

GENDER, TECHNOLOGY & DEVELOPMENT : NEED FOR CONVERGENCE

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Technological change, like any other socio-economic change, needs to bring about equality amongst different segments of society, including gender equality. Technological interventions have affected women in varied ways, but seldom work towards improving the quality of their lives. Often new technologies have displaced women from their traditional areas of employment, while leaving the activities where women predominate untouched, as in the subsistence sector.

Technology does not operate independent of the societal values and ideology that legitimize the woman's subordinate position in the society. Gender has to be seen as a conceptual tool used to highlight various structural relationships of inequality between men and women as manifested in the labour market, political structure, and in the household as well. It would be interesting to examine the implication of technological change for women in general and the extent of access to technology that women have.

Many social scientists believe that technology needs to be *socially contextualised*. Amartya Sen (1989) has pointed out that very often technology has been viewed as particularly mechanical, chemical or biological processes used in making one good or the other. Technology is not only about equipments and their operational characteristics, but also about the social arrangements that permit the equipments to be used and the so-called productive processes to be carried on.

In the production process, the unequal

pattern of social arrangements and the asymmetric sexual division of labour, division between paid and unpaid work brings systematic biases against women. This is central to the inferior economic position of women. Because of these, there are problems of cooperation (adding to the total availabilities) and conflict (dividing the total availabilities) among the members of households simultaneously. Social arrangements regarding "who does what" "who gets to consume what", "who takes what", can be seen as responses to this combined problem of cooperation and conflict. The nature of "social technology" has a profound effect on the issue of cooperation and conflict. To simplify, it has an effect on production and earning, to the distribution of that earning between men and women, to the unequal division of job opportunities and work-freedom between men and women.

Technology and its Impact on Women :

It would be interesting to examine the implication of technological change for women in general and the extent of access to technology that women have.

Agriculture is a prime example of the displacement of women on account of technological introduction. In Asian Regions of the *Green Revolution* where land preparation for paddy production has been mechanised, men ride tractors while women continue to work with hand tools or without tools, performing the backbreaking, tedious work of weeding and transplanting. New technologies have affected the nature and

extent of women's work participation and house-hold responsibilities in diverse ways across the villages. In the agriculturally developed villages the introduction and extensive use of technology and mechanization have increased both the work burdens and employment opportunity for women in agriculture. There has been an enormous increase in the volume of household tasks, both agriculture related and otherwise (cooking more food, cleaning more clothes, washing more utensils, caring for more dependants and livestock, and increased maintenance work for the assets of the household).

Agriculture is a prime example of the displacement of women on account of technological introduction. The modernisation and commercialisation of agriculture has also adversely affected the bargaining strengths of women's agricultural labour. In the case of rice processing-a primary source of female wage employment, the introduction of rice milling has left widespread destitution among the women who were involved in manual dehusking of rice. Similarly, in grain processing, the introduction of grain processing mills usually employ only male labour. Fishing is another industry which supports 5 million fishing communities in coastal areas, where women perform all processing, drying/curing and other related activities. Here mechanisation has forced women to migrate to different states where they work under appalling conditions. Deforestation, vanishing of grazing lands, scarcity in drinking water etc., has added extra burdens to drudgery. As most agricultural labour households are dependent on the landowners for employment, agricultural inputs, fuel, fodder etc, the women of the labour household must work for the landowner on his terms.

At the same time, efforts to modernize food production and marketing have not always meant better nutrition for rural families. The care with which small scale farmers set aside

food stocks for "lean" months of the year, and the need to increase food consumption during seasons of hard agricultural work show that both farmers and landless people are aware of food, as both an input and an output of labouring. This is known as the *food chain*. In rural areas wage employment can undergo sharp seasonal fluctuations, bringing about periods of serious undernutrition and malnutrition. Whenever production and technological innovations alter the level of employment, it affects the food chain of women. Women's share in, or are solely responsible for the cultivation of food crops. Experiences in the areas of agriculture and watershed management have indicated that the failure of many agriculture programmes in developing countries could be directly related to the neglect of women's productive roles, particularly in relations to food crop production, processing and distribution.

Technological interventions, at times, have even increased women's overall workload, as with the introduction of HYV technology. Also though rural women produce up to 80% food in the developing countries, yet, studies indicate they have title to only a fraction of farmland, and access to just 10% credit and 5% of extension advice.

