

Socio-economic empowerment of women through ‘Science, Technology and Innovation Policy, 2013’ – the missing link?*

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Inclusive development must involve women since poverty is particularly acute for women living in rural households. There is a need to empower these poor women through science and technology (S&T). Discussions on the recently announced Science, Technology and Innovation Policy, 2013, however, have not deliberated what the policy entails not only for women involved in S&T but also what S&T has to offer to the poor rural women and improve their lives. This is not a new phenomenon in India as S&T policies have not been particularly favourable to women in S&T since the inception of the Five-Year Plans. The foundation set up during the Nehruvian era continued during later years as well. To understand this the present article attempts to explore how the concerns of women were addressed during the initial Five-Year Plans to the current phase with particular focus on bringing socio-economic empowerment of women through S&T.

Keywords: Innovation, science, technology, women’s empowerment.

Background

THE Science, Technology and Innovation Policy (STI), 2013 document states that the ‘benefits of Science, Technology and Innovation (STI) should focus on faster, sustainable and inclusive development of the people’¹. This emphasis on inclusive growth is very much in line with the objectives of the 12th Five-Year Plan (2012–17) in the country that envisions achieving ‘faster, sustainable and inclusive growth’². Inclusive growth has to ensure opportunities for all sections of the population with a special emphasis on the poor, particularly women who are most likely to be marginalized³. If inclusive development is to become a reality, then the inclusion of poor rural people that includes a large number of women has to be more than in mere numbers or amounts of income generated as reflected in this Plan that intends to achieve the same by ‘focusing on the development of both human as well as institutional capabilities’. Inclusive develop-

ment must involve women, since poverty is particularly acute for women living in rural households. This overwhelming representation of women among the poor is often referred to as feminization of poverty, which is directly related to the absence of economic opportunities and autonomy for women in rural areas. Science and technology (S&T) can play an important role to economically empower these poor women.

The Government in India has mainly followed the welfare route with schemes and special programmes for anaemia, maternal mortality, pregnant and lactating women, and credit⁴, all reinforcing the women’s primary role as mothers. There is a need to see women’s role beyond the reproductive role towards their empowerment, which is possible only through economic empowerment. The National Policy for Empowerment of Women, 2001 adopted in the Ninth Five-Year Plan stated that the ‘Application of science and technology is vital for the advancement of women’. Technology will reduce household drudgery and provide better working conditions for women, particularly in rural areas, with emphasis on the improvement of the environment and quality of women’s lives at affordable cost. However, the recently announced STI Policy, 2013 has little to offer on the empowerment benefits that could be accrued especially for rural women from S&T. There have been few deliberations on the policy document after the declaration of the STI, 2013 policy through workshops, discussions and research papers on various perspectives on S&T and innovation policy in India⁵. Various facets of the above deliberations

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highlighted several handicaps of the policy with it being high on goals and low on commitments, as also the lack of focus and strategy to address the real challenges faced by the country⁶, and its lack of emphasis on rural innovations or informal sector⁷. However, there have not been enough deliberations to review the policy from a gender perspective. Particularly to view what the policy entails not only for women involved in S&T, but also what S&T has to offer to the poor rural women.

Key features of STI Policy, 2013 for women

- Enhancing skills for applications of science among the young from all social sectors and linking contributions of STI with inclusive growth agenda.
- Increasing accessibility, availability and affordability of STI, especially for women, differentially abled and disadvantaged sections of society.
- Wide range of mechanisms is envisaged to be deployed to realize these policy aspirations, specifically for empowering women through appropriate STI inputs.

Gender parity in STI Policy, 2013 is envisaged to be achieved by addressing the following:

STI Policy, 2013 acknowledges that participation of women in STI activities is important and new and flexible schemes would be put in place to address the mobility challenges of employed women scientists and technologists. A broad scope for re-entry of women into R&D and new facilitation mechanisms with special career paths in diverse areas will also be made feasible.

As evident from the recent ST&I Policy, 2013, gender parity is envisaged to be achieved by addressing only the mobility challenges and re-entry of women into R&D. This is largely for women already doing science; there is little on harnessing S&T for economic empowerment of women. It will be important to take stock of the situation in the current context, particularly taking a view of the past efforts, identification of hampering factors to bring further gender parity in STI Policy, 2013, particularly by increasing the share of women in S&T programmes for socio-economic development which has not received much attention in the policy and also the S&T community in the country, evident from the lack of deliberations on the issue on various forums.

