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SPECIAL REPORT

**JA-ELA
PROTOCOL**



**Department of Agricultural and Chemical Engineering
Colorado State University
Fort Collins, Colorado 80523**

July, 1982

LEC REPORT 11

LEC REPORT PUBLICATIONS

- No. 1. Low-cost Extrusion Cookers, International Workshop Proceedings, June 2-5, 1976
- No. 2. Evaluation of Low-cost Extrusion Cookers for Use in LDC's, (Annual Report 1977) April 1977
- No. 3. Evaluation of Low-cost Extrusion Cookers in Sri Lanka. (Special Report) July 1977
- No. 4. Evaluation of Low-cost Extrusion Cookers for Use in LDC's, (Annual Report 1978) July 1978
- No. 5. Mechanical Evaluation of Brady Crop Cooker #206, (Special Report) July 1978
- No. 6. Evaluation of Low-cost Extrusion Cookers for Use in LDC's, (Annual Report 1979) July 1979
- No. 7. Low-cost Extrusion Cookers Second International Workshop Proceedings, January 15-18, 1979
- No. 8. Effect of Extrusion on Calorie Density of Cereal and Cereal/Legume Blends, (Special Report) May 1980
- No. 9. Evaluation of Low-cost Extrusion Cookers for Use in LDC's (Annual Report 1980) December 1980
- No. 10. Nutritious Foods Produced by Low-cost Technology, (Summary Report 1981) April 1981

Publications available from:

Department of Agricultural and Chemical Engineering
Colorado State University
Fort Collins, Colorado 80523

JA-ELA THRIPOSHA PROCESSING FACILITY

Ministry of Health - Government of Sri Lanka

CARE-Sri Lanka

Managed and Operated by
Ceylon Tobacco Company Limited

PROTOCOL-SL-200-1980

FOREWORD

The LEC production unit discussed in the following pages manufactures a product called Thriposha for a free distribution program in Sri Lanka. The Thriposha Program is a joint effort by CARE and the Government of Sri Lanka (GOSL), and is currently reaching 400,000 recipients which include preschool children, pregnant women, and lactating mothers. The food is distributed through health centers throughout the country.

Thriposha was originally repackaged wheat/soy blend (WSB) provided through the PL 480 Title II, Food For Peace Program. In an effort to expand the number of recipients, sorghum was ground and used as a flour for baking a biscuit, then reground and blended with WSB. This process could not meet future requirements in the program, thus a decision was made to utilize the LEC technology to replace the baking process. The LEC technology permitted utilization of indigenous ingredients, corn being the most plentiful, along with soy. Because of the availability of corn, and the need to make Thriposha a more fully cooked product, the cereal ingredient was changed from sorghum to corn. The ingredients are now indigenous corn and soybeans which are cooked, ground, and blended with Title II instant corn/soy/milk blend (ICSM).

The LEC plant originally consisted of a single extruder and ancillary equipment located at Kundesale. Because of an aggressive program requiring more product and the problems associated with this remotely located plant (communication, transportation, etc.), a decision was made to build a new complex in Colombo which would consolidate all independently located units. Thus, the establishment of the plant outlined in this Protocol.

The factory is currently being managed by the Ceylon Tobacco Company, Limited, a private industry. The factory is a part of the Thriposha Program managed by CARE/Sri Lanka, who also distributes the product. The Ministry of Health, GOSL, provides the funds to cover expenses for the program except for the Title II ICSM which is donated by the Agency for International Development (AID/Washington). Funds for the factory and equipment were provided by CARE, Inc., and the Agency for International Development. Funds were made available for technical assistance through a grant from the Office of Nutrition, AID/Washington, through the International Cooperation and Development Staff, USDA, and provided to the Department of Agricultural and Chemical Engineering, Colorado State University.

The project plans to reduce the quantities of Title II commodities by gradually increasing the amounts of indigenous ingredients in the formulation. Additionally, there are plans to introduce Thriposha on the commercial market and produce necessary quantities to meet these demands.

This document is updated periodically by the addition of new data. Those sections where new data are available are revised and attached as appendices.

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1.0 Products Manufactured and Their Distribution

1.1 Institutional Infant Weaning Food

- A. Product Name - Thriposha
- B. Package - 750 gram in a heat sealed 3 mil polyethylene bag. Bag is transparent with two color printing. Printed in three languages (2 native and 1 English). One package equals approximately a two week supply for targeted child group. Shipping container - 30 packets in a 3 ply, 70-72 gram substance paper bag. Bag is stitched shut.
- C. Formula
- a. Cooked Corn-Soybean blend indigenous
70% dehulled corn
30% dehulled soy 30%
- b. Instant Corn-Soybean-Milk (ICSM)
PL480 Title II Commodity 70%
- Progressive changes in formula scheduled with simultaneous phase out of ICSM anticipated by 1987.
- D. Distribution - Ministry of Health through MCH Centers throughout country.
- E. Price - Distributed Gratis. Private firm is reimbursed for managing and operating plant on production basis of \$0.0041 per kilogram. Product value approximately \$0.40 per kilogram.
- F. Nutritional Values
- | | |
|-------------------------|------|
| Protein: | 19% |
| Fat: | 4.2% |
| Calories per 100 grams: | 377 |
| Fiber: | 1.7% |
| Moisture: | 8.0% |
- G. Volume Distributed (January-June 30, 1980): 62,500 master bags containing thirty 750 gram packets = 1,406,250 kg.

1.2 Commercial Infant Weaning Food - to begin September, 1980

- A. Product Name - Thriposha
- B. Package - 454 grams in heat sealed 3 mil polyethylene bags. Bag is enclosed in cardboard box of 350 gram substance. Box printed in 3 colors. Shipping container - 48 packages in a 125/112/125 gram paper lined corrugated case, printed one color.
- C. Formula - Same as Institutional Products, see 1.1.C.
- D. Distribution - Through selected retail outlets specifically in rural low income areas by truck and/or train.
- E. Price - Average price expected retail is Rs. 5/50 (\$0.342) per box or \$0.155/kg
- F. Nutritional value - same as Institutional Products, see 1.1.F.
- G. Volume Distributed - Production began September, 1980. Required volume 363,636 kg for 8-month test market.

2.0 Description of Plant

2.1 Main Processing Building

18 meters x 100 meters floor area, 6.1 meters high wall, 9.1 meters peak. Steel frame structure with brick walls, plastered 2 sides. Steel clear-span roof trusses, asbestos corrugated roofing. Truck height concrete floor designed for 1,200 kg/m². Wood framed windows with mid-points hinge for pivoted opening. Mid-point mezzanine, steel reinforced concrete floor, 18 meters x 5 meters x 2.5 meters walls. Walls plastered.

2.2 Canteen

14 meters x 32 meters floor area, 3.5 meters high wall. Brick wall plastered 2 sides. Steel trusses with mid-wood supports. Corrugated asbestos roof cover. Complete unit provides medical, eating, lavatory and shower facilities for all plant workers.

