12.

Handmade paper from rags and trash

1. GENERAL INFORMATION

1.1 Title of practice or experience

Handmade paper from rags and trash

***1.2** Category **of** practice/experience and brief description*

In India, the manufacture of handmade paper is a fairly well-established industry at the village or small-scale-industry level. It is an interesting technology simply because it uses only waste materials, including rags, tailor-shop cloth cuttings and agro-wastes, in the process of making extremely high-quality paper, paper products and card. For this reason, the industry has been described as "eco-friendly" and one of the outstanding examples of sustainable development. In addition, the technology is fairly simple to operate and requires no special training or certification. The technology is also available in ready-made form and can be ordered on a turnkey basis. The making of handmade paper is a fairly old process in India going back several centuries. Paper-making was largely dominated by Muslim Kagzis.

Much of the industry was destroyed with the entry of foreign paper mills during the 18th and 19th centuries, under colonial rule.

It was under Mahatma Gandhi's inspiration that efforts were made in the thirties to revive the nearly-defunct industry. The revival was carried out under the umbrella of the Khadi and Village Industries Association set up in 1934 under Gandhi's guidance and which was an important component of the Swadeshi movement (movement for indigenous and locally-produced goods). Many freedom fighters in fact received training in the making of handmade-paper and these eventually were instrumental in setting **up** handmade paper units in different parts of the country. Eventually, after India gained her independence, the care of the industry and its research and development (R&D) was taken over by the present Khadi and Village Industries Commission which

has brought an enormous amount of talent and experience to bear on the problems associated with the industry. Today, the handmade-paper industry can be designated as an economically viable, ecologically friendly and sustainable method of producing high-value paper, based on a successful technology that can easily be replicated in any other part of the world.

1.3 Name of person or institution responsible for the practice or experience

Handmade Paper Industry, India

1.4 Name and position of key or relevant persons or officials involved

Directorate of Handmade Paper Industry, India

***1.5** Details of institution*

(a) Address: Khadi and village Industries Commission, 3 Irla Road, Vile Parle West, Mumbai 400 056, India
(b) Telephone: ++ (91) (22) 821 7526,836 4323,836 4324,836 43425 (ext. 313, 317)
(c) Fax: ++ (91) (22) 835 1003,821 7526

1.6 Name of person and/or institution conducting the research

Claude Alvares, Editor, Other India Press

1.7 Details of research person/institution

(a) Address: Above Mapusa Clinic, Mapusa 403 507, Goa, India
(b) Telephone: ++ (91) (832) 263 306,256 479
(c) Fax: ++ (91) (832) 263 305
(d) E-Mail: oibs@bom2.vsnl.net.in

2. THE PROBLEM OR SITUATION BEING ADDRESSED BY THE PRACTICE/INNOVATIVE EXPERIENCE

Paper is one of the most essential commodities of modern life, particularly for the purposes of communication and other human uses. The use of paper in the countries of the South is still fairly low. Per capita consumption in India, for example, is approximately 3 kg per annum (or less) in comparison with citizens of the **US,** Japan and Canada who use between 200-300 kg.

As industrialisation and its requirements keep on increasing, demand for paper and paper products is bound to rise. The problem arises when we look at the raw materials from which conventional paper is made, their sources and the environmental effects of modern paper-making technology. In India, for several decades after independence, paper mills were liberally permitted to use forest stock from virgin forests, including bamboo, as raw material for the manufacture of paper. 70% of the total requirements of pulp for paper was met from forest-based raw materials, wood and bamboo; the remaining 30% came from agricultural residues, including paddy straw, rags and waste paper. To manufacture one tonne of paper board, paper mills require 2.5-3 tonnes of dry forest-based materials. Rates for forest produce destined for such paper mills were set low by forest departments since it was a government policy to support development and industrialisation.

After five decades of this kind of development, it is now officially recognised that the country's forest wealth has been severely depleted. Large areas of good forest, particularly bamboo, have been clear-felled and the situation has become aggravated since very little attention was paid to regeneration of forestlands. Forest cover has already come down from 30% in the fifties to around 16% today. Because of this grim scenario, the very survival of several modem paper mills is at stake: a classic instance of unsustainable and ecologically indefensible development. There is no other choice now but to shift to alternative sources and that too in a fairly big way, if paper needs are to be met. According to a UN study, it will not be possible to raise the four million hectares of additional forest in 15 years to meet wood demand, if seen in the context of present-day planning efforts.

