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Abaca

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Abaca (*Musa textilis*)[1] is also known as Manila hemp. It is a member of the Musacea (banana) family of plants.

8.1 The plant and its cultivation

The stem of the plant is made up of a central soft core, the stem proper, around which are tightly wrapped up to 25 sheaves; these, together with the core, form a 'proto-stem'. When these sheaf-leaves have reached an appropriate stage of maturity they unwrap from the proto-stem and take the recognisable shape of banana type leaves. The plant can reach a height of 7.5 metres and therefore, since the sheaf-leaves grow from the base of the plant some of the leaves, the inner ones, will be almost as long. The outer leaves, which develop later, are consequently shorter. The leaves grow to a width of about 30 cm.

Depending on the variety, of which there are many, the plant will live for between 5 and 25 years, but the longer-living varieties are not usually cultivated for more than 15 years as their productivity decreases from then on. The plants have a shallow rooting system from which sprout vertical pseudo-stems. As it develops, a single plant may successively produce as many as 25 of these stems, maturing at different times. When the plants are between 18 and 24 months old the first pseudo-stems are sufficiently developed to be harvested and three to four stems are then cut at intervals of from 6 to 12 months, depending on their rate of growth. This, in turn, will depend on the plant variety, the meteorological conditions and the type of soil. Abaca is a tropical plant which requires good soil and regular rain.

The pseudo-stems are ready for harvesting on flowering. The stalk is cut off, or 'topped' below the inflorescence with a sickle attached to a long pole and the pseudo-stalks are then cut at their base ('tumbled') and, depending on the method of fibre extraction, either stripped of their fibres *in situ*, or removed to the proximity of the decorticating equipment or machine (see below). The leaves vary in length, the outer sheaf-leaves being shorter than the inner ones.

8.2 The fibres

The leaves which surround the stem can be classified into four groups: the outer three leaves; a group of three to four leaves between the outer and the middle group; the middle group, four to five leaves; the innermost group of seven to eight leaves. Fibre strength and fineness depend on the position of the leaf in relation to the centre of the stem. The nearest to the centre, the finer, whiter and softer the fibres. The fibres are situated in bundles of various thickness that run the length of the leaves and there are also a few smaller transverse bundles at right-angles to these.[2] The physical and chemical characteristics of abaca fibres can be found in Tables 1.1, 1.6, 1.8, 1.9, 1.10 and 1.12 of the Appendix to Chapter 1.

8.3 Early processing

Fibre extraction is done by the growers and takes place as soon as is practical after the stems are cut, whilst they are still moist and the gums which bind the fibres to each other and to the rest of the plant have not yet solidified. The first stage, called 'tuxying' is to separate the fibre bundles from the remainder. Tuxying is done manually. The leaf-sheaves are separated from the cut pseudo-stems and laid on the ground. A curved knife is inserted at the butt end, between the outer and middle layers of the leaf-sheaf, the outer layer is then grasped firmly and pulled away from the rest of the leaf. The ribbons of fibre that result from this operation, the 'tuxies' are about 5–8 cm in width and are the length of the leaf. The second stage removes the gums and any residual leaf matter adhering to the fibres after tuxying. This is done manually, semi-manually or mechanically.

Manual stripping

The tuxies are drawn between the edges of a knife and a smooth wood surface. The wooden block and the knife, which is usually serrated, are fixed in a light wooden or bamboo structure which enables the standing operative to feed one end of the tuxie through the slit between the knife and the wooden block and then wrap it round a small wood cylinder. This cylinder allows the operative to keep a sufficiently firm grip on the tuxie as he pulls it through the slit between the wood block and the knife, an operation which requires the use of considerable force (Fig. 8.1). The width of the gap between the knife and the surface of the block can be slightly adjusted, according to the thickness of the tuxies, by applying foot pressure on a pedal linked to either the block or the knife. The operative then pulls the tuxie through the slit, applying the necessary pressure on the pedal to ensure adequate removal of the non-fibrous matter from the tuxie. After the first part of the tuxie is stripped the operative repeats the