2.3 Warehouse and Garage

Warehouse 15 meters x 18 meters, walls 5 meters high. Wall construction of bricks and plastered both sides. Roof trusses steel with wood mid-support corrugated asbestos roofing.

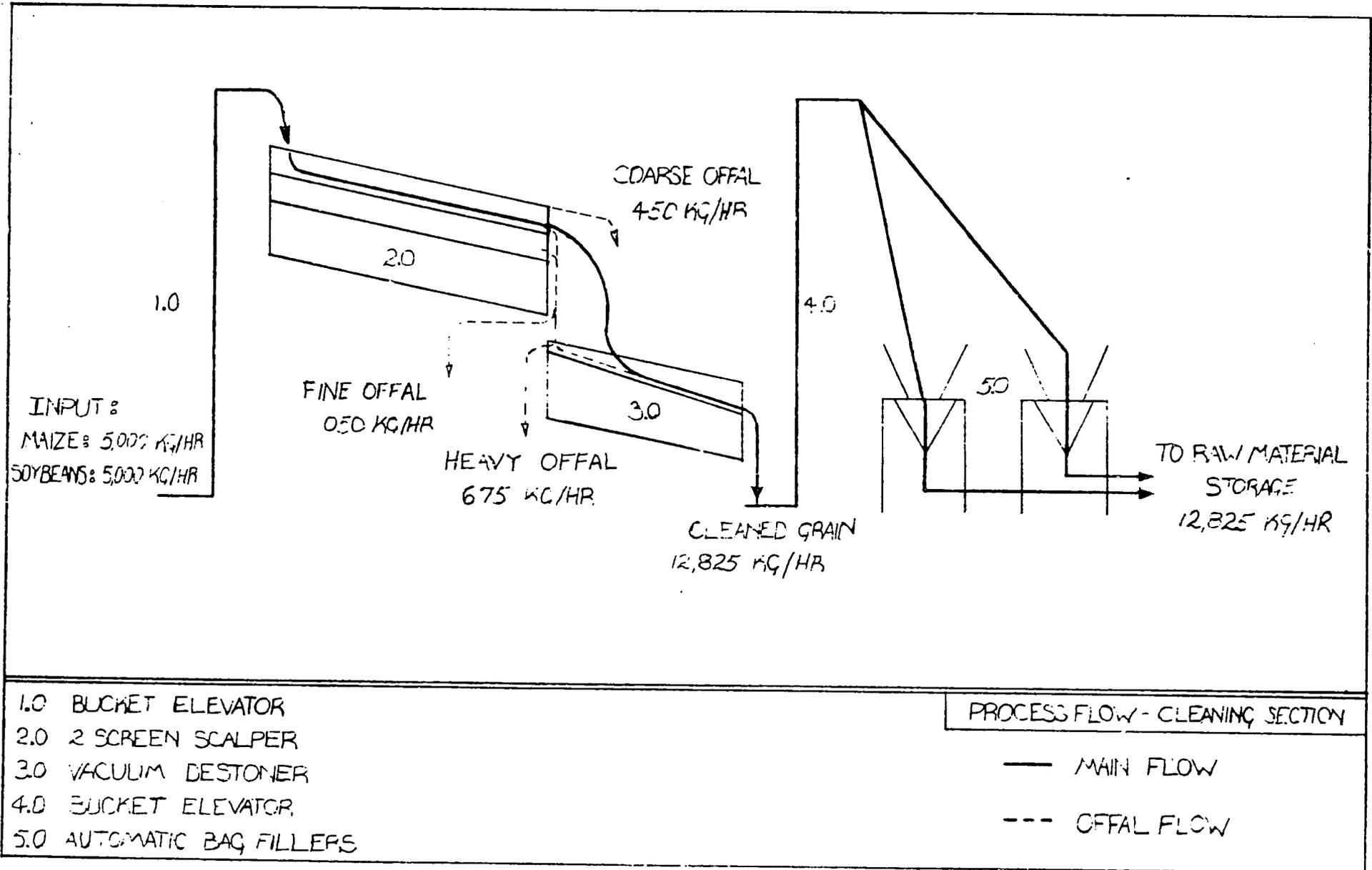
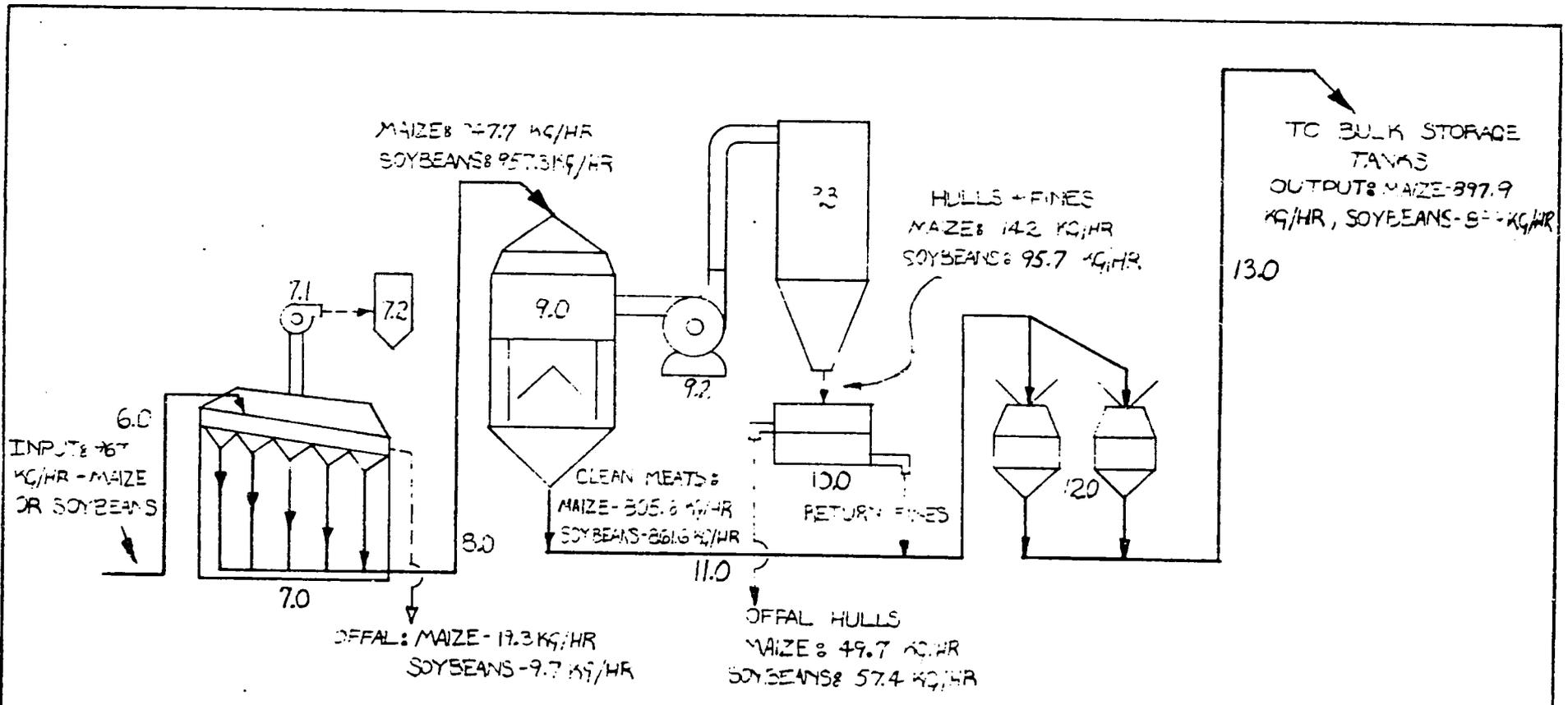


Figure 2.6.1. Process flow -- Cleaning section.



