Gender Advisory Board
United Nations Commission on Science and Technology for Development

Regional Consultative Expert Workshops: Understanding the Gender Dimensions of Biotechnology Research and Development

Pretoria, South Africa, November 26-27, 2004
Co-hosted by the University of Pretoria

Islamabad, Pakistan, November 30 – December 1, 2004
Co-hosted by the National Commission on Biotechnology

IDRC CRDI

1. Introduction: Workshop Goals and Programme

The Gender Advisory Board of the UN Commission on Science and Technology for Development organised two regional consultative expert workshops in sub-Saharan Africa and Asia-Pacific with funds from the International Development Research Centre (IDRC). Partnering institutions were the University of Pretoria, represented by Dr. Mohammed Jeenah, Director of the Office of Research Support and Development; and the Pakistan National Commission on Biotechnology (NCB), with Dr. Tanveer Naim, Consultant to the Commission and GAB Member for Pakistan. The Islamabad workshop was opened by the Minister of Higher Education of Pakistan, and the President of the NCB, Dr. Manwar Asim, attended the first day of the workshop. The workshop also received considerable coverage on the Pakistan evening TV newscasts.

The purpose of the workshops was to engage in consultation with experts from each region to identify the critical gender effects and gaps in research and development of new biotechnologies in terms of social and gender relations; women's food production and natural resources-based enterprises; labour patterns; biodiversity; access and benefit sharing; and poverty reduction in the developing world. A series of key issues were identified by participants which incorporated all of these topics in some respect (see below).

The workshops identified key areas where IDRC, the Gender Advisory Board, and other agencies can support programming and research to encourage improved production for small-scale farmers; build capacity for analysis and development in the South; and assist in the identification of appropriate policies around the gender dimensions of biotechnology research and development.

Ten to fifteen experts from each region attended the workshops, working with the Gender Advisory Board to:

- assess the current status of knowledge and research on gender and biotechnology in their region or country;
- exchange information on ongoing research and programmes in the region;
- identify areas where enough knowledge or data exists that policy and programming can be suggested and implemented;
- identify gaps in knowledge, where more research is necessary to form policy and programming; and
- make suggestions and recommendations for policy and research.

Recommendations and suggestions for policy research which resulted from the meetings provided input into the IDRC Task Force on Biotechnology and Emerging Technologies, and helped the Board develop a programme of research for future activity and collaboration.

2. Overview of Results and Recommendations

Several themes emerged in common in both expert workshops, while at the same time, the analysis of gendered patterns in opportunities and restrictions was essentially similar (with some regional differences in emphasis).This report therefore combines the results of both workshops.[1]

Both gender and women's issues were addressed. "Gender" refers to roles and relations between men and women, while a focus on "women" addresses those issues which pertain specifically to women's constraints and opportunities. Discussions in both consultations tended to go back and forth between focusing on the situations and concerns of women and taking into account larger gender and socioeconomic issues around the development and implementation of technology and biotechnology. While workshop participants addressed both technology and biotechnology issues, only those with clear implications for biotechnology research and development are reported on here. The groups took an analytical rather than descriptive approach, focusing on the "why" of gendered patterns of development and impact. This includes attention to the allocation of work by gender (gender division of labour) and the cultural, economic, religious and political issues which constrain women and men from adopting biotechnologies in beneficial ways. It was also recognised that promoting gender sensitivity in various sectors can require working with both men and women.

Biotechnologies were taken to include the range of both "old" and "new" technologies, such as tissue culture and plant breeding, as well as genetic modification.

The key issues as identified by participants and discussed in the body of the report are:

1. How **cultural relationships** and culturally-based differences in status and power between men and women affect gender equity as well as the opportunity of women and men to benefit equally from technological development and implementation.
2. **Technical assessment** of socioeconomic, political and cultural costs and benefits, or developing appropriate bio- and conventional technologies which have a positive impact on all members of society.
3. Ensuring women have a say in **biotechnology policy making** at all levels.
4. Developing **communication and extension** strategies to engage with and empower all stakeholder groups, using a variety of strategies and media.
5. Women's **intellectual property rights**, closely related to indigenous knowledge and biodiversity.
6. The impact of **trade and international agreements** such as TRIPS and CBD on women's ability to manage and benefit from their knowledge as well as from the use of biotechnologies.

Asia-Pacific participants in addition agreed that priority areas include **access to education** (both formal and non-formal) on biotechnology, **bioethics and health**, and the **commercialisation of biotechnology** by

[1] Although both workshops addressed similar themes and issues, there were some differences in emphasis. Recommendations and discussions in both workshops on similar issues are reported on under common headings, while topics in which there was particular regional divergence are addressed separately.

women scientists and entrepreneurs. In Africa, there was a particular focus on **agricultural technologies and GMOs**.

3. Gender Dimensions of Biotechnology: Context and Main Issues[2]

Participants agreed that gendered patterns of impact of biotechnology are directly relevant to development policy and gender equity in a number of key areas. This is a new area where little data currently exists, but there has been a great deal of research, data collection and analysis on the gendered implications of technological development since the 1970s (most notably in the 1990s), which can inform gender analysis of biotechnology research and development.

While "sex" refers to physiological differences between men and women, "gender" concerns the distinctive roles that men and women are given in a society, as well as the relations between men and women. For example, physiological or sex differences between men and women will raise particular issues concerning the application of biotechnologies for health. In the use of vaccines, it has been found that the HIV/AIDS vaccine affects women's physiology differently than men's. However, the gender implications of biotechnology research and development extend beyond physiological differences to include a wider range of socioeconomic, cultural and political effects and implications for women and men.

The gender division of labour, which evolves out of cultural roles and relations between men and women, varies from region to region. This includes:

- different tasks and responsibilities in household and wider communities
- differences in living and working conditions
- distinct nature of tasks and entitlement to resources
- different risks in the possible development of health problems
- different legal rights and status.

As a result, men and women may have different needs and aspirations. However, in most cultures and regions, women play a central role in food production and provision of healthcare. Gender issues are now highlighted by many development organisations, and increasing evidence exists that improving the livelihoods and health of poor women in developing countries can bring direct benefits to their families.

How then can the development of biotechnology policy take account of the gender dimension in the developing country context? Potential applications of biotechnology with particular gender dimensions include agricultural production, traditional knowledge and health. However, there are also gender dimensions to effects and uses of biotechnologies with respect to:

- the environment and natural resources management
- food safety and security
- access to and privacy in access to healthcare
- ownership and benefit sharing of genetic resources.

[2] This section is taken from presentations at both workshops by Sandy Thomas on "Critical Issues Pertaining to the Gender Dimensions of Biotechnology" and Sophia Huyer, "Gender and Biotechnology: Identified Research and Policy Issues".

