Coir Spinning and The Production of Sandbags

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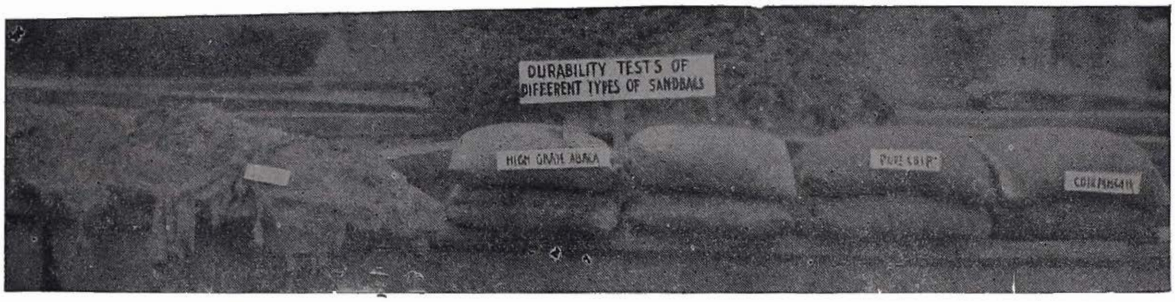
(Editor's Note: *Additional illustrations for this article appear in the centerspread pictorial*).

THE Philippines, in endeavoring to decrease her importation of foreign commodities, has embarked on industrial ventures with varying success. Some of these have been proved failures, others have been pronounced successful, while still others are yet in the experimental stage. To the last or so-called experimental ventures belongs the infant coir sack industry, which became a part of the country's industrial scene when sandbags were produced for the CEA on May 14, 1941. The government entity financially backing the enterprise is the National Coconut Corporation, which undertakes sandbag production principally through its Manila Coir Unit No. 1, located in the premises of the Bureau of Plant Industry, Manila, and which shoulders the turning into finished products, besides its own output, of coir yarns and burlap received from other units of the Corporation established in Manila, Tayabas, Laguna, Pangasinan, Rizal, Albay, Bulacan, Batangas, Mindoro and Marinduque.



A view of different types of sandbags after eighty-two days in the open. Note the busted jute sandbags at the left and the high-grade abaca sandbag, next, beginning to rot.

The Manila Coir Unit No. 1, taking advantage of all the facilities offered by the Bureau of Plant Industry, has produced from May 14, 1941, to September 24, 1941, 7,206.5 kilos of coir yarn, 23,110.0 meters of coir sack burlap and 46,537 sandbags. It has served as an educational institution or model school to hundreds of people anxious to learn spinning or weaving while earning at the same time. At present, it maintains 54 laborers working on daily basis and some 50 weavers and 96 spinners on *pakiao* system, thus helping alleviate the unemployment problem in the city. Some 600 apprentices have already graduated or been dropped from the payroll; they learned either spinning coir yarns or weaving coir sack burlap or both. Obviously, those who left this institution will help promote the coir industry, if properly guided, accommodated and financially backed up by enterprising industrialists.

Besides the manufacture of sandbags, this unit is currently conducting some researches on coir yarn spinning and coir sack burlap weaving, with a view to reducing the cost of production by increasing the speed of weaving and reducing the weight of sandbags. It may be mentioned, in this connection, that preliminary spinning work on coir was done by the Bureau of Plant Industry in 1933 upon the installation of the old Bohler coir defiberizing machine in the premises of its Fiber Research Section, where this unit is now located. Evidently, the present method of spinning practiced in this unit is an offshoot of this Bureau's previous experiments. Because efficient spinning and weaving work requires equally efficient devices to accomplish the utmost production of coir yarns and burlap, it becomes necessary to say beforehand something on spinning and weaving devices presently employed in this unit.