PROCESS FLOW - DEHULLING SECTION		
6.0 INCLINED SCREW CONVEYOR	9.2 BLOWER	— MAIN FLOW
7.0 VACUUM GRAVITY TABLE	9.3 CYCLONE	--- OFFAL FLOW
7.1 BLOWER	10.0 SINGLE SCREEN VIBRATORY SCALPER	
7.2 CYCLONE	11.0 INCLINED SCREW CONVEYOR	
8.0 INCLINED SCREW CONVEYOR	12.0 AUTOMATIC WEIGHING MACHINE	
9.0 SCOURER/ASPIRATOR	13.0 BUCKET ELEVATOR	

Figure 2.6.2. Process flow -- Dehulling section.

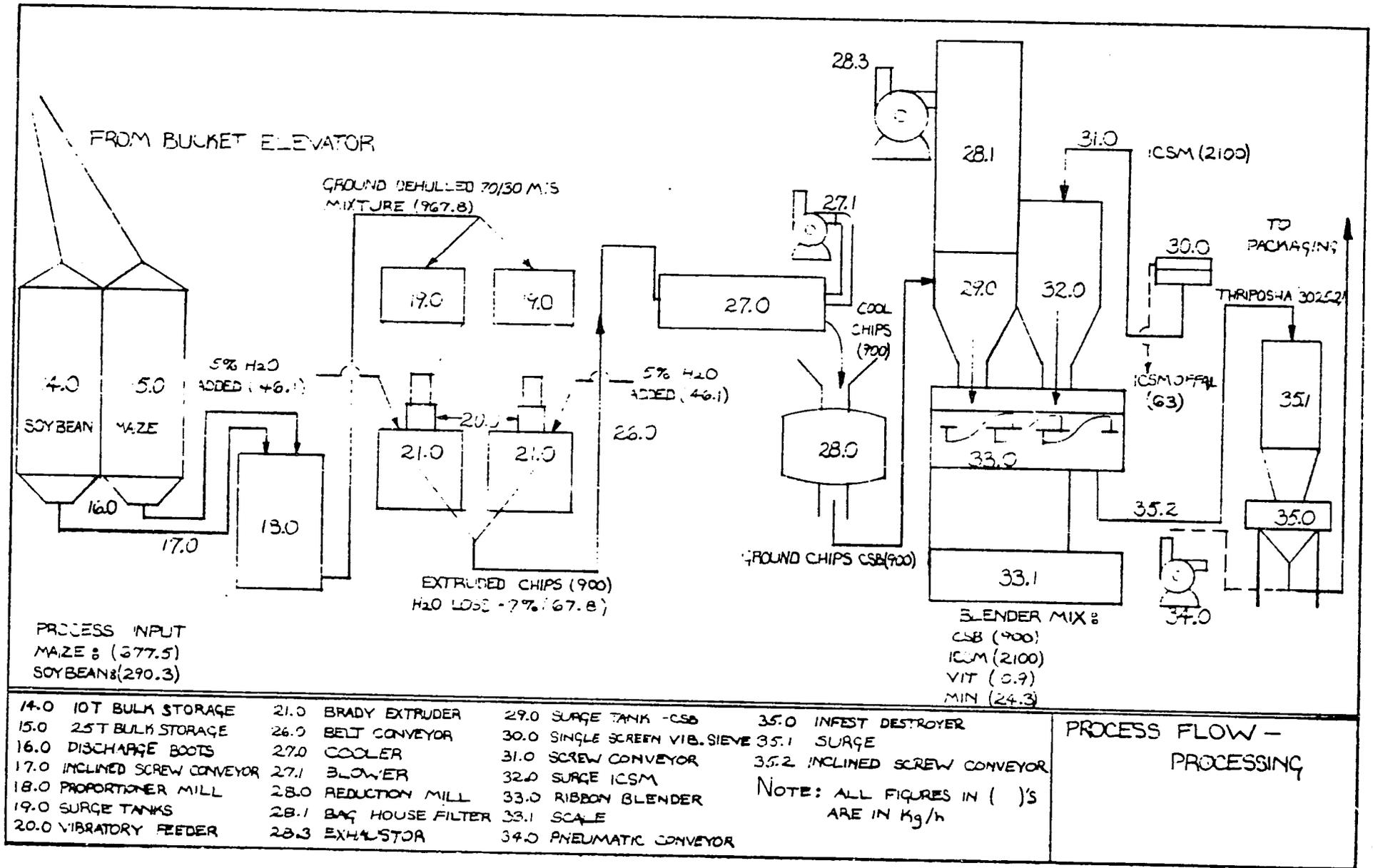


Figure 2.6.3. Process flow -- Processing area.

