efforts predominate but key issues of understanding and quantifying conservation incentives remain as well as basic information on loss of genetic diversity to better understand the costs and benefits of conservation investments. This is an important area for the CGIAR in which there are important potential synergies for working together (SGRP, ILRI, IFPRI, IPGRI, ICARDA). One important area of progress has been on economic valuation of genetic resources, in which SGRP, IFPRI and ILRI have worked together to develop valuation methods and apply them in different crop and livestock systems. Project plans are underdevelopment to strengthen these activities to better understand the status and trends of livestock biodiversity and link this to evidence for conservation actions. To this end, ILRI and national partners are beginning a 10-year study on these issues with national partners in West Africa on conservation of endemic ruminant livestock funded by the GEF with IPGRI as a partner. This is an important area for gains for system coordination on best practice technical methods and applications linked to economic assessment, improved institutional capacity and arrangements and more supportive and consistent policies.

There are a number of key livestock genetic resource issues at international level where the CGIAR could play an important role as a provider of research evidence. These are areas in which different international actors are uncertain of priorities and strategies. One such area is in *ex situ* conservation. At present there is no organized *ex situ* conservation efforts on a large scale and future decisions need to be guided by research evidence into potential benefits and options (semen or embryo banks, DNA banks, etc.). SGRP coordinated an international meeting on this topic in which ILRI and ICARDA participated but there is no consensus at international level on future actions as yet. The issues of international treaties for livestock genetic resources are much less clear and less pressing than for plants. Most of the gene flows are from north to south so there is less interest on issues such as access and benefit sharing. Beyond research evidence, the Centres and SGRP, in coordination with FAO, can make a contribution to knowledge and information management systems to support international and national conservation actions and strategies.

Key Developmental Value of Research Activities

The key developmental value of research efforts is to systematically conserve and use genetic resources that have been selected over the millennia for the benefit of poor livestock keepers. The relative importance of indigenous livestock increases with the variability and harshness of the environment. In many marginal areas, the use of indigenous livestock resources is a critical livelihood strategy. Clearly livestock and livestock products are important high-value products and thus they offer an important route for improving incomes for producers, labourers and market agents linked to activities under SP 3B. Depending on the environment indigenous livestock can be used in either intensification or diversification strategies.

Other global public good benefits are likely to accrue from the conservation of livestock diversity. These need to be better quantified and incentives for conservation better understood so that appropriate private and public responses can be formulated. It cannot be automatically assumed that poor people will conserve livestock diversity and where there are gaps, priorities and incentives for public investment will need to be assessed and articulated.

Case Study --- Systems Priority 3A : Increasing Income from Fruit and Vegetables

A) Summary Position of Center Involvement in MTPs 2007-2009

Table 1 Center investment in SP 3A, --- What, Where and with Whom in the CGIAR¹

Center	Budget	Type	Environment	CGIAR + Collaboration
CIAT	981,000	Tropical fruit, vegetables, biofuels, aromatic plants	Tropical Latin America and generic horticultural whitefly environments	IPGRI, SW-IPM
CIMMYT	203,000	Special trait maize, vegetables	Global	Harvest Plus, RWC
CIP	1,623,000	Potato	Horticultural systems in S. and SE. Asia, LAC and highland SSA, Andes	AHI, RWC, Urban Harvest
ICARDA	1,043,000	Fruit, nuts, vegetables, oil, medicinal, spice crops and protected agriculture	Temperate dry areas of CWANA and LAC	Water and Food CP, AVRDC
ICRAF	2,202,000	Tropical tree fruit crops	Global	CIFOR, IITA, ICRISAT, ASB
ICRISAT	3,197,000	Fruit, pulses, vegetables, biofuels, cosmetic and medicinal crops	Semi-arid tropics of S. Asia and SSA	AVRDC, ICRAF, DMP, IWMI
IFPRI	1,527,000	Generic	Global	Alliance
IITA	1,510,000	Tropical tree fruit crops, vegetables	SSA Humid & sub-humid tropics	AVRDC, ICIPE CP SSA
IPGRI	1,493,000	Tropical and temperate fruit and nuts, coconuts, cosmetics, vegetables	Global	ICWG-GR, IITA
IWMI	1,083,000	Fruit and vegetables	Global (Urban/peri-urban and waste water, West Africa, South Asia and Southeast Asia)	CIP (Urban Harvest), ICARDA, AVRDC, ILRI, CPWF and SWIM-2
WARDA	260,000	Vegetables	SSA Wet lowlands	IVC, AVRDC, IITA
SSA CP	346,000	Fruit and Vegetables, Fruit tree crops	SSA: All three PLS - Kano-Katsina-Maradi - Zimbabwe-Mozambique-Malawi, and - Lake Kivu region	Alliance

¹ All centers are collaborating with multiple NARES and ARI partners in addition to the CGIAR, SWEPs and affiliated centers

Table 2: Key Center Specializations in Crops, Environments and Disciplines

Center	Key Types	Key Environments	Research Areas
CIAT	Avocado, Mango, indigenous andean fruits (<i>Solanum quitoense</i> and <i>Rubus glaucus</i> , <i>Solanum betacea</i>), and generic vegetables	Humid tropics in LAC and whitefly environments	Best agricultural practices and IPM/Virus control
CIMMYT	Special Trait Maize, vegetables	Global, Indo-Gangetic Plain	Breeding, crop diversification
CIP	Potato and sweet potato (Horticultural vegetable)	SSA Tropical highlands, irrigated and humid South Asia, LAC horticultural systems, SE Asia cool weather upland horticulture systems, Andes	Breeding, ICM, seed supply and market chain development
ICARDA	Olive, Pistachio, Pomegranate, Date palm, Aliums, Salad vegetables, Spices, Melons	CWANA temperate dry areas with supplemental irrigation	Crop systems diversification and marketing
ICRAF	Fruit trees, Shea (Butter), Biofuel trees	Global	Germplasm, domestication and marketing
ICRISAT	Biofuel crops and trees, Zizyphus spp. Pulses, Salad and Leafy Vegetables, Sesame	SSA and S Asia under either supplemental irrigation or water harvesting schemes	Crop systems diversification and marketing
IFPRI	Generic	Global	Policy
IITA	Musa, Cocoa, Coconut	Humid and sub-humid SSA	Crop improvement and marketing
IPGRI	Musa, Coconut, Prunus Africana, African Leafy Vegetables, indigenous and underutilized crops	Global	Biodiversity categorization, use and conservation; dietary diversity and nutrition
IWMI	Generic fruit and vegetables	Urban/peri-urban and waste water sites	Policy and environment
WARDA	Generic fruit and vegetables	Low lying, water rich environments in SSA	Crop systems diversification and marketing
SSA CP	Generic fruit and vegetables	SSA Pilot Learning Sites: - Kano-Katsina-Maradi - Zimbabwe-Mozambique-Malawi, and - Lake Kivu region	Crop systems diversification and marketing