However, the depletion of forests is not the only problem associated with paper mills. There are several others: the major chronic problem is the generation of effluents which are highly toxic due to the large quantities of chemicals used for treating the raw materials. There is, in addition, the problem of air-polluting emissions as well. Finally, the technology required for large paper mills also demands heavy initial capital investment per job of around Rs. 15 to Rs.25 lakhs. (Rs.1 lakh = Rs.100,000).

It is in the context of such destruction of forest areas and the necessity of providing low-cost jobs that the Khadi and Village Industries Commission (KVIC) took on the challenge of manufacturing paper from a variety of non-forestry-based resources. Such materials included cotton rags (in the form of tailor/hosiery cuttings), and small quantities of waste paper as well. Other agro fibres like jute, straw and banana were used for purposes of blending with the primary fibres for mottling effect etc. What is more important, the KVIC also developed appropriate machinery and processes that would be pollution-free as well.

Handmade paper manufactured through the KVIC process has several excellent qualities when contrasted with those of mill-made paper. It is elegant in appearance and provides an exquisite surface for writing. It has good strength and is practically indestructible: it actually has double the strength of mill-made paper and does not turn brittle with age. It can be used for several artistic and decorative purposes. For these reasons, it fetches a better price than mill-made paper.

Today, the handmade-paper industry manufactures different varieties of paper, including drawing paper for artwork, permanent document paper, dark-coloured card sheets, deckled-edged stationery, greeting cards, carry bags, watermarked paper for certificates, filter paper, pads and insulation paper. Output is also used for file covers, duplicating paper and tissue paper. Exports are worth Rs.60 million (1994 figures): these include carry bags, deckle-edged drawing paper and converted stationery. With the interesting technical improvements available in recent years, and despite its non-glazed appearance, handmade paper can now even be used for four-colour reproduction on offset machines. Once this takes place on a large scale, handmade paper can replace mill products like cartridge paper, bank note and maplitho paper.

Being a small-scale industry, the manufacture of handmade paper is today an important instrument for the creation of jobs in rural areas. Per job investment ranges from Rs.35,000 to Rs.50,000 depending upon the type of the unit and the variety produced. **A** large percentage (40%) of these jobs can be, and are, handled by women. The technology used is such that it can be easily repaired if it breaks down. Numerous expert centres are easily available for assistance if required.

3. DESCRIPTION OF THE PRACTICE/INNOVATIVE EXPERIENCE AND ITS MAIN FEATURES

The process of manufacturing handmade paper is very simple and involves several clearly-defined stages. These are given below.

(a) **Preliminary operations and treatment:** Cotton rags procured as waste from ready-made garment-making units are cut into small bits with the help of hand knives or power-operated rag choppers after sorting (to remove non-cellulosic material). The cut material is next dusted on a wire-mesh frame. In the case of agro fibres, after chopping, the material is "cooked" in a small open digester with a low percentage of alkali and washed. In general, it is preferable to use 100% new rags and other virgin agro fibres to eliminate dust and dirt at source.

(b) **Beating:** Cut and dusted rags are beaten to pulp/stock in small power-operated Hollender beaters, with or without bleaching. This is done to remove knots and lumps. The material is washed by means of a washer drum,and this is followed by further beating. Addition of natural fillers, loadings, dyeing and sizing chemicals as required for the end product is also completed during the beating operation.

(c) **Sheet formation:** Wet sheets are lifted by the vat man with the help of wire-mesh frames either by dipping these into the traditional vat containing pulp or by pouring a measured quantity of pulp into the mould held in the improved type of pedal-operated univat containing water. It is important to see that the pulp is well-mixed and is in uniform suspension before this is done. The coucher now transfers the wet sheet over to the cloth napkin or woollen felt by a mild pressing of the mould. This lifting and couching process continues till a pile of wet sheets, each interleaved with cloth felt, is made.

(d) **Pressing:** The pile is then pressed under a hand-operated screw press or a small power-operated hydraulic press. Up to 50% of the water from the wet sheets is removed through this step.

