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SCIENCE AND TECHNOLOGY: ESSENTIAL KNOWLEDGE SYSTEMS TO ENHANCE COMPETITIVENESS AND SUSTAINABILITY

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Introduction

Throughout Latin America and the Caribbean (LAC), globalization and related trade expansion forces converge to form previously unimaginable farm and rural sector links driven by regional and global markets. In this setting, if innovative, demand-driven knowledge systems are introduced, previously under-exploited resources have the potential to stimulate broad-based economic growth that reduces poverty. Generally speaking however, this unprecedented potential is not joined with the appropriate, Science and Technology (S&T) program. To confront this fundamental need, this paper discusses: 1) topic rationale, 2) changing dynamics and responses, 3) corresponding policy and institutional recommendations, and 4) suggested activities that USAID may use to stimulate urgently needed country and donor-level responses.

This report serves as input to USAID/LAC's "Rural Prosperity White Paper" which will help guide discussion at an upcoming USAID/LAC conference and subsequent strategy exercise where as appropriate, greater specificity will be developed. To address the challenge in the seven days provided, I reviewed LAC/BBEG background analytical pieces, and met with senior science and technology leaders, donors and sector institutions, and USAID staff. A list of contacts and bibliography is attached.

I. Why S&T Forms an Essential Underpinning to Forge LAC Rural Prosperity?

Herein the economic legacy is contrasted with changing economic dynamics so as to formulate a new rationale to dramatically expand support for market-based S&T. New systems are needed such that agriculture, livestock, and forest producers and related agri-businesses and rural enterprises can more rapidly adapt and compete, thereby generating national benefits.

The fundamental precept: In today's, trade-driven era, country-level economic growth is linked to: 1) improving factor productivity from market-driven knowledge systems; and 2) implementing science-based regulatory and food safety requirements such that external market access is regularly gained. The ability of S&T services to contribute to rural growth, especially in the case of poor farms, can ameliorate the negative and enhance the positive effects of trade liberalization (Tabor 1995) . The processes for introducing new species and/or new varieties, cultural practices, processing technologies, and knowledge tools that have been developed via science-based basic, strategic, and applied research linked to and closely related to technology transfer mechanisms is essential to increasing rural prosperity. This is particularly so for higher-valued activities that inherently generate farm and off-farm employment and new income streams that generates broader rural-based services and products.

Earlier, sub-optimal economic environment and complementary S&T focus: Today's S&T demands differ notably from earlier era S&T system designed to complement the import substitution regime from the 1950s to the 80s. Government sponsored and donor supported agricultural S&T focused mainly on increasing food staples productivity per land unit within a public sector, along "national," commodity-specific programs. Important contributions in improving food crops were provided which generated positive rates of return on research investments, averaged usually more than 20 % per year (Pardey and Alsoton 1995). However, the inherent in-country inefficiencies associated with import substitution, thwarted maximizing economic potential from the rural sector.

Essential national S&T knowledge systems not in step with economic shifts and trade-driven realities: Beginning in the mid 1980s and in the context of Structural Adjustment and the complementary lending programs (SAL), macro- economic reforms introduced the new economic era. Under SAL, governmental attention to agriculture began to wane since "market forces" would respond "rationally" across all sectors. At the same time, SAL budget reforms sparked major budgetary reductions for rural investment-- and particularly for agricultural S&T. Paradoxically, S&T support system capacities eroded notably just as SAL-induced complementary developments required access to market-responsive S&T systems. For example: 1) SAL-generated policy reforms caused overvalued currencies to be revalued requiring tradeable products to be price competitive via improved efficiencies; 2) The Uruguay Round of trade talks launched in 1986 and finished in 1994 resulted in systematic trade liberalization with tropical crops reduced by 42 % and grains to 36%; 3) Most countries liberalized trade as 40 separate bilateral and regional tariff reduction initiatives have been signed. (Diaz-Bonilla 1999) and are heavily dependent on international capital markets; 4) The new round (Doha Development Agenda) will advance trade liberalization (tariff and subsidy reduction) in agriculture globally, while the Western hemisphere's 34 countries are on track to establish the Free Trade of the Americas (FTTA) by 2005. Within these dynamics, little to no consideration has been given to the implications for new S&T capacitates.

