

SMOKE-HOUSE FOR CURING RUBBER ON SMALL-HOLDINGS

BY

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There has been a long-felt want for a cheap smoke-house for curing rubber on small-holdings. So far not much progress has been made in the endeavour to persuade small-holders to dry and smoke their sheet rubber on a co-operative basis, although in certain districts Malay small-holders' rubber is smoked in a smoke-house owned by one of themselves or by a Chinese, for which a charge of about \$1 per picul (133-1/3lb.) is made.

AIR-DRIED SHEET

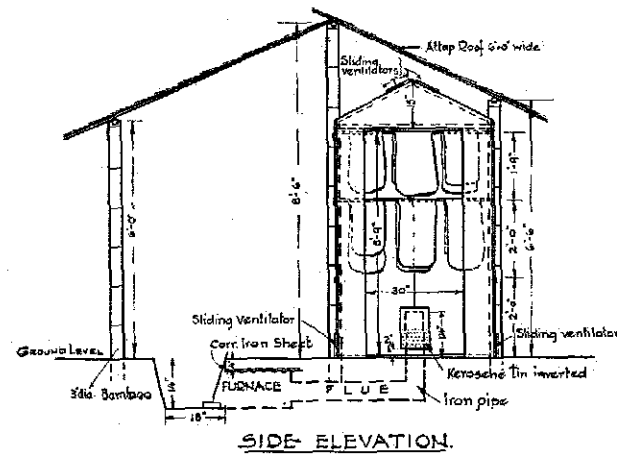
As a rule, the unsmoked or air-dried sheet prepared by the small-holder is by no means satisfactory, chiefly owing to the sheet being too thick, which renders drying at ordinary atmospheric temperature very slow, and secondly, to the fact that the coagulum receives very little washing during machining by hand-operated sheeting machines. Owing to this lack of washing, the sheet retains a higher proportion of serum, which is hygroscopic and renders the rubber more liable to develop moulds. Also, if the sheet is hung to dry too long in the open, tackiness is produced by the sun. This is particularly noticeable in a large proportion of the air-dried sheet exhibited in the District Agricultural Shows. Experiments carried out by the Rubber Research Institute show that such tacky rubber is inferior. If the air-dried sheet is only partially dried, the buyer or dealer will usually give even a lower price than is justifiable on the dry weight, since he has to make allowance for an unknown proportion of moisture and, either he or some subsequent buyer, has to dry the rubber before it can be used by the manufacturer. In some districts the small-holder prepares a very thick, lightly-machined coagulum which it is impossible to dry, until it has been *crêped*.

The loss to the small-holder by selling "wet" rubber has been recognised both in Malaya and Netherlands India.

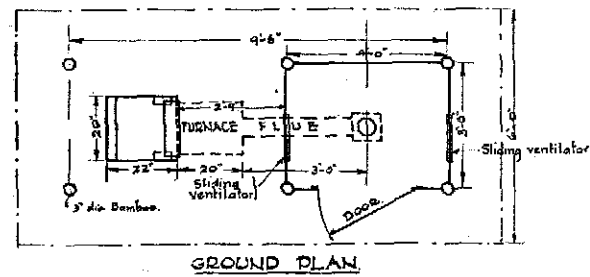
SMOKED SHEET

The smoking of sheet rubber is beneficial for several reasons; firstly, the heating at a temperature higher than that of the

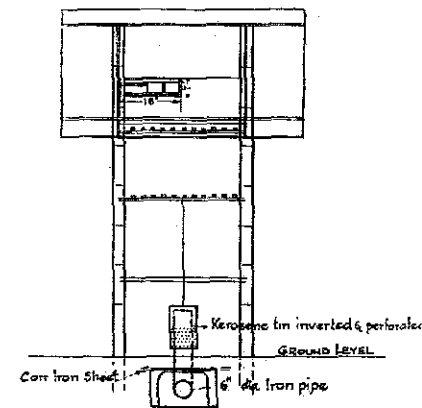
SMALL-HOLDERS' SMOKE-HOUSE.



SIDE ELEVATION.