Food security and agricultural production. Biotechnology presents the potential for new approaches to agriculture as well as development of improved crop varieties. It could be a tool to provide the doubling of agricultural output necessary to ensure food security for a world population of eight billion, as projected for 2020. Women produce the majority of food crops in developing countries, and recognition of their significant role in agriculture is beginning to be evident. We know that they produce between 60-80% of the food in most developing countries, providing half of total global food production. In Africa, the figure is closer to 80%. Activities include small-scale agriculture, farm labour, subsistence farming and sale of agricultural goods.

Despite their important role as food producers, however, adoption of new crops by women has been slow. Women consistently have less access to resources for agricultural production, including land, credit, productivity inputs, education and training, and information. Research on gendered trends in technological inputs has found that gender biases affect who receives technologies, training, inputs and resources. Technology is often considered to be neutral and gender-blind, and it is often assumed that adoption of technology will naturally lead to development. Nevertheless, we know that women's situations, concerns, technological skills, use of technologies, and knowledge are often overlooked. In fact, women have often been displaced and marginalised by technology development, with many of their activities becoming sidelined or taken over by men. This has had resulting implications for the health and well-being of women and children, environmental sustainability, and income levels in developing countries.

An example of effects of agricultural technologies on women may be found in the Green Revolution. According to the Food and Agriculture Organisation (FAO), the Green Revolution has not necessarily benefited those in lower economic strata, either in terms of food security or economic opportunity. It has been found to have significant costs for rural women, through increased need for cash for technology inputs, increased need for unpaid female labour for farming, and displacement of women's wage-earning opportunities.[3]

Other results of the Green Revolution relevant to this discussion include technology development focused on males and cash crops, which displaces women. As well, there has been an erosion of women's right to land, subsistence farming, and access to cash.

In general, women are not considered to be clients for agricultural research and technology. Technology implementation which is targetted at men and implemented with men's goals and situation in mind has tended to lead to an increase in the amount of labour required to be expended by women to attain the same level of production.

More recently, assessment of the implementation of Bt. Cotton in rural Kenya found that genetically modified crops can increase yields and control pests, but are not a solution to poverty in themselves. Rather, there is a need for support services and resources such as access to credit, extension services and marketing; a sound regulatory framework; a strong seed multiplication, certification and distribution system; enhanced information flow; and information on pricing, which affect decisions on adopting the technology. The study concluded that it is necessary to

[3] Food and Agricultural Organisation (FAO). "Women and the Green Revolution." (2004). <http://www.fao.org/focus/e/women/green-e.htm> (4 November 2004).

build capacity of farmers to manage the technology, and provide support in chemical pesticide control.[4]

Gender and agro-biodiversity. In discussing the implications of biotechnology for diversity, it is useful to remember that, after 100 years of agricultural change:

- 75% of plant genetic diversity has been lost and many local varieties and "landraces" have been replaced by genetically uniform, high-yielding varieties;
- 30% of livestock breeds are at risk of extinction; six breeds are lost every month;
- 75% of the world's food is generated from 12 plants and five animal species.
- 4% of the 250 000 to 300 000 known plant species are edible, while only 150 to 200 are used by humans, and only three – rice, maize and wheat – contribute nearly 60% of calories and proteins obtained by humans from plants.
- Animals provide 30% of human requirements for food and agriculture. 12% of the world's population lives almost entirely on products from ruminants.[5]

Women are users and preservers of crops, wild plants, tree products, and wild and domesticated animals as plant gatherers, gardeners, herbalists, seed custodians, and plant breeders. For example, women adapt and preserve different species in their home gardens. In Thailand, 230 plant species were preserved in home gardens from forests which were later cleared.

In assessing biodiversity resources and practices, it is important to remember that women and men have different roles, expertise, practices and knowledge, which affect in-situ conservation, management, and improvement of genetic resources. Women are the possessors of local knowledge which is highly sophisticated and often ignored. The need to codify women's knowledge is an important biodiversity and intellectual property rights (IPR) issue. It is also important to better understand the role of women in the guardianship of traditional knowledge relevant to biotechnology.

Intellectual Property Rights (IPRs). Women possess much of the world's local knowledge on natural resource management, herbs and medicinal plants. To date, IPRs have tended not to take into account gender attitudes and access to resources, since female ownership and rights do not tend to be valued equally. There is a need for acknowledgement and protection of women's innovations, as well as recognition that women do have uses for technology. When looking at the IPR implications of women's relation to technology, it is important to remember that the technological worlds of women and men differ according to social, economic, cultural and sexual relationships. The space in which women live affects their patterns of production and use of technology, as do circumstances such as national disaster, conflicts, environmental changes and market demands. Women's knowledge of processes is rational and based on a logical framework of understanding. It should also be recognised that technical information and skills are communicated to women and between women by different channels.

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[4] Wakhungu, J. and D.K. Walufa. *Introducting BT. Cotton: Policy Lessons for Smallholder Farmers in Kenya*. Nairobi: African Centre for Policy Studies, 2004.

[5] Food and Agricultural Organisation (FAO). "Women: Users, Preservers and Managers of Agro-Biodiversity." (2004). <http://www.fao.org/focus/e/women/Biodiv-e.htm> (4 November 2004); Howard, P. "The Major Importance of Plan Biodiversity." London: Sustainable Agriculture and Rural Livelihoods Programme, (SARL), IIED, 2003.

Health and Reproductive Technologies. Improvements in health have lowered mortality and morbidity rates globally, but access to health care in developing countries continues to be a problem. In 1998, 30% of deaths in low and middle income countries were due to preventable or treatable communicable diseases, maternal and perinatal conditions, and nutritional deficiencies, while incidence of non-communicable diseases is also rising in many parts of the world. 2.9 million deaths occur each year from diseases for which effective vaccines exist; while no conventional therapies for curing HIV/AIDS yet exist.

Biotechnology could provide solutions to some of these issues. To date, 100 new or improved rDNA medicines and vaccines have been developed, and 250 million people in the developed world have been treated. However, there has been very little research on diseases of the poor in developing countries, i.e. malaria, TB and HIV/AIDS. There is also a need for more efficient, cheaper and accessible diagnostics and therapeutics.

Potential biotechnology applications for health include:

- diagnostics
- blood disorders
- infectious diseases
- therapies and vaccines.

Gender issues with respect to biotechnology and health include childbearing, access to healthcare, HIV/AIDS and other communicable diseases.

Gender issues around HIV/AIDs:

- In Africa women are becoming infected with HIV/AIDS more quickly than men; and their rates of infection are catching up with or surpassing that of men's in other parts of the world.
- ARV therapy is relatively costly for women in developing countries, leading to a lower use of ARV treatment in childbirth.
- Women infected with HIV are often stigmatised.
- Women often lack access to appropriate protection from STDs; women in developing countries are often not in a position to prevent infection from their partners.
- Microbicides present a potential benefit to women.

Other issues include the importance of public education around health prevention and therapeutics, the role of PPPs and MICT+, and the need for prevention and treatment technologies for malaria and TB.

It is also important to acknowledge those health issues related to biotechnologies which have ethical implications. They include: in-vitro fertilization; selective screening for sex and other characteristics; reproductive rights; research use of embryos; informed consent; confidential information; and education of patients and public on rights and processes.