Equally significant is the skewed distribution of technological innovation over different sectors. Women have been traditionally using and managing natural resources, collecting food, fodder and fuel, non-timber forest produce (NTFP) products, medicinal plants etc, for their livelihood. They possess vast knowledge of the eco-system and properties and potential uses of forest products. But women's control over such resources and right to land is negligible, which are mainly dominated by men. In dairying for example, wherein women account for 93% of the total employment, the majority of the dairy cooperation membership is assumed by men, who have access to training, extension and

technological innovations, leaving only 14% to women. In case of biogas technology where it was formulated primarily to address cooking energy needs to be carried out by women, men control and operate the equipment, whereas women merely collect and put dung.

The status of women within the household could be a determining factor for household technology adoption. Where such adoption requires cash expenditure, it would depend on the priorities of men, who usually handle the household cash and take decisions on expenditures. The examples of the hand pumps and solar cookers also demonstrate how the exclusion of women from technology design has a strong bearing on its effective diffusion. A study by Development Alternatives, Delhi in the Bundel khand region of central India reveals that an average women in that region spends up-to four hours a day fetching water. Another study, in Orissa shows that women walk an average of 7 km a day to gather various forest products, up from 1.7 km 20 years back. A recent study conducted by the Center of Science and Environment, Delhi in a village in Chamoli, UP unfolds that women spend 59%, children 36% and men 15% work hours every year confirming back-breaking work load on rural womenfolk. In villages, the environment related problems also contribute much to the degradation of production resources: the land, the soil, water and forests. Apart from deforestation, population pressure, urban consumption pattern and rapid industrialisation, wrong land use practices and degradation of village commons have displaced rural women from productive activities - diminishing their means of livelihood.

Agriculture and allied sectors employ 89.5% of total females in rural India. In the Himalayas pair of bullocks work 1064 hours, a man 1212 hrs and a woman 3485 hours in a year on a one-hectare farm. Taking the economy as a whole, women perform two thirds of the work, but earn only one-tenth of

the income.

The kind of tasks that women perform and the environment in which they perform, in turn affect the health of women. During transplantation, for example, women stand in water in a bent position for hours at a stretch, leading to miscarriages and spinal and skin problems. Similarly, cooking with biomass fuels on stones that emit large amounts of smoke generates pollutants that create severe health problems for rural women whose homes are more often than not poorly ventilated. A chulha-user inhales 40mg of Carbon Monoxide (CO) per kg of wood as against 17mg /kg and 43mg/kg of CO inhaled by active and passive smokers respectively. (Sources: Census of India-1991; ESCAP, 1997; UNDP Human Development Report 2002)

In terms of land reform, it is the man who receives production and marketing information on which decisions are based. Women's decision - making powers in turn depend heavily on personal relations between them and men and on men's respect for the expertise of women. This is possible only if women are involved in the policy framework of development programmes.

Attempts on Technology Needs :

A scheme called 'Science and Technology for Women' has been initiated by the Department of Science and Technology (DST) during the sixth plan period. The aims of the programme include :

- (a) Providing opportunities for gainful employment to women;
- (b) Reducing the element of drudgery in their lives;
- (c) Improving sanitation and environment conditions; and
- (d) Protecting women from occupational hazards .

During 1991-92, 28 projects were approved under the scheme. These related to (a) upgradation of skill in areas such as poultry and quail farming, (b) training in conservation

of soil and moisture by planting specific types of plants, and (c) involving women in the identification of water resources and the maintenance of conventional and non-conventional sources of drinking water. Very little investment capital and a minimal demand on labour time was incorporated in a project on fish farming in five villages in Puri district, Orissa state. Here practical skills were incorporated in appropriate inland aquaculture technologies through training, demonstration and follow up action. Technology development and training for women were undertaken in another project on the preparation of prawn feed, and in the preservation and processing of fish into diversified products for generating employment opportunities. In sericulture, the introduction of a reeling machine which replaces thigh spinning reduces drudgery and maximize the production of "tasser" yarn. Rabbit rearing technologies, improved dairy farm technologies and entrepreneurship through homestead practices are a few other successful examples. In the attempt to provide protection against occupational hazards is the development of a polyethylene glycol barrier cream to be used against dermatological problems caused by cashewnut shell oil. The hand carding machine has been developed at Kasauni for the wool spinning community in the hill areas of Almora, thus preventing the women to travel long distances to get the wool carded. DST has also attempted to reduce drudgery in paddy transplanting, another activity carried out exclusively by women, by introducing the mat system of paddy cultivation where transplanting is done by portable paddy transplanters. This has met with little success despite its being cost effective. This system is extensively used in countries like the Philippines and Thailand.

