Gender and Technology at Grassroots Level

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Introduction

It is widely assumed that men and women have different roles and responsibilities ranging across national borders. Many studies into the male and female roles in society lead overwhelmingly to the conclusion that women do not benefit equally from the sexual division of labour: they have limited access to resources, education, land, and credit, less political voice and their contributions are less valued and of lower status. Furthermore, according to the United Nations, women represent 70% of the world's poorest people, showing that poverty is not gender neutral (Appleton, 1995). As a consequence they have little chance to gain control over their lives. These disadvantages also extend to their restricted access to technology or innovation.

This paper describes and discusses how gender and gender relations affect technology policy at grassroots level, identifies the gaps in our knowledge of the indigenous technical skills of women and tries to explore how the situation can be remedied through more appropriate and gender-sensitive interventions. The paper first gives a brief theoretical overview on the development and gender issues, proceeding through the concept of sustainable development and appropriate technology. In the second part the paper brings together significant practices of women's role in technological innovation, with a view to providing practical evidence of both the problem and its possible technology policy solutions at decision-making level.

1.   Gender and development

1.1   Nature and evolution of the concept of development

The usage of the word *development* in the context of human societies was diffused after the Second World War. It described the process through which countries outside North America and Europe (comprising Africa, Asia, the Caribbean, the Middle East, the Pacific region and Central America) were approaching a process of modernisation, from a situation defined by their colonisers as backward, primitive and underdeveloped. Today the group includes former colonial countries, mostly tropical with mainly non-European inhabitants. They are identified with often still inadequate terms like *Third World, underdeveloped or developing countries*, and recently with *South* or the *Economic South*, though there has been an improvement from the terms used in the first developing studies (such as *backward or economically backward countries*).

The term *Third World* hides a broad concept developed in France in the 1950s within an anti-colonial consciousness arisen in a meeting in Bandung (Indonesia) among the newly independent states of Africa and Asia. They adopted a position of nonalignment, arguing the need for a third, alternative world grouping. Despite the validity of the argumentation, many critics questioned the concept of Third World as a suggestion of a hierarchy of nations and that the "third place" is an acceptance of a lower status in the world order (Reddock, 2000).

In the 1950s the early development economists theorised the stages of development that societies had to accomplish in order to be defined as "developed" or "modern". The model used to identify those phases was that of Western industrialised countries, ignoring the broad social, cultural, economic or political differences between countries of the North and of the South. In the 1960s the modernisation theorists started to define a system as "characterised by a rational and scientific world view, growth and ever-increasing

application of science and technology, together with continuous adaptation of the institutions of society to the imperatives of the new world view and the emerging technological ethos" (Dube, 1988, 17). In those approaches industrialisation, urbanisation, progress and advancement were considered the gateways to modernisation and the colonial feeling of superiority over indigenous people was accepted to a great degree.

On the gender front women were thought by theorists to be linked to the traditional and backward aspects of those societies, with little recognition of the gender differences in social, economic or political life. Before the European colonial domination many countries had already been controlled by stratified, patriarchal structures, as in India, by Hinduism, or in North Africa because of the Islamic influence. The colonists therefore often introduced an additional controlling force on women's lives (Reddock, 2000).

In the late 1980s and in the 1990s neo-liberal economic thinking affected international economy policy and developmentalism, forcing the dominant role of the market in the economy through the facilitating help of the State. Neoliberalism came to be widely named as such in the wake of the international debt crisis, within which economic restructuring and structural adjustment policies were advocated by the International Monetary Fund (IMF) and by the World Bank to generate income and ensure debt repayment. Those policies consisted briefly of stabilisation of balance-of-payments deficits, cutbacks in public-sector investment, removal of public-sector subsidies, privatisation of state enterprises, deregulation and promotion of the private sector, market liberalisation and price reforms, opening of the local market to foreign and domestic competition, and exchange-rate liberalisation. In the Third World these programmes have been criticised because of their being not tailored to the needs of individual economies: they have led to a

decline in standards of living (nutritional-educational-employment-social level) and they have increased social ills (criminality, drug abuse, etc.) and legal and illegal migration to the North (Reddock, 2000).

