

UTILIZATION OF COCONUT PRODUCTS

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Coconut is one of the oldest known tropical crops, and in many countries where it is grown there is historical and botanical evidence of its existence since very ancient times. As we know it, it is a commercial crop of overwhelming importance the proceeds of which constitute the means of sustenance for millions of people in this world.

The coconut palm, perhaps yields more products of use to mankind than any other plant. In supplying food, drink and shelter it not only caters for some of the primary needs of human existence but also provides raw materials for a number of important industries. Though every component of the palm is used for some essential purpose, the fruit it bears should indeed be reckoned the most valuable part.

Structurally the coconut consists of an outer husk which is attached to an inner shell, which in turn is firmly united to a hollow kernel on the inside. The cavity of this kernel contains a fluid known locally as 'coconut water' which varies in volume depending on the maturity of the fruit. We may now consider the utilization of the different products that are derived from the various fruit components.

Products of the husk

Coir is the most important product that can be obtained by decortication of the husk. It is an industrial 'hard fibre' of a uniform gold colour. It offers immense possibilities for profitable utilization on account of its natural resilience, durability, resistance to dampness and other properties. By suitable processing, coir can be extracted and converted into a variety of products including bristle fibre, mattress fibre, matting, rugs, carpets, brushes, brooms and other coir manufactures. The fibre can also be spun into yarn for the manufacture of cordage. A versatile product of relatively recent vintage is "rubberised coir". Owing to its astonishing springiness its application in the domestic and industrial fields, as a cushioning material, appears to be limitless. In Europe, it is now employed widely in the automobile industry, air conditioning industries, acoustic installation industries, railways, hospitals and in the upholstery trade.

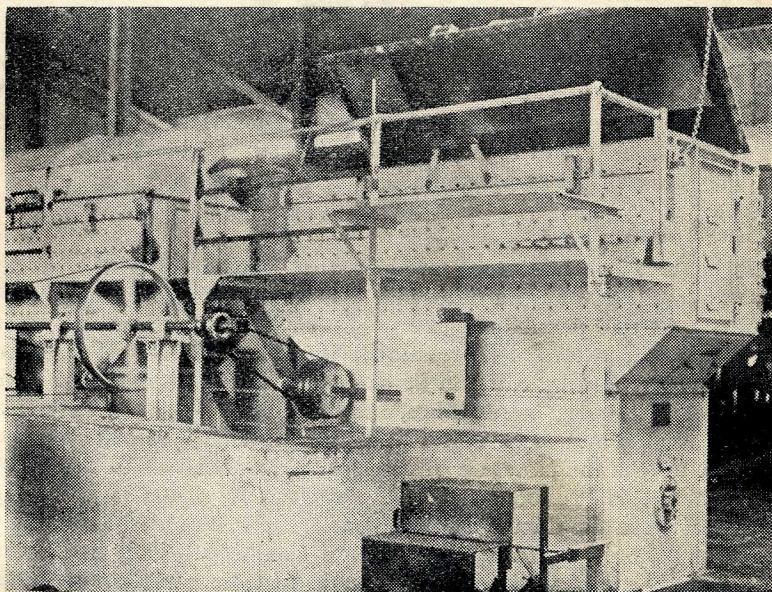
In areas where the husk is not processed for coir, it is generally used for agricultural purposes, as both mulch and manure. A small proportion of the considerable amount of pithy residue ("coir dust") that is separated as a by-product during the decortication of the husk, also finds similar use as a soil additive in horticulture.

Products of the shell

Of the enormous quantities of coconut shells produced annually, the bulk is used as fuel. In those regions especially, where a well developed plantation industry exists, shells are largely used for firing copra-drying kilns. In fact, shells constitute economically useful and relatively smoke-free fuel eminently suited for this purpose.

Apart from their direct use as fuel, the manufacture of charcoal represents the most important direction in which coconut shells are economically utilised at the present time. Furthermore, shell charcoal which is a relatively minor product in the past, has now developed into a general commercial commodity owing to its intrinsic value as a raw material for the manufacture of 'Active Carbon'.

When coconut shells are heated out of contact with air to a sufficiently high temperature, the highly complex substances of which they are constituted break down, the shells as a whole suffering decomposition. The products of this 'destructive distillation' appear in all three of the states of matter—solid, liquid and gas.



The New Semi-Automatic Drier for Desiccated Coconut. An improvement on the Old Tray-Compartment Type Ceylon Drier.

The primary products of the destructive distillation of shells are charcoal (which remains in the retort), pyroligenous liquor and settled tar (which distil over) and uncondensable gases. Hundred pounds of shells may be reckoned to yield about 34 lbs. of charcoal, 40 lbs. of pyroligneous liquor (containing up to 12.5% of acetic acid), 6 lbs. of tar and 20 lbs. of gas.

