

UNDERPLANTING OF YOUNG COCONUTS UNDER ADULT STANDS OF COCONUT PALMS FOR PRODUCTION OF EDIBLE VEGETATIVE PITH OR '*UBOD*'

By

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ABSTRACT

The feasibility and viability of producing edible vegetative coconut pith or '*ubod*' from young coconuts planted with double plants per hill under adult coconut bearing palms was studied at the Philippine Coconut Authority - Davao Research Center, Bago Oshiro Davao City.

The average weight of '*ubod*' from double planting scheme was 5.9 kg/palm (range 2.8 -9.4 kg) on the first year of '*ubod*' harvest. There was a very slight increase (average of 0.2 kg/palm) in '*ubod*' weight on the second year of harvest. The total '*ubod*' yield for two years harvesting schedule was 8.9 t/ha.

Under the Davao growing condition, cost and return analysis of '*ubod*' production in double plants per hill scheme indicated a total net income of P129,030 per ha in 4 years with a return on investment (ROI) of 180%. While copra production from adult bearing palms realized a total of P 114,675 for 4 years with an average ROI of 242%. Considering copra plus '*ubod*' yield from this production scheme, the cumulative net income and ROI obtained were: P 242,389.6 and 203% respectively.

Based on the results of this study with modest fertilizer application of ammonium sulfate plus common salt (NaCl), underplanting of two young coconuts per hill (spaced at two feet away from each other) at 3 x 3 m distance between spaces of bearing coconut palms harvested at three years from field-planting is a profitable and viable production scheme to increase farm productivity. The farm income with this coconut-based production is increased by 200% compared to coconut monocropping.

INTRODUCTION

The coconut palm is known as the 'tree of life' because of its diversified products and by-products that support the human life. Aside from the main product of coconut i.e. copra/oil production which supports one third of the country's population, the coconut tree provides many other useful food and non-food by-products. One new food item which has become popular in the recent years is the edible coconut vegetative pith or '*ubod*'. This food item commands a considerable price in the market today because of its many uses in food making, e.g. fresh *lumpia* or eggroll, pickled '*ubod*', chicken '*ubod*' salad, 'chopsuey' and other food preparations in domestic homes and even in first class restaurants and hotels. With the present modern food processing facilities, this terminal bud or coconut cabbage could be preserved (canned or bottled) and can be marketed locally and internationally as a food delicacy. Thampan (1975) referred to this preserved food item as a 'millionaire's salad'.

With the need for R & D on sustainable coconut farming, a research study on planting young palms under bearing coconut palms for '*ubod*' or pith production was undertaken. This

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system/strategy provides an alternative source of coconut pith or '*ubod*' thus, preventing the indiscriminate cutting of existing productive coconut palms for such food purpose. An earlier study on the production of '*ubod*' was done by Protacio and Ruanes (1997) by planting coconut seedlings at close planting in an open area following a sorjan system of planting and harvesting them after two to three years. They found out that there was no significant difference in '*ubod*' weight from trees harvested at year two and year three after field planting but the number of harvestable trees was higher at year three. Furthermore, they recommended selective harvesting at two years when 20 to 25% of the crop may be ready to harvest.

This study was undertaken at the Philippine Coconut Authority - Davao Research Center, Bago Oshiro, Davao City with the aim of assessing the feasibility of planting young coconuts (two plants per hill) under bearing palms for '*ubod*' or pith production and determining the economics of this production strategy.

MATERIALS AND METHODS

Experimental site

The study was conducted at the Davao Research Center in a Tugbok clay loam reddish brown residual soil (Tropudalf soil taxonomy) with good external and internal drainage. The area has an elevation ranging from 120 to 140 m above sea level. Benchmark soil analysis showed an average pH of 6.5, 5.3 m.e. exchangeable Mg /100 g soil, 0.45 m.e. K , 11.4 m.e Ca., 0.08 m.e. Na and 68% base saturation.

Experimental material

'Laguna' tall (LAGT) seedlings were used as underplants under bearing LAGT palms aged 25 years planted at a distance of 9 x 9 m triangular system.