1.1.1   Sustainable development

The concept of sustainable development became popular in 1987 after the report of the World Commission on Environment and Development, known as the Brundtland Report investigating the question of sustainability in the global context. This definition of "sustainable development" in itself links the two concepts of "environment" and "development" and it refers to a "development seeking to meet the needs of the present generation without compromising the ability of future generations to meet their own needs. It aims at assuring the on-going productivity of exploitable natural resources and conserving of all species of fauna and flora" (WCED 1987, 43).

In 1992 in Rio de Janeiro – within the UN Earth summit – 178 nations, represented by heads of state, ecologists and economists started serious discussions about development paradigms and the fate of Planet Earth. Outputs were the *Declaration of Rio* and *Agenda 21*, the latter being a comprehensive global plan of action to implement the Declaration. The concept of sustainability was strengthened and it became a key priority issue at decision making level to which most of the governments have committed themselves through their own National Agenda 21.

Several approaches to Sustainability have been developed so far with regard to its different economic, social and environmental dimensions and to the different and conflicting policy instruments adopted.

Donald Brooks (1990) identified a paradigm emerged world wide around the concept of sustainable development. It has to integrate conservation and development, maintain ecological integrity,

satisfy basic human needs, achieve equity and social justice and provide social self-determination and cultural diversity (Brooks, 1990 quoted by Reddock, 2000).

Sustainable development has also been central among feminist activists as part of a larger alternative model of development or societal transformation. It implies a new kind of political, economic, social and cultural system: more in harmony with nature, more people and women centred, more concentrated on the needs of the majority – reducing consumption in the industrialised world –, more decentralised and participatory (Bhasin, 1993).

Women and sustainable development issues were included as an essential component of the Agenda 21. The Document contains a special Chapter, the 24th, "Global Action for Women Towards Sustainable and Equitable Development", that outlines strategies to achieve the necessary full and equal participation of women in the programme areas of Agenda 21 in order to address and strengthen the role of women in promoting sustainable development. In Rio, women were considered a *Major Group* together with other eight groups of stakeholders, whose involvement was necessary to achieve sustainable development.

Today there is a growing emphasis on *gender mainstreaming* – the process aimed at first assessing and then incorporating both men's and women's concerns in the planning, implementation and monitoring of all development and environmental policies and programmes in all political, economic and social spheres. It is seen as a strategy to achieve gender equality (Ogunleye and Hemmati, 2000).

1.1.2   The appropriate technology movement

The British scientist Ernst Friedrich Schumacher, author of "Small is beautiful. A study of economics as if people mattered" (1978), anticipated to some extent a paradigm of sustainable development.

Schumacher developed two influential concepts: "intermediate technology" and "small is beautiful", looking at some of the forces that have shaped technology and communities across national borders. He observed that technology exported to poor countries was loaded with the culture of the countries that produced it, who brought large-scale capital and energy-intensive technologies without providing solutions to their problems of mushrooming urban growth and increasing underemployment and unemployment.

Schumacher believed that in order to address rural poverty in a developing country, it is important to create very large numbers of workplaces in the rural areas, where people are actually living. Simple and inexpensive technologies have to be introduced extensively, so that the use of local resources for local needs will not cause problems with foreign exchange or force people to mobilise savings. A localised approach to development is needed for the successful increase of production in developing countries.

In 1982 Schumacher and some collaborators constituted the Intermediate Technology Development Group (*appropriate* is the equivalent of Schumacher's term "intermediate technology"). They employed engineers competent in various technologies dealing with agriculture, building materials, energy supply, and a wide range of manufacturing. Similar groups were then established in Canada, the United States, Germany, France, and the Netherlands. In Africa, Asia, the South Pacific, and Indonesia a network of organisations working on appropriate technology has been developed. These groups are co-operating with similar groups in rich countries to develop appropriate technologies in agriculture, water supply, building materials, energy, manufacturing, and processing, by scaling them down or up, according to local needs. They conform to the definition of appropriate technology as being small scale, simple, capital saving instead of labour saving, and non-violent towards people and the environment.

1.1.3   Is appropriate technology sustainable for the South?

Appropriate technology focuses basically on the local needs of the population or country involved in a development project strategy, that in order to be effective has to solve immediate problems and avoid the creation of long-term ones. Appropriate technology for the Third World countries, it is argued by Hazeltine and Bull (1999), should provide food, shelter, energy and meet other needs, without forcing dependence on other nations, without exhausting the local resources and without destroying the way people live.

