

## **Science, Technology, and Inequalities: Designing Effective Policies and Programs Workshop Summary**

Innovation in science and technology has created remarkable capabilities in today's world. But these capabilities co-exist with poverty, hunger, and ill-health among many of the world's people. In February, 2005, a group of practitioners and scholars gathered in Washington, DC, to consider how to use innovation to share prosperity more broadly. Some participants focused on poverty alleviation, some on reducing disparities by gender or ethnicity, and others on ways to implement health as a human right. All shared a vision of an inclusive, innovation-led global society in which prosperity is widely shared.

The workshop focused on science and technology policies as a tool for achieving such a society. These include research policies, to encourage the production and use of new knowledge; innovation policies, to stimulate new products and processes, particularly in the private sector; and human resource policies, to insure the supply of scientists and engineers. The focus was on inequality in basic needs, especially health and food, rather than on income inequality. This focus anchored the workshop firmly in science and technology policies, since governments almost universally invest in research and innovation in these areas.

The workshop participants agreed that public sector leadership was needed to address these basic needs; markets by themselves have not created shared prosperity in health, food, or environment. Through three case studies (access to essential medicines in poor countries, health disparities in the U.S., and African agriculture), the workshop reviewed a range of available policy tools. The range can be characterized in terms of the breadth of participants, a characteristic which in turn affects the locus of problem definition and control over solutions.

- *Participatory approaches* involve the largest number of people with the broadest range of knowledge and skills in both defining and solving the problem.
- *Capacity building* spreads professional expertise to disadvantaged groups and communities, increasing their capability to produce and absorb knowledge and innovation.
- *Public research* aligns research and innovation efforts in the public sector to develop solutions; but problem definition requires consultation with the affected community.
- *Private sector stimulation* provides conditions and incentives that encourage firms to solve problems targeted by public leadership.

Several participants saw differentials in power, both economic and political, as the core dimension underlying the unequal distribution of the benefits of science and technology. This view suggests several hypotheses:

- (1) The more empowering the approach, the more likely it is to lead to long-term, sustainable inclusion.
- (2) The more involved the affected community, the more likely the approach is to set priorities that reduce inequality.

The less participatory approaches will sometimes be effective in the short term, but leave the fundamental dynamics of inequality in place.

Two **keynote addresses** opened the workshop, one domestic and one international. *Cora Marrett's* paper pointed out that policy makers in the United States do not usually link science and technology to inequality. They assume that S&T investments enhance economic growth, and that growth benefits everyone. Policy makers seek support for S&T investments from their more advantaged constituents, not from those whose basic needs are not met. S&T policies take effect amidst persistent and growing inequalities in the United States. Rising income inequality has been accompanied by growing political polarization, which can in turn influence the policy agenda for science and technology. Casting appeals for research funding in terms of equity and equality would threaten endorsement by those most likely to shape public policy. But U.S. policy making has, at times, responded to the needs and voices of the less advantaged. The task is to dissect the interests and alliances that might be mobilized.

*Sakiko Fukuda Parr* set the global stage for the workshop, using examples of HIV/AIDS drugs and agricultural advances. Two uses of technology are in tension, she pointed out: technology for human development (solving major problems in areas like food and health) and technology for competitiveness and economic growth. Technology has uneven impacts in three ways. First, the benefits do not reach those who are too poor to afford them. Second, the path of development is set by markets, not by human needs. Third, technologically advanced countries have a competitive edge in global markets, and those that lack technological capacity are left behind. Science and technology policies should tackle the obstacles and fill the gaps, she urged.

A panel of respondents to the keynotes made additional points.