Table 3 Center investment in SP 3A, --- Sources of major funds

Center	Budget	Funding Source
CIAT	981,000	Colombia, Rockefeller foundation, Austria, BMZ, Belgium,
CIMMYT	203,000	Canada, Germany, Nippon Foundation, Harvest Plus
CIP	1,623,000	Core, IFAD, Belgium, Canada, Australia, USAID
ICARDA	1,043,000	AFESD, IFAD, USAID, GCC
ICRAF	2,202,000	USAID, Sweden, Belgium, CFC
ICRISAT	3,197,000	UNEP, USAID, DFID, India, Finland and Canada
IFPRI	1,527,000	ACIAR, Bill & Melinda Gates Foundation ,Canada, Denmark, EC, Ford Foundation, Germany, Austria, EU, GIG, Japan, Netherlands, Switzerland, USAID
IITA	1,510,000	
IPGRI	1,493,000	UNEP, Switzerland, Netherlands, Japan, IFAD
IWMI	1,083,000	BMZ, EU, Denmark, Netherlands, Switzerland
WARDA	260,000	EU, USA, AfDB, Japan
SSA CP	346,000	FARA

The Coherence of Research Activities

System Priority 3A was identified by the Science Council on the grounds that the growth of fruit and vegetables (broadly defined in this paper to include nuts, fruit trees and biofuel crops/trees)² would allow poor farmers the opportunity to derive additional income and increasing enterprise stability in the face of natural shocks through crop diversification. This would enable them to move away from reliance on staple cereals, pulses and starch crops and through diversification of their cropping systems into high value commodities would help them make the transition from subsistence to market-oriented agriculture. SP 3A specifically excludes tea, coffee and cotton. The value of fruits and vegetables should be also seen for their strategic role in improving the diets of people around the world. For instance, East and Southern Africa is the region with the world's lowest intake of fruit and vegetables with a mean consumption in most countries of less than half the WHO's recommended daily intake. Low fruit and vegetable intake is as a main contributor to micronutrient deficiencies and a key risk factor for cardiovascular diseases and some forms of cancer.

Though some of the crops being considered have had quite a long history of work by CGIAR centers eg. Musa (IITA, IPGRI), a new emphasis has now been created to bring about improved livelihoods of small-scale growers, often operating in disadvantaged environments. In addition, there are also new areas of work based on neglected and under utilized traditional crops. It is recommended by the SC that the species of fruit and vegetables under study be determined largely through pro-poor criteria. As is evident

² It is noted that there remains some inherent overlap with SP 3D but for purposes of this review *Cacao* fruit, *Jatropha* seed, Banana etc. are deemed to be in the fruit and vegetables category and likewise sweet sorghum for biofuel and special trait maize

from the data presented in Tables 1 and 2, the range of types of product now being allocated research effort by the Alliance of CGIAR Centers is extremely diverse. Yet the logic of each individual center's choice may be assumed to be largely evident in that they are responding to either the specific geographic and environmental zones (CIAT, ICARDA, IITA, WARDA, ICRISAT) with which they have been mandated or are responding to their generic disciplinary mandates (IPGRI, IFPRI, ICRAF, IWMI) or their original crop mandates (CIP, ICRISAT, ICARDA, IITA etc.).

It is also evident from the data given in Table 1, and in the detailed MTPs, that in most cases centers are extensively using partners (from the greater CGIAR system, NARES or beyond) to provide expertise where the existing center staff cadre is lacking. For example, WARDA is availing itself of broad expertise through its Inland Valley Consortium (IVC) which includes 5 other Alliance or affiliated centers (IITA, ILRI, IWMI, World Fish and World Vegetable), multiple NARES organizations in west and central Africa, ARIs (CIRAD, Wageningen University, FAO) and SROs (CORAF). WARDA themselves may not yet have sufficient specific expertise in the good agricultural practices of vegetable production in wet, low lying, flooding environments but they are working with farmers who have a need to diversify their rice-based enterprises. Therefore it is appropriate under SP 3A for them to be involved in the horticultural diversification aspects of rice-based systems in partnership with their host NARES organizations and other IVC members. In the case of WARDA, this must therefore be deemed to be part of a coherent research program for small-scale, disadvantaged farmers in those wet areas where rice is the dominant staple cereal.

Given this example, is there coherence then with other centers working on vegetables in west and central Africa? The answer is probably yes: IPGRI and ICRISAT are both working in similar West African countries to WARDA but their ecological niches (rainfed water harvesting systems and trickle irrigation systems with ICRISAT) and disciplinary areas of specialization (biodiversity use and conservation --- IPGRI) are entirely different thus making the research complementary rather than competitive with WARDA. Moreover, all three center research efforts are further linked through their NARES and other key partner networks such as AVRDC, the SSA CP and the WCA Regional Medium Term plan. The latter mechanism also helping to identify and eliminate any potential serious overlaps during the preparative discussion phase.

Possible Gaps, Duplications and Overlaps

The recent report of the CGIAR Sub-Saharan African Task Forces strongly suggested that there were multiple overlaps and duplication amongst the research efforts of the Alliance Centers. This suggestion emanated from a survey which showed multiple centers working on the same crop and even sometimes in the same country. For example, IITA, CIMMYT, ILRI and IFPRI would all have been reported to be working on maize in sub-Saharan Africa but it is clear now that their efforts on breeding, agronomy, stover amount & quality and policy respectively are both coherent and complementary. Subsequent observations of this type have rather discredited the common notion of extensive overlaps and duplication. Further detailed analysis of the current MTPs in the preparation of this paper only goes to suggest that such the perception of chronic overlaps is essentially erroneous in the subject area in question.

Is duplication of effort and overlaps in perceived responsibility a serious issue in SP 3A? The information presented in Table 2 suggests, at a broad-brush level, most of the potential areas where key crops are shared (eg. *Musa*, *Cocoa*, leafy vegetables etc.) are clearly discriminated between themselves by their associated key research area and geographic environments and are thus not overlaps. For example, ICRAF is clearly involved in the collection and potential improvement of *Jatropha* germplasm in sub-Saharan Africa. Whereas, ICRISAT is also involved in the use of *Jatropha* species. However, ICRISAT is only using those species native to south Asia and available from the Indian NARS which are being employed to provide alternative livelihoods for extremely poor landless people in semi-arid environments. Rather than being concerned at a potential overlap, it would be hoped that soon both research programs would be able to interact more intimately and thus learn from each other's experiences. It should be recognized that the SP 3A programs are largely new and it will take some time for sufficient program maturity to be achieved to allow such fruitful interchanges. Owing to this

newness of the SP 3A programs at most centers, it must be assumed that there still remains a risk of some future overlap between centers activities but it is not yet apparent in the information presented at MTP level by the Alliance Centers. Recent much improved communication between Alliance centers, such as at the level of the Alliance Deputy Executive, helps ameliorate the risk of unnecessary duplication which can now be spotted early and then dealt with through amicable negotiation.

Possible gaps is an area where there is much more scope for germane hypotheses. For the purposes of this paper and gap analysis: it is assumed that a budget envelope of \$15-20 million per year is realistic within the existing MTP time threshold 2007-2009. What is most importantly missing at present is guidance from the Science Council on what might be an effective upper limit to the proportion of funds which a center might allocate to this specific mandate-stretching priority. Priority 3A is essentially open-ended in terms of commitment due to the multiplicity of alternate fruit and vegetable species that might be considered. However, if the proportion of budget expenditure becomes too great for this priority then it could seriously compromise the execution of the center's core mandated activities which one assumes must still remain the main *raison d'etre* of a center. At present, the maximum amount allocated by each center does not exceed *ca.* 10% but if this were to exceed 20% in a traditional crop mandated center it would then perhaps become of serious concern.