The alternative approach of a sustainable strategy has to meet material and attitudinal needs (Hazeltine and Bulls, 1999). Concerning material needs or necessities foreign exchange is essential in order to provide a range of imported goods that are not produced in the countries themselves: from a great demand for oil (gasoline and diesel fuel) or medicines, to manufactured goods. "A plan for a Third World nation which does not include exports earning foreign exchange impossibly limits life there" (Hazeltine and Bull, 1999, 262). Another aspect of material needs concerns the location where they are supposed to be met. In many developing countries cities are becoming overcrowded because of the phenomenon of an overwhelming migration from the countryside to the big urban centres. These great conurbations act as a catalyst for social development in terms of literacy, cultural orientation and labour availability, but they have often tackled the overcrowding by constructing makeshift housing and shantytowns where the basic living conditions lack such amenities as water, sewage systems, hospitals and schools. A sustainable strategy should therefore make village life an alternative to the cities by offering a more attractive lifestyle as regards entertainment and social stimulation in addition to food, shelter and employment.

A further material need concerns environmental issues. The economies of most Third World countries are based on their envi-

ronmental resources – soils, forests, fisheries, wildlife, and parks, that have been subjected to a regular depletion (i.e. the loss of the Amazon forest, the enlargement of the Sahara…). Immediate needs often seem more pressing in the Third World: there is in fact a trade-off between having necessities now and having environmental resources later, especially for those countries that have a large foreign debt. Third World leaders defend their industrial and economic choices through which they sacrifice the environment to the oil industry or to economic development. Such trade-offs have to be avoided by developing an appropriate sustainable strategy.

In the issue of attitudinal needs it is essential to promote self-reliance and self-confidence and to overcome the still prevalent attitude of resignation or of dependence on the help or support of foreign governments or aid organisations to solve long-term problems. There are still many aid programmes that create this need of dependence by utilising their own specialised technicians and expertises in the installation of a plant and by providing a set of technologies based on components and consequentially also spare parts that are not available locally (Hazeltine and Bull, 1999).

In this context the attitude of responsibility is also a prerequisite for a long-term success of a project as long as it contributes to overcoming dependence: the local people in charge have to keep technologies functioning, otherwise irrigation channels will clog, farm machinery will break down at the edge of a field, etc. "It is essential that a project provides what is necessary – training, development of confidence, tools, emergency assistance, and so forth – so the person who will run it when the expatriate team leaves believes herself/himself to be responsible (..)" (Hazeltine and Bull 1999, 265).

On the critical front (Critchfield, 1977 quoted by Hazeltine and Bull, 1999) it has been argued that appropriate technology

does not accomplish all goals, in fact there are many examples in which high technology involving large investment is successful in developing livelihood of the countries of the South. Telecommunications, airlines reservation systems, flight procedures, etc. have to match the international standards, and goods that are produced not only for the local market must meet uniform quality targets.

Another argument is that appropriate technology, being small-scale and simple, does not really allow the country to shift to modern technology and to be competitive. In other words, appropriate technology has been suspected of controlling the industrial development of Third World countries by investing in and promoting only small-scale, simple technology projects.

Hazeltine and Bull argue that "there is no evidence that a country which starts with simple technology cannot move into more complex technology, and there is much evidence that for countries starting with a simple technology the transition to industrialisation was easier than it was for those that shifted directly to a complicated case" (1999, 277). Appropriate technology can be effective in the move to modern technology and to prepare people for high technology by controlling their expertise and mastery and by increasing their self-confidence.

Furthermore the traditional view that poor producers are tradition-bound and resistant to change has been challenged over the past few years: small-scale producers make choices evaluating their needs and resources, and local solutions are appropriate technical innovations reflecting local skills, priorities and needs (Appleton, 1995). As Schumacher (1978) assumed, in some situations appropriate technology is the only feasible way to meet the material needs of developing countries.

