THE PREPARATION OF NEW GUINEA CACAO FOR MARKET.

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INTRODUCTION.

The attention of planters in the Territory has, in recent years, been directed towards the cultivation of crops other than coco-nuts, in order to relieve the depression in the copra market.

Inquiries show that cacao cultivation is receiving a great deal of consideration, and this crop is within the scope of most planters.

If cacao is to become an economic cultivation, then two of the main factors must not be overlooked. First, is a ready market, and, secondly, the quality of the product must be such that when offered for sale in competition with cacao from other countries, it must compare favorably.

It is believed that the first factor is governed by the second, and that a ready market will be found in Australia and elsewhere if the product is of high quality.

Recent prices realized for New Guinea cacao have been equal only to Gold Coast values, and in some instances difficulty was experienced in selling.

New Guinea produces a "fine" cacao, which should command a far better price than that paid for Gold Coast cacao, the premium given for "fine" cacao over "ordinary" cacao being due to the better methods of preparation, and the superiority of the variety grown.

Therefore, if New Guinea is cultivating a superior variety and not receiving the price which it commands, it is safe to assume that the reduction in value is due to the methods of preparation and marketing.

It is obvious, then, that it is to the interest of the planters to improve the present product, and it is hoped that the following notes will be a guide to obtaining the standard of quality required.

The market preparation of cacao may be divided into two sections, namely (1) Fermentation and drying, (2) Grading and inspection.

FERMENTATION AND DRYING.

The Council of International Office of Manufacturers of Cacao and Chocolate define the cacao bean which is required by the trade to be plump and well filled, should crumble when pressed with the fingers, have an open texture, be quite dry, and the inside light mahogany to brown in colour.

If the beans were extracted from the pod and spread in the sun to dry, an inferior product would result. The cacao would be hard, flat, a longitudinal section through the kernel would be cheesy, purplish in colour and astringent when tasted.

To obviate these defects and render the beans suitable for manufacturers' requirements, it is necessary to subject them to a process of fermentation.

To carry out this procedure, fermenting boxes and a knowledge of the methods are essential.

Fermentation Boxes.

It is preferable that the fermenting boxes are constructed of wood. In some instances concrete receptacles have been used, but experiments have shown that concrete inhibits the growth of yeasts, bacteria, &c., essential for the process.

Size of Boxes.

The size of the boxes and the arrangement of the series will depend on the amount of crop.

A box measuring 15 feet by 4 feet by 3 feet, divided into three compartments each 5 feet by 4 feet by 3 feet, would handle 10 cwt. of wet cacao in each section. Should a smaller quantity of beans be harvested each picking, then the boxes could be made relatively smaller, remembering that 6 cubic feet of wet cacao weigh approximately 1 cwt.

It is important to know that the depth of beans in the box should not exceed 3 feet, otherwise aeration is impaired and improper fermentation occurs.

Construction of Boxes.

Only seasoned timber should be used, otherwise warping, with resultant difficulty in removing the sides, is experienced.

The dividing wall between each section should be removable to facilitate transference of the mass from box to box. The ends could also be removable to aid in filling and discharging.

When assembling the boxes care must be taken to see that no metal can come into contact with the cacao.

The floor of the box can be a series of removable boards with holes $\frac{3}{8}$ inch diameter bored 9 inches apart in the form of an equilateral triangle; or grating.

The latter is to be preferred, and consists of narrow laths $\frac{1}{2}$ inch apart. The grating is removable, and may be divided into one or more sections according to the size of the box.

The boxes should be raised 6–9 inches above a concrete floor, which is slanted towards a small drain so that the "sweatings" may get away. It is important to remember that there must be a space between the floor and the bottom of the box to allow for a free circulation of air.

Period of Fermentation.

The period required for efficient fermentation depends on many factors, such as degree of pod ripeness, type of cacao, depth of boxes, stage of crop. Beans from fully ripe pods ferment quicker than those from just matured pods. Criollo types require less fermentation than Forastero. The shallower the mass in the box the quicker the fermentation. At the commencement of the crop season fermentation is retarded on account of the physical condition of the mucilage covering the bean.

No definite time can be laid down for the duration of fermentation, and the period at which the beans are removed from the boxes will depend upon the experience of the planter. However, there are certain signs that can be followed. When the beans are first placed in the fermenting boxes they are covered with a whitish pulp. During the process, the colour changes to brown, and the liquor formed flows away from the box; also as the pulp ferments it is to a large extent destroyed. If the outer and inner colour and plumpness of the beans are observed it will be noticed that at the completion of fermentation the outer colour is reddish-brown, and the inner colour a light walnut to cinnamon.

Method of Fermentation.

Only fully ripe pods should be picked if a uniform sample is to be produced. A. W. Knapp* shows that the seeds from unripe pods produce on fermentation a gummy and mucilaginous pulp with an unpleasant odour. The beans on drying are small, flat, and shrivelled, the shell is hard, cotyledons hard, colour woody, and on roasting there is a sour odour and flavour. Over-ripe beans, on the other hand, have little pulp and the shell in many cases is frail and brittle.

There is also the possibility with over-ripe beans that germination has commenced.

After picking, the pods are broken, the seeds extracted and transported to the fermentary. Only wooden receptacles should be used for transportation, and before placing the cacao in the box it requires to be picked over and any placenta (central core), portions of shell, &c., removed.

Every endeavour should be made to fill the primary box each time. If this is not possible, then the beans in the partially-filled box are not made into a conical heap, but spread out and covered with banana leaves.