In India, the rapid expansion of S&T has taken place in the post-independence era. This growth can be largely attributed to the Nehruvian vision that infused development planning in the country since the 1950s. The institutional structures were evolved to promote the growth of S&T ranging from those funded by the Central Government, State Governments, higher education sector, public

and private industry and non-profit institutions and associations. Advances in scientific and technological knowledge made possible the significant reductions of poverty and improvements in the quality of life. However, despite significant advances, livelihoods and development demands of the informal sector of rural India have gained little from the formal S&T system. The new STI Policy seeks to integrate the programmes of socio-economic sector with the national R&D system. However recent debates have identified the STI Policy to be rather weak on the issues of how it will address the challenges of transformation of systems of innovations with respect to social inclusion and sustainability⁸. Inclusive development demands that S&T be oriented to rural India where poverty is more rampant and women face greater risk due to it than men. Poverty studies have enough evidence to show that women are subjected to both relative as well as absolute poverty than men. Economic empowerment through S&T is an important means of reduction of poverty among women. Though women play a key role in the national innovation system of the country, particularly with respect to inclusive development, their concerns have largely been ignored in most of the post-policy debates. This is not a new phenomenon, but has been a trend since S&T policies have not been particularly favourable to women in S&T since inception. This was despite the fact that great importance was given to S&T for the growth of the national economy after independence with Jawaharlal Nehru, the first Prime Minister of India as the greatest propagator of science.

Nehru had implicit faith in S&T and believed firmly that it could be employed successfully to remove poverty, unemployment and other social problems that the country was facing. However, this belief got little translated into the policy-planning processes that excluded large majority, especially women and thus did not result in inclusive growth and equality through development. The present article attempts to explore this averseness towards women in the context of S&T by reviewing the orientation of policies towards women during the Nehruvian period to the recent period. The analysis brings out the evident lack of vision for improving the socio-economic situation of women through S&T in order to achieve true inclusive growth. The last section will analyse the existing efforts for putting up mechanisms/scope for implementation for 'poverty alleviation and economic empowerment of women through STI Policy, 2013' and point towards the major gaps in the current policy from women's perspective to meet this goal.

Women in S&T during Nehruvian phase

Nehru was convinced that S&T was crucial to the solution of independent India's problems such as hunger and poverty. This view was reiterated in the Scientific Policy

Resolution passed by Lok Sabha in March 1958 and later revealed by the increase in expenditure from Rs 1.1 crores in 1948–49 to Rs 85.06 crores in 1965–66 supported by a rise in the number of scientific and technical personnel. This emphasized the important role of S&T in the economic, social and industrial advancement of the country. The early years of India's independence have always been closely identified with Nehru and his dreams of a modern India. It was under his leadership that the initial Five-Year Plans of the country provided a road map to circumvent the constraints imposed by the tradition-bound society. Nehruvian plans and designs provided a road map to get rid of discriminations that had long been built into our society and economy.

Events in the subsequent years have, however, shown that the reality fell far short of these expectations. Initial Five-Year Plans did not recognize women as important actors in the development process of the country, but as a subject of welfare. This welfare approach towards women prevailed after independence also. Education was used as a general tool with the presumption that it would automatically lead to development of S&T and the economy. Thus, the period saw the rapid expansion of women's education. However, taking care of education of women was presumed to be substantial to recognize their role in growth and development of the country. The policies and programmes related to women's access to higher education (particularly S&T) and their career growth often face criticisms that they remain aloof from the constraints faced by women. The shortfalls are often attributed to the lack of clarity on the purpose of women's education in educational planning⁹. For instance, the National Committee on Women's Education (1956) set up to scrutinize the special problems of women's education reiterated the traditional gender roles in society, while laying emphasis on the need to bridge the gap between the education of men and women. This Committee expressed great dissatisfaction at the slow progress of women's education in the first decade after independence¹⁰. This was also influenced by the ambiguous position of women during the period which was an image of modernized and educated woman, but their traditional roles and conventional gender relationships were not questioned¹⁰.

This pattern of economic development that bypassed a large majority formed the basis for the next 40 years or so. Among this large majority was women's continuing subordination. This was despite the fact that there was systematic information available about the reality of the lives of ordinary women through the document entitled, 'Women's Role in Planned Economy' (henceforth WRPE), that had been prepared in late 1930s for the Congress Party and was later published as part of the National Planning Committee Series¹¹. WRPE did not receive any attention in the planning process of the country as the official policies in independent India showed no interest in women as workers. There was a general blindness

towards women workers (agriculture/industry/unorganized sector), with no mention of them as a category of workers¹³. There were clear policy directives to assure that women would not be denied access to any kind of education or career on the grounds of gender, but ideas of WRPE vis-à-vis economic independence, had never been a part of the policy agenda during this phase¹².