1.2   Historical perspective of the convergence of the themes "gender and development"

Gender is a key development issue and has important implications in respect of poverty reduction, equity, efficiency and sustainability. The women-and-development concept has its origin in the 1950s and 1960s, when 50 countries were freed from colonialism and the women who had participated in independence movements wanted to join men in building the new nations. By that decade women belonging to these new independent countries started to have their delegates at the United Nations and began raising development-oriented issues within the Commission on the Status of Women (CSW), whose actions were at that time limited to the context of human rights. In fact by the 1960s the United Nations women strategy was still inadequate. The UN moved towards a *trickle-down* approach to reduce poverty and to obtain economic growth. The theory was put forward that the additional wealth gained by the richest people in society will have a beneficial economic effect on the lives of everyone and it was assumed that the benefits of development would be shared equally between women and men. There was no recognition, even within areas of family planning and child nurture and education, that women's needs might have different implications from those of men. Planners and policy makers worked at that time on projects focused on population aggregates or family units, with the only exception of issues related to fertility (Corner, 1997).

The development agenda started to deal with women's concerns in the 1970s. After the rare involvement of women in the trickle-down approach, a *basic-needs strategy* was adopted. The basis of this strategy was to improve the situation of the poor while preserving the underlying structures of society, which determined their conditions of existence. In this context women's contribution to society and their specific needs and concerns started to be recognised, al-

though a home, family and social-welfare approach, which saw women as passive recipients of development benefits was still basically emphasised (Rathgeber and Ofwona Adera, 1999).

Women-in-development movements began to discuss women's issues in the national and international forum, in which they were enabled to examine their situations, to act to correct their disadvantaged positions and to enhance their consciousness and abilities. A linkage between gender and development studies emerged on the international scene and together with this concern a linkage among other major development issues like science and technology (S&T), development information, and, most recently, information and communication technologies (ICTs) also matured. The concepts of technology, development and gender have begun to converge at decision-making level too, only over the past 5 years (Hafkin, 1999).

Ester Boserup, an agricultural economist, published the book "Woman's Role in Economic Development" in 1970, which for the first time contained a systematic investigation into the role of women in the social and economic transformation of poor countries (research data from Africa, Asia, the Caribbean, and Latin America). She described how colonialism and modernisation worsened the sexual division of labour through the introduction of the international market economy that gave men an exclusive access to new economic and other new resources, such as technologies drawing them away from family labour. She emphasised the fact that new technologies introduced in developing areas had been generally displacing the labour of women (Boserup, 1970). Her research marked the beginning of the intellectual examination of the effects of new technologies on women's jobs and the opening of debates about gender gaps in technology. Since that time the general tendency was to consider technologies as gender neutral and equally available to men and women. Despite

Boserup's seminal work, governments and many development agencies continued to adhere to the view that technology is gender neutral and that a gender-based technology issue was pointless.

The feminist movement re-emerged in Western countries around 1968, and the central issue of the women-and-development approach was that both women and men must contribute to and benefit from development efforts. The field WID (Women in Development) began to take an institutional and operational form in Africa. In 1971 Africa started a regional programme based in Addis Ababa – the Women's Programme of the United Nations Economic Commission for Africa (ECA) and in 1975 the United Nations organised the first world conference on women in Mexico City which led to the declaration of the United Nations Decade for Women, 1976-85. In the same year the African Training and Research Centre for Women (ATRCW) was founded with a special structured program of activities for women.

In the 1980s and 1990s research assumed that gender relations mediate the process of development and the analyses of structural adjustment policies showed that gender inequalities have an impact on the accomplishment of macroeconomic objectives (Parpart, Connelly and Barriteau, 2000). Development requires more than the creation of opportunities for people to achieve sustainable livelihoods: it needs an environment in which men and women may equally seize those opportunities.

2.   Gender and technology

2.1   Efforts to engender technology and technology policy

Technology policy is part of a process of policy making and it can be defined as a set of instruments and strategies able to determine the conditions of production, acquisition and use of any given technol-

ogy within macro-level goals and objectives (Marcelle, 2000). A gender-sensitive policy formulation on technology takes into account *gender* as an important element of social stratification since the access to resources, to job opportunities, to the income-earning potential etc. are differentiated for men and women in our society. This process has to reformulate and transform the existing approaches to policy development and implementation, redressing imbalances and removing conditions of inequity in technological spheres, where women are under-represented.

In the 1960s technology policy for developing countries started to concentrate on the appropriate technology approach choosing strategies to develop appropriate, small-scale technologies, which were locally produced. The goal, as previously mentioned, was to assist them to provide a productive base for small-scale technological artefacts. At the turn of the 20th century, many developing countries are focusing on the access to competencies in micro-electronics, information and communications (ICTs), and bio-technologies, trying to improve the human resource capabilities.