GROUND PLAN



Capacity: 60 sheets (Each sheet = 1 cattly) 60 catties.
 Smoking Period (Daytime smoking only) 4 days.
 Walls & Roof - Gunny treated with Tapioca paste.
 (Boards can be used if preferred).
 Corner Posts - Bamboos.
 Braties - Light bamboos or Bertams.
 Attop Roof on Poles to cover Smoke House and furnace.

atmosphere accelerates the drying; secondly, the smoke acts as an antiseptic or fungicide and prevents or reduces the development of moulds in the rubber; thirdly, experiments carried out by the Rubber Research Institute show that such rubber is superior to hot-air-dried sheet or to sheet dried by exposure to the sun.

Description of the Smoke-House

In describing the smoke-house, credit should be given to the small-holder in Perak who is responsible for the original construction and to the Rubber Instructors (Che Mohd. Shafi bin Ludin and Che Wan Chik bin Abdullah) who observed this smoke-house in operation and sent to the Institute a detailed description and drawing.

The original design has been improved at the Institute, chiefly in respect of ventilation and in the provision of a more satisfactory baffle to prevent sparks from the "furnace" coming in contact with the walls or with the rubber sheets, thus reducing the fire risk. These improvements are relatively inexpensive and easily carried out.

A great advantage of this smoke-house is that it can be constructed completely by the small-holder himself with materials which are readily obtainable in the *kampung* or the nearest village.

The principal materials required are attaps, gunny sacking, bamboos, a small quantity of meranti or other cheap wood, a kerosene tin, a short length of metal piping and a small piece of corrugated or sheet iron.

CAPACITY

The smoke-house described is capable of holding sixty sheets of rubber each weighing about one catty*, or 60 catties of dry rubber.

The drying and smoking period, if the sheet is sufficiently thin (not more than $\frac{1}{8}$ inch) is three to four days with no night smoking. If five days are allowed, as a maximum, a total quantity of 360 catties of sheet can therefore be smoked per month, which equals 4,320 catties per year, equivalent to the crop from about 13 acres, assuming a crop of 350 catties per acre. The smoke-house should therefore be suitable for several adjacent or neighbouring small-holders who may desire to co-operate.

If a larger smoke-house is constructed, the height and width should be maintained in about the same proportion, i.e. the height should be about one-and-a-half times to twice the width.

*1 catty = $1\frac{1}{2}$ lb.

SPECIFICATION AND MATERIALS (See Plates 1—4)

The walls and roof of the smoke-house are of gunny sacking (hessian) which is nailed to four upright cylindrical poles or bamboos of about three inches diameter. The door consists of gunny sacking nailed to a framework of wood, the framework being about two inches wide and one inch thick. Two hinges are required for the door and a lock may be considered desirable but is not essential. The roof should be suitably sloped as shown in the line drawing (Plate 1) and the illustrations (Plates 2—4).

In order to protect the smoke-house from rain, an attap roof is constructed (see Plates 2 and 3). The ridge of this attap roof can be about two feet above the top of the smoke-house and should extend about $1\frac{1}{2}$ feet beyond the side on which the door is situated and, if an outside furnace is used, as in the illustrations, should extend over the furnace as shown, in order to prevent rain from entering the furnace.

Since the hessian, where it is in contact with a damp soil, may rot, it may be desirable to place a sheet of tin or wood about six inches wide all round the walls at the bottom, so that the hessian does not touch the soil.