Methodology

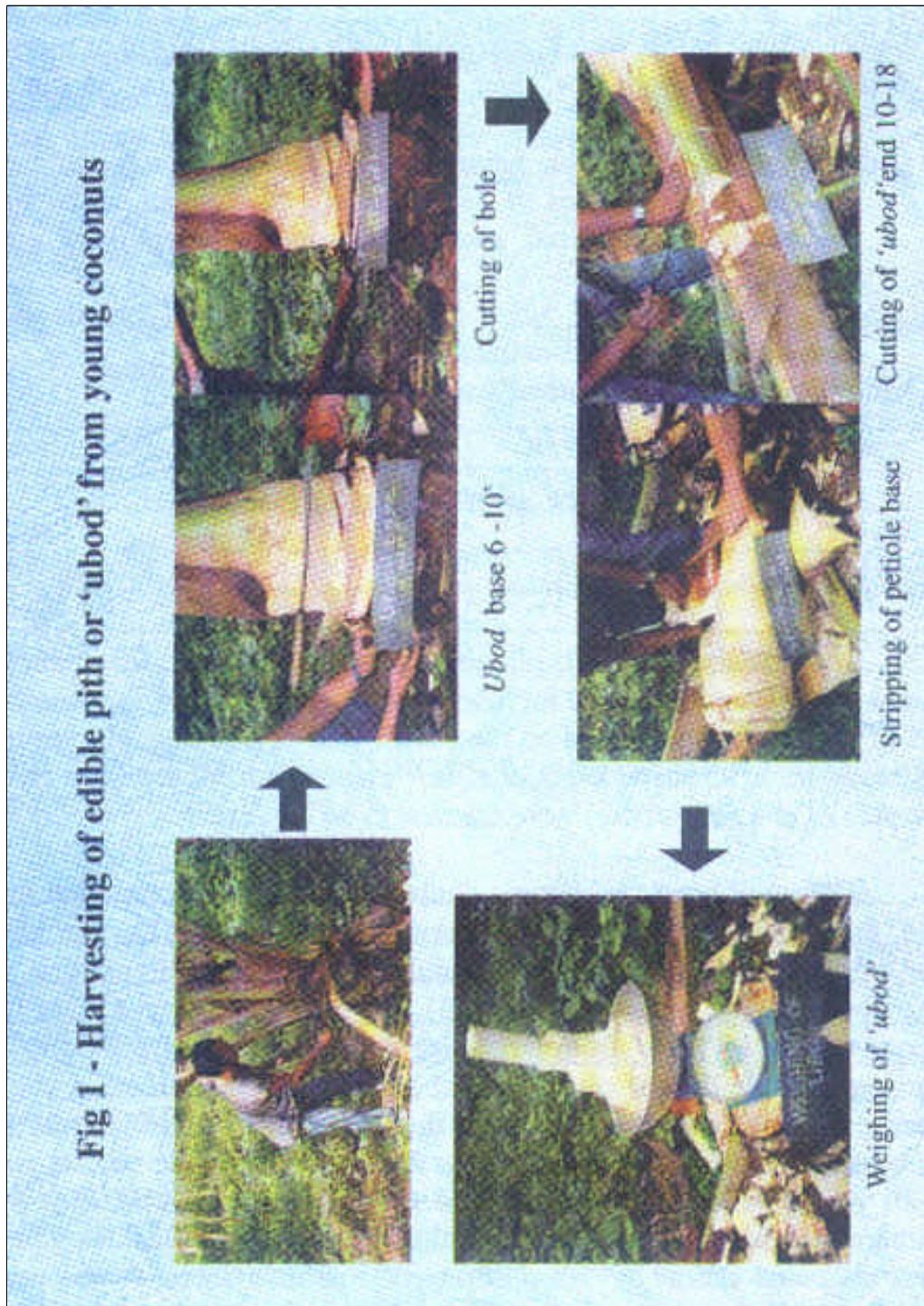
The young coconuts/seedlings (aged six months old) were transplanted in the field under bearing palms. Two seedlings were planted per hill (spaced at two feet from each other) in a 3 x 3 m triangular system at the interspaces of bearing coconut palms, and about two meters away from the row of coconut palms.