The Organization, SEWA has also worked towards developing /disseminating appropriate technology for women.

Focus must be given for technological

improvement of women with skills and critical thinking that fosters a sense of self-reliance and ability to evaluate what is beneficial and detrimental to their interest. For the socio-economic emancipation of women the Government of India initiated a number of programmes. For example, Women Dairy Co-operative Societies (WDCs) provide several benefits which include regular procurement, health care for animals, training programmes, medicines for children and self, income generating activities and adult education etc. Women are happy with these benefits, which is reflected in higher intake of quality food, improved health conditions, better clothing, enhanced savings, and finally leading to enhanced status.

Some of them have also started Self Help Groups (SHGs), and are operating internal loaning. STEP (Support to Training and Employment Programme for Women) is a programme being implemented by the Department of Women and Child Development, (Ministry of Human Resource Development). This scheme provides training for skill upgradation to poor and assetless women in traditional sector like agriculture, animal husbandry, dairying, fisheries, handlooms, handicrafts, khadi, and village industries, sericulture, social forestry, and development. Financial assistance is also provided. But all the stakeholders, ie, the Government of India, the state level cells, unions through women extension workers; supervisors through participatory rural appraisal (PRA) methods; agencies such as NGOs etc. need to co-operate.

The 2003-04 budget seems to have focussed more on consolidating the programmes aimed at rural development rather than just pumping in more resources. The assurance for expansion of Antyodaya Anna Yojna from April 1, 2003; the flagship of Sampoorna Gramin Rozgar Yojana (SGRY) on Sept 2001 for wage employment and food

security; the running of self employment oriented Swaranjayanthi Gram Swarajgar Yojana (SGSY) by organization of women into SHGs; capacity building and training ,infrastructure of development ,financial assistance through bank credit and subsidy and marketing support for families of the poor living below the poverty line (BPL); the stress on nutritional support through NP-NSPE(National Programme of Nutritional Support to Primary Education) for universalization of primary education and simultaneous improvement of nutrition of the students attending primary classes; the pradhana mantri gram sadak yojana (PMGSY) for providing road connectivity to all unconnected rural habitation ; and the Indira Awas Yojana (IAY) aimed to encourage rural housing; are the names of a few programmes targetted to be achieved for poverty alleviation and rural development. With a view to meet the micro credit needs of the poor and assetless women, the Government of India launched a national level programme ,Rashtriya Mahila Kosh(RMK) in 1993. Till Feb2001, a total credit worth Rs.100.27 crore was sanctioned to benefit more than 4 lakh women through 827 NGOs spread all over the country. The recovery rate of RMK is 90 to 95%. Also, the panchayat bodies (through the Panchayati Raj Bill - 73rd amendment) in our country have more than 8 lakh elected members.

Through these programmes, women to some extent have benefited in providing technology, extension, microcapital assistance and in organising co-operatives. Actual results in technology have varied in terms of distribution of farm size and the agricultural technology introduced. In the poorest areas, where the shortage of land is greatest, it is questionable whether new technologies have generated more jobs for the landless. There is some evidence that landless women in particular, have lost important sources of income. The rural population keeps growing.

In 1951, the total population of 36 crores had 83% in rural areas. By 2001, the total population was 102 crores of which 72% was rural. But in absolute numbers the rural population increased from 30 crores to 74 crores during this period. The farmland remaining the same, this amounts to an enormous pressure on land. For all these reasons, there is need for the democratic regime to provide the extension service to the farming communities as a welfare service.

The extraction of energy from biomass resources has, over the years, become unsustainable due to the ever increasing population pressure one hand, and the low level of efficiency of traditionally used methods for burning these fuels to extract energy on the other hand. The role of Renewable Energy Technologies (RETs) in mitigating some of these ill effects cannot be overlooked. The strategies involved in the installation of Solar Water Heaters (SWH) in three villages in Himachal Pradesh during 1995-96 is a successful example. For this, Tata Energy Research Institute (TERI) worked with a local NGO. The participatory contribution of the community in the project enabled it to exercise choices in the demand of devices, based on affordability. These devices were constructed and priced accordingly. The local Mahila Mandal played a crucial role in bringing in the local community to participate in the project. As an outcome, women are able to obtain hot water directly from the community SWH for cooking meals. Therefore, they save on cooking time on fuel used. Villagers are now able to take baths easily in cold weather. Therefore, social acceptance for the desired change was established. In the first three years of operation, the community SWH resulted in fuel savings of about 18000 kg of firewood per annum, thus proving that SWH is an environment friendly alternative to the traditional use of firewood.