The pyroligneous liquor may be regarded as an impure dilute acetic acid contaminated with other compounds. During re-distillation of this liquor, a low boiling fraction—"wood naphtha", (amounting to about 3 per cent) could be recovered. This is mostly a mixture of methyl alcohol and acetone. By sample fractional distillation of the tar, phenol, creosote and pitch could be isolated.

As a result of intensive practical research during the past few decades an entirely new use for commercial exploitation has been found for coconut shell. It is the preparation of *Coconut Shell Flour*. This product is now used extensively as a compound filler for synthetic resin glues and as a filler and extender for phenolic moulding powders. Coconut shell flour is reckoned to give a smooth and lustrous finish to moulded articles and also to improve their resistance to moisture and heat.

There are certain important uses to which coconut shells have and can be put to, which are scarcely to be described as industrial but rather domestic and ornamental. As the shell takes on a polish it can be carved, decorated with lacquer, inlaid with silver or other metals and generally used with great ornamental effect. Articles of very attractive appearance, characteristic of the various countries of origin and as diverse as the ingenuity of man can possibly make them, are being produced by expert craftsmen in different parts of the world.

Products of the kernel

The kernel of the mature coconut is firm and rich in oil and is in fact the most valuable part of the fruit, as it provides important articles of food. Besides the direct use of the raw kernel, grated meat and milk for culinary purposes, the principal products of the kernel include copra, oil, poonac and desiccated coconut.

Commercial copra has only one use, namely in the manufacture of oil and its single by-product-poonac. Superfine edible grades of copra however, are to a certain extent, domestically consumed as such in India and Ceylon.

Unlike some other fruits, almost all the oil of the coconut is present in the kernel. Until very recently, copra was the exclusive raw material for the industrial production of coconut oil. As the commonest culinary fat of the tropics, it is apt to be prepared in the household from the freshly grated meat by the traditional process of heat rendering. On the bigger scale however, it is expressed from copra in bullock-driven mills ("Chekkus"), power-driven rotaries ("Ghanis") hydraulic presses or in expellers.

Refined coconut oil has been sold in Europe under a wide variety of proprietary names, such as Cocolardo, Cocoline, Lactine, Laureol, Nucoline, Nutrex, Palmine and Vegetaline. With the introduction of hydrogenated oil, coconut oil has really lost its pre-eminence as a solid vegetable fat. The oil however still finds use in specialised products, such as "coconut stearin" employed as a substitute for cacao-butter in chocolate manufacture. Commercially, coconut oil is mainly used in the manufacture of soap and margarine, while appreciable and increasing quantities are also being used in biscuits and confectionery. A large volume of pure coconut oil is also employed in tropical countries as a cooking fat, besides its use for other domestic purposes.

Coconut poonac is really a by-product of the oil-milling industry and when it is ground gives rise to coconut meal. Both the poonac and meal are valuable protein concentrates and are widely used as supplementary foods for cattle, pigs, poultry and other farmstock.

Desiccated coconut is manufactured from the white part of the kernel only. It is white in colour, crisp and has a fresh taste of the nut. It is really a luxury product and is widely used in confectionery, biscuit manufacture and cake-making. When desiccated coconut is pressed it yields a superfine white edible oil. The residue which corresponds to poonac can be ground to a suitable degree of fineness to give *coconut flour*. Using a mixture with 50 per cent of wheat flour it has been found suitable for cake-making.

Products of the sap

Any discussion on the products of the coconut would be incomplete without reference to coconut sap or "toddy". In its fresh state, sweet coconut toddy is a liquid containing as its essential constituent about 12 to 15% of cane sugar. If carefully collected under sterile conditions, sweet toddy will remain unfermented for a considerable time. On fermentation the sugar rapidly disappears and its place is taken by 5-8% of alcohol. Fermented toddy, on further keeping undergoes a process of acetic fermentation, the alcohol being converted into acetic acid of which the resulting vinegar contains about 4 to 7%. Sweet toddy is thus essentially a water solution of sugar; fermented toddy a weak solution of alcohol; and vinegar a weak solution of acetic acid. All of the main constituents—sugar, alcohol and acetic acid can by suitable means be separated in a relatively pure state. Partial separation is indeed effected in some industrial and semi-industrial processes whereby products like treacle, jaggery, arrack and vinegar are produced.

The products of the coconut palm are legion, and the coconut industry has a great wealth of raw materials which provide a unique opportunity for improvement and utilization in directions hitherto untried. With further applied research the prospects for development and better utilization of the products from the "tree of abundance" seem good.

In Ceylon, the coconut continues to hold its position as one of the major economic crops and increased emphasis is presently being placed on greater use of the raw materials derived from it. Interest has also been generated in the further development of processing techniques for these raw materials.

Visitors are always cordially welcome to the Coconut Research Institute, Lunuwila, not only to obtain advisory information on these matters, but also to discuss the scope that exists for development in this field.