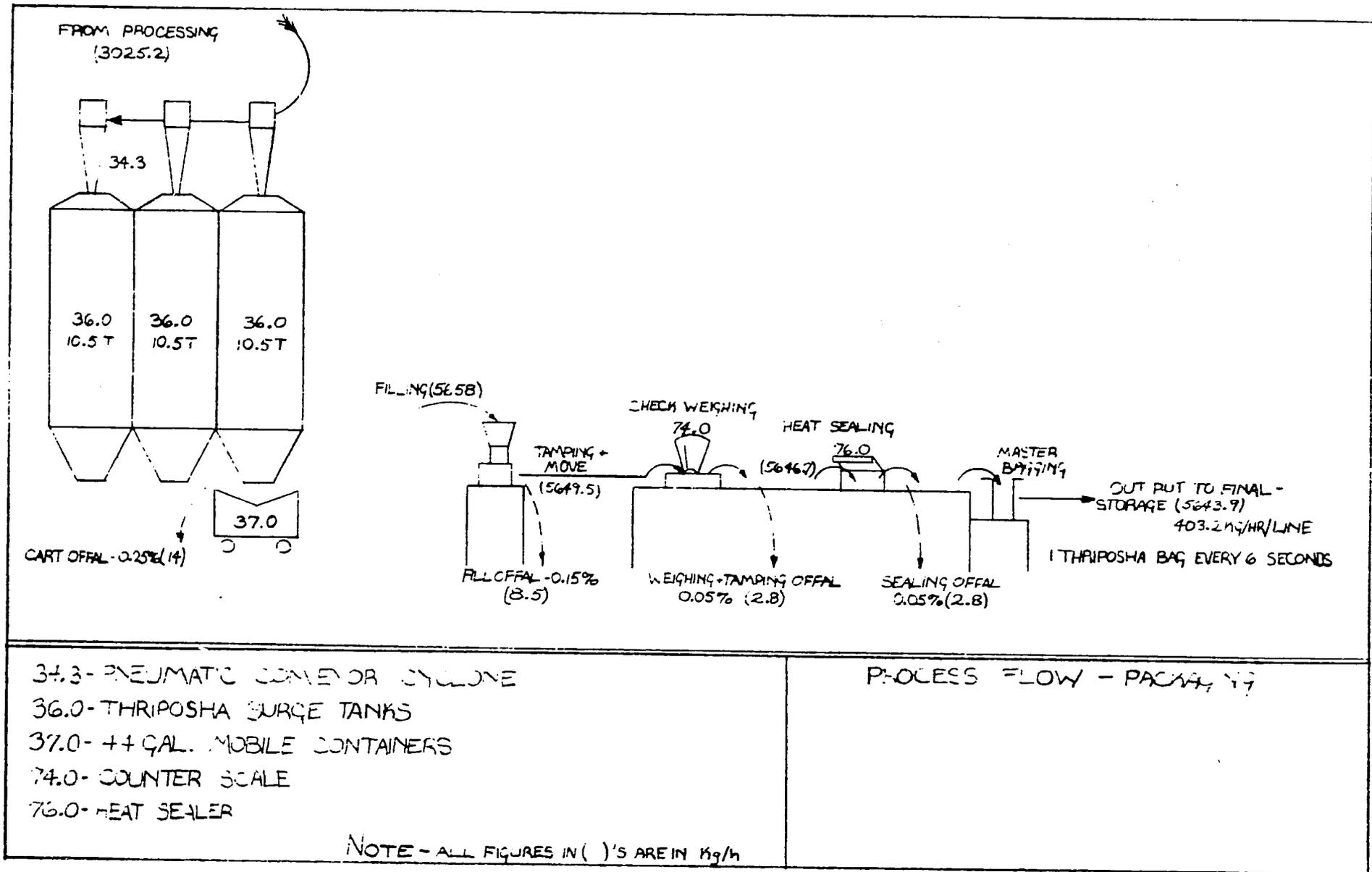


Figure 2.6.4. Process flow -- Packaging area.

2.6.2 Equipment List

RAW GRAIN CLEANING

<u>Item #</u>	<u>Equipment Name</u>	<u>Manufacturer</u>	<u>Model No.</u>	<u>\$*</u>
1.0	Bucket elevator	Universal Industries	C2-700	1,950.00
2.0	Two-screen scalper	Forsbergs, Inc.	8400-60	10,016.35
3.0	Destoner	Forsbergs, Inc.	H-8	9,775.77
3.1	Destoner blower	Forsbergs, Inc.	18H1F	3,334.94
3.2	Destoner cyclone	Kice Metal Products, Inc.	CK-84	2,884.06
3.3	Destoner ducting	Forsbergs, Inc.	16"D	253.27
3.4	Destoner scalper stand	Forsbergs, Inc.		1,699.47
4.0	Bucket elevator	Universal Industries	C2-700	1,599.00
4.1	Bucket elevator downspout	Universal Industries		230.00
5.0	Automatic baggers	W&T Avery, Ltd.	4904	<u>23,309.00</u>
Total				55,051.86
 <u>Spare Parts</u>				
1.1	Bucket elevator	Universal Industries		636.50
2.6	Two-screen scalper	Forsbergs, Inc.		1,189.46
3.5	Destoner	Forsbergs, Inc.		<u>433.00</u>
Total				2,258.96

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1

* Costs are FOB U.S. Port, 1978

DEHULLING

<u>Item #</u>	<u>Equipment Name</u>	<u>Manufacturer</u>	<u>Model No.</u>	<u>\$</u>
6.0	Screw conveyor	Modern Mill, Inc.	4" x 180"	380.05
7.0	Gravity table	Forsbergs, Inc.	50-VM	5,800.00
7.1	Gravity table blower	Forsbergs, Inc.	8-H	
7.2	Gravity table cyclone	Kice Metal Products, Inc.	CK-72	2,574.85
7.3	Gravity table ducting	Forsbergs, Inc.		289.53
8.0	Screw conveyor	Modern Mill, Inc.	4" x 240"	432.45
9.0	Scourer/aspirator	Sturtevant Mill Co.	No. 3	5,745.00
9.2	Scourer/aspirator blower	Kice Metal Products, Inc.	FC9	1,380.00
9.3	Scourer/aspirator cyclone	Kice Metal Products, Inc.	CK-36	2,170.00
9.4	Scourer/aspirator ducting	Flex-Weld, Inc.	FG-30-U	441.00
10.0	Single-deck separator	Eriez Magnetics	S-181	1,667.00
11.0	Screw conveyor	Jeffrey Manufacturing Division		1,895.00
12.0	Automatic weighing machines	W&T Avery Ltd.	4901	6,361.00
13.0	Bucket elevator	Universal Industries	C2-175	5,108.45
			Total	34,244.53
 <u>Spare Parts</u>				
7.4	Gravity table	Forsbergs, Inc.		2,044.20
9.5	Scourer/aspirator	Sturtevant Mill Co.		986.00
10.1	Single-deck separator	Eriez Magnetics		292.00
			Total	3,322.20