ICTs can enhance human development and produce material benefits, particularly in more developed countries. However, only 2% of the world's population is part of the "global village", and women are a very small portion of that percentage, particularly in developing countries where they have lower literacy and skills levels as a result of gender discrimination in education and training.

Another point is that these latter strategies, although trying to keep pace with technological progress, are mostly still inadequate for the addressing of women's needs and requirements. In most African countries investment in ICTs has focused mainly in the urban areas, while the majority of women live in rural settings, and are responsible for the production of food in agriculture both for family welfare and income-generation. 70% of the African agricultural workforce is female and it produces 80% of the region's

food. Although contributing considerably to local and national economies, female farmers are facing major problems including weak agricultural extension services, non-adoption of technologies, non-involvement in decision-making processes, heavy workloads, lack of access to credit and to education, training and supportive policies (Munyua, 1999). At grassroots level ICTs technology policy could therefore, merely serve to further marginalize them as a group.

Women's technological innovation does not only involve the ICTs. Technology is definable with hardware and micro-electronics but it also includes to a great extent skills, expertise, techniques and organisation, basically the entire body of knowledge, connected with a production process, which women adapt, change and improve to their needs and priorities. Improved machinery and techniques became an integral part of the whole production system and need to be effectively adapted to the users and their environment (Ilkkaracan and Appleton, 1995).

Adapting technology to women and redesigning existing equipment in order to suit women is a major goal within technological interventions. Designers should keep in touch with the users and this is not always happening, especially if we think that most of the designers are men, often working in another continent. For example tractors have been sent to the Third World with steps too high for women to climb onto comfortably or pumps, that could not be used by anyone with breasts (Hazeltine and Bull, 1999).

Design might be strategic to get women's technology needs on the agenda, filling the gap between technology and women users. International technology policy has to focus on the social shaping of technology using design in order to empower women and to achieve a sustainable development (Southwell, 2000).

2.2   Why has the role of women in technical innovation been ignored?

In the following section I focus on the lack of recognition of the wealth of technical knowledge and skills owned by grassroots women and seek out the reasons why a low status has always been accorded to their role in technology.

UNIFEM, the United Nations Development Fund for Women, initiated the *Food Cycle Technology* project in 1985, with regard to the special role played by women in the production, processing, storage, preparation and marketing of food. The aim of the project was to spread tested technologies in order to expand the productivity of women's labour in this sector. A parallel aim was to investigate the lack of recognition of their traditional indigenous technical knowledge.

Food is produced and processed around the world mainly by women without external assistance and collectively utilising heritage experience and trial-and-error problem-solving methods, in order to address local difficulties and opportunities. The knowledge connected with all household activities is often not shared with the men. Although women compose about 50% of the African population, they produce between 60 and 90% of the food, process over 90% of it, and carry nearly all the water and fuel (Hazeltine and Bull, 1999).

This brings about a false identification of who holds which information in a community: although the indigenous technical knowledge of women can and should form a solid basis for technology development activities, it continues to be ignored by people working in these areas. There is even a lack of scientific and research publications on the role of women at grassroots level, which probably indicates a lack of reflection on the issue. One reason for this is that much of what women do is classified as "domestic", which means that their activities are probably of

lower status and less visible to the casual (male) observer. A second reason is that very few women are involved in extension services, or in decision-making, technical development or formal research (Ilkkaracan and Appleton, 1995). The belief is also widespread that if the general level of technology in a village is achieved then life will improve for women as well (Hazeltine and Bull, 1999).

Hazeltine and Bull argued that, in Africa especially, the colonial heritage, through which the European administration imposed new rules, further worsened the situation of women. Because of their own European tradition, colonial administrators tended to deal with men and they did not encourage women to participate in politics or to become landowners. Men were always given responsibilities. The pattern that emerged saw men performing the tasks requiring interaction with outsiders and women dealt with the local tasks. Colonial administrators linked with aid agencies often used to send new technology to men, ignoring women, or provided women with unsuitable technology because it was not correctly dimensioned for their needs.

When industrialisation came, it brought technology and men were given more important jobs, while women's jobs were downgraded. Cash started to be shifted from domestic needs to investment for tools needed for new jobs. Furthermore goods that had been handmade at home by women lost their competitiveness because of new factories producing goods at lower costs, though at lower quality.