Another important issue for this analysis regarding duplication is the current presence of unintentional overlaps amongst the various SC Priorities themselves. As an example ICARDA with its partners is researching protected agriculture systems to grow vegetables with reduced water use (soil-less culture and drip systems) in such countries as Yemen and Afghanistan. This research provides options designed to reduce rural poverty and vulnerability while yet improving water productivity. This therefore can presently be equally well categorized under any of the following SC Priorities 3A, 4C or 5D. This type of overlap, without much more specific guidelines from the SC, might be seen to compromise the validity of the current exercise in its current articulated form by each of the 20 priorities. It is a common problem presently and many other examples could be cited.

An old historical gap, which might be worth some re-analysis at this juncture, is the fact that at present, it seems permissible for centers to work on *Cacao*, but yet not on coffee. Yet, these crops will often share a common ecological niche. They are both also similarly commercial crops supported by the private sector. For example, for *Cacao* via the Tree Crops Consortium (IITA etc.) which includes major multinational companies such as MARS. Likewise, in many dryland cropping systems, as experienced by centers such as ICARDA and ICRISAT, cotton is the dominant crop with a back up support structure in the commercial or government sector providing seed, nutrients, extension information, marketing support etc. Rather than prohibit cotton's inclusion, as has been historically the position in the CGIAR, it might be more sensible to consider embracing its study, at least at system level, to then allow small-scale farmers growing traditional cereals and other rotational crops to be encouraged to benefit more from a closer association with the existing commercial infrastructure.

An evident gap is in research for development of niche markets for traditional crops and products. This would involve development of policies and institutional arrangements to link small farmers successfully to markets and trade. Increased efforts are needed in researching and developing efficient and sustainable value chains for traditional foods with new marketing channels, added-value products, timely supply of information and efficient supply chains and distribution of products. This work will require new strategic alliances and partnerships, and will involve transformation of farmer groups into sustainable business associations with strengthened purchasing and selling power and enhanced capacity for networking/communication with other stakeholders.

Furthermore, an obvious research gap that exists is presently found in the present lack of information on ways of assessing the potential contribution to human and animal nutrition of vegetable and fruit crops and their residues. The SC documentation for this priority is presently somewhat restricted to income. Whereas more abundant availability of fruit and vegetables for consumption in subsistence communities may have a substantially greater development impact via nutrition, particularly amongst women and children, and in disadvantaged environments than merely increasing income to the household. At present, little is known about the effective digestibility and food value of, particularly, indigenous

vegetables in complement to meals of traditional starch and cereal foodstuffs. Such expertise will be needed in areas where malnutrition is a major factor in rural communities such as in CWANA, LAC, S. Asia and SSA (particularly in the latter where today's consumption rates are very low).

Key Developmental Value of Research Activities

In consequence of the preceding paragraph, it may be assumed *a priori* that a substantive contribution towards the MDGs which is played by this research area is its contribution to overcoming malnutrition. This conclusion is therefore in full harmony with the objectives and aspirations of System priority 2C and the work of the Harvest Plus Challenge Program. The work of the CP being presently largely restricted to biofortification and biodetoxification of crop staples. The additional benefit to the diets of vulnerable groups such as infants and nursing mothers of extra fruit and vegetables, in addition to better quality cereals and starch crops, is probably much more than merely additive.

As the current *raison d'être* of System Priority 3A is to provide additional income to disadvantaged farming communities, it is logical to assume that this is one way in which farmers can fight their way out of the poverty trap. Research is a vital component for ensuring that such a substantive increase is attainable. For example, a farmer practicing horticulture in Nepal will often find that potato is the most profitable and highest value component of his system. Suitable research back up is thus a necessity for such a farmer if catastrophic disease or insect damage is not to be the factor that precludes his economic liberation from the poverty trap.

Furthermore, one important component of the new research area is the ability for farmers to diversify their agricultural systems and therefore, one assumes, also permits a reduction in the overall risk which they may have been running previously by mono-cropping or its close equivalent. This is a benefit to farmers but it can only be practically sustained if there is sufficient research and information transfer on good agricultural practices to ensure that farmers avoid the pitfalls of growing crops without sufficient experience to ensure good and consistent productivity.

Happily, examples are now common in certain areas of the developing world, such as in South Asia where centers and their partners (eg. ILRI, ICRISAT, CRIDA/ICAR, BAIF in the Watersheds Consortium at Kothapally village in Andhra Pradesh) have used all their combined knowledge and resources of their recent MTP outputs to together, over only a five year period, have had a very substantial impact on development. This includes the tripling of incomes, increased forage availability and quality, improved livestock performance, substantially diversified farming systems (including fruit and vegetables) and allowed many farmers to adopt new entrepreneurial enterprises. These now include vegetable marketing, vermi-compost sales, truck transporting and many others. This is the true measure by which research outcomes should be assessed---- across a full spectrum of a center and its partner's activities.

Likewise in ESA, traditional fruits and vegetables are usually well adapted to local conditions and farmers have good knowledge of their cultivation and use and they are liked by the local population. Yet, markets in developing regions have been frequently developed by entrepreneurs unfamiliar with such traditions, and a population wanting to modernize quickly often holds such foods in low esteem. This is an area highly strategic with regard to research for development. For example, IPGRI and its partners have explored the extent of the potential of leafy vegetables in Kenya, where a combination of improved supply of 13 species, promotion of their nutritional benefits to consumers, and other work along the entire value chain has resulted in a substantive increase in sales (in 2003, 31 t of traditional leafy vegetables were sold through supermarkets in Nairobi; this figure rose to 400 t per month in 2005, without a significant drop in price as a result of such interventions).

Livelihoods are so complex that proposed options to leverage the poor out of poverty inevitably comprise a spectrum of outputs that contribute to development. These need to be addressed collectively rather than as individual discrete issues. Priorities, while useful as a means to an end, should not limit the broader vision required to impact successfully on livelihoods. Therefore, it is vital that the comments in

this paper should be seen in such a broader perspective rather than in a narrow particulated view of each of 20 system priorities individually.