The potential for a "health divide" between developed and developing countries concerning technology diffusion and management exists as well as in patients' awareness of potential

implications of health procedures and of their rights to self-protection and informed consent. Other issues to highlight include the possibility of abuse in drug trials, risk of exploitation in lineal trials of new medicines; collection of DNA samples, removal of ova and tissue, and trafficking of gametes.

To address these risks, it is important to develop and establish consistent national regulatory frameworks on assisted reproduction and research, with the goal of establishing an adequate short-term institutional framework based on accountability, transparency and citizen participation. Development of research and studies to provide data for evidence-based policymaking with a focus on developing countries is also needed, to be undertaken in a context of international partnerships.[6]

4. Gender Dimensions of Biotechnology: Key Issues

A series of overarching issues were identified by the regional experts, which provided a common framework for analysis.

1. There is an urgent need for research and priority setting to ensure that women will be in a position to benefit from biotechnologies, rather than being disadvantaged by the implementation of technologies as has often occurred in the past. Concerted and systematic efforts should be made to develop priorities for biotechnology research and implementation which are consistent with socioeconomic, cultural, agricultural, environmental and political realities and goals. They should incorporate participatory approaches as well as a clear assessment of users and beneficiaries.
2. Although this question was asked in the context of GMOs, it applies to all biotechnologies: what do we need GMOs (or biotechnology) for? What is the purpose of this technology; what will its benefits be? Further, is it preferable, more productive and better-suited to the situation of the user than conventional technologies and methods?
3. It was also agreed that it is not necessarily productive to argue the question of whether GMOs (and other biotechnologies) are “good” or “bad”. Rather, the question should be asked: Are they helpful? And if so, how can they be implemented to produce desired results?
4. Biotechnology is not an end itself but, similar to other technologies, is a tool to achieve certain goals. As such it affects and is affected by the socioeconomic, political, cultural and environmental systems in which it is placed.
5. Recognition of the politics of choice involves understanding who is in a position to choose when it comes to biotechnology, in view of mitigating factors such as poverty and food security. In general, women tend to experience difficulty in accessing information and making independent choices.
7. Analysis should be made of costs and investment vs. actual benefits for all stakeholders – including women, men, farmers, universities, industry and other groups – as compared to conventional technologies.

[6] Acero, L. "Trends in Latin American New Reproductive Technologies and Gender**:** Social Practices, Ethics and Views on Motherhood," 2004.

8. Technologies should not displace women, as was seen in many instances during the Green Revolution, and should not cause a decrease in income levels.

Within the framework of these overarching issues and concerns, the focus areas were further elaborated and developed:

- Culture, gender equity and technological development
- Technology development and application
- Women in biotechnology and S&T
- Communication
- Intellectual property rights (IPR)
- Bioethics and health (Asia-Pacific)
- Commercialisation of biotechnologies and biotechnological processes developed by women (Asia-Pacific)
- Agriculture and GMOs (Africa)

Each focus area was discussed in relation to four sectors: a) health; b) agriculture; c) environment; and d) industry/private sector.

4.1 Culture, gender equity and technological development

The main issue here was defined to be how power relations and differing status between men and women affect the acceptability and appropriateness of biotechnology. This includes the cultural acceptability and appropriateness of introduced technologies, as well as the need for researchers to recognise the importance of determining the acceptability of new technologies. (These questions also apply to technology assessment and implementation, addressed below).

As noted by participants at the Africa consultation, it is important to recognise and take into account the social status of recipients as well as cultural norms in the community. Transferring knowledge in terms which are understandable and relevant to local farmers should also be a consideration. The group emphasised the dangers of assuming that a technology is ‘neutral’. All technologies will have effects on a community, and designating a technology as ‘neutral’ in terms of gender or other effects will allow the implications of its introduction to remain unexamined.

At the Asia-Pacific consultation it was agreed that the gender implications and effects of local cultural attitudes and practices are an important issue in this region also. Additionally it was noted that cultures of practice and attitude vary according to class and level of education. The ability of women to speak for their own rights and situation and make independent choices was seen as critical in the region, especially in South Asian countries such as Pakistan. Development and implementation of formal and non-formal education was considered an area for priority action.

The overall research issue identified is the examination of how cultural relationships, attitudes and practices concerning the roles of men and women affect opportunities to benefit from technological development, and how these relationships, attitudes and practices can be influenced or changed.

Sub-Saharan Africa

Health

The main issues identified include access by women to health services; the ability of women to practice self-protection, especially vis a vis HIV/AIDS and other sexually-transmitted diseases, and family planning. It was recognised that access to new health technologies is affected by power relationships in the home and community, as well as by whether local culture will allow women to take independent actions to protect their health. Nutrition and malnutrition were identified as culturally-influenced, in terms of recognition of the nutritional needs experienced by girls and women (e.g. calcium and iron); as well as cultural practices which determine that women and girls eat after the males in the family have finished their meal. Finally, attention was called to indigenous medical practices engaged in by women to treat family members, including the use of medicinal herbs.

Research issues:

- Research into and development of technologies which allow women to make their own health decisions and protect themselves from communicable diseases, e.g. microbicides; as well as appropriate strategies to introduce these technologies in a community
- Measuring the utility and effectiveness of indigenous health practices and medicinal herbs, with a view to recognising and improving them (where desired)
- Exploring use of and connections between indigenous and western medicines.

Agriculture

A strong emphasis at the Africa consultation was on the effects of GMOs on women farmers, who are responsible for up to 80% of the food production activities on the continent, but whose concerns are not adequately incorporated in technology introduction. Women grow different crops than men for different purposes, a situation which is not adequately recognised in technological development. It was agreed that while GMOs hold the potential to increase food production, the introduction of these technologies also has the potential to negatively affect the income-earning ability of women, as well as their ability to feed their families. Lessons should be learned from the past history of technological development in order to ensure this does not occur. The introduction of agricultural technologies should recognise and take into account the agricultural production roles, knowledge and responsibilities of women, in addition to their decision making power and access to household and farm proceeds.

Research issues:

- What are the effects on food crops of the introduction of GMOs, and which crops are affected (either positive or negatively): men's crops or women's crops?

- How does the introduction of GMOs affect perceptions and allocations of women's crops and men's crops?
- How does the introduction of GMOs affect women's income-generating activities?

Environment

The main issue raised concerns the knowledge held by women about their local environment. Natural resources management practices of women are often not recognised to the same extent as those of men.

Research issue:

- Gathering of data on gendered patterns of knowledge of the environment and environmental management. This is a long-term initiative, but important for the retention of indigenous knowledge.

Industry

The cultural issue raised with respect to the role of biotechnology in industry concerns the acceptance of women working in industries where they were previously not present for reasons of physical workload. For example, new processes to stone-wash jeans using microbes now allow women to work in an industry previously inaccessible to them, introducing changes in employment patterns which can prompt negative reactions from men.