- *Ann Markusen* urged the group not to leave economic inequalities out of the analysis. Supply-side definitions of problems to be solved are part of the problem, she noted, calling for broader participation in setting R&D priorities.
- *Willie Pearson, Jr.*, likewise asked, "Who are the gatekeepers?" The benefits of economic growth do not reach everyone. At the same time, the United States sets human resource policies that affect the rest of the world.
- *Per Pinstrup-Andersen* urged the scientific community not to hide behind utilitarian arguments about "growing the pie." The impact of science depends on what science we do, and the impact of economic growth depends on how that growth comes about. By giving priority to helping the poor, we can improve millions of lives in the developing world.
- *Rodrigo Arocena* provided a perspective from the South. The new combination of capital and knowledge has meant less power for those in the South. We need long-range, strong policies to counteract this trend. The South must act as agent, not patient, setting its own priorities, building public support for innovation, and preventing knowledge resources from concentrating in a few hands.
- *David Guston* called attention to the important roles of knowledge and technology transfer in S&T policy, and asked some important questions. What does the current emphasis on maximizing U.S. society for innovation for the future imply about intergenerational inequalities? What kinds of capacities should developing nations build?
- *Francisco Sagasti* recommended taking poverty rather than inequality as the main line of attack. What incentives have worked best to orient research to alleviating poverty? How can we prevent the present power structure from creating binding constraints on developing countries?

The workshop then explored three examples of active, current efforts to use innovation or research policy to reduce a major inequality. **Access to essential medicines** is a major problem in poor countries, and high prices for effective new treatments are one of the obstacles. Session chair *Reid Adler* noted that the topic of intellectual property protection has taken on a life of its own in the discussions of international health issues. The session presented and discussed two approaches to drug patents.

*Ellen t'Hoën* of Medecins sans Frontieres (MSF) portrayed the role of patents in limiting access to essential medicines in poor countries. The World Health Organization defines essential medicines as "those that satisfy the needs of the majority of the population and therefore should be available at all times, in adequate amounts in appropriate dosage forms and at a price the individual and the community can afford." The AIDS epidemic drew attention to the role of patents in keeping prices high and thus putting effective treatments out of reach for most of those affected. The production of generic versions of the drugs in several developing countries allowed MSF and other organizations to negotiate dramatically reduced prices for anti-retrovirals. But the implementation of the next stage of new global intellectual property agreements is likely to prevent new medicines from becoming accessible through this route.

So how can poor countries gain access to essential medicines? T'Hoën cited the conclusion of UK Commission on Intellectual Property Rights (CIPR) 2002: "All the evidence we have examined suggests IP hardly plays any role at all in stimulating R&D on diseases prevalent in developing countries, except for those diseases where there is a large market in the developed world (for example diabetes or heart disease)" In brief, patents are not the answer. Instead, t'Hoën offered not for profit drug development as the most promising alternative, through efforts like the Global Alliance for TB drug development, the International AIDS Vaccine Initiative, Medicines for Malaria Venture, the Microbicides Partnership, and Drugs for Neglected Diseases Initiative (DNDi). She called for urgent action internationally to use the provisions of TRIPS to ensure availability of affordable second generation medicines in a post 2005 world, and to set a needs-drive international health R&D agenda, including alternative priority setting and financing mechanisms.

*Michael Kremer*, Gates Professor of Economics at Harvard University, made the argument for purchase commitments as another alternative. In a purchase commitment, some coalition of national governments and international public and private entities makes a binding commitment to purchase a pre-determined amount of an essential medicine or vaccine. The purchase commitment lowers the risk of undertaking the research and development for the drug, and market forces should then bring forth a successful product. The bodies making the commitment pay nothing if the drug or vaccine is not developed. This kind of innovative combination of public and private action is emblematic of a new set of partnership arrangements under consideration for directing scientific and technological capabilities through the market to the needs of the poor.

*Respondents*<sup>1</sup> outlined still other options, including the proposed Medical R&D Treaty, and *discussion* highlighted the status of health as a human right. How did something essential to health become private property? Many options for public-private partnerships, relationships, agreements, and incentives are being explored. But why can't government just solve the problem? Where is public research in the picture?

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<sup>1</sup> Jacob Werksman, Rockefeller Foundation; Jamie Love, Consumer Project on Technology; Joan Paluzzi, Partners In Health; Richard Wilder, Sidley Austin Brown.

The topic of **Health Disparities in the United States**, for example, a difference in life expectancy of about six years between black and white Americans, has received considerable attention within government and in private foundations. Session chair *David Introcaso* shared the 2004 edition of the National Healthcare Disparity Report, issued by the Agency for Health Care Research and Quality (AHRQ).