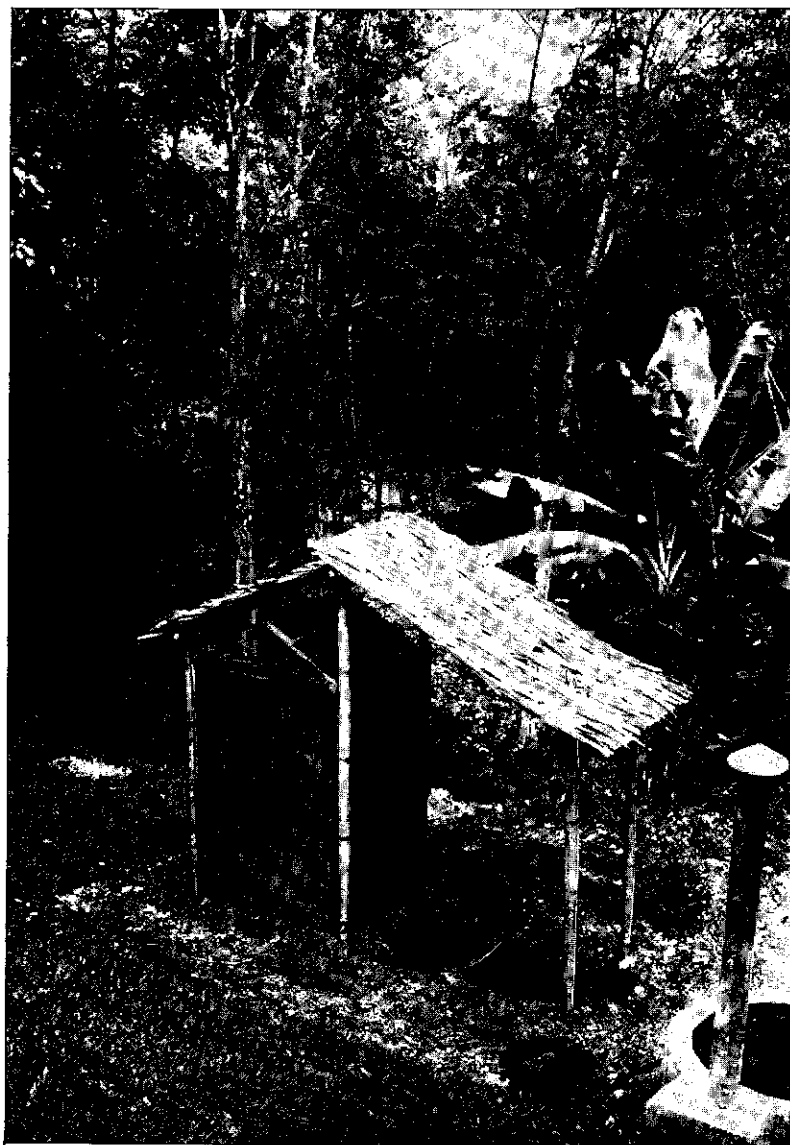
The gunny sacking used for the walls can be treated on the outside with a mixture of cattle manure and clay to render it more fire-proof and less porous. A mixture of sodium silicate and tapioca starch can also be used, but is probably not obtainable by most small-holders. (N.B. In the construction of the smoke house at the Rubber Research Institute, hessian treated with sodium silicate and tapioca starch was purchased from estates which use this material for packing rubber. Experiments are also being carried out to ascertain whether the treatment of the hessian with certain fire-proofing chemicals is desirable)

FURNACE AND FIRING

On most inland small-holdings where the water table is low, the fire or furnace can be constructed below ground by digging a trench as shown in Plates 1 and 2, so that firing can be done outside.

A small length of pipe about three feet long bent at right angles to form a short chimney (about 14 inches long) inside the house, as shown in Plate 1, conveys the heat and smoke. A piece of sheet or corrugated iron can be used on the top of the furnace flue, which is then covered with a layer of earth. Similar pieces of iron can be used, if the soil is light, on the sides of the trench, to prevent the earth falling in. An inverted kerosene tin is sus-

PLATE 2







pended over the chimney to act as a baffle to prevent sparks coming in contact with the walls and with the rubber. Perforations are made by means of a nail, round all sides of the tin, from the open end (bottom) and to about half way up, to assist distribution of smoke.

On coastal estates where the water-table is high, an underground furnace is not advisable. On such sites, a small second-hand drum can be used as a furnace inside the smoke-house, retaining the kerosene tin as a baffle over the drum in which the fuel is placed.

In order to economise in space, if a drum furnace is used inside the smoke-house, a trench can be dug through the ground under the smoke-house and extending about one foot outside the walls, provided the bottom of the trench is above the water level. The drum can then be placed inside the smoke-house, so that its top is at ground level or just above. The object of the trench is to provide air for the combustion of the fuel. Baffle plates of corrugated or sheet iron or even pieces of wood can be placed in the trench outside the house to regulate the amount of air. These baffle plates can be raised on a loose brick or placed at an angle according to the ventilation necessary to keep the fuel burning slowly.