The spinning device, in vogue, is the Siltocruz spinning wheel, Siltocruz standing for Silayan, Torres and Cruz. This device is the result of ten-year research work on spinning of the Bureau of Plant Industry. It has undergone constant evolution and improvement and can aptly be regarded as one of the best, if not the best, available in the local market, for the time being. Properly intended for spinning ramie yarns for the production of ramie linen, which necessarily needs more twists per inch in the yarns produced, it has therefore the advantage over other spinning wheels in speed and twisting power (see Plate 2). Even in the spinning of coir, so noted for resiliency, it still can be expected to turn in, at least, the maximum amount of coir yarn, depending of course on the ability and efficiency of its operator. The specification for this spinning wheel can be roughly stated, thus:

The frame of the spinning wheel should be made of tanguile, properly set and at least 18″ deep, 25-½″ wide and 31″ high to the surface of the table to make the wheel easy to operate in sitting position.

The flywheel and drive pulley should be made of guijo,1-½″, the connecting rod, crank and shaft of the flywheel of yakal, and the pedal of tanguile.

The spool should be lathe turned and its flanges have a diameter of 7½″, made of narra and with a palosapis cylinder. The inside diameter should not be more than ¾″. Both flanges should be shellac-finished.

The driven pulleys attached to the spool should be made of mangachapoy, the one driving the spool at least 4″ in diameter, and the outer one driving the plier not more than 5″ in diameter. Both driven pulleys should be shellac-finished.

The plier arm should be made of tanguile and the spindle of guijo, properly sand-papered. The right arm of the plier should be provided with twelve 1½″ screws, each covered with copper tubing.

The body of the spinning wheel should be finished with a vermillion paint.

The handlooms currently used in the weaving of coir sack burlap are of four types; namely, (1) Cavite type, (2) Ilocano type, (3) Taytay type and (4) Visayan type (see plate 3, and plate 4, No. 2). Of these types, the Ilocano type is the one predominantly used, being more in number and already proven, while the other three types are yet under observation and experiment. Automatic handlooms of American make were tried but they were found to be better than the native handlooms only when weaving maguey warp, which is not as much affected by battening as the coir warp. With coir warp they were found more difficult to operate than the native handlooms. The mechanical loom of English make (see plate 5) was also tried but it was found expensive to operate, it being run by engine power and can only operate on big yarns which make the sandbags as equally expensive as they are heavy.

There is not much improvement made in each type of native handlooms employed. In all cases, the pulley type of heddle horse is being used. The old Ilocano type of heddle horse, supported by cumbersome bamboo joints filled with stone weights, is completely done away with.

The dents of the reeds are made of plain galvanized iron, instead of bamboo, which quite often breaks under the stress and strain of the coir warp ends during intermittent battening. The warp roller is so made that a wooden flange is attached to one of its ends towards the inside and that when the coir warp is completely wound over it a big wooden spool, filled with warp yarn and proportionally placed, is formed. This warp roller is also made detachable so that it can be removed anytime and attached to the new warping frame (see plate 6).

The new warping frame can be roughly described as follows: At the outset, spools corresponding to the number of warp ends to be warped are each filled with the desired yards and then placed in a warping rack in series. The warp ends from the spools are collectively gathered and made to pass through nail dents, 1 cm. apart, then the improvised reed and finally each equally tied inside the detachable warp roller, which is regulated by means of a wood lever and gradually rolled over and over again until the desired length of the warp yarn is attained to prevent the warp ends from going over their respective nail dents and the reed. The specifications for this warping frame will soon be published separately.

Spinning

Efficient coir spinning is determined by several factors, among which is the quality of the coir used. If the coir is not first passed thoroughly through the carding machine, the pulps are not removed, thus the fibers cannot easily stick in unison with each other during in the spinning process, making the spinner