PROCESSING

<u>Item #</u>	<u>Equipment Name</u>	<u>Manufacturer</u>	<u>Model No.</u>	<u>\$</u>
14.0	Bulk tank	Read Steel Products	BB-102	1,592.25
15.0	Bulk tank	Read Steel Products	BB-105	2,107.75
17.0	Screw conveyor	Modern Mill, Inc.	4" x 300"	924.60
18.0	Proportioner mill	Modern Mill, Inc.	400 ground level	2,926.00
19.0	Surge tanks	Longero, Inc.		2,078.53
19.1	Surge tank vibrator	Eriez Magnetics	40S, GX230	1,388.00
20.0	Brady Crop Cooker	Koehring Farm Equip, Div.	2160	11,975.00
21.1	Brady electric motor	Lincoln Electric Co., Inc.	100 hp	3,908.00
22.0	Surface thermometer	William Wahl Corp.	710-4	20.00
23.0	Pressure regulator	Watts Regulator Co.	135AM3	31.50
24.0	Needle valve	Soke, Inc.	2334F2B	19.65
25.0	Flow meter	Fischer & Porter Co.	10A3555-1/4	368.55
26.0	Belt conveyor	Springfield Welding Co., Inc.		8,480.00
27.0	Cooler	Dorsey McComb, Inc.		7,540.00
27.1	Cooler blower	Dayton Electric Mfg. Co.	7C441	1,250.00
27.2	Cooler ducting	Dorsey McComb, Inc.		1,815.00
28.0	Reduction mill	Pulverizing Machinery	3W	11,507.84
28.1	Baghouse filer	U.S. Filter Corp.	36S-6-30	4,434.32
28.2	Air lock	U.S. Filter Corp.	6022	949.40
28.3	Baghouse exhaustor	Clarage Plant	1260-209-XL	1,333.76
28.4	Reduction mill ducting	Premier Pneumatics		1,453.10
28.5	Vibrator	Eriez Magnetics	40S-FX230	353.00
30.0	Vibratory scalper	Sweco, Inc.	CS48C88	5,050.40
31.0	Screw conveyor	Modern Mill, Inc.	4" x 360"	476.35
32.0	Surge tank	American Steel & Iron Works, Inc.		2,101.00
32.1	Surge vibrator	Eriez Magnetics	40S-FX230	353.00
33.0	Ribbon blender	Day Mixing	D-10	10,505.31
33.1	Blender scale level system	Howe Richardson Scale Co.	32000	6,833.84
33.2	Scale printer	" " " "	CP-1	3,425.00
33.3	Screw conveyor	Jeffrey Manufacturing Div.		2,512.00

PROCESSING (continued)

<u>Item #</u>	<u>Equipment Name</u>	<u>Manufacturer</u>	<u>Model No.</u>	<u>\$</u>
34.0	Pneumatic blower	CEA Carter Day	15 hp motivator	3,611.50
34.1	Rotary valve/air lock	CEA Carter Day	6" CI8	1,717.00
34.2	Pneumatic ducting	CEA Carter Day	3" OD	709.50
34.3	Pneumatic cyclones	CEA Carter Day	16 MV	1,721.50
34.4	Pneumatic "Y" valves	CEA Carter Day	e" - CEU1	1,931.50
35.0	Infestation destroyer	Sturtevant Mill Co.	#15	4,445.00
35.1	Surge tank	American Steel & Iron Works, Inc.		1,424.00
35.2	Surge vibrator	Eriez Magnetics	40S-FX230	353.00
36.0	Surge tanks	Miracle Equipm Co.	3410	<u>6,000.00</u>
			Total	\$120,598.20

PROCESSING SPARES

<u>Item #</u>	<u>Equipment Name</u>	<u>Manufacturer</u>	<u>Model No.</u>	<u>\$</u>
18.1	Proportioner mill	Modern Mill, Inc.		1,680.00
21.2	Brady Crop Cooker	Koehring Farm Division		5,083.12
28.6	Reduction mill	Pulverizing Machinery		2,065.00
28.7	Baghouse	U.S. Filter Corporation		369.00
28.8	Air lock	U.S. Filter Corporation		37.20
30.1	Vibratory scalper	Sweco, Inc.		535.21
33.4	Blender	Day Mixing		211.10
35.3	Infestation destroyer	Sturtevant Mill, Co.		<u>34.50</u>
		Total		10,015.13

OTHER EQUIPMENT

<u>Item #</u>	<u>Equipment Name</u>	<u>Manufacturer</u>	<u>Model No.</u>	<u>\$</u>
37.0	Mobile containers	Rubber Maid Commercial Products	2641	637.00
38.0	Magnets	Eriez Magnetics	P	396.56
39.0	Plate magnet	Eriez Magnetics	Series 17	560.50
40.0	Belt conveyor	Advanced Industrial Design	28 x 130	12,675.00
41.0-70.0	Miscellaneous tools	Miscellaneous Manufacturers		2,394.32
71.0	Electric control and devices			41,267.66
72.0	Platform scale	W&T Avery, Ltd.	3205ABA	1,434.20
73.0	Platform scale	W&T Avery, Ltd.	3205ABA	801.80
74.0	Counter scales	W&T Avery, Ltd.	1215BET	1,542.00
75.0	High pressure cleaner	Electric Steam Generator Corp.	3TD-WT4-3	3,048.00
76.0	Heat sealer	Allied Automation	312	1,890.70
79.0	Exhaust fans	Hartzell Propellor Fan, Co.	OZ-16-WFC	4,053.00
80.0	Air conditioners	Amana Refrigeration, Inc.	621-SJ	5,028.00
81.0	Floor sealer	The Goodyear Tire & Rubber Co.	E-7 Perna Seal	747.00
82.0	Compressor	Gardner-Denver Company	ACM 8050	1,350.00
83.0	Paint sprayer	Thor Power Tool, Co.	4Z200	272.60
84.0	Wash fountain	Bradley Corporation	AFC	283.70
85.0	Hand dryer	Excel Manufacturing Corp.	HZ6-W	213.20
86.0	Water cooler	Ebco Manufacturing Corp.	ODP13A-1-50	261.25
			Total	78,856.49

