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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

WOMEN, INDUSTRY AND ENVIRONMENT
Sample cases

Women in industry series no.2

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

Environmental issues play an important role for women in developing countries, since they arise both from poverty and from industrialisation. Women in industry are usually concentrated in low-level positions, which tend to carry higher risks of exposure to serious health hazards or unclean working environments. Where there are jobs involving highly toxic materials, such as using mercury amalgamation for gold recovery in the mining sector, or spraying pesticides in agriculture, these are often performed by women.

Women entrepreneurs in small scale industries typically have to make do with old, inefficient, polluting and unsafe machinery. Although cleaner technologies may exist, the women may not have access to the credit to purchase them or the know-how on how to use them effectively and safely.

Rural women working in the agricultural industry are often the most exposed to the impacts of environmental degradation, whether in terms of agricultural losses, depletion of natural resources, or natural disasters. However, because they are typically responsible for agricultural activities, including harvesting and processing, women are well placed to be agents of change in introducing more sustainable approaches.

Women can also make an important contribution to more sustainable paths of development in their roles as mothers and household managers. Through their purchasing decisions, they are responsible for the consumption patterns of the family, while as mothers they can educate their children about the importance of environmental protection.

The challenges of supplying women with improved access to cleaner technologies are very similar to those of increasing their access to technology in general (see the UNIDO brochure *Women, Industry and Technology*). In particular, women need improved access to credit to acquire cleaner technologies, and to training to operate the technologies in ways that optimise performance while minimising pollution.

UNIDO is addressing the issue of women, industry and environment in three ways:

- Awareness creation and information: UNIDO provides databanks to provide businesswomen in the manufacturing sector with information on cleaner production. UNIDO also conducts training programmes, workshops, and awareness raising campaigns related to cleaner production methods and new and renewable sources of energy.
- Improving local environments: UNIDO projects to improve local environments have a strong community focus, to empower local women, and provide them with new techniques and technologies, for example in waste management or recycling.
- Cleaner production: UNIDO aims to disseminate cleaner and more efficient technologies wherever possible, and also new and renewable sources of energy. A focus on women producers is an integral part of UNIDO's work to establish cleaner production centres.

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: Fish Processing in Chile. Fish processing was creating a big waste water pollution problem, affecting women both as mothers and employees. An initiative by three women at the University of Concepción developed the solution with UNIDO.

Case 2: Solar Drying of Fruits in Senegal. Women collected fruits, but had no efficient way of preserving them. UNIDO helped them to attain food self-sufficiency by drying fruits with solar energy, and to develop a business with the surplus.

Case 3: Artisanal Gold Mining. Many women work in dangerous conditions, especially in mercury amalgamation, which are also inefficient. UNIDO is working in Asia, Africa and Latin America to introduce cleaner, safer and more effective technologies.

Case 4: Craft Producers in Nepal. A women's craft association wanted to install an effluent treatment plant. UNIDO helped them develop an inexpensive and effective solution that has reduced pollution and helped their business.

Case 5: Seed Dressing in Africa. Pesticide spraying is done by women, but is inefficient, hazardous and polluting. UNIDO developed a seed dressing machine, and trained women to use it, improving their yields and incomes, and reducing pollution.

Case 1: Fish Processing in Chile

Background: Chile has become the world's leading producer of fish meal, a material rich in energy and protein, which is used for animal feeds. Over 1.2 million tonnes were manufactured in 1992, of which 60% came from a single area, Region VIII, near Concepción. This intensive production also carries an environmental burden, as the 17 fish meal factories in this region dump process waste water into the sea. In 1992 they emitted over 65,000 tonnes COD (chemical oxygen demand), which is equivalent to the pollution produced by a city of 1.75 million inhabitants. Women working in the factories largely had unskilled jobs, and had to face not only these environmental problems, but also unclean and unpleasant working conditions.

Focus on Women: The initiative to tackle this pollution problem was initiated and managed entirely by women. Three women at the University of Concepción, in the departments of chemical engineering and pharmacology, decided in 1991 to try to develop a solution. They performed experiments at the laboratory scale, worked with the factories to raise awareness of the problems, and then approached UNIDO for assistance in implementing the project.

UNIDO organised a series of experts and study tours to identify a number of technological options, and worked with the university to adapt them to local conditions. One factory was selected to test and demonstrate the new approaches, which are now being implemented systematically across all 17 sites. The women at the University of Concepción worked closely with their contacts in the fish meal industry,

most of whom are also women, to persuade them to support the initiative and implement the new techniques.

Benefits: The new technologies have had a major impact on pollution, which was previously 32 kg COD per tonne of fish processed, but has been reduced to 5 kg COD/tonne. All aspects of the manufacturing process, from unloading the fish from the boats, through drying, evaporation and washing of the fish meal, have been improved with process modifications and cleaner technologies. The project is about to enter a second stage to remove the final 5 kg COD/tonne, by using aerobic and anaerobic treatment, and converting the residues into useful products, for example by increasing the value added of fish oil through fine chemistry.