*Mireille Kanda* of the National Center for Minority Health and Health Disparities (NCMHD) described NIH's efforts to reduce the gap. NIH's strategic plan for reducing and eventually eliminating health disparities has identified six key disease areas for research. Every NIH institute has developed a plan for addressing the issues in its area, and NCMHD itself has a range of programs aimed at building capacity for research on these topics, from individual fellowships to major center grants at minority-serving institutions. The approach thus uses a portfolio of traditional public research funding mechanisms directed strategically to the biomedical research needs of a particular population, along with strong capacity-building programs.

*Diane Rowley* and *Bill Jenkins* of Morehouse College illustrated the problems of health disparities using data on infant mortality. Although infant mortality rates have tumbled dramatically in the United States over the last 100 years, the ratio of black to white infant mortality has remained in the range of 1.5-2 to 1, and is still rising. Studies show that even for mothers who are matched on education, the differences persist. Poorer health status has been explained away with biological differences, but race is a socially constructed category that actually refers to cultural differences, they claimed, not biological ones. Their model attributes health disparities to a combination of factors: socio-economic factors (30%), racism (30%), cultural factors (30%), and medical care factors (10%), with biological factors contributing 1% at the most.

Rowley and Jenkins advocate community participatory research (CPR) as the best way to address health disparities, because it addresses all the causes at the same time. In such research the community sets the research agenda and goals based on its own needs. This type of research takes socioeconomic factors into account, establishes a culture of trust, and addresses racism by establishing community power. The continuing barriers to community participatory research include lack of respect for community competencies, unwillingness to share power, and lack of acceptance of another perspective. Rowley and Jenkins advise the health community to address health disparities by reducing the effect of SES on health through ethnic specific interventions which include social support; improving cultural competence; targeting low social capital communities; and targeting resources to problems (less than 10% of the disparities are due to differences in health services, but more than 70% of research dollars are directed there).

*Respondents*<sup>2</sup> also pointed to culture, white privilege, and power as factors contributing to health disparities in the U.S. The tension between commercial and egalitarian goals is often missing from the discussion. A variety of public policy initiatives have made the problem worse, including the elimination of affirmative action at the land grant institutions and the war on drugs. *Discussion* noted the concern that the NIH culture of molecular-level studies would miss the mark in this area. Several participants were also concerned that an emphasis on culture lets politicians off the hook. Many noted the complexity of the problem, the inter-relations of many factors, the need for interdisciplinary approaches, and the lack of silver bullets.

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<sup>2</sup> Fatimah Jackson, University of Maryland; Aranthan Jones, Legislative Assistant to Congresswomen Donna Christensen.

Seventy percent of the world's poor make their living from the land. Raising agricultural incomes is thus a major route to reducing world poverty. **African Agriculture** is central to addressing that challenge, and the agricultural research community has engaged in several recent efforts to set a strategy and raise resources to address it.

*Kanayo Nwanze*, Director General of the Africa Rice Center (WARDA), described the problems. In Central, Eastern, and Southern Africa, 45-50% of the population is under-nourished. Africa's crop yields are the lowest in the world. While the Green Revolution produced new varieties of basic crops that were successfully planted across broad sections of the Asian landscape, African growing conditions are much more varied, and demand a greater variety of solutions. The imposition of both Western agricultural models and Green Revolution techniques produced costly failures. Lack of adequate infrastructure, including electricity and roads, has hampered African markets for agricultural products. Agricultural research has been badly under-funded, and productivity has been affected by drought, civil wars, and AIDS.

There are signs of hope, however. NEPAD is taking an interest, coalitions of donors are making investments, and there have been some breakthroughs in new crop varieties. NERICA rice, for example, is a symbol of hope for millions of small farmers. The variety was developed with farmer participatory approaches, through partnerships at many levels with sustained funding and political support. Nwanze put the onus of solutions squarely on the shoulders of political leaders, who must work to achieve political, social stability; remove unfair subsidies; improve infrastructure; involve the private sector; provide access to credit for farmers, particularly women; promote local products; and demonstrate a political commitment at the highest level. He concluded that Sub-Saharan Africa's problems cannot be solved with solutions from outside. Africans must decide for themselves what is best, and make economic and political development an endogenous process.