When the cacao from the following day's breaking is brought in, it should be placed in another box. This box is filled with fresh beans until there is sufficient quantity to fill one box when the beans from the previous day are placed with it. The transference of the small quantity from the first day should be made on the afternoon of the second day or morning of the third day. The box can now be covered with banana leaves and fermentation allowed to proceed in the usual manner.

As fermentation continues, transference from box to box is carried out every alternate day, until the process is completed. During the change over the beans should be mixed as thoroughly as possible with a *wooden shovel.*

The writer has observed that the common practice adopted in the Territory is to turn every day, and sometimes twice per day. This practice is quite all right providing no reduction in the temperature of the mass occurs. However, tests carried out on Kulili Plantation, Karkar Island, have shown that alternate days give better results.

It must be remembered that in the early stages of fermentation sufficient heat must be generated to prevent germination of the beans. Should germination occur, then a small hole is noticed at the germinating end of the bean when it is dry. This small aperture allows for the ingress of vermin whilst in storage.

Good fermentation of the bean is responsible for the prevention of germination, a reduction in the astringent and bitter taste, a uniform change of colour, development of aroma which is absent in fresh beans, and later, after drying, a fine "break."

Bad fermentation, on the other hand, is manifested by the lack of heat developed in the mass, no uniform change in colour of the bean, mildew of the beans in the boxes and a bad odour. On drying, the bean has an excessive adherence of mucilage, a cheesy "break", lack of aroma, is astringent, and there is the likelihood of a "germination aperture."

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* *Cacao Fermentation in West Africa*, by A. W. Knapp, Bulletin of the Imperial Institute, November, 1934.

Washing.

It is the practice in certain countries to wash the beans after fermentation and before drying. At the present time the question of washing is very controversial. It is recognized that a loss of weight occurs on drying, and the shell is rendered more brittle and cracks easily, but it is felt that the trade requirements should be tested before any definite recommendations are made either in favour or against.

Drying.

After completion of the fermentation process the beans are dried. There are two methods that can be adopted, namely, (1) sun, (2) artificial.

Sun Drying.

The type of sun drier preferred is one with a large wooden platform covered with a movable galvanized iron roof.

It is desirable that the drying floor be some height above ground as an additional aid in controlling mould during drying.

A drying platform measuring 30 feet by 20 feet should be sufficient to handle the beans fermented in a box 5 feet by 4 feet by 3 feet, approximately 54 feet of drying space being required for each hundredweight of wet cacao.

During the first half to full day after placing the beans to dry they must be spread thinly, and constantly "walked" or agitated with a wooden rake. The reason for spreading thinly is to drive off as much surplus moisture as quickly as possible.

The cacao must be constantly "walked" throughout the whole period, in order to obtain uniform drying.

"Walking" may be described as follows:—A labourer moves through the beans first in one direction and then in the opposite direction, the beans being thrown into ridges with the feet, a portion of the floor being always exposed, so that the beans are exposed on all sides to the sun, and the floor is kept dry.

The beans should be heaped for the first two nights. This aids the further slow fermentation which takes place, and assists greatly in obtaining a uniform product.

In some cacao-producing countries such as Trinidad, it is customary to "dance" the cacao, and the operation is carried out in the early morning three to five days after drying commences.

The object of "dancing" is to spread the mucilage adhering to the beans evenly over the surface, give the beans a polish, and to remove mildew.

The correct time to dance depends on the experience of the planter, and can only be ascertained by tests. Should the beans be too soft they may become unduly flattened, and if drying has proceeded too far, then breaking and cracking are liable to occur.

The method adopted is to make conical heaps each containing 4 to 5 cwt. of beans. The heaps are then sprinkled with water (about 1 gallon per cwt.) and the labourers trample the beans with a sliding motion of the feet. A conical-shaped head must be maintained all the time. "Dancing" is discontinued when a polish appears, which is usually in half to one hour.

After "dancing" the beans are re-spread and drying allowed to continue until completion. The period of drying will depend on the weather, under normal conditions five to seven days are sufficient.

Cleanliness of the drying floor is essential. Each morning it should be scraped and broomed to remove any adhering mucilage or dirt. Scraping is particularly necessary during the first few days of drying.

If mildew is very apparent, then the floor may be lightly sprinkled with water containing a weak antiseptic, and afterwards dried before spreading the cacao.

Artificial Drying.

Sun drying is to be preferred, but where conditions are unsuitable hot air can be utilized. It is generally agreed that the changes which occur during fermentation are continued during drying. However, if the temperature is too high (and it can quite easily occur during artificial heating), no continuation of fermentation takes place, and the percentage of inferior beans are increased. Should artificial drying be necessary, then an even temperature must be maintained, and the beans frequently turned as in sun drying.

The drying of cacao with copra, or in driers used for copra, is not advisable for many reasons—

(*a*) There is absorption of copra odour by the cacao.

(*b*) The period of drying for copra is, in the majority of instances, much faster than cacao.

(*c*) At no stage during drying should the beans come into contact with metal such as is used for copra trays.

(*d*) The type of copra driers used in the Territory does not permit the constant turning that cacao requires.

GRADING AND INSPECTION.

The world markets demand graded produce, and it should be realized that, if New Guinea cacao is to become favorably known and enter into competition on the open market, definite grades must be submitted.

It is to the interest of the producer that voluntary or compulsory grading be instituted.

There are various types of mechanical graders available, which could be utilized by the planter if his production warranted the expenditure. On the other hand, should production be small, then hand grading could be cheaply and efficiently carried out. From the time pods are broken in the field until the beans leave the drying platform, a certain amount of hand picking could be done. Later, prior to bagging, the parcel could be finally thoroughly and accurately graded.