By reducing pollution, the project will benefit women both in their role as factory workers, since the factories are now much cleaner, and also because of the overall improvement in environmental conditions around Concepción. The initiative of the women at the university, and their effort to involve women throughout the fish meal industry, has created a very positive image for professional women in the industry. This is already generating new professional and managerial opportunities for women, as well as giving them new confidence.

On the basis of the success to date, the 17 factories have invested US\$ 350,000 in the next stage of the project, and work has started to replicate the project in six other sites in Chile; in Peru; and in the Ecuadorian shrimp industry.

Case 2: Solar Drying of Fruits in Senegal

Background: In Senegalese rural villages in the region of Thiés, 100 km north-east of Dakar, the communities typically obtain their food from abundant, freely-growing fruit and vegetables rather than from cultivation. However, since the fruit and vegetables are only abundant for 3 or 4 months of the year, and perish quickly, the villagers have to buy food for the rest of the year. This problem could be solved if the fruit and vegetables were dried, as they could then be conserved for use throughout the year.

Focus on Women: All the gathering and domestic processing of fruit and vegetables is performed by women. This is time-consuming, burdensome manual work, which reduces their time available for managing the household, bringing up children, or seeking other income-generating activities. An additional challenge is that the villages often have a very traditional social structure, with rigid divisions of labour between men and women, such that women have few opportunities for change.

The Ministry of Women's Affairs approached UNIDO for assistance in developing an effective approach to drying the fruit by utilising Senegal's abundant solar energy. UNIDO developed the solution with ITA the Institute for Food Technology. The project team started by testing the drying characteristics, water content and nutritional aspects of numerous foodstuffs. The team then approached rural technology institutes with experience of small-scale solar equipment, and selected appropriate technologies for a pilot programme in two villages, Ndam Lo and Ndiop Sao.

In training villagers to use the machines, the team worked with village women's cooperatives, which typically contain 90 members, of whom 10 are particularly active. It trained these core members in technical aspects of solar drying, food and nutrition, and also management and business administration.

Benefits: Through applying solar drying, the village women have been able to attain food self-sufficiency through an environmentally sound energy source, and also produce a surplus for sale in local markets. They are also able to enjoy reduced agricultural labour, and these other social benefits.

The women's leaders at the core of the project have become successful entrepreneurs, able to manage a business and display a degree of independence that is unusual in their traditional societies. By forming cooperatives, the women have also gained access to larger marketplaces, from which they were previously excluded, and they have also become eligible for financial assistance from the state.

With representation at the market, business success, a source of income, and growing visibility, the women are playing a growing role in decision-making. Perhaps most importantly, it has given them new confidence to play a full role in their society.

Case 3: Artisanal Gold Mining

Background: Artisanal gold mining involves non-mechanised, low-output extraction of surface and shallow underground deposits carried out by individuals and small groups. It is estimated that at least 25% of world gold output is produced artisanally, and because of its low productivity, artisanal mining accounts for a very high proportion of employment in the gold mining sector. The value of gold produced by small prospectors in the Brazilian tropical forests alone reportedly exceeds US\$ 2 billion per year.

Artisanal mining is almost completely unregulated, and has many environmental, social and health impacts. Environmental damage includes land degradation, deforestation, topsoil loss, and mercury pollution of terrestrial and aquatic ecosystems. Some 300-500 tonnes of mercury are used each year in gold recovery by amalgamation in the artisanal sector, most of which is introduced into the ecosystem.

Many artisanal mining regions are marked by murder, sexually transmitted diseases, drug abuse, smuggling and child prostitution. Health impacts range from mercury poisoning to accidents, with fatality rates of at least 5% per year in many regions, and accident rates that are higher still. Where miners use wind separation of ore, as in Africa, there is a high incidence of silicosis from inhaling the dust of the crushed rock.

Furthermore, the crude processing techniques of artisanal miners typically lose over 50% of the gold in the tailings, which is a great waste of resources and loss of potential income.

Focus on Women: Women typically make up 40% of the workers in artisanal mines, where they endure hard physical labour. They also comprise the majority of the workers performing mercury amalgamation, where they are unprotected against exposure to the toxic metal. They are usually not even aware when they are suffering from mercury poisoning, since the initial symptoms are very similar to those of malaria.

UNIDO has started a new set of activities in this sub-sector, with two objectives. First, to help governments introduce policy reforms to bring artisanal mining under regulatory control, and hence begin to tackle the social and economic issues. Second, to alleviate the environmental and health impacts, by introducing alternative gold separation technologies based on gravimetric or centrifugal approaches rather than using mercury in the early stages of concentration. Projects on artisanal gold mining are underway in countries as diverse as Viet Nam, Venezuela, Botswana and Niger, and a

workshop on the same subject is under preparation.