Research issues:

- In which industries are changes in gender patterns of employment and skills being influenced and ushered in by biotechnologies?
- What are potential and existing employment strategy and policy responses to the resulting cultural and right to work issues?

Asia-Pacific

Health

Key health issues relating to cultural roles and expectations for women in the region were identified as: nutritional deficiencies; self-protection; access to health services and education on health, nutrition, hygiene and sanitation; early marriage; and closely-spaced pregnancies.

In many countries in the region, strict prohibitions concerning women's interaction with men affect their access to appropriate health care and extension services. Lack of support for women's ability to make their own health choices affects their ability to prevent disease and regulate the number of children.

The group noted that promoting the awareness of men around these issues is also important.

Research issues:

- What is being done to sensitise men and women in policy and programming at all levels on women's health issues and the rights of women to make informed choices?

- Gathering, assessing, and developing strategies against misuse of reproductive technologies for cultural reasons.
- Comparison and assessment of strategies to train health workers in female diseases and women's health concerns.
- What biotechnologies can be developed and used to improve the nutritional status of women and children?
- Developing and making available low-cost technologies for early diagnosis of disease and measurement of nutritional levels.
- Survey the availability of data related to women's health for development of strategies and technologies to address their priority concerns.
- Explore the potential of biotechnologies to help provide health care for women who are victims of sexual abuse and violence.
- Use of biotechnologies for conviction in cases of sexual harassment and abuse.

Agriculture

Participants called attention to the need to inform women farmers of new agricultural technologies, and to develop technologies which ease women's workload, relieve drudgery, and have fewer health effects. For example, cleaner fuel and energy sources for cooking are a priority, in view of the high rates of respiratory illness among women where fuelwood and other polluting energy sources are used.

Research issues:

- Collection of data on the potential of biotechnologies to ease women's workload and increase their production.
- How technologies can ease women's workload without displacing them and reducing their income, including assessment of case studies, potential strategies, and outline of important issues in technology choice.
- Development and implementation of technologies for clean and sustainable fuel and energy; and water filtration.

4.2 Technology Development and Application

Current approaches to technology development, implementation and assessment in many ways overlook the situations, capabilities and knowledge of women. Both expert groups emphasised that technology introduction should occur in a holistic manner, recognising the surrounding agricultural, environmental, socioeconomic and political (power) systems. ***Developing an approach and framework (or set of frameworks) for systematically integrating socioeconomic, environmental and gender equity concerns into technology research and application was identified as a critical priority area for research and action.*** This is considered to include recognition and acknowledgement of gender equity issues in technology development and implementation at the field level as well as in biotechnology research and decision making.

This section addresses:

1) Technology development
2) Technology implementation
3) Technology assessment
4) Incorporation of women and gender concerns into biotechnology policy and decision making processes at all levels.

4.2.1. Technology Development

The overarching question in this area concerns issues of choice with respect to technology introduction, with accompanying implications for gendered patterns of autonomy, benefit and participation. In other words, the question posed was: by what process does one develop appropriate bio- and conventional technologies, or technologies which have positive impacts on a community?

Several underlying or base components of gender- and socially- appropriate technology development were identified:

- Involvement of women and other stakeholders in identification of the technology to be developed (in the needs assessment phase) and determination of what intervention is most appropriate to the gender and socio-cultural context as well as the crop itself, in the context of local knowledge, agricultural and environmental systems.
- Interaction and consultation with users to attempt to define at the outset how the technology might be accepted and used by beneficiaries.
- Assessment of existing biotechnologies implemented in the region or locality in terms of use patterns and performance results:
  - Strengths and successes
  - What is occurring on the ground, and who benefits
- Recognition and incorporation of women's knowledge, role and abilities in design and innovation.
- Identification of technologies and issues in relation to target groups; use of gender analysis and participatory methods to identify gender division of labour and use and benefit patterns.

Sub-Saharan Africa

The experts at the Africa consultation focused primarily on agricultural technologies. It was emphasised that "we need new ways of interacting with farmers," and that biotechnology should be a tool to tailor innovations for farmers based on their socioeconomic context, resources, and concerns, and recognising their knowledge and needs. Empowerment for farmers is gained through integration of the technology into larger agricultural and environmental systems. This involves giving them the information they need to make appropriate decisions and to make the connections between the links in the agricultural production chain.

It was recognised that this requires the engagement of women farmers and women's groups, as well as an understanding of local cultural and gender roles and patterns of knowledge.

Other participants called for closer examination of the construction or definition of would-be beneficiaries. Women are often considered as recipients rather than generators of knowledge. Issues of power around who is the bearer of knowledge, who is speaking to whom, and who is providing knowledge to whom, can invalidate women's knowledge.

Finally, the question was raised as to how technology priorities can be established on the basis of farmers' needs, that is, what are the key elements of such a methodology? Prioritisation in the field is affected by gender: for example, how men react to women's involvement, or addressing comfort-levels of both sexes in bringing forward women's priorities and roles. The intersection between public and private also applies here, in terms of the ability of governments to provide long-term commitment in view of changes in leadership and funding policies. Longer time-frames and strategies to embed programmes in a range of institutions beyond government need to be explored. There is also a need for strong indigenous institutions and joint programmes between natural and social scientists engaging in multidisciplinary approaches.

Research issues:

- Examination and identification of all aspects of the production chain, not just isolated elements, such as the seed or technology itself.
- Development of strategies and guidelines to identify who is in a position to choose technologies, in view of mitigating factors such as poverty, food security and other situations.
- Strategies and guidelines for developing technology priorities which are based on farmers' needs:
  - analysis of how to include women farmers in every phase, with tracking of results to monitor who benefits
  - research on and recognition of gender roles concerning different crops and varieties
- Research on socioeconomic, gender and environmental consequences of targetting women's vs. men's crops: synthesis and survey of research and data which already exists.
- Research on alternative funding and implementation strategies to allow long-term commitment and planning.

Asia-Pacific

Discussion from the perspective of Asia-Pacific experts revolved around similar issues of the importance of targetting women as technology users, and encouraging communities to include women in technology development and design processes.

Research questions:

- Survey of the extent to which women are involved in design of technologies at the community level.
- Survey of the activities undertaken by women in the community, and how these activities might be affected by the implementation of a particular biotechnology, including development of benchmark information to measure effects on health, income earning, time allocation and rights.
- Assessment of existing technologies and identification of health concerns of women which should take priority and are not adequately addressed.
- Survey of availability of biotechnologies for water purification, water for household tasks, and other household-related health issues.

4.2.2. Technology Implementation

Both expert groups called for technology implementation strategies which involve taking into account the concerns and approaches informing technology development. As in other stages of technology research and introduction, effective implementation requires a participatory process to be effective. Additional important elements include: review of experiences and models for implementation as well as assessment of training needs and methodologies in use of technologies. Also, as in other stages, implementation should be undertaken in a holistic manner, recognising the environmental, socioeconomic, gender and agricultural contexts while providing access to appropriate support services and resources. In general, development and implementation phases should incorporate an awareness of decision making power and balance within the household.