A base for generating rural prosperity begins to emerges: Recent analysis demonstrates that when appropriately supported, the previously under-appreciated/utilized land, labor, and agro-climatic "comparative advantages" become "liberated" under SAL. This supports Asian "tiger" and Chile's experiences that demonstrate that agriculture and closely tied rural sectors have the potential to generate much-needed jobs that increase salaries while increasing exports. For example, IFPRI research observed that in those countries where the highest degree of market-based reforms have taken place, agriculture has become a leading or the lead economic sector, exports expanded, and most importantly, economic growth has improved notably (Bathrick1998).

LAC agriculture begins sub-sector shifts that generate national economic benefits: Gradually, LAC countries agricultural sectors have responded to macroeconomic reforms

in ways that begin to generate broader economic impacts. They have began to make shifts away from the commodity mixes prevalent during the old import substitution era which focused on self sufficiency and towards investments producing market-led, higher-valued commodities with greater value added potential. As documented in a USAID/LAC - sponsored study, beginning in mid 1980s, in those LAC countries that had responded to the new policy environment, fundamental sub-sector shifts occurred from less remunerative cereals to higher-valued meat, fruits, vegetables, and oils and this contributed to more robust trade and economic growth rates. Further, those counties showing the largest annual GDP increase also showed the most dramatic increases in agricultural diversification and total sector growth. (Bathrick, Byrnes, and Stovall 1996).

To accelerate this economic transformation process such that rural prosperity is strengthened, a complementary, market-based science and technology support mechanism becomes one essential national priority. From this, producers and related agri-businesses and rural enterprises and industries can more likely and rapidly adapt, compete, and gain as tariffs are reduced, complementary public and private sector investments are intensified, and market shares gained.

II. Changing Dynamics and Related Institutional Responses Affecting LAC's S&T Needs

Given the essential role S&T performs for helping stimulate rural prosperity, a discussion of today's major issues and country and donor responses to new economic and trade shifts is provided.

Some dramatically different S&T-related issues affecting rural prosperity are emerging

More dynamic rural sector and national level multipliers now possible: In response to macro reform, markets and urbanization, and global competitiveness, "agriculture" has shifted strategically from a production focus to a more food and agro-industrial system. This system is capable of generating significant value-added contributions in terms of 1) increased jobs and wages and 2) generally under-valued contributions to national GDP. Based on a review of labor intensity of 19 export crops a range from 20 to 30 person days per hectare for broccoli and melon to 600 person days for snowpeas--with the average at 123 was noted (Carer, Barham, Mesbah, and Stanley 1955). Further, when "agriculture's" GDP account is broadened to embrace agriculture plus the agriculturally related inputs to manufacturing and service sectors, the sector's contributions to national GDP triple or quadruple (Pryor and Holt 1999). IFPRI shows that for every increase in $1 in production agricultural output in Latin America, overall economic output was increased by almost $4 (Pinstrup-Andersen, Lundberg, and Garrett 1995).

Significant numbers of produces are now vulnerable and will be challenged increasingly: With trade liberalization, a large number of producers will need to diversify or confront farm enterprise crop/activity adjustments, or if not, continue to migrate to

already crowded urban centers. In the context of expanded sub regional, FTAA, WTO trade arrangements, millions of producers view themselves inappropriately equipped to compete . The vast majority of the non-staple commodity producers generally find themselves in a sub-optimal situation vis-a-vis external market opportunities and potential competitors. Also, most of the staple food producers--who form the largest agricultural sub-sector, recognize that they can not compete with cheaper commodity suppliers. For example in the case of Mexico, some 4 million producers of maize, rice, coffee, and sugar now view themselves as non-competitive in the face of cheaper suppliers. They see no alternative employment options except to go "north" (New York Times 2001). For those producers who; 1) have sufficient assets, 2) are agro-ecologically well endowed, and/or 3) have access to markets, alternative strategies are urgently needed.