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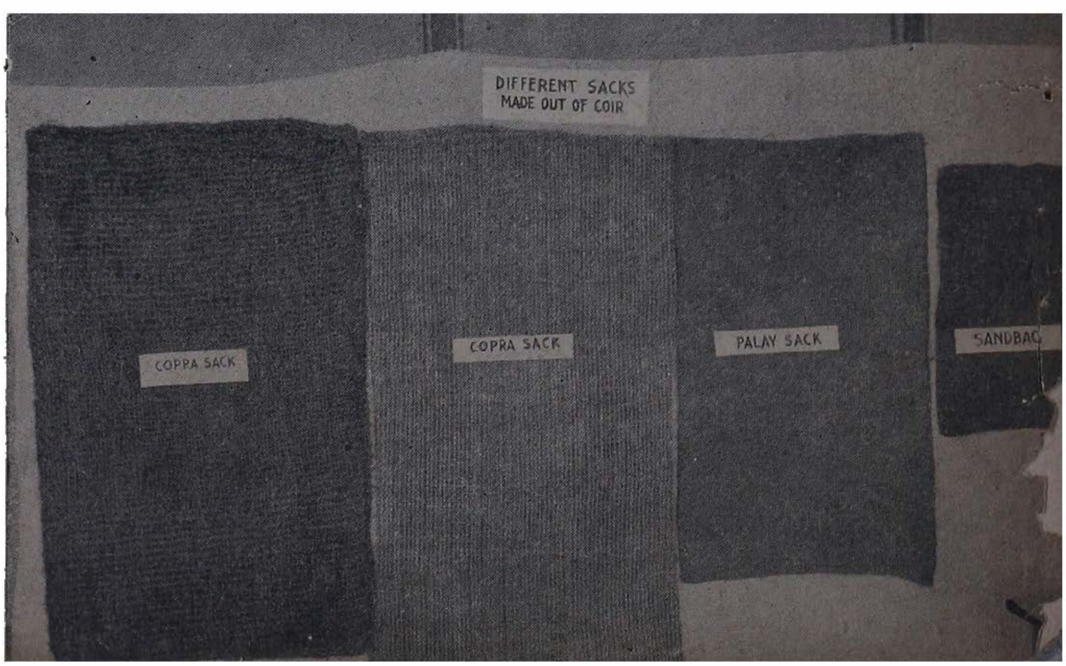
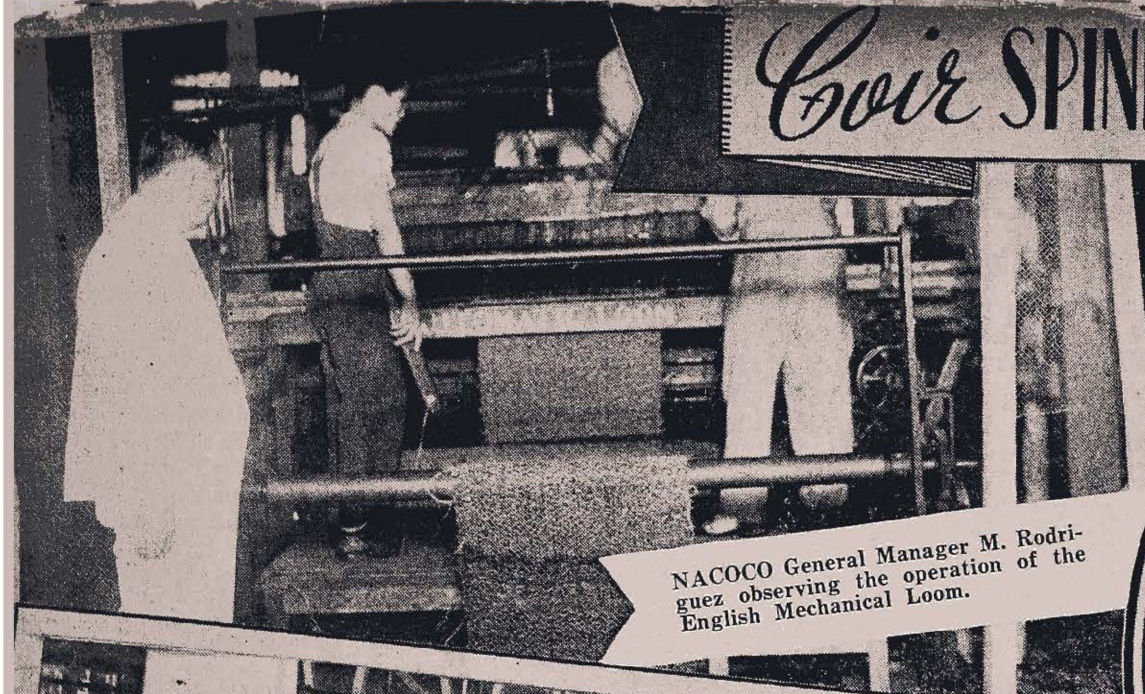


A view of the different types of coir sacks produced. The copra sack second from the left has maguey warp bud and coir filling, while the other three sacks are made of pure coir warp ends and filling yarns.