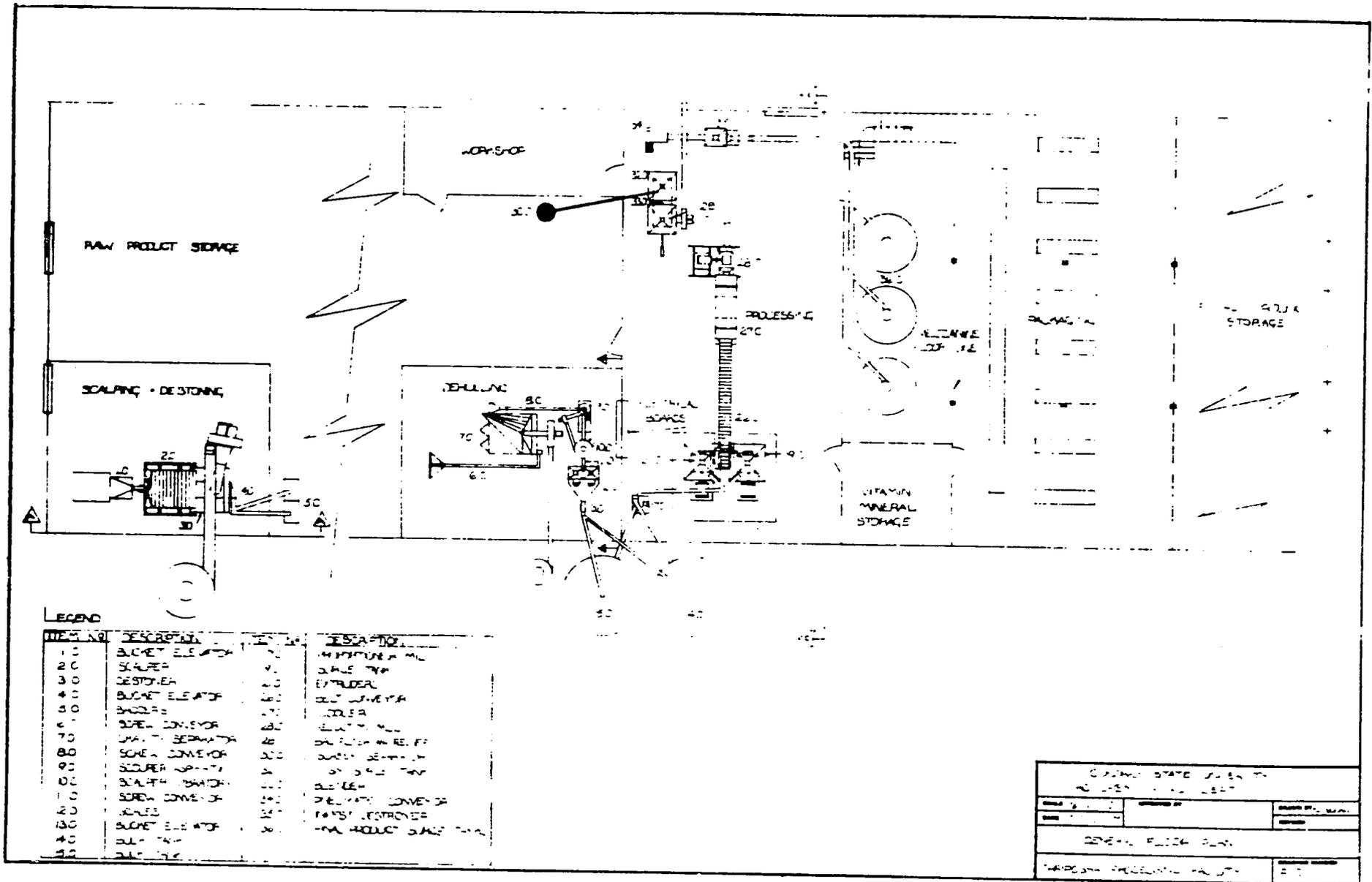
2.7 Services to Plant

The plant is a self-contained unit with enough raw ingredient storage to maintain operations between 3 and 6 months. The plant is staffed to provide services including procurement, processing, loading, accounting, and maintenance and repair. Specialized services must be obtained outside the plant. These include steel machining work, polyethylene bag manufacturing and printing. These service costs are paid on a job basis.

2.7.1 Plant Layout

Figure 2.7.1 -- Thriposha Processing Facility

Figure 2.7.2 -- Layout Sketch, inside building dimensions



LEGEND

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
10	BUCKET ELEVATOR	70	WATER SEPARATOR
20	SCALES	80	SCREW CONVEYOR
30	DESTONER	90	SCREW CONVEYOR
40	BUCKET ELEVATOR	100	SCREW CONVEYOR
50	SCALES	110	SCALES
60	SCREW CONVEYOR	120	BUCKET ELEVATOR
70	WATER SEPARATOR	130	BUCKET ELEVATOR
80	SCREW CONVEYOR	140	BUCKET ELEVATOR
90	SCREW CONVEYOR	150	BUCKET ELEVATOR
100	SCREW CONVEYOR	160	BUCKET ELEVATOR
110	SCALES	170	BUCKET ELEVATOR
120	SCALES	180	BUCKET ELEVATOR
130	BUCKET ELEVATOR	190	BUCKET ELEVATOR
140	BUCKET ELEVATOR	200	BUCKET ELEVATOR
150	BUCKET ELEVATOR	210	BUCKET ELEVATOR

GENERAL STATE OF TEXAS
COUNTY OF _____

BEFORE ME, the undersigned authority, on this _____ day of _____, 20____, personally appeared _____, known to me to be the person whose name is subscribed to the foregoing instrument, and acknowledged to me that he executed the same for the purposes and consideration therein expressed.

My commission expires _____

GENERAL FLOOR PLAN
THRIPASHA PROCESSING FACILITY

Figure 2.7.1 -- Thripasha Processing Facility.

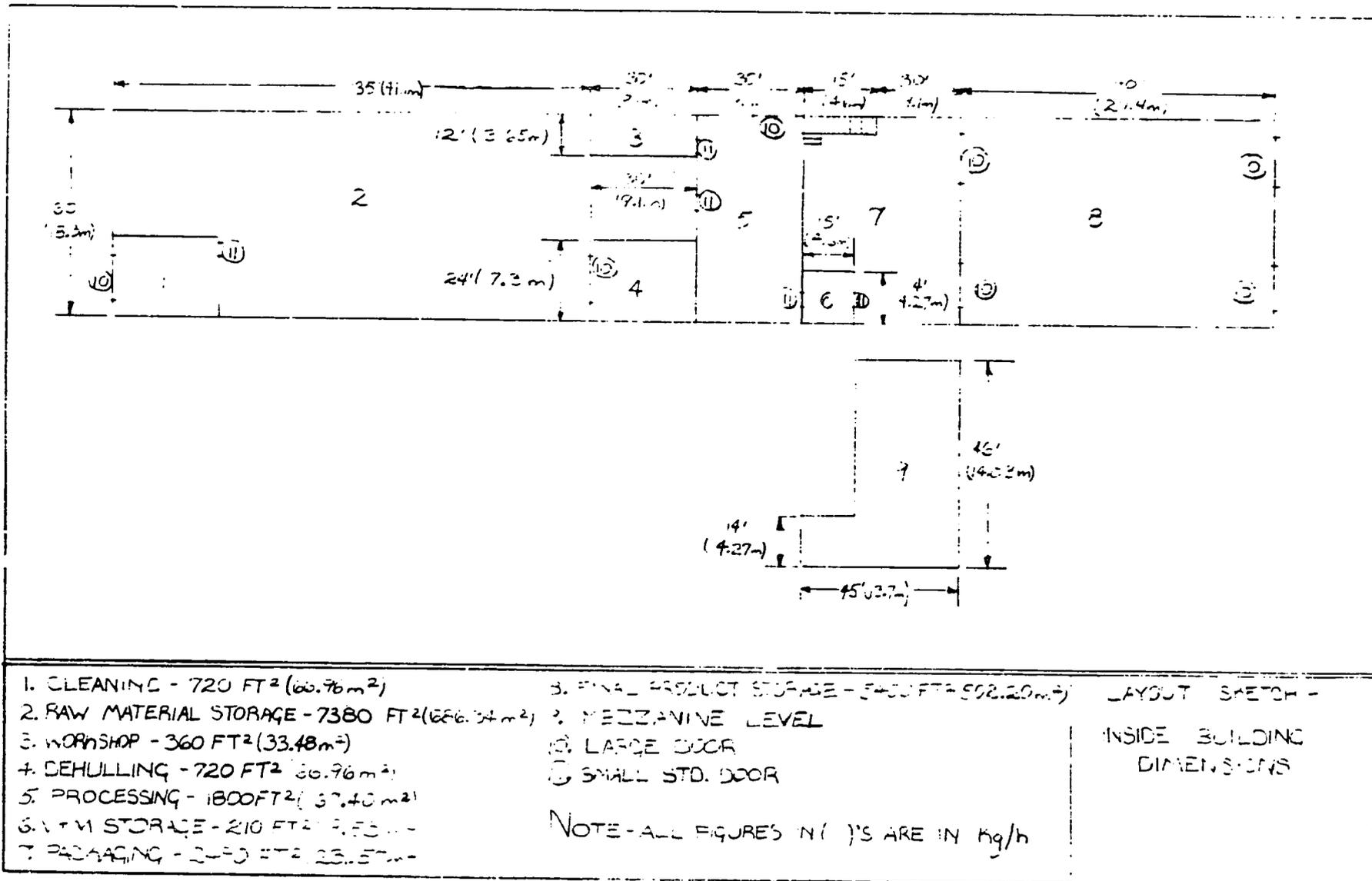


Figure 2.7.2 -- Layout sketch, inside building dimensions.

