



**TOGETHER**  
*for a sustainable future*

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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

WOMEN, INDUSTRY AND TECHNOLOGY  
Sample cases

Women in industry series no. 3

Inside front cover:

**Message from the Chairperson of UNIDO's Task Force  
on Preparations for the Fourth World Conference on Women**

Throughout the world, women make a vital contribution to industrial output. Over 200 million women are employed across all industry sectors, with half of this number in developing countries. Their work not only sustains their families, but also makes a major contribution to socio-economic progress. Most women are employed in low-skilled, poorly-paid positions, where they are often exposed to health hazards. On the other hand, we are seeing the advance of an increasing number of highly educated women into senior decision-making positions. The creativity and talents of all women are an invaluable resource, which can and should be developed both for their own self-realisation and for the benefit of society as a whole.

The key to enhancing women's opportunities, and hence their position in industry and the economy, is to provide them with access to know-how, technologies and credit. Training to upgrade women's technological capabilities and enhance their entrepreneurial and business skills, whether in simple artisanal production or in high-technology industries, is at the heart of allowing women to advance to more rewarding positions. All these activities are an integral part of UNIDO's technical assistance programmes. The case studies presented in this series of brochures demonstrate that women can not only succeed in sectors where they have traditionally had a strong presence, but can also reach leading positions in sectors that were previously believed to be the exclusive domain of men. They also show that technological solutions can directly benefit women by improving their living and working conditions, particularly in sectors where they tend to be concentrated.

UNIDO is committed to sustainable industrial development as a means of achieving economic prosperity, a healthy environment, and integration of all groups in society. It is our firm belief that enabling the full contribution of both men and women, in all sectors of industry, is indispensable for attaining this objective.

A. Tcheknavorian-Asenbauer

The world economy is undergoing a period of rapid change, with important impacts on women. Globalisation and increasing competition are favouring technology-intensive production and skilled labour. Automation and advances in information technology are reducing the importance of the low-skill, labour-intensive occupations in sectors such as agriculture and textiles which have traditionally been seen as women's work.

Women in industry are already disadvantaged in many countries. Although they comprise 30% of the industrial labour force globally, they tend to be concentrated in low-level jobs, where they are poorly paid, lack social services, and face exposure to health hazards. If their skills are not upgraded to enable their full participation in the technology-based industries of the future, women are likely to face further disadvantages in finding and keeping jobs. Where retraining programmes do exist, they are all too often focussed on men.

On the other hand, when women are given access to training, technology and credit, they can play a full role in economic and social development. Changes in industrial structure and production technology give women great opportunities for poverty alleviation, self-sufficiency through income generation, and productive businesses that create local employment.

For women, the issue of technology is not simply about upgrading skills, but acquiring new and more appropriate technologies. For example, the majority of women who live in rural areas use rudimentary and time-consuming technologies in their informal production activities, which are typically in the agricultural sector. Many existing technologies also contribute to unsafe working environments or environmental degradation, where women are often particularly at risk (see the UNIDO brochure *Women, Industry and Environment*).

Introducing new and appropriate technologies can not only simplify work, reduce drudgery and help improve working conditions and the environment, but also create and improve income-generating activities for women. There are three obstacles, however, which hinder equitable use of new technologies by women:

- Access: women have less access than men to cleaner, safer and more efficient technologies.
- Credit: despite evidence that women's loan repayment rates are higher than men's, women still face more difficulties in obtaining credit for new technologies.
- Training: women are less often trained in the operation, maintenance and repair of new and improved technologies.

UNIDO's programmes help women overcome these obstacles, by building awareness of alternative techniques; developing skills and capabilities for operating and applying new technologies; and developing and transferring technological solutions. The projects go beyond the technologies themselves, however, and also help to develop the institutional and policy infrastructures necessary to support the introduction of new technologies.

## The Role of UNIDO

UNIDO assists women in meeting the challenges of industrial restructuring and technological change, and in participating on an equal basis both in industrial decision-making and in the benefits of

development. UNIDO promotes the advancement of women through mainstreaming, recognising women as full actors and equal partners in development activities and training programmes. There are also specific programmes and services to remove obstacles preventing the full participation of women in development. These are initiated by UNIDO's Integration of Women in Industrial Development Unit, established in 1986. UNIDO's approaches are illustrated in the following case studies.