This phase set up a trend where the official policies vis-à-vis women in India's plans for development continued to follow the unproblematic tradition of regarding them merely as targets for household and motherhood-oriented welfare services. Indian feminists often believed that the main reason for this officially promoted forgetfulness was the fact that then, as now, challenging the patriarchal ethos of our society had never been on the agenda of the Indian state.

Women in S&T – post-Nehruvian phase

Post-Nehruvian era in the initial years followed a similar trend as was set up during the Nehruvian era, seeing women as subjects of welfare. By the 1970s, however, with growing awareness, there was emergence of gender as an important social category, and its important needs to be taken into account in development planning. The Women's Decade in India began in 1975 with an official report of the Committee on the Status of Women in India. The Report of the Committee (1974), better known as the Towards Equality Report, for the first time set clear guidelines on the aims of female education¹³. There was also a shift in the approach from 'welfare' to 'development' of women with inclusion of Women and Development as a separate chapter in the Sixth Five-Year Plan (1980–85). Though the Fifth and Sixth Five-Year Plans talked of women's education, they did not stress the need for any planned programmes to ensure women's participation in S&T. Gender-blindness was evident in all the other subsequent plans and policies related to science. While addressing questions of equity in access to higher education, no mention was made to specifically ensure that women have access to science education. It is as if the gender component need not be considered while discussing ways to strengthen science teaching or improving infrastructure¹⁰.

The planning process then however took a turn from purely 'welfare'-oriented approach where women were regarded as objects of charity to the development programmes and currently to their 'empowerment'. A paradigm shift occurred in the Eighth Plan, where 'empowerment' of women was recognized and accepted as a distinct strategy. Through this women secured a special niche and space in the national plans and planning process primarily with thrusts on health, education and employment. A further impetus for sectoral contribution to women's programmes was received with the introduction

of the concept of Women's Component Plan in the Ninth Plan, whereby identified Ministries were required to indicate the flow of funds to the women's programmes and schemes¹⁴.

Concerns for women in science started to be addressed directly during the Tenth Five-Year Plan with the Indian National Science Academy (INSA) in 2004 constituting a Committee to examine issues related to women in science and suggest corrective measures on how best to encourage girls to take up science and provide opportunities to working women scientists. Taking this forward, the Government of India (GoI) also constituted a Task Force for Women in Science in 2005 recommended by the Prime Minister of India under the Department of Science and Technology (DST), Ministry of Science and Technology, GoI.

The National Task Force for Women in Science recommended steps to the Government to ensure that the interests of women scientists are protected, and encouraged woman to take up scientific carriers¹⁵. Since its constitution, the Task Force has had meetings at Delhi in 2006. In these brain-storming meetings women scientists, college teachers and PG students expressed their views. The recommendations of the Task Force were sent to the Planning Commission Steering Committee on Science and Technology. Some important initiatives as a result were included: A website and a directory of women scientists got operationalized, data pertaining to women scientists are being collected, and questionnaire on steps pertaining to reduction of stress on women scientists was also made.

However, it is important to note that most of the initiatives emphasized the need for social and institutional support if women are to do science. This has largely been a top-down approach with a goal to increase participation of women in all levels in Science, Technology, Engineering and Mathematics (STEM), as evident from the published literature.

Studies on women in science

In India, the status of women in science did not receive adequate attention. There are only a few reports and studies on gender and science in India. Books that did mention women's perspective often got minimal importance with chapters located in the end. Studies analysing education and science policies have also revealed the reasons for women's exclusion¹⁰. Empirical research specifically on women scientists is scarce and their research productivity has not been particularly dealt with in detail¹⁶. There are, however, only a few studies on women in science in developing countries and most of the productivity difference data are from the advanced countries. The scattered information about the participation of women in science in the developing countries refers to their access to education and career; very little is known about the

contribution of female researchers to scientific production¹⁷.

Professional areas of engineering and technology still witness a severe imbalance and women's participation has been limited and confined to junior positions as far as science careers are concerned^{18,19}. Only a few women could make it to senior decision-making positions and get recognition. Scientific institutions in India carry essentially masculine ethos and exhibit vertical as well as hierarchical segregation in terms of gender. Women are often underrepresented in the scientific and technological community and are generally seen as consumers and end-users of technology²⁰.