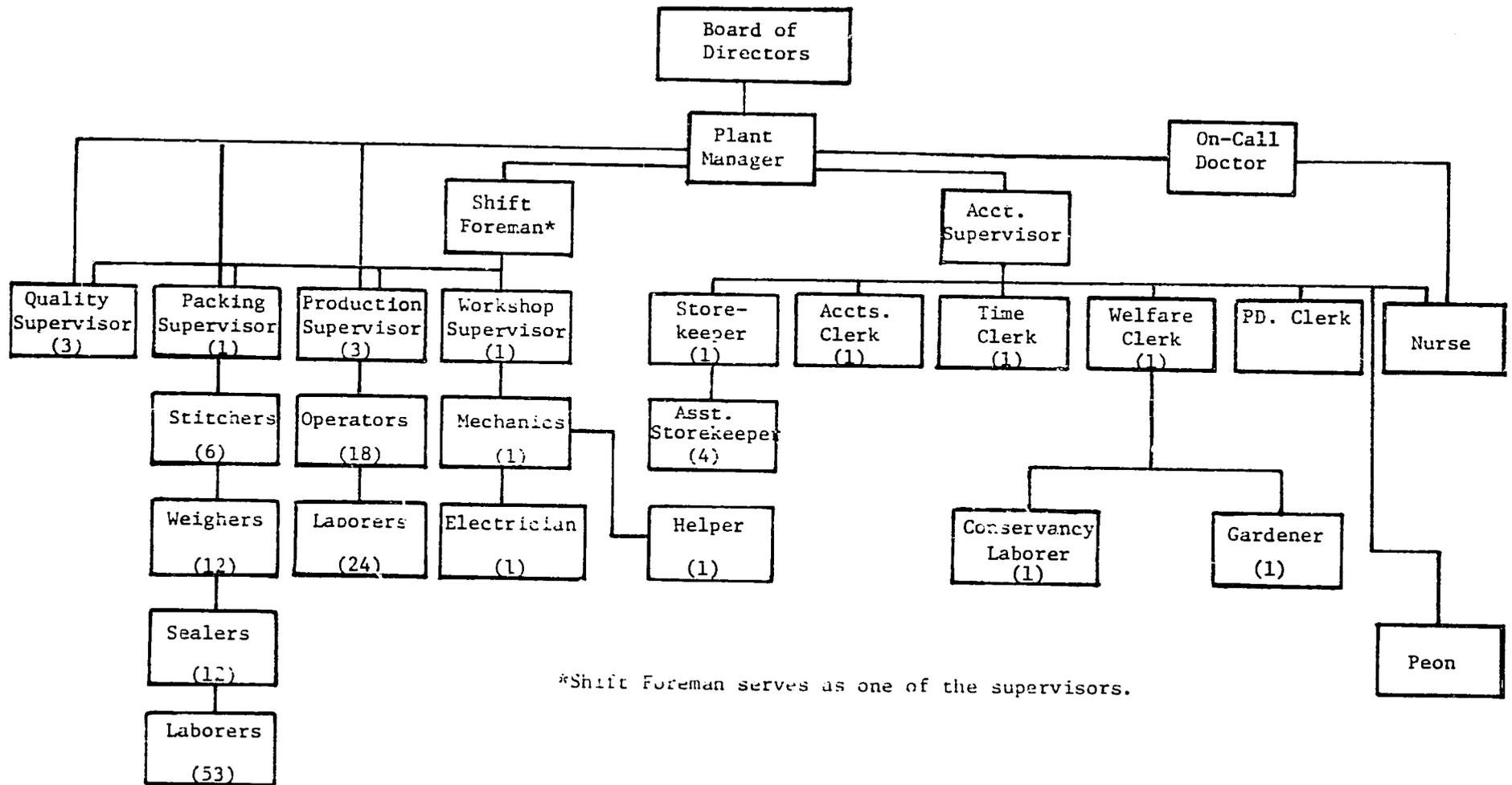
3.0 Investment Costs (1977-1979 prices)

3.1 Fixed Assets

Land -- 2.84 hectares	Rs. 450,000.00	27,967.68
Engineering technical services	986,317.00	61,300.00
Building	4,566,000.00	283,778.74
Rail siding	1,267,170.00	78,753.13
Equipment	4,896,949.10	304,347.37
Installation materials and expense	500,707.93	31,119.20
Installation salary	36,004.83	2,237.72
CARE personnel		45,717.00
Furniture	1,980.00	1,230.58
Machines & fixtures	6,926.50	430.49
Canteen equipment	8,697.50	540.55
		<hr/>
		\$ 837,424.46
Working Capital		<hr/>
		247,811.73
Paid in Capital		<hr/>
		<u>\$1,085,236.10</u>

4.0 Personnel

Figure 4.1.1 Plant Organizational Chart



19-

Figure 4.1.1 Plant organizational chart.

5.0 Plant Capacity Experience

5.1 Rated Capacities

Cleaning (day shift only)	15,000 kg/hr
Dehulling	1,000 kg/hr
Cooking Corn-Soy Blend	900 kg/hr
Blending & packaging finished product	3,000 kg/hr

5.2 Finished Product Production Performance, Jan. 14-July 31, 1980

kg/hr scheduled	% of rated capacity	kg/hr operated	% of rated capacity
1,424	47.5	1,947	64.9

5.3 Plant Reliability

	Hours	%
Time scheduled	1,804.0	100.0
Actual time operated	1,311.5	72.7
Time lost	492.5	27.3

5.4 Time Loss Breakdown

Time lost due to:	Hours	Percent of Total Downtime	Percent Scheduled Operating Time
Mechanical problems			
Cleaning	0	0	0
Dehulling	0	0	0
Processing	105	21.5	5.8
Packaging	0	0	0
Raw materials and water shortage	36.5	7.4	2.0
Plant logistical problems*	31.5	6.4	1.8
Power service failure	319.5	64.7	17.7
Total downtime	492.5	100.0	27.3

*Late start, non-explained downtime, baghouse plugs.