**Case 1: Manufacturing Plastics in Vietnam.** Women make up 60-70% of plastics workers, often in unskilled positions. UNIDO helped set up the Plastics Technology Centre, which helps give women new opportunities by improving their skills.

**Case 2: Women in the African Leather Industry.** Women play an important role in the industry, but often have poor skills and inadequate equipment. UNIDO's leather project is helping them obtain skills, jobs and equipment in eight African countries.

**Case 3: Marble in Ethiopia.** Marble is traditionally seen as a man's industry. UNIDO's assistance not only transformed the industry into a dynamic modern operation, but also enabled many women to find jobs, including jobs in senior management.

**Case 4: Electronic Equipment Design in India.** Electronic engineering has not traditionally employed many women. The Centre for Electromagnetics is giving them leading-edge technical expertise to help them build careers in electronics.

**Case 5: Food Processing in Sub-Saharan Africa.** Women in Africa spend much of their time gathering and processing food. UNIDO helped introduce new technologies to reduce their labour and give them income-generating opportunities.

#### **Case 1: Manufacturing Plastics in Vietnam**

**Background:** In many developing countries, the plastics manufacturing sector is composed of numerous small companies, some as small as a single family. There are some 1,200 plastics enterprises in Vietnam, although many use inefficient and poorly maintained machines, and inadequate technologies, raw materials and product designs. Capacity utilisation is low, and product quality is often poor.

The real weakness, however, is the lack of trained and experienced staff at all levels: from foremen and technicians to engineers, materials scientists and polymer chemists. The only way to meet such a broad need is to develop an institutional capability for training and human resource development. Therefore, in conjunction with the Vietnamese government, UNIDO set up the Plastics Technology Centre within the Union of Plastics Enterprises in Ho Chi Minh City.

**Focus on Women:** Approximately 60-70% of all workers in the plastics industry are women, spanning a wide range of skill levels. There are numerous unskilled jobs in the industry, such as preparation of components, flash removal, finishing and grinding rejects. These jobs are poorly paid, require no qualifications, and are where most women are employed. Women also perform jobs such as painting, assembly and packaging of final products, and there is also a much smaller group of women involved in managerial or technical jobs, such as chemists and quality controllers.

Many women also work in other parts of the industry. For example, agriculture is an important user of plastics, with applications including greenhouses, mulching, irrigation systems and water supply. Women are employed in manufacturing, installing and servicing these products, particularly in rural areas. Recycling plastic wastes also represents an important source of raw materials for the plastics industry, especially in countries without an indigenous petrochemicals industry, and large numbers of unskilled women are employed in the systems for the collection and sorting of plastic wastes.

**Benefits:** The Plastics Technology Centre has developed a prominent role for women, including the deputy director and over 60% of the staff. The centre has helped raise skill levels of women at all positions in the Union of Plastics Enterprises. It is also contributing to improving industrial safety and women's working conditions. With the boom in investment and tourism in Vietnam, the centre has been well placed to help plastics manufacturers meet the demand from the construction industry, and it has also acted as a focal point for putting customers in contact with manufacturers with appropriate capabilities.

The centre is now self-financing, and it has helped many plastics manufacturers make the transition from state control to profitability in the marketplace. The rapid growth of the industry has also created many job opportunities for women, and the centre's work ensures that women are increasingly able to flourish in higher-skilled, higher-paid employment. From 1980 to 1995, a number of other projects of this type within the plastics industry have had similar results.

## Case 2: Women in the African Leather Industry

**Background:** Most countries in sub-Saharan Africa derive 60% of their exports from primary commodities. In many countries, hides and skins are an important resource that, when tanned, can generate added value on the domestic market as well as export revenues. Over the last 30 years, structural changes in world markets have encouraged the relocation of the leather industry to developing countries, which has given them the opportunity to establish successful export-oriented industries in footwear and related products.

