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THE EFFECTS OF SCIENCE AND TECHNOLOGY ON THE EMPLOYMENT OF WOMEN

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Report of the Secretary-General

SUMMARY

This report is part of the review and appraisal of actions taken since 1975 to achieve the objectives set forth in section IV of the World Plan of Action adopted by the World Conference of the International Women's Year. It has been prepared by the secretariat of the World Conference of the United Nations Decade for Women in compliance with a request by the Preparatory Committee at its third session (A/CONF.94/23, chap. I, para. 2) and on the basis of General Assembly resolution 33/189 of 29 January 1979. The report deals, in particular, with the impact of technological changes on women, suggesting ways in which scientific and technological policy and planning should intervene to improve the position of women in society. It begins with a general introduction, indicating the broader context in which women, science and technology should be examined. It then proceeds to examine women and technological change in agriculture and industry. The concluding part of the report suggests points of intervention for planners in redressing existing inequities between men and women in the use of technology.

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INTRODUCTION

1. Technology may be defined simply as the application of scientific principles to the performance of practical tasks. The evolution of technology achieved revolutionary proportions with the beginning of modern science, coinciding with the advent of the industrial revolution. Specifically, the discovery of the laws of thermodynamics, the use of electricity and developments in industrial chemistry presented humanity with increasing mastery over nature. In the continuing struggle to control production and the environment, the scientific breakthroughs of the last decade in electronics have added a formidable impulse to technological advance through the application of micro-electronics and microprocessors. While presenting humanity with new opportunities, science and technology have also, however, created problems and generated controversies with respect to the development, choice and application of innovations and the impact of such innovations on society and particular population groups.
2. Until recently, discussions and research on technology have focused on the functions of technology in increasing production through new or improved physical inputs. The focus was premised on the notion that scientific activity automatically results in economic growth. Although the concept of technology is now wider and is understood to encompass the institutional support factors (software) necessary for the successful use of the technical package (hardware), some scientists and technologists still perceive the field as technical, par excellence, and closed to socio-economic and political considerations. For such scientists and technologists, the field is ideologically neutral and sex-neutral. Talking of women, science and technology is unscientific in this perspective.
3. The traditional approach emphasizes the productivity aspects of technology and ignores the socio-economic and political aspects. Experience and contemporary research have, however, established that technology is both a resource for creating new wealth and an instrument of social change. It must therefore be seen in its socio-economic and political context.
4. Technology is always owned. It gives the owners power to exercise control over society through cultural and political influences, as well as economic advantage internationally and nationally. 1/ The industrialized market economies have achieved their material levels of development on the basis of a highly sophisticated technology, privately owned, which has acquired commodity status in the form of patent rights and know-how and has then been placed in the market. Only 2 per cent of the research and development for new technology takes place in the developing countries. Under the circumstances, one of the most complex issues in the debates on the new international economic order is the transfer of technology - the process through which the productive system of a country acquires a technology produced in another country, for incorporation in its system. As part of this debate, attention has increasingly focused on the adaptation of imported

1/ Rural Development: Issues and Approaches for Technical Co-operation,
United Nations Development Programme Evaluation Study No. 2 (New York, 1979).

technologies and the development of new forms of technology better suited to local conditions, generally referred to as "appropriate technologies".

5. Alongside the international debate has been the increasing acknowledgement that the ownership, choice access to and impact of technological changes discriminate against women at the national level. Thus the United Nations Conference on Science and Technology for Development recognized that:

"Technological development often affects men and women differently and the introduction of new technologies has tended to have an adverse impact on the latter, thereby lessening their earnings and social status. It is therefore of the utmost interest to society that in the future the full participation of women be ensured in the planning and setting of priorities for research and development as well as in activities relating to the design, choice and application of science and technology to development. They should also be provided with equal access to scientific and technological training and professional career opportunities. In developing countries an adequate share of resources available for research and training should be allocated to the advancement of the skills of women in the fields traditionally occupied by them as well as new fields." 2/

The Conference adopted a resolution to this effect entitled "Women, science and technology".