Case Study System Priority 4B

Sustaining and managing aquatic ecosystems for food and livelihoods

A) Summary of Center Involvement in MTPs 2007-2009 (data for 2007 only)

Table 1 Center investment in SP4B --- What, Where and With Whom

Center	Budget	Type	Environment	Collaborations
IFPRI	196,000	IFPRI to complete	Global	National partners; International Assessment of Agricultural Science and Technology Development, UNEP Global Environmental Outlook
IWMI	2,270,000	Water allocations in basins; Water management to reduce poverty; Transboundary and Interstate Water Management; Environmental flows and environmental water requirements; Dam management for improved livelihoods and environment; Sustainable use of wetlands; Wetland inventory and assessment Agriculture wetland interactions	Global Africa Asia East and West Africa South Asia Global SE Asia South Asia East and Southern Africa Sri Lanka Southern Africa Global Sri Lanka	Approximately 30 National partners in project countries, including National Agricultural Research Institutions, National Universities and National Environmental Agencies; International Organisations (FAO, Ramsar Convention on Wetlands, World Conservation Union (IUCN), other universities and research centers (Wageningen University, Center for Ecology and Hydrology CEH, (UK), Danish Hydraulic Institute (DHI), ZEF, SEI), IFPRI, ISNAR
WARDA	890,000	Development of databases and decision support tools for inland valley intensification; integrated natural resource management technologies for increased inland valley productivity; valuating local management of natural biodiversity as a common resource; testing alternatives for agrochemical use and their impact	West Africa	Five CGIAR centers are members of IVC: Africa Rice Center, IITA, ILRI, IWMI and WorldFish. The following NARES are members of IVC: INRAB n Benin; INERA in Burkina Faso; IRAD in Cameroon; CNRA in Côte d'Ivoire; SARI and CRI in Ghana; IRAG in Guinea; IER in Mali; NCRI in Nigeria; LWDD in Sierra Leone; ISRA in Senegal; IRAT in Togo; and NARI in The Gambia. The sub-regional organization CORAF, the UN organization FAO and the ARIs CIRAD, ITC, and Wageningen UR are international members of IVC.

WorldFish	7,770,000	<p>Governance of aquatic resources (in particular the fisheries sector); Ecological assessment of aquatic ecosystems and fisheries in data poor environments Tools for diagnosing constraints to improved fisheries Pro-poor income diversification through use of fisheries and aquatic resources; Community based rice-fish culture; Community-based fisheries management</p> <p>Assessing environmental impact of aquaculture Breeding and restocking of marine invertebrates</p>	<p>Africa, Bangladesh, Mekong Mekong</p> <p>Africa, Asia, Pacific</p> <p>Africa and Asia</p> <p>Bangladesh, China Africa, Bangladesh, Indonesia South-East Asia Africa, Asia Pacific</p>	<p>National partners in project countries; Universities and training institutions (Asian Institute of Technology, Can Tho, Nong Lam, Syiah Kuala University, Indonesia; Univ. of Philippines Marine Science Institute); International Organisations (FAO, NEPAD, AU, FARA, Mekong River Commission, Secretariat of the South Pacific Community, World Conservation Union, WWF); NGOs (multiple); IWMI, IRRI, IITA,</p>
CPWF	2,143,000	<p>Integrated fish-crop production technologies – pro-poor income improvement Fisheries management systems Economic valuation of ecosystem goods and services Assessment of ecosystem water requirements Wetland management Wetland valuation Environmental flow accounting</p>	<p>India, Bangladesh, Mekong</p> <p>India, Mekong, Africa Global</p> <p>Global</p> <p>Southern Africa Southern Africa BFP basins, Global</p>	<p>WorldFish, IWMI, IRRI, NARES (multiple, including many universities), NGOs (multiple), University of Bergen, CSIRO, IRD, UC Davis, SEI, IUCN</p>

Table 2: Key Center Specializations in Aquatic Ecosystem, environments, and disciplines

Center	Aquatic Ecosystems/Issues	Environments/Scale	Research Disciplines
IFPRI	IFPRI to clarify	IFPRI to clarify	Modeling tools for land use and crop production systems.
IWMI	Inland and coastal wetlands, lakes and rivers; Infrastructure design and management	Global –	Spatial analysis, Wetland ecology, Hydrology, Livelihoods analysis, Ecological economics, Water governance and institutions, Economics, Environmental science, Customary and transboundary water law; Environmental impact assessment; Environmental flows, Environmental water requirements;; Wetland inventory; Economic valuation of wetlands services/trade-off analysis
WARD A	Inland valleys	West Africa	Decision support tools for inland valley intensification; integrated natural resource management: optimizing natural resource use; valuating local management of natural biodiversity as a common resource; Testing alternatives for agrochemical use and their impact
WorldFish	Inshore coastal ecosystems, lakes, rivers and floodplains; small scale fisheries	Africa, Asia, Pacific	Governance of aquatic resources (in particular the fisheries sector); Ecological assessment of aquatic ecosystems and fisheries in data poor environments; Tools for diagnosing constraints to improved fisheries; Pro -poor income diversification through use of fisheries and aquatic resources; Community based rice-fish culture; Community-based fisheries management; Assessing environmental impact of aquaculture; Breeding and restocking of marine invertebrates
CPWF	Water productivity enhancement	Focal basins of CPWF	Integrated fish-crop production technologies – pro-poor income improvement; Fisheries management systems; Economic valuation of ecosystem goods and services; Assessment of ecosystem water requirements; Wetland management; Wetland valuation; Environmental flow accounting

Table 3 Center investment in SP 4B, --- Sources of major funds

Center	Budget	Funding Sources
IFPRI	196,000	Canada, Denmark, EC, Ford Foundation, Bill & Melinda Gates Foundation, Germany, Sweden, Switzerland, USAID, and Unrestricted
IWMI	2,270,000	Government of Austria, Global Environment Facility, CGIAR Challenge Program on Water and Food; Government of Taiwan and Core
WARDA	890,000	Netherlands, World Bank, CFC, and Unrestricted
WorldFish	7,770,000	ADB, Australia, Canada, EU, IFAD, Netherlands, New Zealand, Norway, Sweden, United Kingdom, World Bank
CPWF	2,143,000	Denmark, EU, France, IFAD, Netherlands, Norway, Sweden, Switzerland, United Kingdom, World Bank

The Coherence of Research Activities

System Priority 4B focuses on the importance of aquatic ecosystems in supporting livelihoods, notably through the harvest of resources from these ecosystems and in particular fisheries which normally represent the single most important harvestable wild resource. A better understanding of governance, trade and inter sectoral linkages, and development of innovative ownership and management arrangements, have been identified as crucial to improving management of these resources and to enhancing their value for the rural poor in particular. SP4B proposes that “priority be given to research on governance and management systems that will sustain and/or improve livelihood benefits to the poor from these ecosystems, and on the provision of information on the value and management requirements of aquatic ecosystems and their resources”.

On this basis SP4B identifies a General Goal: “to safeguard and enhance the livelihoods of the poor through sustaining and augmenting the value of aquatic ecosystems and their resources”, and two specific goals:

1. Identification of viable governance and management systems that sustain aquatic ecosystems and increase the sustainable benefits that poor households derive from these ecosystems and their resources;
2. Develop tools for biological assessment of aquatic ecosystems and their resources, valuation and management in data poor environments and development of the capacity to use and apply them.

Under specific Goal 1 the development of methods and approaches and comparative studies across region and ecosystem types are expected, including research on property rights, management systems, incentives, controls and compliance, pro-poor income diversification and improvement, poverty mapping, assessment of constraints, and alternative livelihood options.

The research activities planned for 2007 under SP4B address many of the specific issues envisaged under Goal 1. These include substantial investments in research by WorldFish on property rights and governance, management systems, pro-poor income diversification and improvement, assessment of constraints and alternative livelihood options; by IWMI and CPWF on wetland livelihoods analysis, and customary and trans-boundary water law; by the CPWF on integrated fish-crop production technologies, fisheries management, and the influence of macroeconomic and trade policies on environmental and ecosystems outcomes; and by WARDA on decision support tools for inland valley intensification and management technologies for increased inland valley productivity. This provides a diverse array of research activities making a contribution to achieving the Goal 1 of SP4B. In the absence of a more targeted and quantitative goal it is difficult to conclude other than these activities do indeed constitute a coherent investment.