The UNIDO leather project operates in eight countries in sub-Saharan Africa, namely Ethiopia, Kenya, Malawi, Somalia, Sudan, Tanzania, Zambia and Zimbabwe. It aims to improve the quality of hides, skins, leather and leather products, and thus enhance the prospects of the leather industry in these countries.

**Focus on Women:** The proportion of women in the leather industry has increased steadily over the last two decades. Women now make up 25% of the industry as a whole, and 50% of the leather goods subsector, where there is a large number of women entrepreneurs. Throughout the industry, however, women have low skill levels, and the entrepreneurs do not have adequate skills in product design and marketing.

UNIDO has integrated the needs of women as a central part of its leather programme since 1991. A detailed study was carried out, including in-depth interviews with male and female managers and employees, to examine women's career prospects in the leather industry and how their status might be enhanced. A campaign was initiated to promote gender sensitivity in the industry, and a training course in leather goods was set up specifically for women, in cooperation with local training institutes and footwear factories. Production units were upgraded by purchasing improved equipment, on the condition that the loans would be repaid to the institutes to finance further training of women. In several

cases, women who were trained together have set up their own cooperatives to produce leather goods, and they are now working closely with the factories that assisted them in their training.

**Benefits.** The project has provided women with the skills and confidence necessary to integrate them into the leather industry, and has thus helped them secure employment. In Zimbabwe, for example, there are now 50 women in the leather products industry where previously there were none. In Sudan, one of the tanneries involved with the project now has women for 300 of its 450 operators.

By introducing improved techniques and new equipment, the project has also improved working conditions for women in the leather industry, and assisted women entrepreneurs to increase their production, sales and exports.

### Case 3: Marble in Ethiopia

**Background:** Ethiopia is a country rich in marble, with a long-established marble industry. By the early 1980s, however, the sector needed to be brought up to date, as it was operating below capacity and with outdated techniques, which limited its revenue earning and employment generating potential.

In cooperation with the Italian Government, UNIDO became involved with the Ethiopian Marble Industry Corporation (EMI) in 1983, and rehabilitated three marble factories at Gulele, Bole and Nefasilk, the last two of which had been inactive for nearly a decade. Apart from the restoration of the original equipment and introduction of new technologies, there was also a comprehensive training programme covering new techniques of quarrying, cutting and polishing. 175 Jobs were created for men and 30 for women at the factories, and 40 at the quarries.

The second stage of the project opened a new factory, and increased the quality and quantity of the block marble production by introducing new technologies and techniques. For example, the quarry output at Harrar rose from 900 m<sup>3</sup> in 1989 to 2,700 m<sup>3</sup> in 1992, while the average block size rose from 4 to 11 tonnes. EMI is now established as the market leader in Addis Ababa, and has been flourishing during the recent boom in the construction industry in Ethiopia.

**Focus on Women:** Prior to 1983, there were no women at all working in the Ethiopian marble sector, which was perceived as a man's industry. Through UNIDO's intervention, however, it gradually became possible to overcome these preconceptions.

The first stage of the programme trained and employed 30 women as machine operators, and also a woman senior engineer, who has since risen through the company to become manager in charge of all four factories in Addis Ababa. Subsequent phases have included women as at least 10% of the workers being trained or given jobs. Following the project, other links are being set up between women and the marble industry. For example, cooperation has started with the University of Addis Ababa to train architects, who are mostly women, in developing designs and applications of stone products in building design.

**Benefits:** The project demonstrated the potential of the stone industry, generating four new private companies, and a total investment in quarrying and processing of US\$ 25 million. The woman who is now managing four EMI factories has shown that women have the skills and determination to contribute to industrial success at the highest level. Her example has provided great inspiration for other women at EMI, while yielding benefits throughout the company. The project shows that it is wrong to typecast

an industry sector as being unsuitable for women, since with the right institutional support, women can be integrated successfully into even those industries which have never employed women before.

#### **Case 4: Electronic Equipment Design in India**

**Background:** The Centre for Electromagnetics (CEM) in Madras was established by the Indian Government in 1983 as a national laboratory for advanced research and development in Electromagnetic Interference (EMI) and Electromagnetic Compatibility (EMC). The centre has 200 staff, and works closely with manufacturers and users of electronic equipment in product development, testing and advice.