Cultural Management

All palms in each plot were circle weeded, within the root zone every two months. The area was kept free of cover crops since spaces between main crops were planted to young palms. Both the full bearing palms and the young intercrops palm were applied with mineral fertilizers (ammonium sulfate and NaCl) in broadcast-fork-in method at 2 m around the base of the palms and incorporated with soil. Double rates of fertilizers were applied in double plants per hill. At young stage of seedlings when pest and disease occurred, spraying of chemical was done.

*Harvesting of '*ubod*' from young coconuts*

At three years from field planting, when palms have developed a bole, began to form a trunk and the girth at the base of the stem at least 100 cm, young palms were harvested for '*ubod*' production. With these indexes, selective harvesting was done leaving behind the smaller palms for the next's year harvesting. The actual field harvesting of '*ubod*' included the following steps (Fig.1):
Fig 1.



- 1) Select young palms with bigger bole (girth size of 100 cm or more);
- 2) Trim/cut with a bolo few older leaves to avoid obstruction during bole cutting;
- 3) Cut the bole of harvestable palms at 6-10 inches below 'ubod' base and about 10-18 inches above the 'ubod' end. Longer cut beyond the 'ubod' end ensured protection from early spoilage after harvest;
- 4) Remove outer covering of 'ubod' by stripping the base of petiole until 'ubod' (soft portion) is extracted; and
- 5) Determine the weight of 'ubod' using a weighing scale.

RESULTS AND DISCUSSION

'Ubod' production

Three years after field planting of the underplants, fifty percent of total plants were harvested for 'ubod' production (Figure 1). Another 50% of palms were harvested on the fourth year of planting. Harvesting was made on a selective basis, that is, plants with bigger bole (with girth size of at least 100 cm) were the first to be harvested.

The *ubod* produced from double planting were classified into large, medium and small sizes and were weighed (Table 1). The girth size (bole) of harvested young palms and length of 'ubod' in relation to size were likewise measured (Table 2). It could be observed that the average weight of 'ubod' from large size did not increase from third to fourth year while that of medium and small sizes manifested a slight increase in their 'ubod' weight from first to second year of harvesting. These results indicated that there is no need to wait for the second year for all young palms to be harvested since the palms have reached the optimum weight and length for a profitable net return. Besides young palms are better source of 'ubod' than older palms (Cinco; Pugoy pers. communication, 1997).

This result was corollary to that of Protacio and Ruanes (1995) except that their first year of harvesting 'ubod' was two years from planting and distance of planting young coconuts in open field was much closer to each other (1 x 1 m square). In our present planting distance, the smaller palms were allowed to grow bigger due to more space despite two plants per hill. Hence, heavier and longer 'ubod' were produced.

Table 1. Average fresh weight of per palm at 3rd and 4th year from planting

Classification	At 3 rd year	At 4 th year	Average
	(In kg)		
Large	9.9	8.8	9.4
Medium	5.7	6.1	5.9
Small	2.1	3.5	2.8
Average	5.9	6.1	6.0

Table 2. Girth size (bole) of harvested young palms and length of fresh *ubod* in relation to its sizes

Particular	Classification		
	Large	Medium	Small
Girth (cm)	96.0	88.5	84.4
Length (cm)	28.1	25.1	22.3

Economic analysis

a) 'Ubod' production

Under double planting scheme, young underplants showed a total 'ubod' yield of 4,377.8 and 4,526.2kg/ha on the first and second year of harvest (third and fourth year from planting). While there was no yield of 'ubod' on the 1st and 2nd year of planting, the net income from third and

fourth year could compensate for the net loss incurred on the previous year (Table 3). Hence, the cumulative 'ubod' yield was 8.9 tons per ha for two years and a total net income of P129,030 for four years with an average return on investment (ROI) of 180%.

Table 3. Cost and return analysis of "ubod" production per hectare from young coconuts.