Economies based on indigenous technologies have been viewed as backward, unproductive and often associated with poverty. This association and the introduction of modern technologies have led to the constant removal of the indigenous ones. "On the contrary, the destruction of ecologically sound traditional technologies, often created and used by women, along with the destruction of their

material base is generally believed to be responsible for the "femi-nisation" of poverty in societies which have had to bear the costs of resource destruction" (Shiva, 1989, 12).

The equality between men and women within the family dis-appeared with industrialisation: women cannot raise funds or bor-row money to improve their own position by starting new busi-nesses and bringing technologies into a community. Subsequent experience has shown quite to the contrary, however, that the pro-ducts of businesses started by women tend to match women's needs and that the cash earned goes directly toward meeting family expenses (Hazeltine and Bull, 1999).

In 1995, Appleton published the results of a broad investiga-tion on the contributions of women to technical innovation at grassroots level within the research programme *Do it herself: Women and technical innovation*. It clearly showed an apparent invisibility of women's technical knowledge as users and producers due to several factors.

Firstly unpaid work has not been recognised in its effective significance by governments and economists compiling the GDP figures, because of its not being easily measured or estimated.

Unpaid work comprises the subsistence activities, basic among rural people and communities. It consists of providing care and services to all community members and is essentially done by women. Unpaid work represents an area in which women operate through small-scale and rudimentary technologies (informal business organisation with small requirements of capital, lack of separation of consumption and production) and reliance on family labour. For example in Nigeria, despite a considerable increase of government assistance programs aimed at reaching small-scale entrepreneurs, women's enterprises in food processing, petty businesses, dressmaking, hairdressing and small-scale manufac-turing are usually not included in the Census on Production

Surveys that includes enterprises with at least 10 employees (Soetan, 1995). The lack of recognition of women's technical contributions also deprives national economies of the possibility of adding value to local production.

Secondly, the invisibility of women's technical knowledge is linked to the cultural perception of what is "technical" and what is "domestic". During their daily household activities women deal with several technologies. But farming, processing food, weaving, cooking, fishing, sewing, collecting food and water, etc., despite their dependence on technical equipment, are labelled as domestic activities and included under the unpaid work, noted above.

These activities are probably considered of lower status and less visible to outsiders, to the specialists developing assistance programs or to women themselves.

The third factor concerns the concept of "technology" as usually understood by donors: this is more oriented to provision of hardware and equipment and to the transfer of expensive large-scale technology, rather than small-scale technology based more on knowledge and skills.

The last factor takes into account the rare involvement of women in research and development or technical development planning and the broadly held view that technical development must be brought in to developing countries from abroad, often without sufficient information on the women grassroots activities being available.

2.3   How technological change affected women at grassroots level and how women can affect technological change

The acknowledgement of the role of women in technological innovation processes is almost completely lacking. While their technical knowledge concerning soils, trees and crops may be recognised, it is still not accepted that they are also actively involved in adapting their tools and techniques to changing circumstances

(Ilkkaracan and Appleton, 1995).

Different types of technical activities and tasks are generally allocated to women and men within the family, in household production and in production for the market, implying also different perceptions and approaches to technology.

Women's knowledge of production processes is rational and is based on a logical framework of understanding (Appleton, 1995). Women at the grassroots have their own efficient experimental methods that are scientifically based in a manner that may be different from those of formal science and technology professionals. They know for example how to use and treat chemicals as they would be used and treated in a laboratory, as for instance in Sudan, where they carry out 40-step fermentation processes to preserve food for up to two years in a hot climate. Mutagaywa (1995) gives another good example describing how Kenyan women make durable pottery products and fuel-efficient stoves using the properties of different clay sources and of mixture proportions. Pottery is the major income source for many women of western Kenya, and in order to safeguard their only source of income they have invented a wide range of products in response to changing eating habits and to tourist demand, although they have not been helped in this by the national policies. The Lake Basin Development Authority decided in fact to clear vegetation and to introduce large-scale farming of irrigated high-value cash crops, despite potters in the lake region being dependent on the lakeshore papyrus, one of the plants to be cleared, which they use for firing their kilns.