The new era S&T agenda is more expansive: To generalize, except in the case of Chile and maybe along certain commodities such as asparagus in Peru, cut flowers in Colombia, snow peas in Guatemala, and a variety of nascent NTAE experiences in Central America, the fundamental S&T support systems are lacking. In the old era, agricultural S&T focused on genetic improvements for a few species of common food crops (Pineiro 2000) whereas today, the agenda deals with broader productivity, efficiency, and market access needs.

Increasingly demanding "competitiveness enhancement" production and post-harvest technologies, and new knowledge of plant and animal health, food safety regulatory requirements, etc. are needed. In addition, a broader range of related natural resource management and conservation practices will require attention to sustain one of LAC's most valuable production factors--its diverse agro-ecological setting. Business and technology skills will be required to respond to rapidly emerging opportunities

What this all means in terms of S&T capacities? During this critical crossroads period, new, market-driven S&T support system to generate knowledge and efficiency provide an indispensable element to forge much needed economic, social, environmental, and political wellbeing. Dr. Martin Pineiro, one of LAC's most respected agricultural development leaders concludes that the development of differentiated plant products will require the package statements of provenance, safety and quality certification. New institutional mechanisms and technologies will address these requirements whose development requires a joint public and private effort. In this area "Latin American technical and institutional weakness in these areas is considerable (Piniero 2000).

Country–level responses: An overview of public and private sector support to S&T. In today's changed environment, well-regarded LAC rural growth strategists conclude that in many areas the promotion of agricultural growth should be a first priority in support of rural development, particularly high value-added crops and farm enterprise activities produced for agro-industry, non-traditional exports, and labeled products for niche markets. Furthermore, within this setting, improved technologies become important sources for agriculture and for poverty reduction (de Janvry and Sadoulet 2001).

Declining LAC country support to agricultural S&T: During the four decades of import substitution, government-led but with commensurately large donor support, was directed to the expansion of the "National Agricultural Research Institute (INIA) models. INIAs became the major purveyors of research and extension services of inward-focused, "national" commodity programs, Generally speaking, they lacked strong links with the private sector, stakeholder producer associations and agri-businesses (McMahon 1995) . They generated almost no domestic support base and seldom confronted national "competitiveness" issues. .

As mentioned in Section I, beginning in the 1980s INIA capacities eroded notably. By the mid-80s, average producer per scientist ratio for the LAC region as a whole showed widespread and substantial declines (Pardy and Rosesboom 1990). Compared with other regions of the world, after showing the highest annual budget increases in public sector agriculture S&T from 1976-1981 (9.5%), for the periods 1981-86 and l986-91 they fell to the lowest growth rates (.5 % and .4% respectively). From the period 1991-96, this trend bottomed out and began to increase to 2.9 %. This upturn put LAC one level above Sub Saharan Africa for next to last place and way below developing country averages worldwide showing annual increases of 3.6 % ((Pardy and Beintema 2001).

The introduction of institutional innovation: Commensurate with these truly disconnected institutional responses to changing economic order, beginning in the 1980s, some innovative, quasi-private foundations were created. The focus was to provide more technical focus, ensure institutional responsiveness, and to generate broader financial support. In some countries, new models were created to capture more funding. However, after more than a decade, most of these foundations were receiving 80 to 90 % of their funding from their governments and this was at about the same level observed before the reforms (Pardy and Beintema 2001).

Private sector support to agricultural S&T: While public sector support is far and away the largest support base, private sector S&T support began to expand notably in the 1990s. Big jumps in Chile, Argentina, and Brazil and in some smaller countries were observed. For example, by 1996 in Panama, private sector agricultural S&T was estimated at 7% of the total. However, overall in LAC, only 3.8% of the total $100 million in 1996 was from private sector sources (Pardy and Beintema 2001).