The prevailing socio-cultural systems in India result in a 'triple burden' for women in academic and scientific careers²¹. Women in all professions perform a double role of managing job and domestic responsibilities, which has been commonly referred to as a 'dual burden'. In science, the dual burden is combined with various problems that are specific to the scientific profession.

Very few women have been a part of these structures in senior positions. Their participation is confined to the junior level and the few women who do make it to senior decision-making positions are unable to change the essentially masculine ethos of these institutions. Scientific institutions in India are extremely hierarchical and competitive. Women either drop out of the rat race or learn to compromise on their ambitions. Women scientists also seem to cluster in life sciences and chemistry and are not necessarily found in earth sciences or physics or mathematics. They also seem to prefer taking research topics that do not require long hours in the laboratory or extended periods of fieldwork. These trends for women involved in science have largely been due to the prevailing education and science policies in the country.

Most of the studies on women and S&T have addressed issues and challenges related to women involved in S&T in India. However, with most of the population of women living in rural India, it is important to have a bottom-top approach and harness S&T for socio-economic empowerment of women. S&T offers solutions to many challenges faced by rural women, including labour-saving technologies related to domestic and productive work such as water pumps and community water schemes, improved cooking technologies, transport of water, wood and crops, post-harvest and food processing. As poor women continue to use labour-intensive traditional technologies or use no technology at all, there is a need for serious commitment on the part of the Government if women are to achieve parity with men in the rural sector.

S&T for women's empowerment

Women contribute to the economy through both remunerated and unremunerated work at home, in the community

and in the workplace. Poverty is particularly acute for women living in rural households. Women's poverty is directly related to absence of economic opportunities and autonomy, lack of access to economic resources, and lack of access to education and support services resulting in poor participation in the decision-making process²². Rural women constitute 66% of the total labour in farm production and livestock-related activities have low participation in decision-making processes such as marketing or selection of the livestock/crop. Market economy trends in the new era of globalization have further widened the gap between education and technology opportunities for women.

Despite the fact that women share greater burden in agriculture, there are hardly any special programmes for enhancing women's agricultural skills. While rural women are involved in micro/small enterprises or manufacturing, most of training programmes have poor female participation. There is often less involvement of women in opportunities related to construction, trade, transport, storage and services due to lack of skills. S&T can help in creating opportunities to enable them to acquire the skills necessary for entering these newly emerging occupations. S&T can be a powerful tool in bridging the gender divide and achieving inclusive development, if effectively and universally adopted. S&T offers solutions to many challenges faced by rural women: it can contribute to food security by boosting crop yields, increasing women's performance by introducing labour-saving technologies and increase their participation in the rural labour market through better communications. Women can greatly benefit from a combination of ICT and space technology²³.

Government efforts

DST has been making pioneering efforts in initiating and implementing programmes based on appropriate S&T inputs for the welfare for women. This endeavour was aimed to support these women through reduction in drudgery involved in their daily chores, improvement in their quality of life and empowering them with the opening of new avenues of income generation. The scheme 'S&T for Women' in 1981 was a pioneering gender initiative of DST being implemented since the Sixth Five-Year Plan to promote research, development and adaptation of technologies to enhance the overall social status of the women and augment their incomes through S&T, especially in rural areas.

Due to the efforts of the last two decades, this programme of DST has made a distinct impact through its innovative approach, gender sensitivity and involvement of S&T-based voluntary organizations having strong linkages at the grassroots. They have also focused on women through All-India Coordinated Programmes (AICP), women technology parks, scholarship schemes and by the

constitution of national awards for women development through application of S&T. The focus of these interventions has largely been to demonstrate the application of S&T to women. These initiatives enabled women to get newer opportunities for income generation, reduce drudgery and improve health and environment. With feminization of agriculture, women played an important role in the genomic conservation of natural resources and scientific validation of traditional knowledge which helped them lead a better quality of life with their empowerment. Partners in this exercise have been select voluntary organizations having an S&T base and key R&D laboratories in the country. Initiatives were taken up both in the farm and non-farm sector. With focus on technology development and demonstration aspects, emphasis on these initiatives has been to improve upon existing skills, provide managerial capabilities and to understand the science behind the processes/products. This has made them more open to improved/emerging technologies for improving production efficiency and reducing drudgery in their day-to-day work. Since rural women have special understanding of natural resource management, they also play a crucial role in upcoming issues pertaining to climate change. S&T helps ease women's work load inside and outside the house involving them as equal partners, recognizing their knowledge, experience and the significant role they can play in sustainable development²⁴. These programmes involve field-level agencies and S&T institutions. Technology up-scaling and demonstration projects undertaken through such programmes have shown potential for improved quality of life and livelihoods gain at pilot scale.

