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Sustainability, Economics, and Ecology: Issues and Opportunities for IARC Social Scientists

Larry Harrington, CIMMYT

Harrington pointed out that the notion of sustainability encompasses population growth and pollution; deforestation and land degradation; agroecology and energy cycling; erosion and intergenerational equity; biodiversity; global warming; and the ultimate fate of humanity. He began by outlining issues under active discussion.

Issues Surrounding the Concept of Sustainability

Harrington held that most differences in interpreting the meaning of sustainability stem from the diversity of answers to the question, what is it that we wish to sustain? People working at different scales and using different approaches have diverse perceptions, which are as far apart as people who emphasize the ethical duty of humans to steward nature and those who study energy flows in a single ecosystem.

He expressed concern that the measurements of sustainability are fundamental to making the concept operational, but that how to go about measurement is less clear. Much of the recent work has focused on total factor productivity, an approach viewed as too narrow by those who interpret sustainability in terms of diversity, energy cycling, irreversible land degradation, exhaustion of nonrenewable resources, or global climate change.

During the next 60 to 100 years, by which time the global population is expected to stabilize, food security and sustainability will become an indivisible issue. There is reason to believe that food security and agricultural sustainability are both at risk in Asia. Expansion of crop area has ceased, little new investment is being made in irrigation infrastructure, and farmers in advanced agricultural areas have already adopted most of the new productivity-increasing techniques that have been made available by science. At the same time, there is evidence of ongoing degradation of land and water resources. Stagnating productivity combined with land degradation will make it exceedingly difficult for Asian agriculture to continue to contribute to growth of income and employment and alleviation of poverty. Chronic poverty, in turn, can cause continued land degradation and population growth.

Land degradation in farmers' fields frequently is difficult to define and measure. Degradation caused by slow processes of nutrient mining and loss of organic matter may be considerably more difficult to detect than damage caused by erosion. Water-induced land degradation, especially salinization and sodification, is a particular problem in selected lowland irrigated areas of Asia. Change is also expected in farmers' external circumstances

through global warming, depletion of nonrenewable resources, and an irreversible loss of genetic diversity.

Ecosystem resilience is enhanced by system diversity. Modern monoculture is characterized by low levels of diversity and is viewed as having a fragile ecological equilibrium controlled by external inputs rather than internal feedback mechanisms. Harrington noted that IARCs maintain that their core breeding programs foster system stability and resilience through the induction of disease resistance and tolerance to abiotic stress. Increased participation of farmers in germplasm screening would help to balance the scientists' view.

Resource degradation is frequently the consequence of common property rights. Although privatization of common property rights is often suggested, it can place resources in the hands of the very wealthy. Actions to foster user groups and community management of common property rights can be preferable. Externalities and the ability of certain farmers to impose off-site costs on others exacerbate sustainability issues.

Finally, the public health problems linked to chemical use in agriculture are another dimension of the sustainability question. The trade-off with food security brings these problems under the umbrella of "sustainable agriculture."

Opportunities for IARC Social Scientists

A wide range of institutions are targeting the sustainability issue; many are not involved in agricultural technology. Harrington asked how the CGIAR contribution is unique, how sustainability concerns can be reflected in centers' programs, and again, what IARC social scientists can do to inform this decision.

Direct contributions of agricultural research aim to halt or reverse processes of resource degradation through farm- or community-level interventions in threatened areas (e.g., research on alley cropping). Preventive contributions of research aim to avert or forestall resource degradation indirectly through generation of employment or income growth, even in areas where resources are not threatened as long as labor markets operate efficiently. Perhaps the most efficient route for IARCs is to help prevent problems before they occur.

Harrington also addressed the extent to which center social scientists should monitor external global level threats to farm situations from global warming or from an irreversible loss in genetic diversity for the centers' mandate crops. In monitoring internal threats to farm situations, Harrington noted the links with FSR. When FSR is combined with the dynamics of sustainability, an array of methodological questions arise, many of which are best addressed by social scientists. These include:

- How can social scientists foster farmers participation in diagnosis and experimentation in addressing sustainability themes?

- What are cost-effective ways to monitor farmers over time, to track changes in resource quality, technology use, input levels, and factor productivity?

- How can carryover effects be explicitly introduced in the design and analysis of on-farm trials?

- When assessing alternative technologies, how should we adjust for external effects and nonuse values such as off-site costs of erosion, on-site user costs, option values, and others?

- How do social scientists confront the possibility that it may be essential to degrade one area to save another?

Technology is clearly important to sustainability, but policy interventions can be even more powerful. To what extent should IARC social scientists concentrate on analysis of policy rather than generation of technology? Are there other policy research institutions to do this? Would a shift in emphasis sacrifice the IARC social scientists' comparative advantage in working partnerships with biological scientists? Strong alliances may be needed with other institutions.

As IARCs pursue research on sustainability themes, there is a danger that they will move beyond their comparative advantage. Few of the CGIAR centers have adequate in-house expertise to seize all the issues and opportunities described earlier, particularly centers that focus on germplasm development. How should the boundaries be drawn on investments in research focusing on sustainability? What directions should these limited investments take in the different centers? And finally, how can social scientists contribute to these decisions?

Integration of Economics and Ecology in Addressing Sustainability Issues in Agroecosystems

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The goal of achieving sustainable agricultural systems will remain elusive until some method for assessing sustainability in systems is developed. Sustainability incorporates holistic notions of ecological stability and resilience, economic viability, and human welfare. Scientific research requires a more specific and rigorous definition susceptible to measurement. Reconciliation of the broad holistic concept with a rigorous measurable one is the key to an operational approach to research on sustainability.