While monitoring and evaluation will be covered in the section on Technology Assessment, it was stated at both workshops that implementation should incorporate ongoing monitoring and assessment throughout the life of a project. As well, working with women and other users to fine tune and ensure the relevance of the technology should be a priority.

Sub-Saharan Africa

As identified by African experts, additional components of appropriate and effective implementation strategies include:

- ensuring the technology is sustainable in terms of effect, maintenance and continuing use after the project has ended
- use of a regulatory framework
- ongoing assessment and encouragement of community preparedness and acceptance, and relation to knowledge and understanding of the technology
- provision of resources and support for farmers' organisations to organise and contribute to implementation.

Research issues for technology implementation in general:

- Assessment and application of training needs and methodologies

- Review of existing experience of biotechnology implementation methods
- Survey of models for introduction and provision of support services and resources.
- Methodologies to include women's knowledge of biodiversity in choices around technology.

Research questions with specific application for the agriculture, industry and environment sectors were also identified.

Agriculture

- Needs assessment with farmers concerning seed recycling, using participatory approaches
- Research on interactive methods of extension.

Industry and Environment

- Ongoing monitoring of effects on biodiversity and environment of technology implementation.
- Research on cleaner production and biosafety issues, recognising that women tend to be most vulnerable to negative effects in a community.
- Approaches and techniques to designing technologies to help small-scale industries reduce pollution
- Research on liability and compensation issues and potentials for small-scale biotechnology enterprises.

Asia-Pacific

Additional contributions from the Asia-Pacific region included a call for gender-sensitive policies supported by gender-sensitisation training for policy makers – at all levels, from national government to the local level – to allay fears and discomfort with gender approaches. This is a main challenge. It was reiterated that it is important to include men in technology implementation, as all stakeholders are needed for success, but to keep in mind socioeconomic and class differences among both women and men.

Research issues:

- Document experiences in gender issues, sensitisation and training with respect to biotechnology implementation in the field.
- Collect and develop disaggregated data and indicators on technology implementation.
- Measurement of effects of biotechnology on women's health, income earning, time allocation and rights against benchmarks established in development phase.

4.2.3. Technology Assessment

Technology assessment requires following on and measuring the effects of technology implementation in the context of overall socioeconomic, gender, environmental and political

systems and relations. It should provide an assessment of costs and benefits in view of each of these sets of issues. Overall research questions include:

- Examination of applicability of participatory methodologies
- Technical assessment of socioeconomic, political and cultural costs and benefits, including comparative studies of new and conventional technologies: Does the technology do what it is promoted to do?
- Long-term assessment of how to influence changes in cultural values (particularly around gender relations), and in the short-term, how to introduce gender issues within cultural paradigms affecting technology development and implementation.

The Key Performance Indicators developed by the Department of Science and Technology in South Africa for the national Biotechnology Research Innovation Centres (BRICs) provide one example of technology assessment guidelines. The KPIs address the demographics of administration and projects by asking questions concerning who is involved in design of projects and technologies, and who is affected. They are meant to prompt awareness of beneficiaries and participants by leading project developers to identify them in each stage of a project.

Health

It was recognised that little systematic work has been done on differential impacts of new generation vaccines and therapeutics on the lives and physiologies of women and men. Such research should include household level assessments, assessments of options for action and choice by women and men, and assessment of physiological responses. Related issues include social support, monitoring, and national and regional capacity to administer and monitor effects of health biotechnologies.

Research issues:

- Methodology to measure differential impact on lives and physiologies of women and men.
- Monitoring and synthesising long and short-term effects of biotechnologies on women's and men's health.
- Assessments of and strategies to increase regional/national capacity and human resources to administer and monitor health biotechnologies.

Agriculture

An issue identified as critical for Africa is the need to develop capabilities and capacities to develop and manage agricultural biotechnologies. This capacity is needed for the purpose of assessing cases such as the Makhatini Flats and the reasons for rejection of biotechnologies by farmers. It was strongly stated that assessments of agricultural biotechnologies should be undertaken by Africans who are seen as independent – that is, interested parties such as seed companies should not be involved – and that funding is needed for this.

Research issues:

- Establishment of local testing facilities for biotechnology and agricultural technologies, to assess food safety and environment impacts.

- Assessment of gender patterns in recent cases of technology introduction, such as Makhatini Flats. The introduction of genetically-modified cotton and maize was identified as particularly important to assess.
- Research in use of biotechnologies by small-scale farmers, in view of inputs needed (fertilisers, herbicides) with accompanying health, environment and economic implications.
- Assessment of strengths and weaknesses of biotechnology crops in comparison to conventional crops.
- Accessibility of assessment processes and institutions to resource poor/farmers (i.e. participation in assessment)
- How to measure issues of socio-cultural and economic effects – i.e. weighting of scientific claims vs. socio-cultural effects and desired outcome.

Industry and Environment

Research:

- Effects of GMOs and other agricultural technologies on biodiversity and biosafety, including loss of genetic resources
- Benchmarking to compare species loss with effects of biotechnologies.

4.2.4. Biotechnology Policy

As defined by the expert groups at both workshops, gender issues around biotechnology policy pertain to getting women involved in policy processes and governance to a greater extent. It was agreed that there is a need for stronger engagement of women in policies that relate to biotechnology. This involves both increasing the participation of women in biotechnology decision making, and empowering communities to make inputs into biotechnology decision making at national and local levels.

Sub-Saharan Africa

As identified at the Africa consultation, key research questions include:

- What models exist for gender mainstreaming of institutions? What has been the experience of other institutions, such as UNEP-GEF?
- Surveys of government legislation and policies affecting gender dimensions of biotechnology research and implementation.
- What role can women's ministries and advocacy groups play in lobbying for increased participation of women and incorporation of gender concerns in policy and programming? What strategies exist or can be developed to get them involved and activated?
- Research on approaches and indicators to monitor progress of gender-related issues through policy and implementation
- Development of indicators to track relevant long- and short-term policies.

Asia-Pacific

Discussion around this issue for the Asia-Pacific region included analysis of strategies to "gender-ise" policies and policy-makers. Key research issues identified were:

- Analysis of existing policies to determine the potential for gender discrimination and gender-disaggregated effects, leading to identification of areas that need to be revised.
- Survey of existing or potential differential impacts, risks or benefits of biotechnology.
- Compare and assess methods to sensitise men and women at all levels to the gender implications of biotechnology and its applications, including comparison and analysis of strategies for gender sensitisation of policy makers.
- How can women's ministries, networks and organisations best be sensitised to the importance of engaging with biotechnology policy?
- Analysis of approaches and methodologies to implement policies and translate policy into strategies and action plans
- Development of statistics and data to base sound policy which is relevant to the national situation
- Review and assessment of strategies to lobby governments around gender and biotechnology for NGOs and other advocacy groups
- Analyse and synthesise connections to Beijing+5, Millennium Development Goals and other international gender- and science- related conventions, with respect to gender and biotechnology issues
- Comparisons of gender and biotechnology issues between North and South as well as continuation of dialogue with women from developed countries and S&T networks.