Under specific Goal 2 research is expected on fisheries stock assessment, assessing the value of fisheries and other aquatic resources in contributing to poverty alleviation and the wider economy, determining water quantity and quality regimes to sustain fisheries and other ecosystem benefits, assessing impact on aquatic ecosystems and fisheries of basin level processes, and information sharing geared to management action including through rapid assessment tools.

The research activities planned for 2007 under SP4B also address many of the specific issues envisaged under Goal 2. These include investments in research by WorldFish on valuation of aquatic resources in particular fisheries, more broadly on ecological assessment of aquatic ecosystems and fisheries, breeding and restocking of marine invertebrates, and assessing the environmental impact of aquaculture; by IWMI on environmental flows, environmental water requirements, and dam management, on decision support

tools for water quality, and on economic valuation of wetlands services and trade-off analysis; by the CPWF on economic valuation, and environmental flows; and by IFPRI on modeling of land use and production systems. This provides a diverse array of research activities making a contribution to achieving the Goal 2 of SP4B. As for Goal 1, in the absence of a more targeted and quantitative goal it is difficult to conclude other than these activities do indeed constitute a coherent investment.

A related question is whether the investment being made to address SP4B could be more effective if targeted at a different suite of research issues or sites; would this increase coherence and by implication impact? There is clearly a spread of research being undertaken by the Centers, ranging from that which reflects explicitly the terms of the priority as agreed by the CGIAR, to that which is related to but not specified directly in the wording of SP4B. In addition as discussed below there are a number of gaps and it is likely that all types of research would deliver IPGs more effectively if there was comparative research in others sites. It is our understanding however that the list of research types was meant to be indicative, and this combined with evolution in our understanding of the issues being addressed argues against tighter adherence to the detail of the list of research areas. For example while fisheries stock assessment is listed in the research areas, recent analysis by WorldFish suggests that this should not be a high priority for research investment if we are to develop more effective approaches to managing small scale fisheries. In addition while greater geographical integration is highly desirable in some areas the very diverse nature of the funding being used for the research, much of which is restricted to specific countries and limited in volume, limits opportunities to do so. These are increasing however and explicit efforts are being taken by the Centers to increase this, as exemplified by the growing collaboration between WorldFish and IWMI, the basin focal projects of the CPWF, and the Inland Valley Consortium managed by WARDA.

Possible Gaps, Duplications and Overlaps

With a total planned expenditure of less than US\$15M in 2007 there is very limited funding available to address the range of issues under SP4B. This is especially so given both the novelty of this priority for the CGIAR and the intent that information be harnessed from comparative studies across regions and ecosystem types. Comparison of major research outputs against the types of research specified in SP4B indicates that at present the Centers' research focuses on management systems, property rights and governance, alternative livelihood options, valuation, water quality and quantity assessment, and impact assessment of basin processes. While this focus is to some degree an artifact of the rather heterogeneous nature of the research issues specified within SP4B (with the result that some of the more specific issues such as incentives and compliance will probably be addressed by research under issues such as management systems) it also suggests that the Centers have chosen to focus within SP4B. While this may be expected to increase the likelihood of impact, the generation of true IPGs is hampered by the fact that much of the research described is being carried out in a very limited number of study sites and there is clearly a need for building linkages with similar research being done in other countries and regions, or seeking to develop this where it is currently absent. Given the Centers' IPG mandate and the importance in INRM of learning across sites to develop such IPGs this is an obvious area for strengthening.

Overall there is little evidence of duplication or overlap. While WorldFish, IWMI and the CPWF are all engaged in valuation and environmental flows each has as a specific niche within these area of research. WorldFish focuses exclusively on the valuation of fisheries and other living aquatic resources, while IWMI complements this by assessing wider ecosystem values. Similarly IWMI has a major focus on environmental flows while WorldFish work in this area is specifically on integration of fisheries requirements into such research. The CPWF supports work in both of these areas with IWMI and WorldFish being the principal CGIAR partners for this investment of the CPWF, while the growing CPWF focus on Basin Focal Projects provides one mechanism for integrating research results at the basin scale.

Key Development Value of Research Activities

SP4B is premised on the importance of aquatic ecosystems for many millions of rural poor in Africa, and Asia, and to a lesser degree in Latin America. In addition for the Small Island States of the Pacific and Caribbean aquatic ecosystems are important for an even larger part of the regional population, although total population size is smaller. Yet despite their multiple benefits and in particular the role that they play in providing food and income for millions of poor, aquatic ecosystems are threatened across the world and in all of the regions where they play this important role. These ecosystems and the resources they provide are vulnerable to changing management practices at both catchment and local levels and many have been overfished or seriously degraded in recent decades. Generally open access and weak governance lie at the core of most of these problems. Indeed the issue of poor governance is generic to small-scale fisheries in developing countries.

In this context the research underway to address SP4B makes an important contribution to addressing the key issues being faced. The emphasis given to Governance in SP4B reflects recognition that most of the communities that are dependent upon these ecosystems for food and livelihood are marginalized and many of the economic benefits that can be derived from them are harnessed by external actors. By improving understanding of the value of these resources and how they are harnessed, coupled with research on the institutional arrangements that oversee more equitable distribution of benefits, this CGIAR research can play an important role in harnessing the resources of aquatic ecosystems to improve food security and livelihoods over significant areas. Similarly by improving understanding of the biophysical factors that threaten the sustainability of these resources, as well as that of the mechanisms through which this information can be used to support decision-making at multiple scales, PB4B is generating knowledge that is both largely absent at present and urgently required if the livelihoods dependent upon these ecosystems are to be sustained and enhanced.

Case Study System Priority 5D: Improving Research and Development Options to Reduce Rural Poverty and Vulnerability

Summary of Center Involvement in MTPs 2007-2009 (data for 2007 only)

Table 1 Center investment in SP5D --- What, Where and With Whom

Center	Budget	Type*	Environment	Collaborations
Africa Rice (WARDA)	\$2,030,000	Characterization of the rural poor; Access of Rural Poor to Assets; ex-post impact assessment; Crop management	Sub-Saharan Africa	IFPRI, ICRAF, ICRISAT, IITA, ILRI, IWMI, WVC
CIAT	\$472,000	Characterization of the rural poor; ex ante risk management	Central America & Andes	National agricultural and geographical research institutes; World Bank; Universities of Bonn & Kentucky; Private Sector(Munich-Re); IWMI; Harvest Plus
CIFOR	\$2,347,000	Use of Assets by Rural Poor, Access of Rural Poor to Assets, Analysis of Rural Development Strategies	Forest areas	Not listed
CIP	\$3,707,000	Ex-ante policy analysis, characterization of rural poor, targeting, crop area estimation, policy promotion, capacity strengthening, knowledge management	Highland tropical systems, global	National research and extension programs in LAC, SSA, South Asia and Se Asia, numerous universities, Harvest Plus, and CPWF
ICARDA	\$1,336,000	Characterization of the rural poor; Access of Rural Poor to Assets; Use of Assets by Rural Poor; Capacity Strengthening; Ex-ante and ex-post impact assessments	Dry areas (CWANA region)	National research and extension programs (in Central and West Asia, North Africa, sub-Saharan Africa, South Asia, and Latin America), numerous universities, IFPRI and other CG centers, Challenge Program on Water and Food, system-wide programs (CAPRI, PRGA, project on assessment of impacts of NRM research convened by SPIA (see attachment for details)
ICRAF	\$2,689,000	Use of and Access to Assets by Rural Poor, Policy analysis; Capacity Strengthening; Knowledge & Information Management	Global	
ICRISAT	\$1,129,000	Characterization of the rural poor; ex-ante risk assessments,	Semi-arid tropics of SSA and south Asia	SPIA, IFPRI, IWMI, ILRI, ICRAF, CIP, IITA, ICARDA
IFPRI	\$5,198,000	Characterization of the rural poor; Ex-ante and ex-post risk management; Access of Rural Poor to	Global	Universities, CG centers, NARS, farmers' organization, system-wide and challenge programs.