In 1989, the Indian Government asked UNIDO for assistance in strengthening CEM's capabilities in EMC, thermal engineering, electronics packaging and ergonomic design. In cooperation with seven Indian external agencies covering industry, R&D and academia, UNIDO helped to upgrade CEM's capabilities to the international state of the art in three different ways:

- Augmenting the laboratories to offer test facilities conforming to international standards.
- Overseas training of personnel for a total duration of 138 work-months.
- Visits from 25 external experts who spent 50 work-months conducting in-depth training with scientists.

From 1990, CEM helped to transfer this leading-edge experience to Indian industry and business, and 71 seminars with a total of 2,150 participants from 985 industries had been conducted by January 1994.

**Focus on Women:** Electronic engineering has not traditionally attracted as many women as other branches of engineering, but 10% of CEM's staff are women, as is a significant proportion of the participants in CEM training programmes. By providing these women with exposure to leading-edge research and technologies, CEM has given them an important competitive advantage in securing their future careers in the world of electronic engineering.

**Benefits:** CEM has established itself as the most complete and advanced electronics facility of its type in India, and its success can be judged by the rapidly growing demand for its services. By the end of 1993, test and evaluation services covering 262 products had been offered to 112 industries, with consultancy assignments in 99.

The experience of women in CEM has demonstrated that even in electronic engineering, a very demanding field at the cutting edge of advanced technology, and one in which women are not especially well represented, setting up the right institutional structures can give women an equal opportunity to develop the skills that will enhance their professional growth and allow them to play a leading role in the industry.

Similar results have been found in other UNIDO projects in high-technology industries, such as machine tools manufacture. For example, in Machine Tool Factories numbers 1 and 2 in Beijing, women are absorbing leading-edge production techniques such as computer aided production planning and scheduling, and AMI (autonomous manufacturing islands).



## **Case 5: Food Processing in Sub-Saharan Africa**

**Background:** Burkina Faso and Mali are two of the poorest countries in Africa, lacking raw materials and vulnerable to the harsh conditions of the Sahel. Most of the population depends on agriculture, and subsistence farming occupies a high proportion of the land under cultivation. Production is limited by unfavourable climatic conditions, inadequate water supplies and seriously eroded soils. They suffered badly from the Sahel drought of 1968-1974, and the hope of self-sufficient food production only returned with the heavy rainfalls of 1988.

**Focus on Women:** Women are the main food producers in sub-Saharan Africa. They spend long hours in farming, transport of wood and water, milling of cereals and food processing. They work longer than men and on more labour-intensive chores, but enjoy less access to equipment and credit. Labour-saving technologies would improve the women's quality of life greatly, but remain a distant hope unless credit can be obtained for their purchase and unless they generate sufficient income to repay the loans. Developing appropriate food processing technologies is central to promoting women's integration in development, both to alleviate their daily work and to contribute to their income. This, in turn, must be supported by credit, opportunities for income generation and training.

UNIDO's assistance to the rural women of Burkina Faso and Mali focussed on developing an integrated facility for village-level food processing machines. This combined the most important functions - a flour mill, a de-huller and an oil press - in a single multipurpose machine with a diesel engine on a trailer.

The operation of each machine is managed by a group of village women, who hire a miller (also trained by the project) to make basic repairs and maintenance. The project is self-financing, since the other villagers pay for their use of the machine. The first phase of the project has been based in two sets of ten villages, centred in two locations, Bobo-Dioulasso in Burkina Faso and Sikasso in Mali.

**Benefits:** The women organised themselves, elected officers, received training, and are successfully operating the machines. In addition to food processing, the machines have also been adapted in several villages to provide power for neon lighting, electric water pumps, and air pumps. One village has even installed an electric wood cutter for the carpenter. An unexpected benefit is that the villagers also found that the machine can be operated using pourghère oil, a locally grown plant oil, which can itself be extracted using the machine.

The women are generating a useful income from the machines, up to an average of CFA 150,000 over 3 months in some cases. Their quality of life has improved significantly, and both villagers and onlookers agree that the project holds considerable promise for positive impacts in the future.

**Back cover:**

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