Comparative S&T institutional "competitiveness" capacities: Concrrently throughout LAC the increasingly favorable policy/trade environment did not mesh with the essential S&T capacities now required. As increasingly national economies compete more vigorously, this structural disconnect becomes more alarming. An IICA review of national capacity among 22 major agricultural products serious "competitiveness" issues were disclosed CIICA 2001). Smaller and medium countries are particularly vulnerable for to generalize, the bigger and all Southern Cone counties posses the better S&T systems, to include to a smaller degree Mexico and Colombia (IICA 2001).

Donor-level responses: An overview of USAID, IDB, and World Bank activities: In the earlier era, particularly from the 1970s, donor-level programs provided crucial

support for INIA formation. This support peaked in LAC in the mid 1980s at well over $300 million and then rapidly declined. Currently, donor support to agricultural research has eroded to about $10 million annually, the lowest level since 1961 or about 15 % of the annual governmental level (Beintema and Pardy 2001). In response, innovative institutional approaches have been introduced.

USAID: Beginning in the 1950s by USAID predecessors, and expanding in the 1960s and 70s via USAID, agricultural S&T institutional bases were established in many countries. A broad range of research and extension support activities were developed to include extensive links with US Land Grant Universities, U.S.D.A, and to establish productive relations in basic and strategic research with the International Agricultural Research Centers (IARCS) –principally CIMMYT ,CIAT, CIP for wheat and maize, topical crops and livestock, and potatoes respectively. As USAID's agricultural support budgets expanded from the mid 1960s to the mid-1980s, the technical support base expanded to include links with the US and international private sector and NGOs, and a series of global focused, theme-specific global programs-- Collaborative Research Support Programs (CRSPS) under Title XII were launched.

According to a comprehensive worldwide review of agricultural S&T programs done under a joint USAID /World Bank study, from 1952-96, agricultural research support peaked in 1987 at $220 million (Alex 1997). Though no regional breakdowns are available, from this study about $20 million was for LAC's INIAs in 1987. This was supplemented by considerable PL 480 commodity support to cover essential host county counterpart support for local costs. USAID levels also declined notably such that by 1996 (the last time detailed data was available), the INIA support level worldwide was $6 million, from which an estimated $1.5 million was for LAC's INIAs. Based on this trend, the researcher projected, "USAID is in danger of becoming a minor player in its support to international agricultural research" (Alex 1997).

Programmatically, during this period of dramatic decline, two important innovative institutional thrusts are noted; 1) Private Sector Foundations and 2) Non Traditional Agricultural Export (NTAE) support.

1) Private Sector Foundations: -Beginning in 1984 and expanding, USAID supported in Honduras, Jamaica, Peru, Ecuador, and the Dominican Republic initiated new private sector research institutions as an innovative approach to better ensure quality and stimulate broader support. A comprehensive evaluation of this effort flagged inherent structural barriers that impeded their sustainability. Unless systematic corrections were done, innovative programs would last only as long as the USAID project (Sarles 1990).

2*) NTAE Support*: Beginning in 1986 and directly responsive to the improved policy environment, a pioneer program in Central America commenced. The program focused on technical assistance in 14 product lines with enterprises trained to provide essential support to small farmers. A subsequent analysis of this experience concluded

that ".. there were particularly positive effects on higher wages , including the creation of new jobs and improved working conditions" (Damiani 2000).

USAID/LAC's current regional support portfolio: At the USAID/LAC level there are a two trade capacity building initiatives that deal with S&T. The key elements of the LAC "Trade-Related Capacity Building Project" that relate to food safety and animal and plant health are covered in Section IV. The other project, "Increased Central American Competitiveness in Global Markets" deals with support activities that relate to trade policies, WTO negotiations and labor markets. These support projects assist host country officials to prepare the regulatory systems required to "play by the new rules" so that U.S. market access can be provided. Regional support programs to begin to prepare the large numbers of rural residents with the other S&T more production-related capacities were not however observed in the portfolio. A listing of current mission-level projects did not indicate support activities.

Inter-American Development Bank (IDB) : The IDB has been the largest LAC door to agriculture. Support peaked in 1985 at $950 million and plummeted to around $10 in 1993. While all donors are now working to pursue new rural sector development initiatives, the IDB is the only one that has seen funding levels reverse and now increased to over $100 million (IDB 2000). Over the last two years the IDB has given considerable attention to raise rural sector visibility via research activities and major conferences and strategic planning activities (IDB 2000).