6. The final report of the Conference of Non-Aligned and Other Developing Countries on the Role of Women in Development, held at Baghdad in May of 1979, attributes the roots of women's oppression and unequal position to poverty and the "iniquitous unequal utilisation and distribution of resources and power that characterise the present world order". 3/ Similarly, the unequal distribution and use of scientific-technological resources and power internationally has implications for women's access to technology and/or lack thereof. Despite islands of scientific-technological competence in third world countries, the technological gap between the developed and the developing countries has widened as a result of the near-monopoly that some industrialized countries have acquired on the generation and productive use of technology. The diffusion of technological knowledge from these centres to the developing countries has been minimal, circumscribing the latter's participation in the production of knowledge. The development and use of science and technology contribute to the marginalization of nations and their peoples to the extent that such development promotes the concentration of knowledge and technology in the hands of dominant countries and

2/ Report of the United Nations Conference on Science and Technology for Development, Vienna, 20-31 August 1979 (United Nations publication, Sales No. E.79.I.21 and Corr.1 and 2), annex IV, para. 21.

3/ A/34/321, annex, p. 7.

social classes. 4/ This situation in the field of science and technology seriously affects the condition of women in both the industrialized and in the developing countries.

7. In the context of most countries, the choice of technologies and their implantation sharpen the already marked disparities in earnings and in socio-political efficacy between men and women. Technological changes have in most cases led to a concentration of women in domestic roles, such as food production, household maintenance and child care, non-market productive work, both agricultural and non-agricultural, and labour-intensive activities in general. 5/ Men seem universally to assume women's work when production changes from a subsistence to a market economy. It also appears to be a universal pattern that, as soon as a working operation becomes mechanized, it becomes the preserve of men. For women, this translates into the loss of control over the means of production and economic resources, and reduced possibilities to provide food and care for their families. Often it means harder work for longer hours. This is the case largely because present methods of choosing and introducing technological improvements have the dual effect of increasing the female work burden while simultaneously undermining women's rights of appropriation over the returns to their own labour.

8. The Mwea irrigated rice scheme in Kenya provides a documented case study, illustrating how the introduction of commercial crops and the commercialization of food staples can have the effect of reducing women's ability to secure an equitable share of family produce and cash income while increasing their working day, ensuring their continued employment in labour-intensive, low-productivity work and reducing their control over the family's purchasing power.

9. The Mwea irrigated rice scheme was intended to raise family income via the intensive cultivation of rice as a cash food crop. Families were transported to the irrigated settlement village and the agro-inputs were supplied to the male heads of household. As a result, the domestic provision of food continued to be a female responsibility but the earnings from the household's cash cropping were placed under the control of their husbands by virtue of the latter's special relationship with the settlement authorities.

10. In the new village, the plots for growing traditional food crops were smaller and inadequate for feeding the household. Moreover, the women found that they were allocating more time to the cultivation of the rice crop. The wives received from their husbands some of the crop in return for their labour but, because the husbands refused to eat rice, it was sold in order to buy traditional food. The

4/ Pamela M. D'Onofrio, The Implications of UNCSTD's "Ascending Process" for the Exploitation of Women and Other Marginalized Social Groups, Science and Technology Working Paper Series, No. 7 (New York, N.Y., United Nations Institute for Training and Research, 1979).