Only small logs of wood—a mixture of jungle wood and dry rubber trees (wood from trees which are cut down, owing to disease etc.) should be used as fuel. The logs should not be allowed to burn fiercely but to smoulder gently to produce both smoke and heat. Since no night smoking is usually done in small-holders' smoke-houses, a final log can be added about 8 p.m.

VENTILATION

In the drying and smoking of rubber, ventilation is required in the smoke-house to carry off the smoke and moist air. Two roof ventilators, constructed of thin wood, sliding in a frame, are shown in Plates 1 and 2, but it is only necessary to cut two square or rectangular flaps in the hessian on opposite sides of the roof, so that the hessian can be rolled back like a blind to leave an opening. Similar flaps should be cut on three sides of the walls about three to four inches from ground level. A few trials will soon determine the amount of ventilation required for optimum drying and for producing a sheet which is not too dark in colour.

FLOOR

The floor can be of clean sand or clay which is pressed down.

RACKS

A smoke-house of the size shown will contain two rows of *beroties*; the lower should be about four feet above the furnace and the higher about 1 foot 9 inches above the lower.

Each row will contain ten bertam or bamboo *beroties* about $\frac{3}{4}$ to 1 inch in diameter and spaced about two inches apart each of which will hold three sheets, i.e. 30 sheets on each row. If the temperature is too high on the *beroties* in the lower row, immediately above the kerosene tin baffle, the space where the middle sheets are hung should be left vacant. If firing is carried out properly, however, the temperature should not be too high.

The *beroties* should be wiped with a dry cloth periodically to remove dust or soot. If the smoked sheet is "dusty" when removed, owing to particles of ash or soot, the sheet should be well brushed after removal.

ADDITIONAL PROTECTION FROM RAIN

If found desirable, a protecting wall of attap or any cheap wood (from old boxes etc.) can be placed all round the house to a height of about 7 feet. The "wall" need not be carried to the ground level but can stop at about two feet from the ground.

COSTS

The figures given below are the average costs obtained from the erection of a number of these smoke-houses used for demonstrations at various District Agricultural Shows. The erection was supervised by a Rubber Instructor. The materials were purchased locally and local labour was employed.

Many small-holders will be able to erect a smoke-house without employing outside labour and may also be able to obtain the materials at a lower cost.

Labour	...	...	\$1.50
Poles or bamboos for frame	...	...	1.20
Gunny bags for walls	...	...	1.50
Galvanized iron for flue and furnace	...	...	0.85
Attap and Rotan for tying	...	...	0.50
Kerosene tin	...	...	0.20
Meranti wood for door frame etc.	...	...	0.75
Material for treating walls	...	...	0.30
Beroties	...	...	0.30
Hinges for door and nails	...	...	0.40
			<hr/>
			\$7.50

Alternative Construction

A criticism of this smoke-house has been raised to the effect that rubber can easily be stolen from it at night, by cutting the hessian. It is not considered, however, that the question of stealing is of great importance, since all small-holders who at present market only air-dried sheet, have to bring the sheets into their own houses at night to prevent theft, and if there is risk of theft from the smoke-house, the sheets of drying rubber can also be kept in the house at night.

The reason for using hessian for the walls of the smoke-house is because it is cheaper than other materials. Other cheap materials that may be used instead and which would offer greater protection from theft of the rubber are (a) split bamboo (b) cheap wood, (c) galvanised iron or tinned iron from second-hand kerosene tins, and (d) expanded metal with hessian.

An objection to the use of galvanized iron from second-hand kerosene tins is that metals radiate heat and are not so desirable on that account for the construction of smoke-house walls as wood or other insulating material, especially when no firing is carried out during the night. If expanded metal with hessian outside is employed, a piece of expanded metal 10 ft. \times 8 ft. can be bent and used for three walls 3 ft. \times 3½ feet, which can be embedded in a trench about 1½ feet deep, so that walls above ground are 6½ ft. high. Another piece of expanded metal 8 feet \times 6 feet is sufficient for a door 6 feet \times 3 feet which will form the fourth wall and also provide sufficient material for the roof.

The use of such expanded metal will amount to about \$6/- and thus double the cost of the house.

These alternative materials are described for the benefit of small-holders who are able to spend more money on construction.

REMARKS

Small-holders can obtain the services of the Rubber Instructors for advice and assistance in constructing these houses.

Kuala Lumpur

26th July, 1935