Regarding the IDB's S&T investments, over the life of the IDB, they have invested 5.5 % of their total agriculture and rural development portfolio for agricultural S&T. Their most important S&T activity is the Regional Fund of Agricultural Technology (FONTAGRO). This is an endowment fund initiated in 1998 with a target of $200 million. Bank members have provided currently around $30 million, of which around $3 million is for actual LAC research support. During the first two years via a competitive grant mechanism, they awarded 12 research proposals. The research portfolio is a diverse range of mainly CGIAR-related activities. Of the 24 projects, 17 have direct Center participation.

The World Bank: Some years ago in response to the World Bank's president's concern that poverty could not be addressed in any meaningful way unless they better supported agriculture and rural development, the Bank launched its "Rural Development Vision to Action" planning activity. During this same period sector resource levels have further declined. However, over the last year plus this effort has been revisited and in that regard the Bank's LAC region (as have other Bank regions) has generated their input to this re-invigorated Bank commitment. When approved by the Bank's Board, their LAC strategies can be more broadly shared. Within this strategy, they do place great impetus on rural sector knowledge generation systems.

III. Fundamental Policy and Institutional Suggestions for Launching the New S&T System for LAC Rural Prosperity

Building from sound economic policies and the demonstrated opportunity for generating rural prosperity in this increasingly competitive world, a new battery of institutional adjustments to include research and development and technology transfer become essential (Quiroz 2000). This need becomes critical given the absence of an appropriate knowledge generation system in the face of WTO and FTAA realities commencing in 2005. Some basic policy and institutional suggestions are provided.

Creating a more pro-rural/pro- complementary S&T national commitment: In today's era, national-level investments in science and technology become an essential, national political priority. It appears that LAC is behind their competitors in a critical sector across numerous product lines. However, LAC's import substitution legacy forms a powerful inter-connected economic and political impediment thwarting rural investment.

In this setting, an interesting comparison with Asia during the Tiger era, proves useful. For their rural sector to stimulate successfully broad-based economic growth nationally, "competent and active government" was required (Timmer 1995). To create the required pro-rural sector commitments, policy makers and business leaders, producer associations, and political leaders will have to foment a support base such that new national "directions" and national "ownership" are stimulated.

Formulating a national, new era S&T program frame: Today's diverse and complex technology demands surpass the "national" commodity structure that supported "production–driven" systems of earlier programs. Little, alternative S&T systems have been introduced in the face of changed economic realities. In today's rapidly different era where rural residents gain incomes from multiple sources, though "agriculture" remains critical given its multiple effects, "technology" must be cast more broadly. "Technology has an important role to play both through indirect effects in their roles as workers and net buyers of food and through direct effects in their roles as wholesale producers of their own food needs" (de Janvry 2000) . In this setting a new, Rural-Based Knowledge System focusing on three priority, interrelated themes becomes critical; 1) competitiveness, 2) natural resources, and 3) rural poverty alleviation.

Competitiveness: Increasingly, country-level competitiveness will be determined on specific points related to commodity specific market share, comparative costs of production, relative export advantage, and related competitiveness support (Blackman, Shui, Cramer and E.J.Wailes 1992). Export product entrance requirements for establishing market shares will be the available only for those fresh and processed commodities that meet WTO standards. The challenges in all of these will be to be able to access where possible, or improved local sources for the appropriate variety of species "x "that has market demand and conduct adaptive research in the most appropriate agro-ecological zone. New methodologies to provide cost effective but exacting technology diffusion for production and increasingly labor-intensive, highly exacting, post-harvest technologies, also become essential. NGO or other institutional arrangements also become appropriate to conduct increased attention to adaptive practices that increase

efficiencies. Other S&T needs related to food safety and bio-technology safety regulations also become increasingly essential.