5/ Zenebeworke Tadesse, Women and Technology in Agriculture: An Overview of the Problems in Developing Countries, Science and Technology Working Paper Series, No. 9 (New York, N.Y., United Nations Institute for Training and Research, 1979).

wives were continually in need of cash to compensate for the inadequate traditional food plots and the reduced time allocated to their cultivation. This form of agricultural modernization detrimentally affected women by requiring them to work longer hours and by decreasing their ability to draw upon their own resources to supply the family's food. 6/

I. WOMEN AND TECHNOLOGICAL CHANGE IN AGRICULTURE

11. The Bouaké region of the Ivory Coast stands as further evidence that the advent of current forms of agricultural modernization leads to women's loss of control over the returns to their family's and their own labour in cash or produce. In the Bouaké region, only 10-35 per cent of the family income in modernized villages is allocated to women, against 50 per cent allocated to women in traditional villages. 7/

12. In India, in villages where modernized agriculture is introduced, there is a decline in women's economic activities compared with villages where traditional farming techniques are still in use. 8/

13. In agriculture, where no new technology has been introduced, there is a high percentage of women. In those areas where commercial agriculture dominates, such as coffee plantations, women have fewer opportunities to work as permanent labourers and constitute much of the seasonal labor supply in addition to subsistence farming.

14. When high-yielding varieties are introduced, with the resultant extra yields and intensive cultivation, there is an initial short-term increase in the demand for labour, including that of women. Later, the introduction of labour-saving mechanical innovation leads to a substantial displacement of women from the labour-force. 9/

15. A case in point is that of wheat production in the Punjab in India:

"Rather suddenly a market for rapid mechanical reaping has come into existence with the change in varieties and some machines have

6/ See Jane Hangar and Jon Moris, "Women in household economy", in Robert Chambers and Jon Moris, eds., Mwea: an Irrigated Rice Settlement in Kenya, 1973 (Munich, Weltforum Verlag, 1973).

7/ M. P de Thé, Participation féminine au développement rural dans la région de Bouaké (Abidjan, Ministère du plan, 1968), p. 83.

8/ Brita Brandtzaeg "Women, food and technology: the case of India", Economic and Political Weekly, vol. XIV, No. 47 (24 November 1979), p. 1921.

9/ Zenebeworke Tadesse, op. cit.

already come into the market ... It is estimated that by 1983-84, this device will reduce human labour by 33 percent in the month of April, most of which will be casual and women workers. The reaper thresher system will reduce demand for human labor to about one fifth of that required by the traditional method. Combines ... will reduce it to no more than three percent of the traditional level. These machines will greatly affect female labour in Harayna." 10/

Similar trends of displacement can be seen in Brazil 11/ and Chile, 12/ as in other developing countries.

16. In Indonesia, the introduction of rice hullers in Java alone resulted in the loss of the major regular source of income for poor women, depriving them of 12 million days of work, equivalent to \$50 million in earnings; 10 per cent of these earnings were in food, which would have satisfied a household's food consumption needs for four months. For larger landowners, hullers save money, preserve rice better and facilitate sales; at the same time, women from the land-owning households are freed from the task of harvest-management and are able to invest their time in trade. 13/

17. In India, traditionally, dairy production and marketing used mainly to be done by women, particularly of the poorer castes. Currently, both the management as well as the rewards have been moved out of women's hands. Not one woman has been given the chance to master the new technology that has taken over the traditional women's tasks of making butter and cheese in the Amul complex, which is one of India's largest dairy complexes. The training courses for the care of new breeds of cattle do not include a single woman farmer. Thus, as the dairy industry becomes a big money concern, women have been debarred from participating in it. 14/

II. WOMEN AND TECHNOLOGICAL CHANGE IN INDUSTRY

18. Studies which have examined the decline in female employment in particular industries, such as the metal trades, clothing, leather footwear, food and

10/ Martin Billings and Argun Singh, "Mechanization and the wheat revolution: effects on female labor in the Punjab", Economic and Political Weekly, Survey of Agriculture, 28 December 1970, pp. A-169 and A-173.

11/ Glaura Vasques de Miranda, "Women's labour force participation in a developing society: the case of Brazil", Signs, vol. 3, No. 1 (1977), p. 266.