Coir SPINNING AND



NACOCO General Manager M. Rodriguez observing the operation of the English Mechanical Loom.

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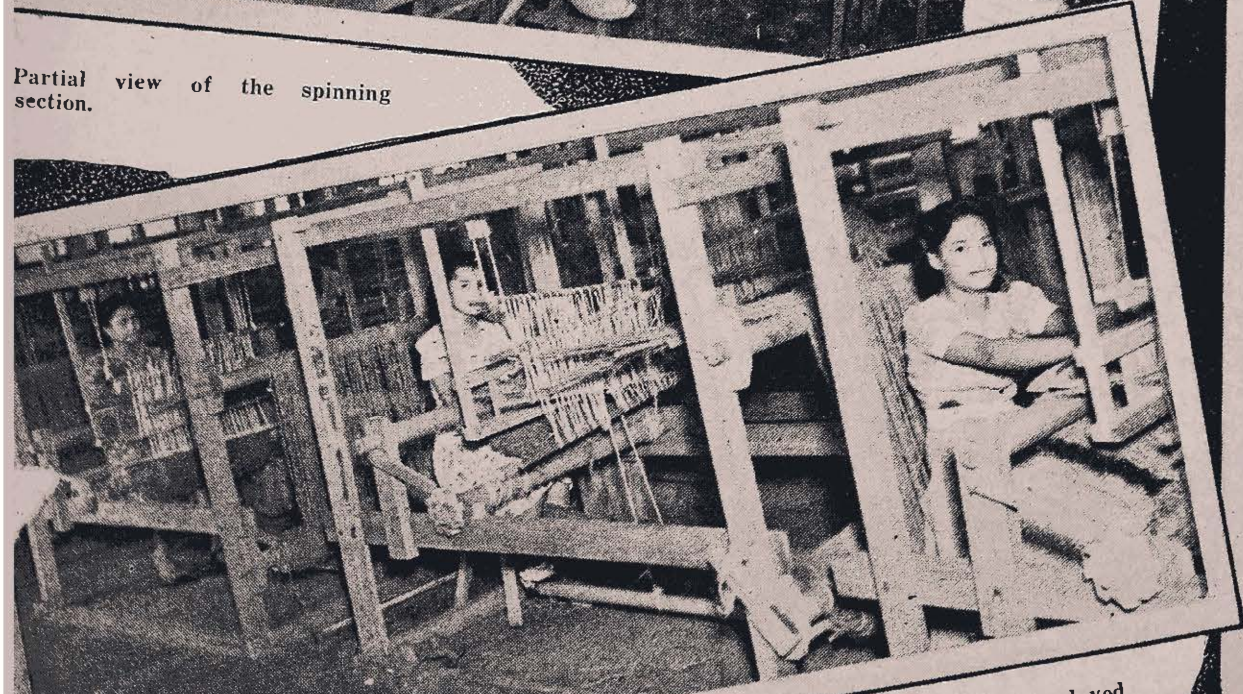
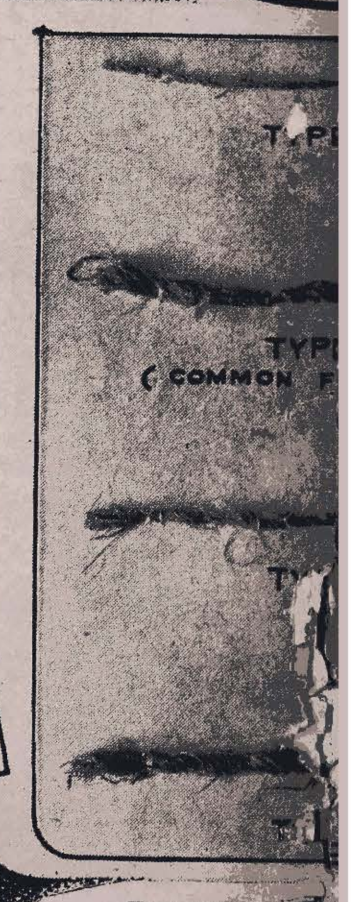
Partial view of the spinning section.