Center	Budget	Type*	Environment	Collaborations
		Assets; Use of Assets by Rural Poor; Analysis of rural development strategies; Health; and Capacity Strengthening		
IITA (from MTP)	\$4,934,000	Access of Rural Poor to Assets; Use of Assets by Rural Poor; Capacity strengthening; Ex-ante and ex-post risk management	Sub-Saharan Africa, savanna-based cropping systems and other environments	NARS, universities, CG centers, NGOs, extension services, farmer's organizations
ILRI	\$6,635,000	Characterization of rural poor; Use and access of assets by rural poor; Access of rural poor to assets, Ex-ante and ex-post risk assessment; Analysis of poverty pathways and the role of livestock	Global	Universities, NARS (KARI), CG Centers (ICRISAT, IFPRI), ILRI themes, development agencies (ODI), International Agricultural Research Centers, Government Ministries, NGOs, FAO
IPGRI	\$3,030,000	Characterization of the rural poor; Use of Assets by Rural Poor; Capacity Strengthening; Ex ante risk management;	Global, tropical forests	NARS, Universities, farmers' organizations, NGOs, UNEP, IFAD, FAO, CG centers, system-wide programs and challenge programs (PRGA, SSA-CP, SGRP, HarvestPlus), AVRDC;
IRRI	\$4,305,000	Access of Rural Poor to Assets; Ex-ante and ex-post risk management; ex-post impact analysis, Analysis of rural development strategies; Capacity Strengthening	Global	NARES, sister CG centers (CIMMYT, IWMI, ICARDA), the Irrigated Rice Research Consortium (IRRC) and the Rice Wheat Consortium (RWC) and advanced research institutes, Challenge Program on Water and Food, NGOs, private centers, Universities.
IWMI (see also Water and Food Challenge Program)	\$1,534,000	Characterization of the rural poor; ex-post impact assessment; Capacity Strengthening; poverty analysis; Use of Assets by Rural Poor	Global	Not listed
WorldFish	\$960,000	Policy analysis; Ex-post evaluations; Characterization of the rural poor; Access of Rural Poor to Assets; Health; Knowledge and information management; Capacity Strengthening	Coastal, coral reefs, and riverine environments	Water and Food Challenge Program, ARIs, NEPAD, NARS
Generation (headed by CIMMYT)	\$3,582,000	Access to and Use of Assets by Rural Poor, Capacity Strengthening	Global	NARS
SSA (headed by FARA) –	\$1,187,000	Access to and Use of Assets by Rural Poor ;	Sub-Saharan Africa	NARS, NARS extension services, farmer's organizations and groups,

Center	Budget	Type*	Environment	Collaborations
from MTP		Capacity Strengthening; Policy analysis		universities, government bodies, private sector and agribusiness firms, NGOs, IARCs, ARIs,
Water & Food (headed by IWMI)	\$1,860,000	Characterization of the rural poor, Ex-post impact analysis, Capacity Strengthening, Policy Analysis	Global	

* Mainly based on the System Priority 5D's Scopes of Research

Table 2: Key Center Specializations in key types, environments and disciplines related to 5D

Center	Key Products or research areas	Key Environments	Research Disciplines
Africa Rice (WARDA)	Interactions between HIV/AIDS and food and nutrition security tentatively described and evaluated; Options for early warning and emergency response; Disaster preparedness and rehabilitation strategies.	Sub-Saharan Africa	Social Sciences , Socio-economy, Policy and Institutional Sciences, Natural Resource Management, Informatics, modeling, governance
CIAT	Disaggregated information systems on foods consumption and nutritional outcomes; Feasibility of site sensitive natural hazard insurance; Indicator maps of vulnerability to natural hazards.	Tropic ecosystems in Harvest Plus priority countries; Central America and Andes	Geography; economics; nutrition.
CIFOR	Biodiversity conservation; use of participatory tools regarding biodiversity; water use and carbon sequestration use; climate change mitigation and adaptation schemes, rehabilitation of degraded forest; analysis of decentralization policies; collaborative forest management	Forest ecosystems	Biodiversity, socioeconomics
CIP	Improved seed systems, integrated soil management, integrated disease management, integrated pest management, research targeting, poverty mapping, ex-ante economic analysis, watershed management, policy analysis, environmental organization analysis	Global, High Andean ecosystems, African highland systems,	Plant breeding, biotechnology, seed technology, pathology, GIS, anthropology, economics, natural resources management
ICARDA	Poverty mapping; Micro studies of farm households; impacts of agricultural research; options and priorities for public investments	Non-tropical dry areas globally and selected areas within the tropical zone in Central and West Asia and North Africa	Socioeconomics, Natural resource management
ICRAF	Dissemination and diffusion of new germplasm, technologies and practices; negotiation and harmonization of policies and strategies; for improved agroforestry management for small holder farmers; development and use of an integrated, participatory NRM approach	Forest areas of Asia, East Africa, Sahel, Southern Africa and South Asia	Natural resource management, biodiversity, economic and environment modeling
ICRISAT	Poverty dynamics, vulnerability studies, livelihood	The semi-arid tropics	Agricultural