Year	<i>Ubod</i>	Yield /ha	Gross	Total	Net Income	ROI ⁴
	Yield/palm		Income ³	Cost	(Net/Loss)	
	(kg)	(kg)	(P)	(P)	(P)	(%)
1	-	-	-	29,550	(29,550)	
2	-	-	-	12,628	(12,628)	
3	5.9 ¹	4,377.8	87,556	19,127	68,429	
4	6.1 ²	4,526.2	113,155	10,376	102,779	
Total	12.0	8,904.0	200,711	71,681	129,030	
Average	6.0	4,452.0	100,356	17,920	32,258	180

¹ Average yield of *ubod*/tree (3rd yr)

² Average yield of *ubod*/tree (4th yr)

³ *Ubod* price - P20/kg- 3rd yr P25/kg- 4th yr

⁴ Return on investment

b) Copra production

A positive return on investment was obtained for four years from copra production from bearing palms (Table 4). Higher net income could be observed from third to fourth year from planting of young coconuts (almost doubled the first and second). This is most possibly due to the double dosage of fertilization in young coconuts wherein the roots of bearing palms could have absorbed more nutrients from nearby double fertilized seedlings in one hill. Subsequently, higher ROI of 242% was noted for bearing coconut with young double plants.

Table 4. Cost and return analysis of copra production of bearing palms.

Year	Copra ¹	<i>Ubod</i>	Gross	Total	Net Income	ROI ²
	Yield/ Palm (kg)	Yield/ha (kg)	Income (P)	Cost (P)	(Net Loss) (P)	%
1	26.4	3,775.2	30,201.6	13,411.0	16,791	125
2	22.6	3,231.8	32,318.0	10,902.0	21,416	196
3	27.9	3,989.7	43,886.7	10,577.0	33,310	315
4	26.2	3,746.6	56,199.0	13,040.0	43,159	331
Total	103.1	14,743.3	162,605.3	47,930.0	114,675	
Average	25.8	3,685.8	40,651.3	11,982.5	28,669	242

¹ Copra price per kg: 1st yr - P8.00; 2nd yr - P10.00; 3rd yr - P11.00 4th yr - P15.00

² Return on investment

c) Cumulative copra and 'ubod' production

Cost and return analysis for combined copra and 'ubod' production from bearing and young coconuts, respectively revealed an encouraging return on investment from this planting scheme (Table 5). Double planting scheme under bearing palms produced an ROI of 203% which implied that by following this production scheme, a coconut farmer could obtain a net profit twice that of his investment cost after four years. This is assuming that there is an available market for such food item.

Table 5. Cost and return analysis of copra and 'ubod' production of bearing & young coconuts per hectare.

Year	Yield/ <i>ubod</i>	Ha/ year (kg) Copra	Gross Income (P)	Total Cost (P)	Net Income/ (Net Loss)	ROI
1	-	3,775.2	30,201.6	42,961.0	(14,075.4)	
2	-	3,231.8	32,318.0	23,530.0	8,788.0	
3	4,377.8	3,989.7	131,442.7	29,704.0	101,739.0	
4	4,526.2	3,746.6	169,354.0	23,416.0	145,938.0	
Total	8,904.0	14,743.3	363,316.3	119,611.0	242,389.6	
Average	4,452.0	3,685.8	90,829.1	29,902.7	60,597.4	203

The higher net income and ROI obtained in double planting could be attributed to better yield of bearing palms brought about by the benefits obtained from double fertilization of young coconuts and to the higher number of palms (1,484 young palms per ha) harvested for 'ubod' production. The detail of cost for ubod and copra production is presented in Annex 1.

CONCLUSION AND RECOMMENDATION

Planting of young coconuts with double plants per hill in a 3 x 3 m triangular system under bearing coconut palms is a feasible and profitable production strategy that could augment the income of coconut farmers. High net income from 'ubod' per hectare could be produced from double planting scheme due to its higher planting density. Furthermore, coconut bearing palms benefited more due to more nutrient absorption from double planting, thus cumulatively, produced higher net income and ROI.

Based on the results of this study with modest fertilizer application of ammonium sulfate plus NaCl, planting two young coconut palms/hill under coconut bearing palms for 'ubod' production is a profitable and viable production scheme to increase coconut farm productivity. The best time to harvest coconut palms for 'ubod' production is on the third year from planting. There is no need to wait for another year to harvest all palms for this food purpose.