In a recently launched collaboration

programme, between the Council for Advancement of People's Action and Rural Technology (CAPART), New Delhi, and DST, CAPART has taken up large scale replication of some of the technology models as package of appropriate technologies evolved and proven by the latter to their partners ie. S and T (Science and Technology) field groups along with collaborating S and T institutions through a systems approach by providing technical backup to participating partners. In this endeavour, one of the most successful models recently developed is in the food processing sector, involving women as "primary stake holders" at all levels as producer, as consumer and change agent from designing to adoption of cost effective technology package to suit local needs. This is because the appropriateness of technology delivery system though S & T base would revolve around effective educational and learning process to facilitate the development of creative, innovative and autonomous capabilities in individual women and women's groups through attitudinal/behavioural changes to promote evolution and transfer of environmentally sound technologies. The technology package includes some innovative techniques, suitably de-scaled and adopted equipment /machines to produce conventional products or intermediates like juice, pulp, puree, pickles etc, with a major emphasis on production of innovative dehydrated / Osmo-dehydrated products such as onion and garlic powder, dried apricots /plums, apple chips, papaya candy and mango/jack fruit leathers etc. Given the focus on innovative work, and the perspective of adopting low cost energy saving technologies (such as agro-residue based flue-heated driers, zero energy cooling chambers for farm fruits and vegetable storage based on the principle of evaporative cooling, lactic acid fermentation and other nutrient preservation techniques), major thrust under this program was given on minimizing pre and post harvest losses;

increased shelf life with quality control; controlled atmospheric and aseptic packaging; and emphasizing on drying and dried products to have all year round production and sustainable income ensuring maximum benefit to women's groups. In each team/unit trained women acted as *para-technologists* involved in imparting training and technical know-how to other women. The products being marketed by women themselves, at the village level gave a value addition approach at the source itself thus reducing dependency on middle-men, reduction in post-harvest losses, saving in transportation, cost and time. Success of this program lies in "bottom up approach" and linkages among DST, S & T based field Groups, S&T institutions and above all target group (Women)-from planning to implementation stage as partners, carriers and change agents in technology development and transfer.

Livestock enterprise with appropriate production technologies also offer potential for social transformation of rural women's lives. This will help them to strengthen both nutrition and livelihood security. Today biotechnology offers a powerful capacity to produce science based products like bio-fertilizers, biocide, microbial culture and vermi-culture for sustainable agriculture; tissue culture based production of fuel, fodder and commercial species of plants; fertility control vaccines for population control; improved production and productivity of cattle and buffaloes using embryo transfer and conservation techniques.

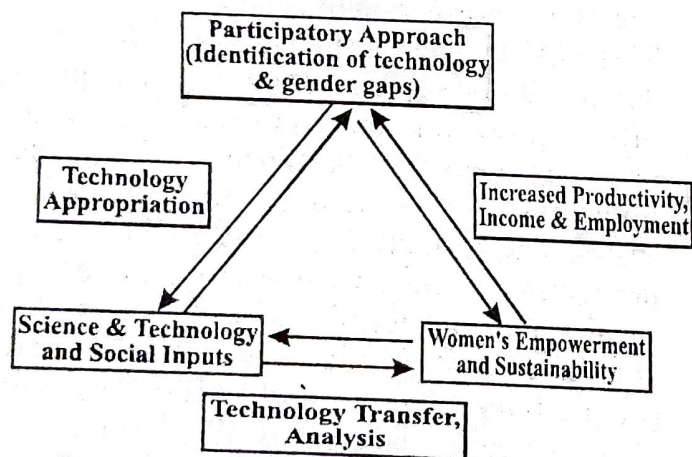
Conclusions and Recommendations :

To speed up economic development and to produce significant social gains, women's participation and their upliftment is essential. Women empowerment strategies should be context and temporal specific. Enhancing her role in decision-making, providing her with nutrition knowledge, and educating her will in turn influence the general health and nutrition status of the family. Women therefore need to

exercise control over one final resource: their own labour and its allocation. If domestic chores and child care are added to their agricultural work, it is easy to see that women have a full work load. Should any change require their greater attention in one sector, it might have to be at the expense of their commitment to another.