Center	Key Products or research areas	Key Environments	Research Disciplines
	resilience studies, niche evaluation, examination of HIV/AIDS on rural agricultural development	of SSA and south Asia	economics and rural sociology
IFPRI	5D is included in all 15 of IFPRI's research themes, which are: global food scenarios; globalization, retail food industries, and trade; managing natural resources; governance structures and policy processes; food systems and prevention, relief and rebuilding after crisis; food and water systems; diet quality; nutrition improvement; country and regional strategies; science and technology; smallholder farming; urban-rural linkages; knowledge systems and innovation, policy communications; capacity strengthening	Global	Economic modeling, policy and economic valuation, natural resource management, strategy and governance (poverty pathways), food and nutrition security, socioeconomics, poverty mapping, political science, institutional development
IITA (from MTP)	Collection and characterization of new genetic reserves; models for scaling out of technologies and practices; capacity strengthening; Impact assessment and technology evaluation.	Topical ecosystems, SSA	Biodiversity, plant breeding, germplasm collection, natural resources management, socioeconomics
ILRI	Formulation of sustainable pro-poor livestock interventions and poverty reduction strategies; identification and impact assessment of livestock based interventions; Enhanced understanding of livestock innovation systems and innovation capacity; increased ability of smallholder livestock producers to sustain a viable livestock enterprises; improved quality and safety of livestock commodities and products; improved management and use of pastoral and agro-pastoral systems; and development of strategies to reduce health risks and improve nutritional benefits associated with livestock.	Global, livestock friendly environments	Agricultural economics, natural resource management, poverty mapping, vulnerability analysis, socio economics, ecological and environmental economics, spatial econometrics, sociology, spatial analysis, GIS
IPGRI	Practices that use genetic diversity to maintain and improve productivity, resilience and resistance; marginalized groups' income options; develop effective systems for cultivar deployment, seed multiplication and production (key products include African leafy vegetables, cacao, banana, musa roots) ; characterization of diets and identification of nutrition vulnerability; participatory management of diversity assets; models for community organization and poverty alleviation using commodities; improving income options through the use of biodiversity and markets.	Global,all ecosystems	Biodiversity strategies, policies and conservation; socioeconomics, anthropology, nutrition
IRRI	Comprehensive knowledge of changes in rural	Global rice-based systems	Socioeconomics, Natural resource

Center	Key Products or research areas	Key Environments	Research Disciplines
	livelihood systems and interactions among technology, infrastructure, and institutions ; impacts of rice research; characterization of the rice production environment; capacity strengthening of scientists, technicians, and extension staff; informatics and communication technology		management, Information and Communications Technologies
IWMI	Appropriate water accounting methodologies and allocation frameworks developed and adapted for use in developing country basin level water management; development of policies, institutional models and strategies for management of agricultural water;	Basin scale water environments in Central and East Asia, India, and sub-Saharan Africa	Natural resource management
WorldFish	Improving institutional approaches and policies towards enabling Small and Medium Enterprise (SME) and development and enhancing performance of value chain actors; Enhance capacity of rural institutions and local government agencies to manage inland fisheries more effectively	Inland and coastal fisheries, South Asia, sub-Sahara Africa, and global	Natural resource management, aquaculture technologies, economic modeling, governance
Generation	Development and transfer of low-cost marker technologies for pyramiding useful genes in crops; Capacity strengthening in genomics/molecular breeding, bioinformatics, and phenotyping; Development of public databases (genotypic and phenotypic data) to support breeding activities in breeding programmes; Training and capacity building of NARS breeding programmes	Tropical legume regions in Sub-Saharan Africa and GCP target regions	Molecular breeding, Knowledge Management/ Information and Communications Technologies
SSA (from MTP)	Generation and promotion of appropriate technologies and innovations to improve crop, livestock and natural resource productivity for smallholder farmers; Expansion of market access and diversification options for market development; NRM policies and institutional options developed; and capacity strengthening.	Integrated biophysical components (such as farmer's product systems, soils, crops, herds and flocks, rangelands, forest and water catchments) in sub-Saharan Africa	Natural resources management, socio-economics, knowledge management/ information
Water & Food	Assessment of policies and institutional arrangements for enhancing crop water productivity; Assessment of impacts of payment for environmental services schemes on poverty; managing aquatic ecosystems and fisheries; impacts between global change (in particular climate change) and water and food security;	Upper catchments and downstream, and nine water basins (global)	Natural resource management, governance

Table 3 Center investment in SP 5D, --- Sources of major funds

Center	Budget	Funding Source
Africa Rice (WARDA)	\$2,030,000	AfDB, Chemonics, CFC, CORAF, EC, France, IFAD, Japan, Netherlands, Rockefeller Foundation, UNDP, USA, World Bank, and unrestricted

Center	Budget	Funding Source
CIAT	\$472,000	CGIAR; World Bank
CIFOR	\$2,346,000	Australian Centre for International Agricultural Research, CORDAID, European Commission, Ford Foundation, Germany (GTZ/BMZ), International Development Research Centre, Italy, Japan, Korea, Netherlands, Swiss Agency for Environment, Forests and Landscape, Switzerland, U. S. A., United Kingdom (DFID)
CIP	\$3,707,000	Canada, CPWF, Belgium, Denmark, Germany, Harvest Plus, IFAD, Netherlands, OPEC Fund, Switzerland, UNEP, USAID, World Bank, and unrestricted budget
ICARDA	\$1,336,000	Arab Fund for Economic and Social Development, CGIAR System wide Program on Participatory Research & Gender Analysis, DFID, IFAD, SDC, USAID, and Water and Food CP
ICRAF	\$2,689,000	Australia, Canada, Common Fund for Commodities, EC, Ford Foundation, Global Environment Facility, IDRC, IFAD, Italy, Japan, Netherlands, Norway, Rockefeller Foundation, Spain, Sweden, Switzerland, UK, USAID, World Bank
ICRISAT	\$1,129,000	EU, USAID, Canada
IFPRI	\$5,198,000	ACIAR, Bill & Melinda Gates Foundation, Canada, China, Denmark, EC, Ford Foundation, France, Germany, HarvestPlus, Hewlett Foundation, IDRC, IFAD, Ireland, Italy, Kuwait, Netherlands, NIH, Norway, Rockefeller Foundation, Spain, Sweden, Switzerland, UK, USAID, World Bank, WFP, and Unrestricted
IITA	\$4,934,000	Austria, Belgium, Canada, CARE, Common Fund, Denmark, EC, FAO, Ford Foundation, Germany, Global Issues Group, Harvard University, IDRC, Netherlands, Rockefeller Foundation, Shell Petroleum Development Corporation, Sweden, Switzerland, USAID (these donors support SP5 activities, not specifically 5D; the MTP doesn't give the break down for 5D).
ILRI	\$6,635,000	ASA, CALPI, CFC, DFID, FAO, GTZ, ICRISAT, IFAD, IFPRI, Rockefeller, Kenya, OPEC, SITE, University of Florida, USSD, Switzerland, World Bank and unrestricted donors
IPGRI	\$3,030,000	Canada, Christensen Fund, HarvestPlus/CP, IDRC, IFAD, Japan, Norway, Rockefeller Foundation, and Sweden, Switzerland, UNEP, and World Bank
IRRI	\$4,305,000	ADB, Australia, Canada, CP-Generation, CP-HarvestPlus, CP-Water and Food, Germany, EC, France, IFA-PPI-PPIC-PPI, IFAD, Iran, India, Japan, Korea, Malaysia, Philippines, Rockefeller Foundation, Switzerland, UNEP, USAID, World Bank, and unrestricted
IWMI	\$1,534,000	Challenge Program on Water and Food (CPWF), ACIAR, FAO, Comprehensive Assessment (CA), USAID, National Institute for Rural Engineering (NIRE), International Commission of Irrigation and Drainage (ICID), CGIAR, Austria, European Commission (EC), SDC and Core
WorldFish	\$960,000	DFID, EC, Germany, Norway, USAID, Water and Food CP, World Bank
Generations CP	\$3,582,000	EC, DFID, Rockefeller Foundation
Water and Food CP	\$1,860,000	Denmark, EC, France, Germany, IFAD, Netherlands, Norway, Sweden, Switzerland, UK, and World Bank
Sub-Saharan Africa CP	\$1,187,000	Unrestricted and center income

The Coherence of Research Activities

This SP notes the biophysical and economic sources of vulnerability among poor rural communities, acknowledges that natural and human disasters disproportionately affect poor people and marginal areas and highlights the role of technologies and human capacity to reduce or manage risk can set households on pathways leading out of poverty.