4.3. Women in Biotechnology and S&T

This discussion was closely related to the discussion on gender representation in biotechnology decision making at both consultations, in that to increase the representation of women in biotechnology regulation and policy making it is necessary to increase the participation of women in the biotechnological sciences, especially at the senior levels where representation generally remains low.

Sub-Saharan Africa

Issues raised by experts in Africa included the need for deliberate policies and actions to enhance the participation of women in biotechnology. It is known that women do not tend to apply for senior and leadership positions, so that strategies to encourage women to apply for these positions should be implemented. There is also a need for emotional and financial support, and recognition of and provision for women's home and life responsibilities.

The question of why there are so few women at senior levels in science was raised. This is the case in most countries, even in those such as South Africa where biotechnology is more open to women as a so-called "softer" science. It was agreed that there are a series of reasons for this attrition through the system: systemic barriers which fail to take into account women's life

situation, lack of support for women and girls to enrol in science courses, failure to pursue women candidates for employment and research positions; selection and interview panels and processes which disadvantage women.

Research issues:

- Collection of national and institutional efforts to change the representation of women in the sciences in the region; comparison with experiences in other regions.
- Synthesis of experiences and literature review on women's representation in S&T generally, particularly in relation to the African context
- Research on how to encourage participation in new professions and development of skills in new technologies, e.g. plant breeding, genetic counselling, biology
- Development of best practices for action, including mechanisms to strengthen women's involvement and participation.

Asia-Pacific

Discussion among experts from Asia-Pacific focused on the need to increase access to education for women and girls, and to provide support to women scientists for commercialisation of their biotechnology innovations (see below).

It was noted that there is little sex-disaggregated data on biotechnologists, and little data, sex-disaggregated or otherwise, on how many biotechnologists are developing commercial products and applications.

It was also stated that steps should be taken to promote science education for girls as well as to promote female role models with the goal of encouraging greater female enrollment and retention at tertiary education levels and in the scientific workforce. The importance of increasing public awareness of the importance of understanding science and biotechnology – that is, to develop a national culture of science – was also emphasised.

Research issues:

- Produce compendiums of women in science in the Islamic world.
- Analyse the low translation of women in science in university to the workforce, higher education and senior management levels, in terms of:
  - socio-cultural/work conditions/ family roles
  - workplace conditions and expectations in comparison to other industries, including re-entry and bridging programmes; as well as transportation availability and family expectations
- Comparison between countries concerning policies, data and situations in the South, with analysis of potential strategies to address and increase women's participation
- Collection and analysis of case studies of women who are successful in biotechnology, with lessons learned, including supportive policy initiatives and legislation.
- Recognition of and research on women's employment in biotechnology (pharmaceutical) industries in relation to equal opportunities and employment, including household-based industries.

4.4 Communication

Public engagement and understanding was identified in both expert workshops as an important precondition for appropriate and successful implementation of biotechnologies. It was also pointed out that there should be more public awareness and discussion of potential risks, harm and benefits of biotechnologies, as well as recognition that farmers and communities may have knowledge which will affect decisions on and uses of biotechnology in the local context. Nonformal training in understanding the technology is necessary for farmers, local communities and the public to participate effectively in development programmes. It was noted that extension services are often weak in this respect, that knowledge in the labs doesn't reach farmers or the beneficiaries of health technologies. This topic therefore includes extension activities.

The key issues in this area were identified as:

- how to communicate with communities and stakeholders;
- how to provide conditions for empowered choices
- developing a bottom-up approach.

Sub-Saharan Africa

The Africa consultation identified a range of stakeholders and targets of communication and extension strategies.

Grassroots stakeholders include:

- consumers
- teachers and students
- small-scale farmers
- interest groups

Research:

- Assessment of which groups are being reached and involved, and which are not.

Government and political parties

- health/agriculture ministries
- standing committees.

Research:

- Is communication with government and political parties working, and can we learn from experience in terms of pros and cons, successes and failures?
- Communication with the women's movement and women's ministries – how can this be accomplished, what strategies are effective?

Regional networking

- Is it happening and working successfully around other technologies?

- Do NEPAD, regional agricultural networks and other entities have a role to play or anything to teach us?

Public and private funders

How do we look beyond the private sector for funding for research, development and communication? How can Africans communicate and prepare for communication and interaction with Northern funders, to prevent donor preconceptions about how and where to implement biotechnology in the region. One option is to set national or regional priorities in the form of strategies, guidelines, and policies.

The Council on Health Research, Evaluation and Development (COHRED) is an international health network which provides capacity building, advocacy and priority setting support. There is a related need for awareness raising in international health agendas, programmes, and institutions in general.

Research:

- What is the level of sensitivity to gender and biotechnology at these institutions, and what is the reason for high or low level of sensitivity?

Communication and **protection of indigenous knowledge**

Key communication issues include how to disseminate awareness that knowledge can be protected as well as how to protect it.

General research questions:

- What are appropriate and effective methods of communication?
- What are the power issues in communication around biotechnology and gender? How can we deconstruct communication channels, to understand who is speaking to whom, and who has the power to make choices?
- What media and communication processes are most effective in particular situations?

Asia-Pacific

Discussion on this topic from the perspective of Asia-Pacific followed similar lines, with a focus on the education of women on their rights, health, and related issues such as hygiene, nutrition, and sanitation. The importance of using female extensions workers to reach women was also emphasised. The importance of creating awareness of intellectual property rights was also raised. Education, either formal or nonformal, was recognised as important for understanding how to apply the new technologies, as well as to understand the potential both for harm and advantage. In this region it tends to be people in the urban areas who have access to knowledge and science – through schools. The same education could be disseminated to women in the rural areas through NGOs and volunteers. It was stated that education should be oriented toward rural needs, and that education also encourages women to understand and fight for their rights

Research:

- How does education and knowledge for empowerment flow between groups?
- Identify and review the most appropriate communications media and methods to convey biotechnological research and information to different target groups in different localities and regions.
- Analysis of training methods and strategies to encourage extension workers and health visitors to convey biotechnology concepts and information and increase their understanding of related national and international policies and rights.
- Comparison and analysis of training programmes for rural women in science; use of barefoot doctors, local knowledge and traditional medicines, etc.
- Development of a book, *Biotechnology for Women,* to be used as a textbook or guide on key biotechnology issues relating to health, food, and environment issues, translated in local languages and available in a variety of formats.
- Analyse, assess, and develop strategies for the role of government and media in communicating gender-sensitive information on public health
- Strategies to encourage more effective liaison between government ministries, other influential bodies (e.g. religious leaders) and advocacy groups on dissemination and implementation of technologies. Assess and compare strategies and policies between countries
- Comparison and assessment of arguments, strategies to convince policy makers and religious leaders on the value of using technologies with respect to social goals and increased standards of living and well-being.
- Collection of sex-disaggregated data on health workers and health service providers, especially in rural areas.