This production strategy offers an alternative source of producing coconut pith without cutting our existing productive coconut palms. This could contribute to the conservation of natural resources such as coconut trees, thereby maintaining the natural balance of the ecosystem. Likewise, with the increasing demand for this food item in our growing population, it is best to try this production scheme in old existing bearing coconut palms. The planting scheme used for the underpants can also be utilized in replanting old existing palms with some remaining young coconuts arranged in a 9 x 9 m triangular planting distance.

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REFERENCES

- CINCO, O.L. 1997. Personal Communication, as Market of the Bankerohan Vendors Association, Davao City. A prospect of '*ubod*' production, younger palms better source than older palm.
- PROTACIO, C.M. and D.A. RUANES. 1997. Alternative Production Technology for Coconut '*Ubod*'. Proceedings 13th Annual Scientific Conference of the Federation of Crop Science Societies of the Phil (FCSSP). Baguio City, 25-29 May 1997. p.52
- PUGOY, R. 1997. Personal Communication ('*Ubod*' dealer) Bankerohan Vendor Association. Prospect of '*ubod*' product; younger palm better source of '*ubod*' than older palms.
- THAMPAN, P.K. 1975. Minor product of food value. The coconut palm and its product. Green Villa pub. House. p. 302.

Annex 1. Details of production cost under the economic analysis of:

1. *Ubod* production of young palms per hectare

Materials	Cost
1,484 seednuts + 296 (20%) for replanting (P3.00/seednut)	P 5,340.00
14 bags (700g) Ammosul @P3.90/kg	5,460.00
14 bags (700g) NaCl (salt)@3.75/kg	5,250.00
2 bottles insecticide (P140/bottle)	280.00
knapsack (insecticide sprayer)	1,070.00
3 pcs weeding scythe @ 150/pc	450.00
<i>Sub-total</i>	<i>P17,850.00</i>

Labor	No. of mandays (P90/manday)	Cost
Cleaning of seedbed	4	360.00
Harvesting of seednuts(1500 pcs)	4	360.00
Selection, lay-outing & setting of seednut	4	360.00
Seedbed maintenance i.e. sanitation	16	1440.00
Lay-outing, stick preparation staking	6	540.00
Digging of holes	42	3780.00
Planting & initial fertilization	12	1080.00
Maintenance(weeding & sanitation (3x/year)	12	1080.00
Second fertilization (2x/year)	24	2160.00
Spraying insecticide	6	540.00
<i>Sub-total</i>		<i>P 11,700.00</i>

Grand total cost (double planting) P 29,550.00

Year 2

Materials	Cost
1,113 kg (22.26 bags)ammosul@P3.90/kg	4,341.70
1068.4 kg(21.4) table salt @3.75 kg	4,006.50
10 bottles insecticide P140/bottle)	1,400.00
Sub-total	9,748.20

Labor	No. of mandays	Cost
General weeding & under brushing (3x/year)	12	1,080.00
Fertilizer application & fork-in	12	1,080.00
Spraying insecticide	8	720.00
<i>Sub-total</i>		<i>2,880.00</i>

Year 3

Materials	Cost
1,484 kg (29.6 kgs)Ammosual@4.29/kg	6,366.36
1,855 kg (18.6) table salt @4.13/kg	7,661.15
10 bottles insecticide @140/bottle	1,260.00
2 pcs bolo @ P200/pc	400.00
2 pcs shovel @ P255/pc	510.00
<i>Sub – total</i>	<i>16,197.51</i>

Labor	Man-day	
General & ring weeding (3x/yr)	12	1,080.00
Fertilization	12	1,080.00
Spraying insecticide (2x/yr)	4	360.00
<i>Ubod</i> cutting (5.8 min/tree@P.19/min)		409.55
	<i>Sub-total</i>	2,929.55
Grand total cost (double planting)		19,127.06

Year 4

Materials		
935 kg (18.6bags) <u>Ammosul@P4.29/kg</u>		4,011.15
1,006 kg (20 bags) <u>NaCl@P4.13/kg</u>		4,154.78
	<i>Sub-total</i>	8,165.93