(e) **Peeling and drying:** Pressed sheets are peeled, separated from the couching cloth/felt and loft dried for natural drying indoors. They should not be dried on floors because this is bound to pick up dirt and affect quality.

(f) Removal of dirt and dust: As part of quality control, dirt specks, if any, are carefully removed by hand with the aid of small knives and brushes.

(g) **Tub sizing:** Document papers, certificates, drawing and other specification papers in particular are dipped in a bath containing animal glue, starch etc. and dried again to build unique characteristics like permanence, erasability and long life by preventing mould growth and damage from insects.

(h) **Calendering:** Dried paper is plate glazed, interleaved between zinc/galvanised iron sheets and passed *to* and fro under heavy mechanical pressure through a small power-operated calendering machine. Rough drawing papers are not, however, calendered but are only pressed flat before trimming and packing to maintain specific characteristics.

(i) **Final sorting, trimming and packing:** Calendered paper is hand-sorted, edges trimmed with the help of a hand- /power-operated cutting machine, and packed in suitable packets. Deckle-edged papers, however, are sorted and packed without trimmings. **All** the equipment in use in the process of handmade-paper manufacture is avail-

able in the country, is indigenously made and therefore does not require any foreign exchange. Several manufacturers produce low-pressure digesters, rag choppers, vats, screw or hydraulic presses, calendering machines, agitators, pumps and cutting machines. Banks and other development institutions have taken policy decisions to support the installation of handmade paper-making units.

The sale of handmade paper in either the domestic or the international export market is well organised. There are several sales outlets for disposal of handmade paper and handmade-paper products within the country as well.

4. DESCRIPTION OF THE INSTITUTION RESPONSIBLE AND ITS ORGANISATIONAL ASPECTS

The Khadi and Village Industries Commission is a statutory body created in 1957 by an Act of the Indian Parliament. The Commission's mandate is to plan, promote, organise and implement programmes for the development of khadi (handmade cloth) and other village industries in the rural areas in coordination with other agencies engaged in rural development and NGOs. The Commission looks after the research and development of a large number of cottage industries which include, besides khadi, the processing of cereals and pulses; production of edible oil; leather cases; matches; fireworks and incense sticks (agarbatis); pottery; bee-keeping; carpentry; blacksmithy; bamboo and cane work and several others. The Commission is also required to provide reservation of raw materials and implements to supply to rural producers, to create common service facilities and, finally, to provide facilities for the marketing of such products in the entire country. The Commission also undertakes training of artisans as well as direct marketing and sale of village products.

The KVIC provides two types of training programmes in connection with the handmade-paper industry at present:

(a) managerial courses and
(b) artisan training courses

The managerial course is imparted at the Handmade Paper Institute, Maharashtra State Khadi and Village Industries Board, K.B. Joshi Road, Shivaji Nagar, Pune 411005. There are four institutions which deal with artisan training. These include:

(a) Handmade Paper Unit, Gandhi Ashram, Zamin Eallepelli, Tiruchengodu, Salem District, Tamil Nadu
(b) Handmade Paper Unit, Khadi Ashram, Radaur, Yamuna Nagar District, Karnal, Haryana

(c) Handmade Paper Demonstration-Cum-Extension Centre, Khadi and Village Industries Commission, Maganwadi, JBCRI, Wardha, Maharashtra
(d) Handmade Paper Centre, Abhoy Ashram, Birati, Calcutta, West Bengal

There is a consultancy centre also set up under United Nations Development Programme (UNDP) auspices which provides project consultancy and also helps in the recovery of sick units. This is:

Kumarappa National Handmade Paper Institute, UNDP-Handmade Paper Project, Ramsinghpura, Shikarpura Road, Sanganer 303 906, Jaipur, Rajasthan. Telephone/Fax: ++ (91) (141) 552015

5. PROBLEMS OR OBSTACLES ENCOUNTERED AND HOW THEY WERE OVERCOME

Though the KVIC has been successful in improving handmade paper-making technology, particularly in reducing human drudgery by shifting some of the operations to motors, there are still areas of concern. One of the obstacles is inadequate attention to quality, a characteristic feature of Indian exporters generally, not restricted to handmade paper alone. Quality-control measures often do not work. The Indian exporter has generally picked up a bad name on this account. There is also the difficulty, being a small-scale industry, of meeting bulk orders within a specific period of time and with uniform quality. In addition, there is a complete absence of an aggressive marketing approach or publicity with the result that the Indian market for alternative paper is itself undertapped.