2) Natural Resources: Under the new economic environment, the natural resource base to include soil, forest, genetic, and water resources becomes the base from which current and future growth prospers. Consequently, given the increasing degradation of these resources, under the new framework technologies to reverse deforestation, soil degradation, overgrazing and loss of bio-diversity become an imperative. "Green Seal" type technology certification systems, organic certification practices and science-based coffee shade grown habitat for topical birds become market-driven S&T activities that generate additional value, while enhancing the environment.

3) Rural Poverty Alleviation: While a more dynamic, food and agro-industrial system will form an essential role for creating numerous multipliers, some rural residents will be displaced either by not being competitive with alternative suppliers, or by not finding suitable non-tradeable-related employment. Since most of the affected are the highly vulnerable cereal producers, they will probably be in a position to employ an interim land alternative strategy to maximize family subsistence needs on smaller land units. This option is described in Section IV. Other S&T knowledge systems are needed relating to handicraft production, eco-tourism promotion, and the growing number of new off-farm employment opportunities projected.

Facilitating the new era institutional model: To generalize, the INIA institutional framework does not serve the demands now required. New era public good issues need to be defined and promoted to generate private sector political and financial support. A broader governmental presence in a facilitating supportive role plus a new private sector support base to include producer associations, universities and NGOs is probably required. In the evolving multi-sector and multi-institutional world now emerging, other ministries than just agriculture need to interact in mutually supporting ways to facilitate support to this generally marginalized sector; i.e. trade and commerce, environment, economy and finance, health, and science. While this national-level support base contemplates this activity and designs the new mission and support elements, a broader array of complementary international support experiences should be considered. These include; the range of international crop, problem, and discipline specific global networks organized by the CGIAR, USDA, and also under USAID's Collaborative Research Support Program (CRSP) and the reformulated support program evolving from USAID's "New Agricultural Strategy" exercise now under way. Some NGOs and consulting company experiences provide new front line adaptive research and technology outreach experiences to provide the interim experiential base until more sustainable institutional bases are in place.

Stimulating common donor focus and coordination. While donor support declined notably during the 1990s, all key donors are now finalizing strategies to prepare for new needs. There is an urgent need to ensure effective donor coordination for LAC's S&T system in the context of the FTAA. USAID and the US Executive Directors in the Bank could do much more to stimulate urgently needed strategic and county-level program

coordination. In this regard, the concept of donor-level institutional comparative advantage becomes important.

IV. Suggested Activities and Areas of Importance for Launching the "New Era" Agriculture Science and Technology Program

Given the many structural issues and institutional reforms required, new S&T efforts organized by national leaders and facilitated by donors become essential pillars. Some of the initial support activities are described.

Conceptualize potential product lines and outline support requirements around real and potential "comparative advantages:" The smaller and medium-sized countries are particularly vulnerable due to their limited S&T capacities and in some cases, limited opportunities. They will require assistance to conduct the necessary assessments of market opportunities, agronomic potential, and cost factors to help guide assess their future strategies. Based on available data and in consultation with major agribusiness and country-level commodity leaders, an effort should be made to sketch out and analyze the prospective potential "winners." IICA, IFPRI, and USAID have done studies on country-level comparative advantages and competitiveness approaches which help provide initial framework. However, within these studies there are methodological inconsistencies. To help provide some initial guidelines from which greater assurances generated and interests mustered, more rigorous reviews of the methodologies must be done and closer examine of ongoing country projects of promise also undertaken to include external "intelligence."

Within this framework, national and international expertise particularly from the business side can interact to serve as a base for developing S&T agenda to include the initial articulation of public and private sector roles and responsibites. This process also would help mobilize essential political commitments and business interests. "Competitiveness" themes begin to be strategized and institutionalized broadly, and a base for forming new, private/public partnerships is established.

Initiate a participant training program to form a new era critical cadre of MS and selected Ph. D. personnel: There is a great dearth of technical skills that in a selective way, must begin to be addressed.. In addition, local applied, vocational training in select areas will also become a requirement. Early on while design work is underway, targeted disciplines will be determined and guarantee postings provided upon graduation to ensure maximum developmental impacts.