General goal: To enhance impact of agricultural research in promoting options for the reduction of rural poverty and vulnerability

Specific goal: To identify agricultural research and development pathways, in order to implement options to reduce rural poverty at the global and regional level.

In the “scope of research” the Science Council identified 6 broad areas:

(1) **Characterization of the rural poor**, in relation to agriculture, livestock, forestry and fisheries production systems and their environment. Centers that reported activities in this field are: ILRI, CIAT, CIP, ICARDA, ICRISAT, IFPRI, IPGRI, IWMI, World Fish and WFCP. (2) The **identification of options** for the rural poor to access, acquire, protect and use assets to improve their livelihoods and move out of chronic poverty. Scenario development work done at CIP and IFPRI fits in this category. Also IWMI and ILRI focus on the identification of options. ILRI’s work on pathways out of poverty focuses on how livestock can be used to identify options for reducing poverty and vulnerability. IPGRI focuses on improving income options through the use of biodiversity and markets. (3) Research activities that improve the quality of the context where the poor **use their assets** and reduce risks affecting the livelihoods of smallholders and the rural poor. CIFOR, ICARDA, IFPRI, IPGRI, ILRI and WFCP report activities that fit in this category. (4) Identification and evaluation of the means to improve **ex-ante risk management** through the livelihood diversification, formal and informal insurance mechanisms, financial and in kind savings, futures and forward markets and improved information systems, CIAT, CIP, ICRISAT, IFPRI, ILRI, IRRI, IPGRI and ICARDA all have activities in this category. (5) IFPRI, IRRI, WFCP, WorldFish and WFCP conduct activities that lead to the identification and evaluation of the means to improve the availability and effectiveness of **ex post risk coping mechanisms** through credit, safety nets and more efficient, accessible and stable asset and labor markets. (6) CIFOR, CIP, ICRISAT, IFPRI, IPGRI and IRRI conduct activities that contribute towards a greater understanding of the effectiveness of **rural development strategies** and programs to reduce rural poverty and vulnerability as well designing new strategies to achieve those goals by combining agricultural and non agricultural sources of employment and income. Many centers and programs also include **capacity building and training** activities that contribute to SP 5d (CIP, ICARDA, IPGRI, IRRI, IWMI, World Fish and Generation Challenge Program).

As can be seen by table 2, the centers define a very wide range of research outputs as belonging to the scope of research of this priority. In addition to research outputs that directly address the scope of activities listed above, the link of poverty reduction and risk

management lead centers to define germplasm conservation, breeding for multiple resistances and crop management strategies.

As can be seen from the above Tables 1, 2 and 3, the centers collaborate a great deal with each other as well as with NARS. The Irrigated Rice Research Consortium based at IRRI is an example of such an effort where a CG center has made an explicit effort to work more closely with NARS. From the information received so far, six centers reported collaboration with at least one other sister center. At the same time, however, there are few examples of public private partnerships.

Is there coherence between centers working on SP 5D? The answer is **yes**. The CG centers combine their best research approaches and make use of their competitive advantages. For example, ICRISAT's work focuses on the semi-arid tropics of SSA and South Asia and if necessary will seek collaboration with other centers such as IFPRI, ILRI or IWMI. While IRRI's work will inevitably mainly focus of rice related issues, there is a general recognition that this will need to be placed in a broader context. To achieve this, IRRI seeks collaboration with partners ranging from sister CG Centers to NARS as well as the private sector. To achieve the general and specific goals mentioned by the Science Council for this SP, research activities will be required at different levels of aggregation, ranging from the farm household, to the global level. Today, developing countries face challenges in designing rural development strategies and understanding the pathways that link various investment and policy interventions with specific development goals. IFPRI, ILRI, ICRISAT, IWMI and IITA are working together to establish a Strategic Analysis and Knowledge Support System (SAKSS).

Possible Gaps and Duplications

Gaps:

As the analysis in the previous section shows, all six focal areas under the Scope of Research for SP5D are being addressed by at least one CGIAR center. Given the level of detail available from the MTPs for this desk study, no clear gaps emerge in addressing that component of the CGIAR's system priorities. However, more direct detailed interaction about what centers are doing in each of the focal areas could reveal gaps not evident in this study.

Significant financial resources are being dedicated to this sub-priority -- \$47 million or 9% of the CGIAR budget, making SP5D financially the largest sub-priority. The large financial investment in this sub-priority reflects the importance CGIAR centres place on ensuring that their research is targeted at poverty reduction outcomes. Again, given the lack of detail on center investments it is difficult to judge whether center activities best fit under 5D or would be better housed under a separate sub-priority. Additional information is needed to make this assessment.

The "identification of long term options" for the rural poor is mainly being addressed by one center (IFPRI). Additionally, there are very few partnerships with the private sector working on this sub-priority. Collaboration with this sector is increasingly critical in

order to achieve the CGIAR's mandate of reducing poverty and hunger. Efforts should be made to explore such collaborations – and IFPRI can play a facilitative role in this regard through the CGIAR-wide Pro-Poor Public-Private Partnership Program.

Duplications:

From the information received thus far, there appears to be little duplication of work in SP5D. The centers are primarily focused on their distinct mandates – so there from this desk study there appears to be little overlap. For example, ICARDA is mostly focused on dry lands agricultural production and natural resource management which is complemented by IFPRI's focus on land management policies, institutional development, and governance issues related to food security. Similarly, IPGRI's focus on biodiversity is complemented by IFPRI's focus on biosafety policies and impacts of biotechnology on the poor. In Africa – the centers are striving to reduce duplication through the joint planning and development of CGIAR-wide medium-term plans for East/Southern and West/Central Africa. One cross-cutting theme in the SPs, capacity strengthening, is being addressed by several centers and 2 CPs. Capacity strengthening is an area where there could be overlap between the centers' efforts and additional coordination among centers is needed to ensure a synergistic impact. SAKSS and the regional MTPs provide an excellent opportunity in 2007 for centers to benefit from each others research activities in Africa, for example in the fields of cross-cutting poverty characterization such as poverty mapping.

Key Developmental Value of Research Activities

The Millennium Development Goals will not be achieved if they are addresses separately. By now, it is generally accepted that an integrated approach is required. Research contributing to SP 5D, fully acknowledges the interlinkages between the MDGs. The research includes establishing the link between small scale innovative approaches, the development and adoption of technologies, development strategies that enable households to move out of poverty in a sustainable way. For example, through strengthened links with regional SAKSS nodes, IFPRI will help monitor and report on trends with respect to hunger, productivity and rural incomes, public expenditures and investments, including the presence of any confounding factors affecting the achievement of the MDG goals of poverty and hunger in East, West, and Southern Africa. Research activities in the SP 5D also contribute towards a greater understanding of linkages between different levels of aggregation, ranging from the farm level to the global level. A thorough understanding of the role of participants at all levels is essential and this is also addressed in the research undertaken in this SP.