6. EFFECTS OF THE PRACTICE/INNOVATIVE EXPERIENCE

The economic impact of the handmade-paper industry is quite substantial. In 1953 when the KVIC took over the development of the industry, there were only 35 units all over the country with an annual production value of Rs.5 lakhs. In 1991-92, there were 340 units producing 8,700 tonnes valued at Rs.lOO million. The production of handmade paper during 1993-94 was around 12,000 tonnes valued at Rs.15.06 crores (Rs.1 crore = Rs.10 million) and it provided full-time employment to 6,800 rural artisans. It is expected that by 2000, the output will reach 18,000 tonnes valued at Rs.18.52 crores and with an employment potential of 15,000 people. Indirect employment figures for those involved in collection of material sales are not included. India **is** today one of the largest producers of handmade paper in the world. For this reason,

and respecting India's expertise, the UNDP has now commissioned a handmade-paper project in India with several objectives. These include further upgradation of technology, use of alternative materials, and improving training and marketing. The general objective is to enhance the performance of the industry and to make it competitive in world markets.

It is estimated that by the year 2000, the projected demand in India for paper and board generally will reach 32 lakh tonnes. This cannot be met by large- and medium-scale paper mills alone as they have numerous chronic weaknesses, such as shortage of raw materials, shortage of power supply, huge capital investments, long gestation period etc. Small handmade-paper makers will therefore, with less investment and using non-forest resources, play a vital role in fulfilling the demand. The production of handmade paper requires the use of cotton rags from tailoring shops and small agro-waste. It thus makes use of raw material that cannot be used for other purposes. In this sense, the handmade-paper industry literally produces wealth out of waste which would otherwise be thrown away on streets as litter and choke the environment. The R&D put in by the KVIC over several years has now made it possible for units to be speedily set up so that not much time need elapse between the decision to start the industry and the date of production itself.

7. SUITABILITY AND POSSIBILITY FOR UPSCALING

The industry is necessarily small-scale and labour-intensive. The KVIC has several workable models with the smallest sized unit called the tiny size model. It also has plants purely designed for production for export. Finally, it has worked out a system of production through cluster units in which a number of small-scale units link up with a central services unit in the same geographical area which not only provides training skills but can also help in problems like quality control, marketing, etc.

8. SIGNIFICANCE FOR (AND IMPACT ON) POLICY-MAKING

The handmade-paper industry is a good example of a sustainable model of development which meets several desirable criteria: it is eco-friendly and provides rural employment for both men and women, usually near their homes, since the industry can be located near villages. For countries in need of foreign exchange, the export market is beckoning. Though some handmade paper is made in Europe and Japan, this is not enough to meet projected needs. European consumers are keenly interested in using products made from natural fibres. Handmade paper meets the criteria.

Since the technology and know-how is available within the country, no

foreign exchange need go out in the form of royalty payments. The principal experts in the making of handmade paper are in India and the production of such paper is of such standard that it can safely meet international requirements if sufficient measures are instituted for quality control.

9. POSSIBILITY AND SCOPE OF TRANSFERRING TO OTHER COMMUNITIES OR COUNTRIES

The entire technology of handmade-paper units can be supplied to other communities at cost. There are a very large number of registered producers of handmade-paper equipment in the country who can supply the different components required for setting up a unit to manufacture handmade paper. The KVIC is capable of erecting such units on a turnkey basis. Since the KVIC is a statutory institution, there is very little prospect of being cheated as far as prices of machinery are concerned. These are low enough to be ordered by other countries in the South as well.

10. OTHER COMMENTS

The KVIC has produced a project profile of the handmade-paper industry in India which can be ordered from the Commission's office at a price of Rs.20. The book provides complete information on the process of making handmade paper, whom to approach, which companies in India one can source technology, where one can get subsidies and loans, and which centres abroad import finished handmade-paper products. The book also gives details of estimates for erection of tiny units, export units and cluster units which can be submitted to funding institutions in a ready-made form for loan applications.