This ability to make rational technical and market-oriented decisions using their local skills and experience is unfortunately still often ignored in several national policy fronts. At the moment, for example, drought relief in Sudan is managed with foods that are production surplus in countries of the North, while women own many techniques to preserve foods to face times of drought and

food shortage. Across the whole African continent there has been a gradual impoverishment of seed stocks under the pressure of cash cropping of one "exportable" variety of seeds per location. The role of women in agriculture as guardians of bio-diversity has been neglected, despite their remarkable experience in breeding food crop species, preserving seeds, domesticating and using wild edible plants, diversifying cultivation patterns to avoid crop failure due to climatic change or diseases (Easton and Roland, 2000).

Indigenous women are able to modify, adapt and change production processes responding not only to environmental changes but also to market demands and conflicts, providing simple but innovative solutions. After the Ugandan civil war, women made use of the cassava, as the only available staple, in every possible way: as food, drink, building material, medicine, glue (Simwogerere, 1995). Innovation, in extreme situations but also in normal times, is always based on the perception of risks and priorities related to all aspects of life. Women's decisions to reject particular technologies or not to grow new crops are often labelled as conservative or being reluctant to change. On the contrary such decisions are based on women's knowledge of their resources, environment, priorities and responsibilities, including care of family and children: they evaluate the risks they can afford to take. In Sierra Leone women salt extractors did not want to use fuel-efficient two-burner chimney stoves because the eventual costs of repairs or maintenance by a blacksmith could lead to the loss of the whole season's income (Appleton, 1995).

The Sierra Leone salt extraction example is also significant to underline another aspect of women indigenous technological knowledge connected with their ability to build informal communication channels in order to transfer technical information and skills. In a salt processing community, the acquisition of skill and knowledge takes place within the family. The procedures are

mastered through observation and practice and then shared and communicated at a personal level. Inter-villages marriage, visits between kin and migration are other factors leading to information sharing (Lahai, 1995).

Informal communication systems play a key role in the survival of traditions that must be understood and respected by outsiders bringing inputs and support or by internal technology policies. As previously mentioned in the example of the Kenyan potters, policy decisions at national, regional or international level can undermine indigenous knowledge and innovative capacity. "Policies which are made and implemented without regard to local knowledge and practices may even contribute to national disasters by disrupting the harmony between indigenous production systems and their local environments" (Ilkkaracan and Appleton 1995, 73).

3.   Some conclusions

As Ilkkaracan and Appleton remarked (1995, 1), "if food technology is seen as the knowledge and skills needed to produce and prepare the food necessary for survival, then people have been generating and using food technologies ever since the very beginning of human existence".

This precious thousands of years old "people's technology" still lacks proper recognition today at decision-making level. Furthermore, the indigenous knowledge, transferred through generations in the forms of beliefs and common practices, is often defined by scientists as "inferior" or "non-scientific", although there are many cases in which local technologies give better results than those suggested by institutional and professional scientists.

There is a lack of understanding among governments, aid agencies, universities and research institutes in particular of the differ-

ences in the technological contexts in which men and women live and their different expectations of, and contributions to, technical change. Science and engineering are often on the margins of national and international discussions on women in development.

Women play a key role within the household livelihood and food security due to their technological knowledge and skills, such as traditional storage techniques to avoid waste of foodstuffs, fermentation techniques to preserve and enrich food during droughts and famine and fruit preservation to provide food for the off-season or rainy days. Despite their remarkable role in food security paradoxically preference is often given to the food aid packages, that appear easier to approach especially in a situation of emergency (Ilkkaracan and Appleton, 1995).

Technologies based on the indigenous knowledge of women is coherent with the appropriate sustainable development concept because they make use of the local resources, respond better to the users' priorities, are low cost, easy to disseminate, environmentally sound and controlled by the users (Ilkkaracan and Appleton, 1995). Although over the years several attempts have been made, this approach has not yet found its proper acknowledgement in projecting technology development at grassroots level. The programs supporting small enterprises or technological activities are few and far between and often do not provide an opportunity to break free of the dependence on external technologists. In this latter framework the local people are still seen in a passive "user" role, because priorities, knowledge and control have continued to be an outsiders' prerogative.

In order to readdress this imbalance more must still be done to disseminate information on the indigenous knowledge of women, both at decision-making level and among the women themselves, as principal actors at grassroots level. The technological knowledge of women has to be balanced with technology policy at macro level in

order to become fully visible and contribute to the creation of sustainable appropriate livelihoods.

Literature

Appleton Helen (1995), *Do it herself. Women and technical innovation*, Intermediate Technology Publications, London, UK.