Different types of native handlooms employed in the weaving of coir-sacks, burlaps.



Four types
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RODUCTION OF SANDBAGS

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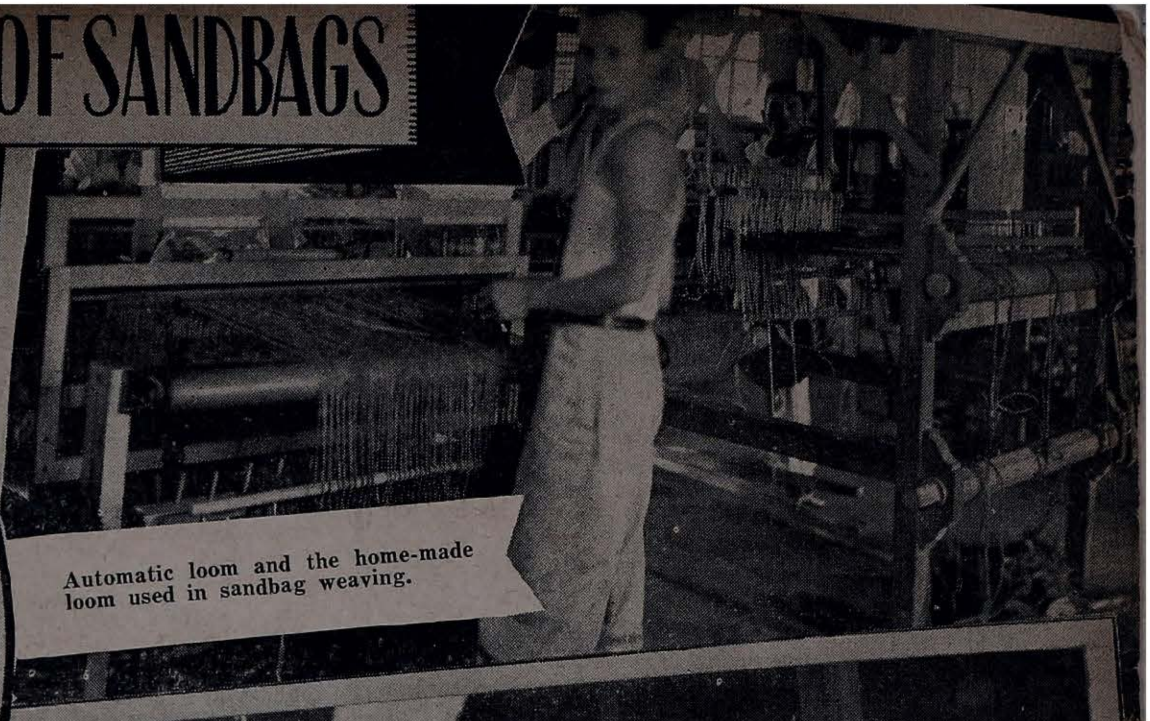
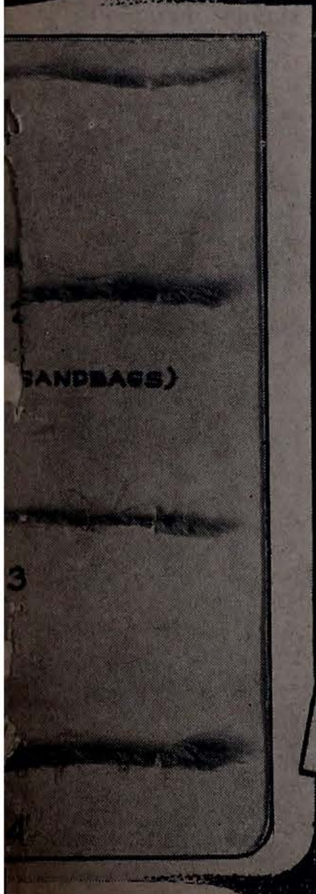


Automatic loom and the home-made loom used in sandbag weaving.

The sewing department. Note the three Goliath sewing machines in action sewing bags.