Benefits: Using alternative processing methods and introducing safe recovery techniques for mercury in artisanal gold mining provides several benefits to women, including their own health and that of their children, improved living and working conditions, and less environmental degradation. By increasing efficiency and productivity, these techniques will also bring economic gains to the miners' families, and open up additional marginal gold areas that were not previously considered economically viable.

Case 4: Craft Producers in Nepal

Background: The Association for Craft Producers in Nepal was set up in 1984, and currently has about 750 member producers, of whom 85% are women. It has 44 full time staff, who provide advice on design, marketing, management and technical issues, and also on the problems of women in development. The members of the association work in areas such as pottery, weaving, garment production and metal work.

The association also has a workshop, which includes facilities for dyeing cotton thread and woollen yarn. Unfortunately, due to lack of funding, no waste water treatment facilities had been installed. Although the association was providing many benefits to its members, it was losing its support within the local community in Kathmandu, because the waste water from the dyeing facilities was polluting the adjacent river.

Focus on Women: The women comprising the members and staff of the association became aware of the community concerns, and decided to act upon them by building an effluent treatment plant. Their decision was purely voluntary, as there are no laws in Nepal governing industrial pollution, and it reflected their close links to the community and its concerns.

The association searched for technical advice in Nepal, but did not find the necessary specialised expertise. Therefore, in cooperation with the government, the association asked UNIDO to study the situation. The UNIDO expert concluded that it would not be appropriate to use advanced effluent treatment equipment at the site. Frequent power failures render sophisticated control systems inoperable; dependency on imported chemicals would risk the sustainable operation of the system due to their limited availability and accessibility; and Kathmandu does not have adequate systems to process sludge and solid waste. The expert therefore proposed a simpler system based on locally available technologies, which was not only more resilient in the face of uncertain operating conditions, but also cost only US\$ 2,000. The system was immediately installed, tested and made operational.

Benefits: The treatment system has achieved significant reductions in pollution, including reductions of 57% in total suspended solids, 80% in COD and 100% in greases and oils. The colouring has also been reduced considerably. The women of the association have restored their good relationships with the community, and are now also able to demonstrate a good environmental record to discriminating foreign customers, who are increasingly demanding lifecycle assessments for products.

UNIDO is also involved in Nepal in an Industrial Pollution Control Management project with the Ministry of Industry, which is developing regulations that will help reduce industrial pollution over the long term. Over the short term, however, pollution reductions will only be achieved by voluntary actions such as those of the Association for Craft Producers.

Case 5: Seed Dressing in Africa

Background: The 23 states of the Eastern and Southern African subregion are largely poor, with 13 classified as least developed countries. Despite attempts made in the 1960s to diversify their economies, agriculture still dominates. The region is not self-sufficient in food production, however, and pre- and post-harvest losses from pests and diseases reduce food availability by 30-40% or more. Grain losses alone are estimated at over two million tonnes per year.

The pesticides which farmers are using to tackle this problem are largely imported, except for copper oxychloride which is manufactured in countries like Zambia and Zimbabwe. The demand for pesticides is growing rapidly, absorbing valuable foreign exchange. In addition, limited knowledge of pesticide use has led to pests developing resistance, the breakdown of cropping patterns, and health hazards to farmers.

Focus on Women: Women in small and medium scale farms suffer the worst health problems, since they perform the pesticide spraying, usually without safety precautions. UNIDO has sought to assist them by developing a safer and more effective method of crop protection than blanket spraying.

Seed dressing, in which seeds are coated with pesticides directly, has proved to be one of the most effective and economic forms of protection. It can control a wide variety of fungal and bacterial diseases, in addition to soil-borne insects and nematodes. The much lower amounts of pesticide needed also result in great reductions in pollution. Although seed dressing is already practiced in many areas, the large and expensive imported seed dressing machines that are required are limited to large farmers.

UNIDO therefore developed a mobile seed dressing applicator to meet the needs of women in small-scale farming, initially focussing on Arusha in Tanzania and Lusaka in Zambia. The machine is based on a European design modified by local engineering institutes and manufactured locally. It can travel between regions, and offer on-the-spot treatment of seeds to farmers' cooperatives. Men and women were trained in the use of the seed dressing equipment and safe handling of treated seeds. Trials of the approach were made from 1992-1994 and further tests are being done for optimization.

Benefits: The trials were successful, and the ground has been laid for commercial implementation of the project. Farming women are very pleased with the new approach, which will not only enable them to increase their yields, and hence their food supply and their income, but will also dramatically reduce their exposure to pesticides and reduce the levels of pollution in their local environment.

Back cover:

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