All the above efforts have largely been carried through women component programmes (with 100% allocation to women) being implemented through two major schemes: Science for Equity Empowerment and Development (SEED), and Disha Programme for Women in Science. However, the expenditure on these schemes is meagre; only 0.04% of the overall expenditure on S&T in the country as revealed through gender-based statement of the expenditure budget²⁵. Besides, there is also little gender mainstreaming in the other S&T programmes for socio-economic development being carried out in the country by the Ministry of S&T.

Way forward

Realizing the need for S&T to play an important role in poverty alleviation and economic empowerment of women, gender mainstreaming of S&T programmes for socio-economic development of women is the only way forward. There is a pressing need to address the challenges hampering the access of S&T to women in the country. With the Twelfth Plan's commitment to improve the conditions of self-employed women, increase women's

employability in the formal sector as well as their asset base, the STI Policy has to put up mechanisms to achieve the same, if the policy aims to meet the goals of inclusiveness. Bringing the benefits of S&T to women, especially those in the rural areas who are often invisible actors in the informal sector, can play a key role on women's workforce participation, particularly in secondary and tertiary sectors. Some key recommendations could be:

- Technological empowerment for drudgery reduction: Rural women make significant contributions to household production, economy and food security. Along with drudgery, they also face problems related to health and energy efficiency with use of traditional technologies (cooking stoves and chulhas) at the household level. Since women have different ergonomical characteristics compared to men, it is necessary to develop technologies to suit them and reduce the burden and drudgery, especially for small holders and marginal women farmers. S&T is required urgently for modifying available equipment to suit the ergonomic needs of women, testing them in different locations and producing them in bulk. The consequences of new technologies on women-specific occupations and the constraints responsible for their transfer have to be separately studied in detail so that technological packages can be gender-friendly, socially sound and can be coupled with appropriate packages of services and Government policies. Non-governmental women's organizations can help in ensuring the flow of benefits from these technological packages. Women-friendly implements/tools can reduce drudgery, save time and enhance output.
- Promoting rural enterprises for women: A report on the condition of work and promotion of livelihoods in the unorganized sector in 2007, revealed large disparity in work participation among women across rural and urban areas. Higher work participation rate per se among women in rural areas is because they are mostly engaged in agriculture and allied activities with restricted work opportunities. However, this does not mean that their economic condition is better than their counterparts in urban areas. Encouraging entrepreneurship for women in rural areas in the era of increasing feminization of agriculture in the country is important. Enterprises focusing to bring linkages between farm and non-farm activities would be useful for rural development. This was also one of the key strategies for poverty alleviation in rural India, since the Tenth Five-Year Plan. Development of agriculture and other non-farm enterprises in rural areas that involve large number of women can be a key factor in reducing poverty.
- Skill development and capacity building: More than 90% of rural women in India are unskilled and this

restricts them to low-paid occupations. Providing women with skill and training them in the use of equipment (technological empowerment) as also in various components of running rural enterprises is the most important need of the hour. Identification of key areas for skill development and capacity building is required based on the enterprises and other needs of the women. Poor control over land and other production assets, restricts their access to institutional credit and renders them dependent on high-cost informal sources of credit. Promotion of women entrepreneurship in rural areas through capacity building in the key areas such as finance, literacy skills, marketing, production and managerial skills would play a crucial role²⁶.

- Research and development for the relevance of rural women: It is important to include the woman's perspective as an in-built component in research projects and identify certain gender-based monitoring and evaluation indicators to assess the output and outcomes. S&T can be useful in developing gender segregated data which would be the key for further planning. Research studies should also identify the needs, requirements, potential and constraints faced by women in science, especially in the areas of technological development, access to inputs, credit and other productive resources and marketing intervention.
- Value addition and market linkages for livelihoods promotion of women: S&T can play an important role in livelihood promotion of women through value-chain development and marketing linkages. These measures would result in better access to inputs and services, technologies, credit and support services as envisaged in the National Policy of Farmers, 2007. This would help break the gender stereotypes that prevail in traditional agriculture and have been keeping poor and uneducated women in low-paid and less skilled work.

S&T is the key to the growth of any nation, as it improves the well-being of the population. Equal opportunities are essential for the economic growth of a country. Using S&T to improve the lives of women will help unravel the vast amount of untapped potential as it equips them with a scientific outlook and logical thinking ability which would greatly influence the mindset of the society²⁷. Empowering rural women would ultimately lead to empowering the nation.

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