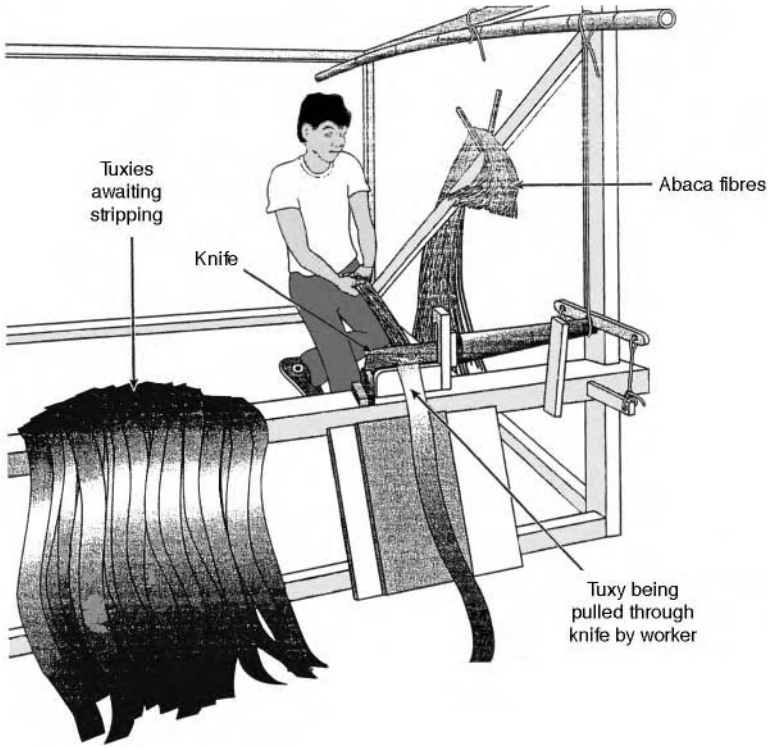

Figure 8.1 Hand stripping tuxies from abaca. Source: C. Jarman, *Plant fibre and processing: A handbook*. Courtesy: ITDG Publishing, UK.

process for that part of the tuxie which is not yet stripped because he was holding it in his hand. In this way the whole tuxie is stripped. Too little presure on the pedal will not adequately strip the tuxie but if the pressure is too great the fibres will be damaged and broken. The number of serrations of the knives used in stripping will vary according to the thickness of the tuxie and the thickness and strength of the fibres. Stripping is relatively skilled work and requires experience.

Spindle stripping

This is a mechanised version of the same principle used for manual tuxying. The machine, called a hagotan, consists of slightly tapered wooden cylinders set co-axially on a 'spindle' that is motor powered. This axle is set a convenient height so that, as in manual stripping, the operatives can feed the tuxies through the slit between the knives and the wooden blocks, attach them to the tapered cylinders by overlapping one or two turns of the unstripped tuxie and hold the

tuxie as the power rotates the tapered cylinder so that the tuxie is stripped. As the wooden cylinders are tapered the operative can control the degree of stripping by guiding the tuxie across the cylinder, thus increasing or decreasing the speed at which the tuxie is pulled through the slit. A hagotan will have six or eight positions so that this number of tuxies can be processed at the same time. Hagotans increase labour productivity by two to three times compared to manual stripping.

Decorticating

This is a fully mechanised process, using a machine similar to a sisal decorticator. These machines process whole abaca stems. As one such machine can deal with the production of 2,000 to 2,700 ha they are used only on large plantations. Generally speaking the quality of fibre produced decreases with the productivity of the stripping process, but the price, naturally, increases with fibre quality. After stripping or decorticating the ribbons of fibre, which can be up to 3 m long, are hung up to dry, they are then graded, packed into bundles and baled for shipping.

There are two systems of grading used. For Philippine fibre, according to the manner of extraction, i.e. hand or spindle stripped, the fibres are graded:

Excellent; AD, EF, S2, S3
Good; I, G, H
Fair; JK, MI
Coarse; L, and
Residual; Y1, Y2, O, T, WS.[3]

Details of the grades used for different end products are set out in the Appendix. Grades for Ecuadorian fibre are 2, 3, 4, 5 and tow.