Technology must be applied judiciously, in order not to impose additional work on farming women, while maintaining sources of wage employment for landless women. Resources management, restoration of environmental support and building local facilities will all be handled quickly, efficiently and economically, if the people concerned are sensitized, enthused and guided. Agricultural extension must focus on this, as Indian agriculture is undergoing a rapid transformation under globalization from a simple way of making a living to a complex economic endeavour.

Gender Based Participatory Approach for Empowerment Through Technology :



Every technological change necessarily needs to be accompanied with changes in attitudes, values and beliefs of people who are affected by such change, is acceptance and use are essential (Social Technology). In a rural scenario, choice and role of appropriate technology in relation to women and development emphasizes to improve upon existing skills, provide managerial capacities and to understand the science behind the

processes/products. This will inculcate a scientific temper and make them more open to improved /emerging technologies for improving production efficiency and reducing drudgery in their day to day work.

Technology has a bearing on three major aspects of women's life-economic, health and social. Keeping this in view, the following recommendations are cited :

1. Community need assessment: of gender and technology gaps.
2. An understanding of local resources, their optimal use of which involves appropriate technology with the involvement of women in technology innovations
3. An understanding of the triple role of women during technology preparation.
4. While innovating appropriate technology, other areas of development such as health, management, education of girl child, adult education, reproductive health, water and sanitation facilities, social forestry and nutrition cannot be overlooked for the sake of overall sustainable community development. These can be go side by side as support mechanisms and will help enhance the participation and training of women in reality .
5. Traditional knowledge of the women regarding the characteristics of various local species (flowers, fruit , bark, grasses ,root and plant species ,etc.,) involving a diverse range of uses (for eg. medical food, lighting material ,fibre productions ,fruit, edible flowers, mulch and organic fertilizer, besides fodder and firewood) needs to be propagated and technology innovated should be primarily based on these.
6. Identifying and utilizing the knowledge of women is critical to the successful promotion of biodiversity in areas like forest management.
7. Technology innovated or designed should ensure sufficient production of fodder, fuel,

energy, lean drinking water supply and fertilizer without spoiling and damaging the environment.

There should be equal sharing of benefits between different stakeholders.

8. Community participation, particularly women's participation, as well as the local community has to work as the implementation institution at every stage of technology development, testing, and modification.
9. Since every technical change necessarily needs to be accompanied with changes in attitude, the choice and role of appropriate technology is crucial in building up local capacity.
10. Attention has to be paid on gender sensitization in research and technology and to work towards bridging the gender gap. This has to be linked with a need for broadening the concepts in gender relations.
11. As a result of technology, the pathway to entrepreneurship is developed for improvement of women's income generation capability; provide their children good nutrition and health and access to education; enhance their quality of life & contribute meaningfully to natural development.
12. There has to be appropriate convergence of gender, environment and poverty (GEP).
13. Women leaders and members of Panchayati Raj of local NGOs, of Mahila Mandals and of other welfare and training organisations can act as active "change agents" of technology by dovetailing the motivation process through various communication methods (method & result demonstrations, involvement of radio

programmes, on the job field training, use of posters & audio visual aids etc.)

Two way interaction needs to be incorporated-a dialogue between the scientists /professionals, the village extension agents and the poor peasants or other underprivileged (in particular women) users of innovations.

14. There need to be strong institutional linkages between S&T field group, R & D institutions with an extension machinery to disseminate the proven technological package at grassroots which empower and enable the rural women to seek local solutions and have face-to-face interaction between them and scientists for proper scientific know-how.
15. Eco-restoration and employment generation through judicious use and transfer of appropriate technology packages appropriated with involvement of women at all levels both as "change agents" as well as "consumer" of technologies.
16. A systems approach needs to be devised for the development of appropriate technology through need assessment of the community.
17. Proper training programmes should be organised for women in soil conservation, social forestry and other occupations allied to agriculture.
The sustainability, success and impact of water supply programmes also can be positively affected by proper attention to gender perspectives in user participation.
18. Extension service too has to make appropriate readjustments in its goals and strategies, while its principles and processes remain intact.

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