*Laurens van Veldhuizen* of ETC Ecoculture, a European non-governmental organization partnering with nine developing country organizations in a project called Prolinnova, "Promoting Local Innovation." The project's approach values experimentation and innovation by farmers themselves, and accepts the challenge of dialogue with other knowledge systems by looking for science outside the walls of research stations and laboratories. Farmer-led approaches generally avoid over-reliance on external inputs, give priority to options with a high labor input factor, and avoid high-risk options, which poor farmers cannot afford. They also take contextual factors into account, such as access to land, forest, and water; local patterns of collaboration and leadership; and culturally appropriate conflict resolution mechanisms. Like more traditional agricultural R&D, farmer-led approaches claim successes, such as pit-growing approaches for maize in Tanzania. Traditional agricultural research and development could draw on the strengths of farmer-led projects, if researchers are willing to share power. The approaches are complementary.

*Respondents*<sup>3</sup> stressed that agricultural research is part of a system that includes capacity-building, infrastructure, markets, and finance. Too much emphasis on process and systems, however, can distract from asking whether results are actually being achieved. *Discussion* brought in the complexity of solutions. Agricultural researchers have to listen to farmers, yet solutions ultimately have to scale up. The call for stronger

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<sup>3</sup> Julie Howard, Executive Director, Coalition to Cut Hunger and Poverty in Africa; Franklin Moore, U.S. Agency for International Development.

African leadership does not mean that the donor community should withdraw. The discussion also brought in the relationship between poverty and environmental sustainability. The productivity increases have to be sustainable. Food is an eminently tradable commodity, but the effects of trade policy and food aid also need to be taken into account.

**Workshop synthesizers** articulated general themes across the presentations. *Judi Wakhungu* noted that governments often hide poverty. Inequality is not a popular topic. Science and technology policies themselves are complex, and even more so when applied to problems of the disadvantaged. We cannot be confident that solutions that worked in the past will work again. Even the best science and technology cannot address the growing powerlessness of the South.

*Steve Nelson* reminded the group that most research and development spending in the North is in private industry. Can we take that into account in our analysis, along with the long-term trend towards privatization of knowledge? While there is consensus that a North-South partnership should build capacity in the South, what kind of international body can actually accomplish that? The policy implications of the workshop's observations need attention. If new technologies tend to increase inequalities, what can we do to change that outcome? Can we create a demand-side research agenda to address the problems we have discussed? How do we set priorities? As *Kenneth Boulding* observed, innovations are a dime a dozen; critique is the rare commodity.

*Judith Sutz* portrayed inequality in the context of this workshop as the growing gap between capabilities science and technology have made available and the actual life conditions of the poor. Leaving the poor behind is unacceptable; reducing inequality is the business of the S&T community, because it is everybody's business. The gaps appear in priority-setting, development, access, human resources, infrastructure, distribution, and power. The creation of public goods requires public investments; markets will not do the job by themselves. We need to remember that many institutions mediate the effects of S&T in everyday life. Those other institutions need to be taken into account in designing policies and programs. Changing national and international research agendas is crucial, and possible. More research is necessary, but not sufficient. The research must also be

- Differently oriented (the issue of the research agenda)
- Differently approached (the issue of multi, inter, trans, schizo...disciplinarity)
- Differently conducted (participatory and respectful collective research: all types of knowledge counts and everybody knows something useful)

She concluded with the hope that better policies will be put in place. But to implement them, "new" people will be needed. Science, technology, innovation and their role in fighting inequality and poverty need to be discussed with the young people entering science and technology policy. The older generation cannot provide them with answers, but we can and should encourage them to raise new types of questions.

*Full workshop report and edited volume of papers are in preparation. For further information, contact Susan Cozzens, Technology Policy and Assessment Center, School of Public Policy, Georgia Institute of Technology, [susan.cozzens@pubpolicy.gatech.edu](mailto:susan.cozzens@pubpolicy.gatech.edu). We gratefully acknowledge the support of the Program on Societal Dimensions of Engineering, Science, and Technology at the National Science Foundation, through Grants SES 0354362 and SES 0354356. All views expressed are those of the authors, and do not necessarily reflect the opinions of the National Science Foundation.*