8.4 Textile manufacture and end uses

Abaca fibres are processed is a similar manner to sisal and other hard fibres, although the fibres do show a little more elasticity. The major outlet for abaca fibre is for high quality and specialised papers such as banknotes, meat casings, etc. Over half of the Philippines' production is consumed by this growing end-use. Abaca fibre textile outlets (30% of Philippine production) are similar to jute and include rope, cordage and twine, especially marine rope (where the good resistance to sea water and buoyancy are advantages), filter cloths, tea and coffee bags, disposable fabrics, reinforcement fibres for plaster, lighter weight woven fabrics mostly of an artisanal type, and other handicrafts. The cordage market is decreasing owing to competition from synthetic fibres.[3]

8.5 Production

Table 8.1 shows world production by country. The dominant producing country is the Philippines with some 70% of total production, followed by Ecuador with about 25%. The production of the other countries is very small. In the Philippines abaca production is concentrated in the three regions of Eastern Visayas, Bicol, and Mindanao.

As can be seen from Table 8.2 global production over the last few years has hovered around 100,000 tonnes per year and production in the early 1960s was also at about this level However, from 1977 to 1980 production was up to 60% higher, after which it decreased to its previous level. Over 65% of Philippine produced abaca fibre is consumed by the country's processing sectors. Exports of fibre, semi-manufactured and manufactured products for the ten-year period ending in 1999 totalled US$78 million, with about three-quarters of this export value being for semi-manufactured and manufactured products.[3]

Table 8.1 World abaca (Manila hemp) fibre production (tonnes) by country (2002)

	2002
World	99,320
Costa Rica	1,100
Ecuador	26,000
Equatorial Guinea	500
Indonesia	600
Kenya	30
Philippines	71,090

Source: FAOstat.
Courtesy: Food and Agriculture Organization of the United Nations.

Table 8.2 World abaca production 1961–2002 (tonnes)

2002	99,320	1989	81,935	1978	142,122
2001	98,232	1984	109,262	1977	168,309
2000	104,430	1982	128,697	1976	139,653
1999	99,840	1980	169,968	1969	113,801
1998	97,400	1979	160,746	1961	97,000

Source: FAOstat.
Courtesy: Food and Agriculture Organization of the United Nations.

8.5.1 The organisation of the industry

In the Philippines abaca production is in the hands of smallholding farmers, whilst in Ecuador the fibre is produced on large plantations, although there is also a co-operative of smallholders. In the Philippines the farmers, who produce and strip the fibre, sell it to local 'banranguay' dealers. These grade the fibre and sell it on to town/city dealers who then sell to exporters who deal with fibre merchants based in major economic centres such as London, Hamburg, Zurich, Tokyo and New York. There are cases where fibre producers sell directly to exporters who have their in-house grading operation and others where local co-operatives supply domestic processors.[3]

8.6 Appendix: Uses of Philippine grades of abaca fibre for various end-uses[3]

Grade	Cleaning	Layer of leaf sheath
S2	Excellent	Next to outside
I	Good	Innermost and middle
G	Good	Next to outside
JK	Fair	All except outside
Y2	Damaged during cleaning	All

Source: C. Jarman, *Plant Fibre Processing,* Intermediate Technology Publications, 1998.

8.7 References

1. Jarman, C. (1998), 'Jute-like fibres', *Plant Fibre Processing*, Intermediate Technology Publications, Rugby, UK
   Kirby, R. H. (1963), *Vegetable Fibres*, Leonard Hill Ltd, London.
2. Catlin, C. and Grayson, J. (1998), *Identification of Textile Fibres*, Archive Publications, London.
3. www.da.gov.ph/agribiz/abaca_new.html

8.8 Glossary of terms

Baranguay Local abaca fibre dealer.
Hagotan Machine for spindle-stripping.
Manila hemp Common name for abaca fibre.
Musacea textilis Botanical name of abaca plant.
Proto-stem Name of the central structure of the abaca plant.
Sheaf-leaf Leaf-like structure making up the proto-stem.
Spindle stripping Semi-manual removal of gums and extraneous matter from tuxies.
Topping Cutting-off the top part of the abaca plant during harvesting.

Tumbling Cutting down the proto-stem during harvesting of the abaca plant.

Tuxie Ribbon of abaca fibres after separation from the harvested leaf-stem.

Tuxying Stripping the tuxies off the harvested leaf-stem.