Bastos Maria Ines and Cooper Charles (1995), *Politics of Technology in Latin America*, Routledge, London, UK.

Bhasin Kamla (1993), *Some thoughts on development and sustainable development*, in "Women in Action", n. 1, p. 10-18, Isis International, Manila, Philippines.

Boserup E. (1970), *Women's role in economic development*, Allen & Unwin, London, UK.

Brooks Donald (1990), *Beyond catch phrases: what does sustainable development really mean*, International Development Research Centre, Ottawa, Canada.

Corner Lorraine (1997), *Rural Development and Poverty Alleviation in ASEAN – a gender perspective*, paper presented to the ASEAN Senior Officials Meeting on Poverty alleviation and Rural Development, Kuala Lumpur, Malaysia.

Critchfield Richard (1977), *Small is beautiful, but it's small*, in "RF Illustrated", The Rockefeller Foundation, New York, USA.

Dube, Siddhart C. (1988), *Modernisation and Development: the search for alternative paradigms*, Zed Books, London, UK.

Easton Peter and Roland Margaret (2000), *Seeds of Life: Women and Agricultural Biodiversity in Africa*, in IK Notes, n. 23, Knowledge and Learning Centre Africa Region, World Bank, Washington, USA.

Ilkkaracan Ipek and Appleton Helen (1995), *Women's Role in Technical Innovation*, Food Cycle Technology Source Books, Intermediate Technology Publications in association with the UNIFEM, London, UK.

Hafkin Nancy J. (1999), *Convergence of Concepts: Gender and ICTs in Africa*, in "Gender and the Information Revolution in Africa", International Development Research Centre, Ottawa, Canada.

Hazeltine Barrett and Bull Christopher (1999), *Appropriate Technology. Tools, Choices and Implications*, Academic Press, San Diego, USA.

Lahai Bernadette (1995), *Salt extraction in Sierra Leone*, in "Do it herself. Women and technical innovation", Intermediate Technology Development Group, London, UK.

Marcelle Gillian M. (2000), *Gender, Justice and Information and Communication Technologies (ICTs)*, Paper presented at the CSW-Workshop on "Emerging issues, trends and new approaches to issues affecting women or equality between men and women", Commission on the Status of the Women, New York, USA.

Munyua Hilda (1999), *Application of ICTs in Africa's Agricultural Sector: A Gender Perspective*, in "Gender and the Information Revolution in Africa", International Development Research Centre, Ottawa, Canada.

Mutagaywa Josephine A. (1995), *Pottery technology in Kenya*, in "Do it herself. Women and technical innovation", Intermediate Technology Development Group, London, UK.

Ogunleye Bisi and Hemmati Minu (2000), *Women and Sustainable Development 2000 - 2002. Recommendations in Agenda 21 and Related Documents and Suggestions for a Review of Implementation*, Paper Prepared for Discussion at the UN Commission on Sustainable Development, UNED Forum.

Parpart Jane L., Connelly M. Patricia and Barriteau V. Eudine (2000), *Theoretical Perspective on Gender and Development*, International Development Research Centre, Ottawa, Canada.

Rathgeber Eva M. and Ofwona Adera Edith (1999), *Gender and the Information Revolution in Africa*, International Development Research Centre, Ottawa, Canada.

Reddock Rhoda (2000), *Why Gender? Why Development?*, in "Theoretical perspectives on Gender and Development", International Development Research Centre, Ottawa, Canada.

Schumacher Ernst Friedrich (1978), *Small is beautiful. A study of Economics as if people mattered*, Abacus, London, UK.

Shiva Vandana (1989), *Staying alive: women, ecology and development*, Zed Books, London, UK.

Simwogerere Erioth (1995), *Cassava processing in Uganda*, in "Do it herself. Women and technical innovation", Intermediate Technology Development Group, London, UK.

Soetan Funmi (1995), *Technology and Women's Ventures in Nigeria's Urban Informal Sector*, in "Technology Policy and Practice in Africa", International Development Research Centre, Ottawa, Canada.

Southwell Mirjam (2000), *Design for sustainable development: a gendered perspective*, Paper presented at the International Summer Academy on Technology Studies, Deutschlandsberg, July 9-15, 2000, Austria.

WCED - World Commission on Environment and Development (1987), *Brundt-land Report: Our Common Future*, Oxford, UK.