Develop an outreach program for the utilization of improved technologies for basic food producers as a crucial "Alternative Strategy: Most of LAC's small producers are maize, or other cereal producers . For this large grouping, a particularly daunting challenge prevails as tariff reduction expose many to cheaper producers. Competitiveness issuers become real. For this group, alternative employment options will be extremely limited for those displaced until a broader range of employment activities and a more robust economy is in place. In the meantime, at least subsistence needs must be

confronted while many of these producers, explore other land use pursuits to include livestock, tree crops, or mixed farm/non-farm activities. Therefore, a major priority is the introduction of technologies that reduce per-unit costs of production and as appropriate, reduces production areas for these crops thereby providing additional land to undertake more remunerative pursuits . As trade liberalization negotiations expand, there is an urgent need to engage CIAT and CIMMYT and maybe appropriate USAID CRSPs (Intsormil for example) to assess the status of current technology and existing outreach capacities. From this review to include tentative farm budgets, a base for determining the broadest use of improved technologies and program elements for implementation is made possible.

Consider specific technical areas of increased importance: In conjunction with the trade liberalization process which increasingly focuses on consumer safety and new tools related for enhancing competitiveness via rapidly advancing biotechnology, computer, and learning technology applications, USAID/ LAC places special importance on areas as biotechnology, food safety, plant and animal health, and ICT. This thrust is very complementary with IDB thinking. "The new opportunities provided by trade liberalization make it essential to accelerate the process of technological development to increase production in a way that is competitive and sustainable over the long term" Echevarria 2000b).

Biotechnology: There is considerable attraction to biotechnology for its opportunities as a positive crop improvement tool to address multiple needs. Important biotech products include pest resistance, improved yield, biotic tolerances, nutritional benefits, and reduced environmental impact (National Academy of Sciences 2000). In the U.S., where 50% of the trials have occurred world wide (Pardey and Beintema 2001), genetically engineered food crops also include canola, rice, tomatoes while other crops such as sugar beets, wheat, squash, papayas, berries, bananas, and pineapples will be going through the approval process for marketing (Congressional Research Service 1999). Worldwide, by far the greatest area expansion for genetically modified organisms (GMOs) has been with cotton, maize, and soybeans. Less than 29 % of the biotechnology trial work has been done in developing countries (Pardy and Beintema 2001). Iin these countries, limited wide scale use by small farmers of GMO work has been observed.

In LAC, Argentina is the unique world leader (with the US and Canada), being the second largest exporter of genetically engineered crops, almost all of which is soybeans, more than 90% with 5 % for maize. Both GMO production systems were developed with leading tans-national companies (Burachik and Traynor nd). The other LAC GMO using countries are no where close to Argentina's dramatic expansion over the last 10 years. They include Mexico, Venezuela, Colombia, Bolivia, Brazil, and Uruguay (New York Times 2001). While GMO agricultural products in LAC hold "promising results for agricultural productivity " this potential is constrained by the universal concerns associated with human health safety and affects on bio-diversity (Diaz-Bonilla 1999).

This wide spread fear and concern requires that highly professional national-level bio-safety systems be in place for all insist that strict standards for safety related to human

health and environmental must first be in place. In their absence, private sector biotech investments are reduced, local product sales limited, and product entry for exports is denied. In the context of this report the absence of such capacities forms one of the region's biggest barriers (Cohen 2001, and Pardy and Beintema 2001).

Since throughout LAC country-level capacities must become more competitive, a timely assessment of current capacities, needs and potentials requirements related to bio-safety should be undertaken. From this assessment, a basis for exploring alternative support, possibly via a regionally-based equivalent service mechanism, can be explored.

Food Safety: A review of the Congressional Research Service's regular Food Safety Reports reveals the increased importance the U.S. places on food safety, due in part to the increased arrival of imported food products, preserved and fresh. In 2000 the President asked for a total $421 million to carry out the Food Safety Initiative (Congressional Research Service 2000 and 2001). This vigilance will become more serious in the context of the FTAA for as tariffs are dropped, science-based food safety inspection systems will be enforced. Food safety attention becomes much more complicated in the context of the emerging producer to processor to export to consumer "chain" with increased chance for contamination.