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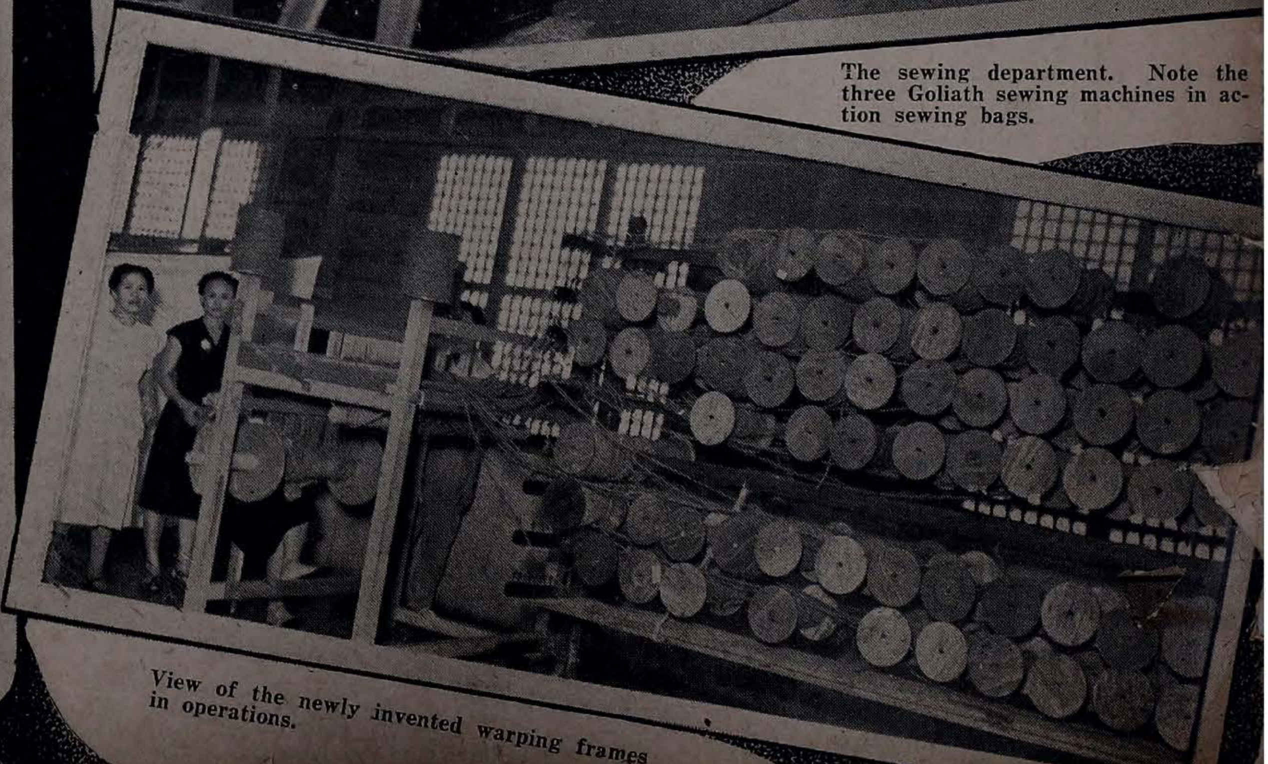

View of the newly invented warping frames in operations.

The Coconut In Emergency Times

A prominent doctor of Dumaguete, Oriental Negros, the other week volunteered a piece of information to us which we may just as well transmit to our readers because of its value and significance to the coconut as part of our national diet. Our informant one day asked a farmer of his town this pointed question: "What have you in store in case of an emergency here?"

The farmer, fully aware of what he had on hand, replied: "Well, I have two sacks of rice, and besides, I have a coconut plantation, and I guess these will take care of me and my family."

The farmer was right. The nuts on his coconut plantation can very well take care of him in a time of crisis, provided he knew how to utilize certain parts of the same. For, if we consider the fact that the coconut is rich in fats, vitamins and other nutritive elements, and the further fact that western nations pay millions of pesos for the use of the coconut products in their food, their proper utilization by us will certainly play a leading role in the solution of the local food problem should an emergency develop in this part of the world.

Dr. Vicente Lava of the Bureau of Science recently computed that each mature coconut gives 15.1 grams of protein; 116 grams of oil; 10.7 grams of sugar; 8.8 grams of crude fiber; and 4 grams of mineral water. Laguna nuts were used in the analysis.