4.5 Intellectual Property Rights (IPR)

Both expert groups recognised that women's knowledge is often different from that of men's; that it needs to be documented and protected; and that it is important to develop strategies which allow women to benefit from the use of that knowledge. It was nevertheless also recognised in both consultations that patenting and documenting indigenous knowledge is not a straight-forward activity, in view of the potential for exploitation and loss of rights, resistance to codification of knowledge by indigenous groups, and the tension between protection and exploitation of knowledge for public good.

Sub-Saharan Africa

Research priorities:

- Research on protecting women's knowledge base in cultural and social contexts.
- Analysis and comparison of policy to support the ability to use and benefit from patents while at the same time protecting women's ownership.
- Assessment and exploration of strategies to resolve the tension between protection of knowledge and exploitation of knowledge for public good, e.g. libraries, databases
- Assessment and comparison of patents for public domain or exploitation for profit

- Investigation into potential for community ownership and management of patents.

Asia-Pacific

The discussion on IPR among experts from Asia-Pacific was tied very closely to indigenous knowledge and biodiversity. It was clearly a strong concern of many of the participants, and a subject of much attention.

Senior women in villages possess much of a community's indigenous knowledge. Many cannot read, so there is a need for it to be documented. The concern is to patent the knowledge in the village, while ensuring that the benefit goes to the women and communities. Documentation of indigenous knowledge was often referred to, recognising that the key issue is how to protect it once it is documented.

The Pacific is rich in natural resources and biodiversity, but the level of biotechnology expertise is relatively low. Protection for natural resources is implemented through the Convention on Biological Diversity (CBD). Agreements and requirements have been established for pharmaceutical research, and a line of ownership and proceeds has been implemented which includes all groups in the chain, from farmers up to government. Efforts are being made to preserve traditional plant varieties. The International Plant Genetic Resource Centre based at the Secretariat of the Pacific Community in Suva, Fiji maps out germ plasms for the Pacific Islands, and some are in tissue culture. As well, women's crops are now included in policies on traditional varieties and food security, e.g. floriculture and handicraft crops.

One example of activity to protect biodiversity and IPRs is that of Wainamate in Fiji which publishes plant information, including botanical name and pharmaceutical properties, without documenting the method of distilling the product from the plant.

Countries can build on conventions ratified. For example, the Convention on Biological Diversity covers IPR issues, invasive species and traditional knowledge and requires countries to develop a National Biodiversity Strategy Action Plan. If endorsed by government, advocacy groups can use the Action Plan for lobbying and further discussion with governments and other stakeholders. Fiji is currently drafting IPR legislation, while the Pacific Islands Forum Secretariat (PIFS) is drafting legislation for the Pacific Island Countries (PIC).

As noted by one participant, much indigenous knowledge held by women is directly related to biotechnology, and much of it is shared in the community, e.g. knowledge of efficacy of medicinal herbs. Engaging agencies to work with local groups to put their knowledge into a database could:

- Provide a means to allow groups to use and benefit from indigenous knowledge
- Provide a way to allow owners to benefit without the knowledge being exploited (biopiracy).

Hiring women as interpreters, etc. would provide employment for women in addition to strengthening protection of women's knowledge.

Research:

1) Biodiversity

- Research on how biotechnology can be used to extract active ingredients in herbs for increased effectiveness, further pharmaceutical uses and testing, and to understand the combinations of herbs and chemicals used. This would also contribute to preservation of these plants and related knowledge systems.
- Research on the knowledge of plant properties held by women, for example, the properties of the Morcella mushroom are known only by senior women in the community where it grows.
- Documentation of herbs and their effects or functions.
- Development of seed banks, for herbs as well as crops.
- Research on political, legal and other strategies for the protection of genetic resources (including animals and microbial flora).
- Strategies for sharing indigenous plant and herbal knowledge (communication and education) between communities to prevent loss of plants and erosion of knowledge.
- Analysis of the gender and socioeconomic implications of the National Biodiversity Strategy Action Plan and other related international agreements, national strategies and policies.

2) Intellectual Property Rights

- Implications of and strategies to allow release of IPRs to poorer countries in the area of health.
- How to document local or community IP so that the owner/developer will benefit, as well as to prevent biopiracy.
- Review of national IP legislation from a gender and socioeconomic perspective
- Research on and comparison of efforts to preserve traditional plant varieties.
- Examine various legislative, legal, and ownership strategies to ensure fair recompense to owners, and to determine rightful ownership to IPR
- Explore potential for recourse in cases of biopiracy, such as through the CBD.
- Means of supporting women through the patenting process: documentation, transfer, legal requirements; use of information packages; support agencies, etc.

4.6. Trade and International Agreements

Sub-Saharan Africa

As raised in the Africa consultation, research issues concerning trade and international agreements include:

- The impact of international agreements on the place of women in the decision making chain at all levels.
- The impact of international agreements on women's ability to manage and own biodiversity and natural resources.
- Effects of labelling requirements on small-scale women farmers and entrepreneurs.
- Effects on women entrepreneurs of the European Union embargo on GMOs.
- The implications for women of:
  - movement of genetic material across borders
  - extraction from women of genetic material
  - trafficking in women's genetic material
  - trafficking in reproductive materials, organs, and DNA

Asia-Pacific

Discussion at the Asia-Pacific consultation identified research issues relating to effects on biodiversity and IPR of international agreements:

- Comparison of national strategies in the use of the Convention on Biological Diversity to protect natural genetic resources
- Strategies on using existing national and international agreements when lobbying national governments to protect indigenous knowledge.

5. Regional Focus Areas

Each workshop also identified 1-2 key areas which had particular relevance to that region.[7] The issues particularly emphasised in Asia-Pacific are bioethics and commercialisation; while in Africa the focus was strongly on agricultural biotechnologies, particularly GMOs.

5.1 Bioethics and Health (Asia-Pacific)

Primary concerns identified by regional experts include the right of self-determination, the right to appropriate health care access, informed consent, and appropriate and informed rural extension services. It was noted that health care tends to be preferentially available to males in

[7] It is difficult to assess to what extent this was a reflection of the expertise of the participants rather than the regional context; however, the uniqueness of these issues to the respective regional discussions leads us to identify them primarily with one particular region.

many countries: the vaccine coverage programme in Pakistan (EPI), for example, is said to be universal. What is the reality on the ground?

Another pressing issue is the use of genetic screening to select the sex of children, as practised in China and India. In both countries the ratio of girls to boys is reverse that of the rest of the world – in China, there are 100 girls for every 117 boys. This service is beginning to be offered in other countries. Genetic testing is also used for prenatal testing for genetic disorders.