Labor	Man-day	
General weeding (ring & under brushing 3x/yr)	12	1,080.00
Fertilization	6	540.00
Spraying insecticide 1x/yr	2	180.00
Cutting of <i>ubod</i> (5.8 min/tree@P.19/min)		409.55
	<i>Sub-total</i>	2,209.55
Grand total cost (double planting)		10,375.48

2. Copra production of bearing palms per hectare

Materials	
2 sets harvesting poles @P170/set	
4.3 bags Ammosul (215 kg) @3.90/kg	
4.9 bags(NaCl (243.1 kg)@P3.75/kg	
4 pcs scythes for weeding at P180/yr	
3 pcs grub hoes for fork in at P180/pc	
2 pcs bolos @ P180/pc	
1 unit weighing scale (25 kg cap)@P1,300	

Labor	No. of Man-day
General weeding (3x/yr)	12
Fertilization (2x/yr)	8
Harvesting, hauling & copra making (20% of copra value)	

Labor	No. of mandays (P90/manday)	Cost
Cleaning of seedbed	4	360.00
Harvesting of seednuts(1500 pcs)	4	360.00
Selection, lay-outing & setting of seednut	4	360.00
Seedbed maintenance i.e. sanitation	16	1440.00
Lay-outing, stick preparation staking	6	540.00
Digging of holes	42	3780.00
Planting & initial fertilization	12	1080.00
Maintenance(weeding & sanitation (3x/year)	12	1080.00
Second fertilization (2x/year)	24	2160.00
Spraying insecticide	6	540.00
Sub-total		P 11,700.00
Grand total cost (double planting)		P 29,550.00
Year 2		
Materials		Cost
1113 kg (22.26 bags) ammosul @ P3.90/kg		4,341.70
1068.4 kg(21.4) table salt @ 3.75 kg		4,006.50
10 bottles insecticide P140/bottle)		1,400.00
Sub-total		9,748.20
Labor	No. of mandays	
General weeding & under brushing (3x/year)	12	1,080.00
Fertilizer application & fork-in	12	1,080.00
Spraying insecticide	8	720.00
Sub-total		2,880.00
Year 3		
Materials		
1484 kg (29.6 kgs) Ammosul @ 4.29/kg		6,366.36
1855 kg (18.6) table salt @ 4.13/kg		7,661.15
10 bottles insecticide @ 140/bottle		1,260.00
2 pcs bolo @ P200/pc		400.00
2 pcs shovel @ P255/pc		510.00
Sub – total		16,197.51
Labor	Man-day	
General & ring weeding (3x/yr)	12	1,080.00
Fertilization	12	1,080.00
Spraying insecticide (2x/yr)	4	360.00
Ubod cutting (5.8 min/tree@P.19/min)		409.55
Sub-total		2,929.55
Grand total cost (double planting)		19,127.06
Year 4		
Materials		
935 kg (18.6bags) Ammosul @ P4.29/kg		4,011.15
1006 kg (20 bags) NaCl @ P4.13/kg		4,154.78
Sub-total		8,165.93
Labor	Man-day	
General weeding (ring & under brushing 3x/yr)	12	1,080.00
Fertilization	6	540.00
Spraying insecticide 1x/yr	2	180.00
Cutting of ubod (5.8 min/tree@P.19/min)		409.55
Sub-total		2,209.55
Grand total cost (double planting)		10,375.48
Copra production of bearing palms per hectare		
Materials		
2 sets harvesting poles @P170/set		
4.3 bags Ammosul (215 kg) @ 3.90/kg		
4.9 bags(NaCl (243.1 kg)@P3.75/kg		
4 pcs scythes for weeding at P180/yr		
3 pcs grub hoes for fork in at P180/pc		
2 pcs bolos @ P180/pc		
1 unit weighing scale (25 kg cap)@P1,300		
Labor	No. of Man-day	
General weeding (3x/yr)	12	
Fertilization (2x/yr)	8	
Harvesting, hauling & copra making (20% of copra value)	10	