The work of Sherman showed that coconut is a poor source of vitamin A, but a good source of vitamins B, and G. The work of Miller showed that the soft spoon or young coconut has a higher vitamin A content than the mature one. And compared with other fats, the coconut oil contains the highest percentage of assimilable glycerides, and it is, therefore, even more digestible than the butter fat.

The foregoing facts certainly indicate that the Philippine coconut, found in abundance in this country, and seldom included in the daily diet of the Filipinos, may yet prove to be the key to our food salvation in times like these.

COIR SPINNING

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realize less spun yarn than he should at the end of day's work. Also, if the carded fibers used are of poor quality, too small amount of yarn can be spun out of them even by the average or topnotch spinner.

The preliminary results of observation and experiments bear out the fact that, even using good quality coir for spinning, there is a striking difference in the amount of spun yarn produced daily between the spinner working on daily basis and the one on *pakiao* system, both classes working under close supervision. The average daily spun yarn production per spinner of 24 spinners working consecutively for ten days on daily basis is 752 grams, while that of the same number of spinners working for the same length of time on *pakiao* system, is 1,669 grams. The production per day of the daily-wage spinner ranges from 142 to 1,495 grams, while that of the *pakiao* spinner from 300 to 5,050 grams. In both classes of spinners, the average daily production of spun yarn per spinner is generally on the increase and towards better workmanship from the first to the tenth day. The daily-wage spinner shows daily averages of 464, 609, 681, 750, 802, 835, 800, 636, 908 and 1,033 grams, while the *pakiao* spinner, the averages of 1,318, 1,363, 1,305, 1,740, 1,585, 1,522, 1,916, 1,875, 2,016 and 2,046 grams. These results apparently indicate that, in factory scale yarn production especially, it is not advisable to change spinners who have been on the job for ten or more days with new ones. For after ten or more days spinning work, a spinner has already acquired the skill and knowledge necessary for the work; changing him with a new one, who certainly has to begin to learn the A, B, C of the art, will only mean the employment of another inexperienced newcomer to take his place after he has been developed into a state of productivity.

There seems to be no difference in the quality of yarn produced daily between the daily-wage and *pakiao* spinners. In fact, experience with both spinners in the production of better quality yarns apparently shows that the *pakiao* spinner is even more controllable than the daily-wage in this respect. This is of course to be expected for, while the latter boldly assumes the "don't-care" attitude because of his sure wage in the pay-roll anyway, the former works at a disadvantage. He is duly bound to abide by the rules and regulations prescribed by the unit; if he does not produce the required standard of yarn or if he is caught cheating, his work is discounted payment. It has been found that some stones, and wet and unspun fibers were placed in some of the balls of yarn received from other units, probably done intentionally by some *pakiao* spinners desirous to put some more weight to their respective balls. Such a deceitful practice as this only occur because of poor supervision, and is not sure to happen when strict supervision, tagging and inspection of every ball of yarn turned in by each spinner are exercised daily.

In an attempt to gradually standardize the yarns mainly for the manufacture of various types of sacks, four types of yarn have been clasified and set as standards, (1) Type I (1/16″), (2) Type 2 (1/8″), (3) Type 3 (3/32″) from fresh husks and (4) Type 4 (3/16″). In practical yarn type differentiation, type 1 can be untwisted by roughly seven turns with the fingers; type 2, by four turns; type 3, by five; and type 4, by three.

Of these four types, types 2 and 4 are the ones commonly used in sandbag production, while the other two types are still under observation and experiments. Type 2 is being used as warp and type 4, as filling.

Preliminary results of experiments on the production of type 2 yarn indicate that the *pakiao* spinner again shows better performance than the one on daily basis. It only takes the average *pakiao* spinner 3 hours and 7.6 minutes to spin a kilo of type 2 yarn, while it takes the daily-wage spinner 12 hours and 8.5 minutes to do the same work. It also takes the former 7 hours and 2.7 minutes to spin 500 meters of the same type of yarn, whereas the latter consumes some 14 hours and 51.6 minutes to accomplish the same yarn length. The reason for this difference in performance between the two classes of spinners is obvious. It is invariably due to the *pakiao* spinner's determined desire to get as much amount of money as possible from his day's work, thus accounting for his accomplishing more and longer yarn in less time than the daily-wage spinner who always receives a fixed wage for whatever amount and length of yarn he produces at the end of every day.