In this setting, IICA's recent assessment concluded that in LAC there was a "different imbalance" as to the status of their institutional, regulatory, and technological capacities. This relates to installed capacities in terms of standard setting, and the relationship between national legislation and international regulations and their equipment and capacities. While they concluded that much progress had been made in the regulatory arena overall: 1) LAC countries play only a small role in international reference organizations; 2) risk analysis units either do not exist or are inadequate ; 3) there is little interaction between the public and private sector; and 4) there is an absence of information and surveillance systems to support decision making" (IICA 2001).

In response to these dynamics it is important to note USADI/LAC's sub-regional program approach under the "Caribbean Agricultural Competitiveness Program." Beginning in 1998 and working through CARICOM, a series of technical support services to assist the Caribbean countries to respond to principals set forth in the "World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures. Under this agreement, attention is directed to: 1) Hazard Analysis Critical Control Points (HACP) certification; 2) risk assessment analysis, legislation to strengthen surveillance, quarantine vet drugs , plant health, food control and quality, pesticides and toxic chemicals; and 3) Testing procedures and protocols to enforce standards.

Considerable interaction has been done to expand this activity in Central American where dialogue continues. In the Andean region, however, little interest has been generated. In the context of the important gap this effort is addressing, minimal support to help foment large numbers of future trading partners with the basic tools to function—becomes a most worthy investment.

Animal and Plant Health : Though very much related to Food Safety, the focus herein is more on the prevention and eradication of pest and disease from crops and livestock as noted above. In addition, human health concerns, for example pesticicide residues form the other major food safety grouping. There are broad economic concerns for receiving countries of unhealthy animals or plants that might affect similar species or native fauna and flora. If not appropriately diagnosed and/or quarantined, they have the potential for causing considerable damage. On the animal health side, in LAC the principal concerns relate to foot and mouth disease, poultry influenza and Newcastle disease, and classic swine fever. For plant protection issues are much more extensive starting from the larger number of insect born plan diseases (IICA 2001). Rigorous, science-based public sector institutions conduct a standard series of activities related to clear health and trade policies and precise standards, technical audit and inspection mechanisms, and quarantine controls, and disease and pest eradication.

Information Communications Technology (ICT): Resulting from considerable advances in internet and electronic commerce and their application to the needs of the developing countries, exciting opportunities to provide new cost–effective knowledge systems becomes possible. This was the message with the launching in the White House in 1998 of the Internet for Economic Development (IED) done to help "bridge" the digital divide between the developed and developing world. Particular benefactors of this new era will be isolated rural residents where communications and access are so expensive and spotty while new realities further restrict them if access is not provided. There are some examples to illustrate this new bridging. Under a FAO-sponsored program they have been able to develop "public call offices" in Indonesia such that via satellite and cellular telephone links, villagers can greet distant kin and farmers obtain market prices on crops where time differences cause major shifts. In an Internet electronic information system farmers in Senegal were able to obtain premium prices for their product and presented with new varieties more relevant to miller's needs. The Bureau has seen the utility of these technological applications to development and has just contracted an ICT specialist with considerable international experiences.

Conclusion

Our increasingly inter-connected world is passing through a time of unprecedented change and uncertainty. Access to appropriate knowledge becomes a major impediment while currently, country capacities are of questionable merit. A Rural-Based Knowledge System focused on competitiveness, natural resources, and poverty amelioration is needed to help provide millions with critical skills so that they may begin to adapt, compete, and win. President Bush has placed great hope on the successful launching and functioning of the FTAA. Targeted U.S. assistance to help formulate large and beneficial participation will be crucial to ensure the promised mutual gains FTAA signatories aspire. USAID, because of its rich inventory of diverse S&T experiences and current ties to US and international centers of excellence, universities, agribusiness, and commodity groups is uniquely positioned to provide critical, technical assistance and training and services to work with donor partners such that unparalleled, mutual benefits can emerge.

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