12/ Lourdes Beneria, "Production, reproduction and the sexual division of labour", ILO Working Paper, series WEP 10 (WP.2) (July 1978).

13/ Ann Stoler, "Class structure and female autonomy in rural Java", Signs, vol. 3, No. 1 (1977), p. 77.

14/ Brita Brandtzaeg, loc. cit.

beverages, printing and allied trades, jute, and mines, have attributed the decline in large part to the extent and nature of modernization methods.

"Industries which have adopted a higher capital-intensive technology resulting in displacement of labour have found it easier to displace women rather than men. They have justified this on the ground that women lack skills and are illiterate and unwilling to learn new processes. While a chance for on-the-job training is generally denied to women, there is evidence to show that wherever such training has been provided, women have proved themselves to be capable of acquiring new skills and a few have even proved to have greater aptitude than men in some of the new industries." 15/

19. In a study of textile industries, the International Labour Organisation found that when a new machine was installed, the tendency as a whole was to substitute male workers for women workers and to keep women workers on the older and non-automatic machinery. 16/ In postal and telecommunications services the ILO found that rationalization measures that introduced new technical equipment often resulted in the abolition of temporary or part-time posts. Thus, automation in telecommunication eliminated operator's jobs: computers eliminated clerical or bookkeeping work. The ILO found that such posts were frequently occupied by women and it was the female staff who were the most affected by the adoption of new techniques. 17/

20. The Central Bureau of Statistics in Sweden estimated that, by 1975, between 60,000 and 90,000 jobs had been eliminated or had failed to materialize as a result of computer technology. The areas of commerce, banking and insurance, as well as public administration, accounted for 60,000 of these jobs. 18/ Those occupational groups that have been cut back most in the industrial sector are the

15/ Glaura Vasques de Miranda, loc. cit.

16/ Report of the Subcommittee on training requirements in the textile industry in the light of changes in the occupational structure, submitted to the ILO Textile Committee at its tenth session, held at Geneva in April 1978; reproduced in Zenebeworke Tadesse, op. cit.

17/ The Effects of Technological Changes on Conditions of Work and Employment in Postal and Telecommunications Services, paper of the Joint Meeting on Conditions of Work and Employment in Postal and Telecommunications Services (Geneva, International Labour Organisation, 1977), reproduced in Zenebeworke Tadesse, op. cit.

18/ See TCO Arbetsgrupp för Datafrågor, Datorerna och arbetslivet (Computers and the Work Experience in the Economy) (Stockholm, TCO, 1978); see Maria Bergom-Larsson, Women and Technology in the Industrialized Countries, Science and Technology Working Paper Series, No. 8 (New York, N.Y., United Nations Institute for Training and Research, 1979), p. 26.

category of office staff, clerks, typists, purchasing agents etc. - mainly female employees. ^{19/} The fields of commerce, officework and health care which are being computerized most rapidly are expressly female-dominated sectors. Because women are concentrated in the most unskilled, low-paid, low level of technology, assembly-line jobs, they are the first casualties of labour-saving technology.

21. Computerization also affects the development that occurs in the direction of equality between the sexes in the area of the labour market and the working environment. ^{19/} In Sweden, "at least 90 per cent of those employed in executive posts in Automatic Data Processing as well as systems programming and applications programming are men. Also the area of the Automatic Data Processing operation that encompasses planning, managerial, and public relations work with regard to the Automatic Data Processing operation plus preparations for data processing and the running of computers is for the most part (80%) a male occupational area. Only data entry is dominated by women". ^{19/} Thus, in the new hierarchy that has risen in computer jobs, women have also wound up at the bottom. Gunilla Bradley, a Swedish researcher on the social consequences of computer technology makes the following comment on the computerization of work that is specially relevant for women:

"Many of the simpler routine-type chores may ... disappear, which in several respects is a desirable development. But at the same time this will probably result in jobs being regarded as retirement posts for older employees or employees with reduced work capacity as well as 'training posts' for young people made redundant by rationalization. Hence, computer technology would lead indirectly to a general increase of requirements for competence in the workplace. Clearly, this means that, as a result of computerization, the mechanisms for eliminating people in the work economy are going to be made even more effective, that the division of the labor force into one A team and one B team is going to become more and more evident. The women today who (on account of their responsibility for reproduction) already belong to the B team - doing a lot of part-time work among other things - are going to have an increasingly difficult time holding their own on the labor market, as are other not very powerful groups." ^{19/}

22. A study on the repercussions of scientific and technological advance on the role of women in heavy industries concluded that women were not employed in industries involving changes in science and technology since they were not yet physically and psychologically equipped for such work, mainly because of the lack of facilities for scientific training and research. But being deprived

^{19/} Gunilla Bradley, Datateknik, Arbetsliv och Kommunikation (Computer Technology, the Work Economy and Communication) (Stockholm, Delegationen för Langtidsmotiverad Forskning, 1977), see Maria Bergom-Larsson, op. cit., pp. 26-27.

of such additional technological knowledge equally resulted in widening the skill and wage gap between men and women. 20/

23. The situation of unequal access to new techniques and institutions is reproduced through the nature of existing educational institutions:

"New techniques based primarily on know-how, such as application of fertilizer or the use of improved seed varieties obviously do not carry an inherent sex designation for utilization. But to a certain degree, the acceptance and use of improved agricultural methods depend on education. And unequal education for the sexes with primarily boys sent to school or boys remaining in school longer than girls, creates an ever widening gap between the sexes." 21/

24. Women's inaccessibility to training in productive skills is reinforced by an educational focus on domestic maintenance. In addition, "stereotypes that women cannot manage technology are reinforced by the fact that illiteracy is more wide-spread among women, who therefore cannot read instructions." 22/

III. POINTS OF INTERVENTION

25. To ensure that the promises of technology become accessible to everyone, men and women, and that they are suitable for their daily tasks and compatible with their social, political and economic aspirations, its users must have a substantial input in its design, choice and control. In a world in which women form an extremely significant part of the population performing economic tasks, a scientific and technological policy that ignores their contributions and special needs is failing to mobilize the full developmental and growth potential possible within the existing scientific capabilities.

26. In designing specific points of intervention to redress existing inequities between men and women in the control, choice and use of technology, it is of crucial importance for planners to appreciate the fact that the problem is not fundamentally a technical one but a socio-economic and political one. It is the manner in which most societies are organized which ultimately ensures that science and technology discriminate against women. Thus, for instance, the export-oriented nature of the agricultural sectors of most developing countries encourages the development of new seed types through scientific research and the

20/ "Repercussions of scientific and technological progress on the status of women workers" (CE/CN.6/500), reproduced in Zenebeworke Tadesse, op. cit.

21/ Irene Tinker, "The adverse impact of development on women", Women and World Development, 1976, p. 27, reproduced in Zenebeworke Tadesse, op. cit., p. 10.

22/ Carmen Diana Deere, "The agricultural division of labour by sex: myths, facts, contradictions: the northern Peruvian Sierra"; reproduced in Zenebeworke Tadesse, op. cit., p. 10.

application of technology in cash crop production (the traditional male domain in agriculture) and ignores the subsistence crops (the traditional female domain). Without changes in the structure of the economy and the sex division of labour, the mere introduction of packets of knowledge and technical know-how is unlikely to change the subordinate place of women. The experience of the developed countries in this respect is illustrative. Whereas the drudgery of household work has been progressively reduced through technological innovation, full use has not been made of the contribution of women to development. The technological intervention has not changed the traditional division of labour. On the contrary, it has reinforced this division on a higher level, by making women managers of household technology. The conclusion must be reached that, although it is important to develop suitable technologies for women to perform tasks, this must be done within a context of wider socio-economic and political change in the structures of the national and international economies.