Even among the *pakiao* spinners themselves, there is also a difference in the amount of yarn produced daily between those producing type 2 and the ones working on type 4. The average daily production per spinner of type 2 yarn of a group of 20 spinners working consecutively for six days is 1,677 grams, while that of another group of the same number of spinners working for the same length of time on type 4 yarn is 1,893 grams. This difference lies perhaps on the sheer weight of the two types of yarn in question, type 4 yarn being heavier than type 2 and, therefore, accounting for the heavier yarn of the group producing type 4 than that of the group working on type 2.

It has been also observed that the average length of a kilo of type 2 yarn is 213.2 meters, with an average weight of 5.12 grams per meter, while a kilo of type 4 yarn has an average length and weight per meter of 156.6 meters and 6.5 grams, respectively. This preliminary results of observation seems to bring out the question of the possibility of paying by the meter of yarn spun, instead of by the kilo. At present, the price per kilo of spun type 2 yarn is twenty-five centavos and that of type 4 yarn, twenty centavos. If one centavo is paid for every ten meters of type 2 yarn, it will cost only around twenty-one centavos to spin 213.2 meters, equivalent to one kilo of this yarn type, instead of twenty-five centavos if it were paid by the kilo. Also, 156.6 meters or one kilo of type 4 yarn will only cost about fifteen centavos by the same method of meter payment, instead of twenty centavos by the kilo system. Besides its more economical money value than the kilo method, the meter payment system will ultimately encourage the standardized production of yarn, for the spinners will be forced to gradually reduce the size of their yarn in the rush of producing as much length of yarn as possible every day. The draw-back, however, to the meter payment system is the absence of a handy device by which to determine the length of the yarn in a filled-up spool on sight. Unraveling of the balls of yarn to determine their respective lengths will mean additional hands which will incur added overhead to the factory. The present approach to the yarn length recording device is the observation that a spool tightly filled up to the brim with type 2 yarn contains an average length and weight of 293.1 meters and 1.375 kilograms respectively of this yarn type. The use of this finding is not yet availed of for the present, pending the discovery of more data regarding its efficacy in big scale yarn production.

It has been noted that not exactly one kilo of yarn can be spun out of a kilo of coir, for some percentages of this amount always go to waste during the spinning process. Some results of observation on the percentages of waste incurred by spinners during their work show that the per cent of waste per kilo of fiber ranges from 17 to 38. The better the quality of fibers used, the less the waste, and the poorer their quality, the more their waste. While researches designed to avoid wastage are being undertaken, the waste fibers are not all thrown away. Waste fibers which are still workable are given, in the absence of good ones, to *pakiao* spinners, who, anxious to finish as much amount of yarn as they could possibly do, make the most out of them.

Weaving

The efficiency of coir sack burlap weaving depends to a large degree on the quality of the warp yarns used and not quite as much as on the ability of the weaver. If the warp yarn is weak and not well twisted, it easily yields to the strain of continuous battening and finally snaps out of action, so that the intermittent breakage of the warp ends renders the weaving process slow and difficult for the weaver. On the other hand, if the warp ends don't break all the way through, even the amateur weaver can be expected to finish a considerable length of burlap daily. The need for desirable warp yarns, therefore, brings the idea of finding and employing some sizing materials in the strengthening of coir warp yarns but their use has been limited, in the meantime, only to experimental production of treated yarns, as it seems risky yet to immediately employ them in commercial scale warp yarn production because of their expensive nature. However, it is believed that, provided selected and good quality coir is used in the spinning of warp yarns, the need for proper sizing materials can altogether be dispensed with in the factory scale production of coir sack burlap.

As in spinning work, there is also a difference in the amount of coir sack burlap produced daily between the weaver working on daily basis and the one on *pakiao* system. Observations on this respect show that the average daily production of burlap per weaver of 15 weavers working consecutively for 15 days on daily basis is 7.35 meters, while that of the same number of weavers working for