Research issues:

- Sex-disaggregated assessments of coverage of drug and vaccine programmes. Are they available to the woman and girl-child? What proportion of available health services and immunizations go to women? What potential and existing biotechnology solutions are available?
- What will be the implications for the sex ratio as effects of sex selection emerge in the population in countries where families experience strong cultural and financial incentives to choose boy children?
- What are potential legal, policy, public education and other initiatives to counteract uses of genetic screening and prenatal testing for sex selection? Which are most effective?
- What are the cultural, ethical, political issues and implications and support issues (counseling, government services) involved in different countries, communities, and regions, once prenatal testing for genetic disorders becomes more available? This is a gender issue in that women can often be blamed for "causing" the disorder; and because there are sex differences in diseases (as well as racial differences).
- What are models for regulation to protect rights of women in genetic testing, etc., including issues of informed consent, literacy, minority groups? Are they effective?

Health effects related to GMOs in foods:

- What research has been done, and what health effects may result from eating genetically modified foods? What are the nutritional implications of varieties improved through genetic modification as opposed to conventional methods?
- Research on enriched foods to supply nutrients which women tend to have a deficiency of, such as calcium, iron, zinc. Other technologies and approaches may also meet this need, such as biofortification. These options should be compared with GMO modification for results and efficacy.

5.2 Commercialisation of Biotechnologies and Biotechnological Processes Developed by Women (Asia-Pacific)

As identified by participants at the Asia-Pacific consultation, there is a need to provide support to women scientists for commercialisation of technologies. Women often do not know how to begin this process: where to go, who to contact. They don't tend to have the same connections as men to access start-up funding and other forms of entrepreneurial support. In many cultures it is not acceptable for women to work with men, and they do not have the same access to informal and formal professional networks.

It was argued that there is a need for training programs on how to write proposals for funding, how to manage and start up businesses, and how to take products to the end user. The Women's Biotechnology Park in Tamil Nadu, India, was pointed to as a model for further experimentation and analysis in providing development and support services for women's technology-based enterprises.

The need to support "backyard biotechnology" was also referred to – simple techniques such as sterilisation, use of hoods, use and handling of microbial cultures to grow plants, mushrooms, make cheese and other fermented products, preserve food, etc. They can also serve as a strategy for preservation of the local seed bank. These techniques hold much promise for women at the village level.

Research issues:

- What are the mechanisms required to facilitate commercialization by women in innovation?
- What kind of support services will be effective in encouraging women to develop their innovations?
- How can venture capital be made more available to women?
- Development and assessment of pilot projects to test approaches, lessons learned, i.e. Biotechnology Park, sending extension agents to households and villages, etc.
- Analysis of the link between cultural issues with women's confidence and ability to promote their technologies.
- How can funding be made more widely available for women's local level micro enterprises? Should women's banks include targets for biotechnology funding?
- Assessment of the impact of the Women's Bank in Pakistan, to learn what works and what doesn't for women in rural and urban locations, provision of support services, and exploration of potential models for liaison with universities and support centres.

5.3 Agriculture and GMOs (Sub-Saharan Africa)

The major issue agreed upon relating to GMOs was the need for scientific assessment of the introduction of GMOs to small-scale farmers (particularly women) and the generation of reliable data. The nature of women's seed-recycling activities and their lower rates of access to technology inputs and resources have brought about differential and substantial effects on women farmers.

Studies on impacts of introduced GMOs on small-scale farmers have found that GMOs are not solutions to poverty reduction in themselves, and will fail unless implemented in a larger support and knowledge system. In certain cases, use of GMOs by farmers was decreased or dropped entirely once external supports were withdrawn; credit provided for the crop was often used for other purposes. It was found that the appropriateness of the introduced variety was important, as was the provision of appropriate economic credit and support services.

Recycling of seed is a major activity by resource-poor farmers who make up the majority of farmers in the region. Women are primary seed managers in many areas. A variety of concerns around this practice emerge in the context of GMOs. Issues of concern include:

- need for improving recycled seed, by empowering farmers to choose and develop best seeds
- effects on farmers of patented seeds which can't be recycled
- cross-pollination of patented to non-patented crops
- liability and compensation
- costs to farmers for increased inputs.

It was also noted that there is a need for plant breeders in South Africa and in much of Sub-Saharan Africa, as well as physiologists and extension workers. Expanding this system in Africa will require a systemic regional effort, including a range of stakeholders:

- universities – to produce the human resources
- private sector – to support and contribute to the breeding research
- governments – to develop supportive policy
- farmers themselves.

Research issues:

- Review of national and international policies and legislation on seed-saving with respect to GMOs and effects on women farmers; as well as propagation of tissue culture material
- Implications of and potential for licence-free vegetative propagation
- Research on development of protocols and information dissemination strategies on allowable seed propagation activities
- Assessment of public vs. private research and funding, in terms of crops developed and beneficiary groups
- Strategies and policies to support farmers, e.g.. licence fees
- Policy and support mechanisms required to facilitate development of a regional system to build capacity in plant breeding in Africa.
- Amplify issues of farmers' rights under the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)
- Audit the role of IPR in development, acquisition and application of biotechnology and consequential impacts on food security and livelihoods

6. Conclusion

Although the focus of the discussions in both workshops was on the gendered dimensions of biotechnology, many participants widened the debate to discuss the gendered dimensions of science and technology as a whole. Frequently these discussions were also relevant to biotechnology and when this was the case they have been included in this report. When there was no clear connection with biotechnology they were not captured in the report.

It is clear from the discussions that gender dimensions to biotechnology development and application do exist. Many exist in terms of the effects of technological development on women

and men in general; however, there are gender dimensions which are uniquely relevant to biotechnology. Three issues stand out. In many areas the gendered impact of biotechnology on the lives of women and men is not known apart from a few anecdotal cases. Much more research is needed before we can identify the full range of gendered impacts. Secondly, regarding agriculture, it is well documented that in much of Africa and Asia men are responsible for growing certain crops and women are responsible for growing quite different crops. Current evidence suggests that the application of biotechnology has mainly been directed to the crops grown by men rather than those grown by women. This hypothesis needs to be tested and appropriate implications drawn and understood. Thirdly, in the health domain, biotechnology has a different impact on the lives of men and women mainly because of biological and sex differences. There are also gender differences, but the biological differences seem to be more important both in terms of benefits, as in the case of microbicides which are potentially empowering for women; and risks, as in the potential for exploitation and trafficking of women's genetic material.

Finally, an important conclusion of both workshops addresses the way biotechnologies are implemented. There was consensus that biotechnologies in themselves are not positive or negative, good or bad – although their potential for damage may be greater than older technologies. Development, implementation and assessment methodologies that assess socioeconomic, gender, environmental and other implications are critical for the beneficial and productive use of these new technologies.

Appendix One

Regional Consultative Expert Workshop: Understanding the Gender Dimensions of Biotechnology Research and Application

University of Pretoria and the Gender Advisory Board, UNCSTD
Kievits Kroon Country Estates, Pretoria, South Africa
November 26-27, 2004

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Appendix Two

Regional Consultative Expert Workshop: Understanding the Gender Dimensions of Biotechnology Research and Application

National Commission on Biotechnology, Islamabad, Pakistan
November 30 – December 1, 2004

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