6.0 Yield Data

6.1 Yield - Material balance per metric ton of Thripasha

	Finished kg	Offal kg	Loss kg	Purchased Raw Material kg
Maize	210.0	22.4	0.4	232.8
Soybean	90.0	11.7	1.1	102.8
ICSM	<u>700.0</u>	<u>4.8</u>	<u>0.0</u>	<u>704.8</u>
	1,000.0	38.9	1.5	1,040.4
Yield	96.1%	3.7%	0.2%	100.0%

6.2 Yield - Material balance per metric ton of CSB

	CSB kg	Offal kg	Loss kg	Purchased Raw Material kg
Maize	700.0	74.6	1.4	776.0
Soybean	<u>300.0</u>	<u>38.9</u>	<u>3.6</u>	<u>342.5</u>
	1,000.0	113.5	5.0	1,118.5
Yield	89.4%	10.2%	0.4%	100.0%

6.3 Yield - Packaging Materials per metric ton of Finished Product

	No. for Thripasha	% Loss	No. Lost	No. Total Usage
Poly bags	1,334	4.7	63	1,397
Poly liners	12.5	49.8	6.5	19
Master bags*	44.5	1.5	1.5	46

* Includes crepe tape and twine

7.0 Unit Costs and Expenses

7.1 Material Cost Prices, Delivered Plant - Average over - FY80

Maize	Rs. [*] 2,618/MT	\$ 162.75/MT
Soybean	Rs. 6,250/MT	\$ 390.64/MT
ICSM	Rs. 6,275/MT	\$ 390.00/MT
750 g poly bag	Rs. 160.5/1,000	\$ 1.00/1,000
Poly liner	Rs. 920.0/1,000	\$ 57.18/1,000
Master bag	Rs. 2,210.0/1,000	\$ 137.35/1,000

7.2 Total Operating Expenses Period, Jan. 14 - May 31, 1980

Quantity produced:	62,500 master bags (30 x 0.75 kg = 22.5 kg)
Operating expense:	\$52,018.82
Cost per master bag:	\$ 0.832
Cost per kilogram:	\$ 0.037
Cost per pound:	\$ 0.017274

*
Rs. 16.09 = \$1.00

8.0 Unit Costs and Price Calculation

8.1 Thripasha distributed MCH Centers - 1 Master Bag

Raw Material Cost

Maize	4.725 kg at \$0.16275/kg	\$ 0.77
Soybean	2.025 kg at \$0.39064/kg	0.79
ICSM	15.75 kg at \$0.390/kg	<u>6.16</u>

	Gross Raw Material Cost	7.70
	Less Offal Credit (0.8325 kg at \$0.05/kg)	<u>- .04</u>

Net Raw Material Cost \$ 7.66

Packaging Cost

31.5 polybags at \$0.001	0.03
1.01 master bags at \$0.13735	0.14
0.42 poly liner at \$0.5718	<u>0.24</u>

Gross Packaging Cost 0.41

Net Cost with Packaging \$ 8.07

Operating Cost

(Labor, utilities, maintenance, etc.) 0.832

Net Cost with Operating Expense \$ 8.902

Process Cost

(Fee for plant operations) 0.092

Net Value of Thripasha/master bag \$ 8.994

8.2 Thripasha Unit Values

Value per master bag	8.994
Value per 750 gram packet	0.300
Value per kilogram	0.400
Value per pound	0.182

9.0 Operating Statement (Jan. 14-May 30, 1980)

9.1 INCOME*

	Value (\$US)	Percent of Gross Value
62,500 master bags of Thriposha @ \$8.994	562,125.00	98.9
91 MT offal @ \$50.00/MT	4,550.00	0.8
44,416 empty containers @ \$0.0489	<u>2,171.97</u>	<u>0.3</u>
Gross Value of Thriposha	<u>568,846.97</u>	100.0

9.2 COST AND EXPENSE**

	Value (\$US)	Percent of Total Cost & Expense
<u>Material Costs</u>		
327.4 MT maize @ \$162.75/MT	53,284.35	9.4
144.7 MT soybean @ \$390.64/MT	56,525.61	9.9
991.2 MT ICSM @ \$390.00/MT	386,568.00	68.0
63,444 master bags @ \$137.35/1,000	8,714.03	1.5
1,962,945 polybags @ \$1.00/1,000	1,962.95	0.3
25,934 liners @ \$57.18/1,000	<u>1,482.91</u>	<u>0.2</u>
Material costs	<u>508,537.85</u>	86.1
<u>Expenses</u>		
Wages & salaries	18,915.81	3.3
Employee benefits	4,016.94	0.7
Insurance	1,781.10	0.3
Depreciation	17,890.07	3.2
Electric power (min. charge \$233.06/mo)	1,048.77	0.2
Telephone	166.24	0.1
Maintenance materials & service	2,312.88	0.4
Operating supplies	717.80	0.1
Transportation & expense	2,793.96	0.5
Security	1,356.95	0.2
Equipment spares	<u>1,023.30</u>	<u>0.2</u>
Expenses	52,018.82	9.2
Net Margin after Expenses	<u>8,290.30</u>	<u>1.5</u>
Total Cost and Expenses	<u>\$568,846.97</u>	100.0

* Figures for income are based on actual costs. This is a nonprofit operation.

** Figures for expenses are actual costs for period. Some items were donated, but are included for the purpose of determining overall costs.

10.0 Balance Sheet (as of June 30, 1980)

Assets

A. Current Assets

Inventories \$ 593,168.11
Prepaid expenses 2,654.51
Accounts receivable 7,761.09

Total Current Assets \$ 603,583.71

B. Fixed Assets

Depreciable assets \$ 789,469.74
Less depreciation 21,865.64

Undepreciated balance 767,604.10
Nondepreciable assets 47,954.72

Total Fixed Assets 815,558.82

TOTAL ASSETS \$1,419,142.50

Liabilities

A. Current Liabilities

Accounts payable \$ 19,310.38
Land payment 27,967.68

Total Current Liabilities 47,278.06

B. Capital Liabilities

Paid in Capital 1,371,864.40

TOTAL LIABILITIES \$1,419,142.50

APPENDIX 1

JA-ELA PROTOCOL UPDATE

PERIOD: January 15, 1980 - January 14, 1981

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1.0-1.2 Same as original Protocol, See page 1.

2.0-2.6 Same as original Protocol, See pages 2-3.

2.6.2 Equipment List Same, Add below

87.0	1	12" Grinding Mill	\$ 705.62
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88.0	4	Rentoflash Insect Control Units	\$ 1,151.72
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2.7-3.0.1 Same as original Protocol, See pages 14-16.

3.0 Investment Costs

3.1 Fixed Assets:

Land 7 Acres	Rs. 2,000,000.00	\$117,302.05 ¹
Engineering: Technical Services	986,317.00	63,300.00
Buildings	9,254,750.00	558,778.74
Rail Siding	1,266,170.00	78,753.13
Equipment	4,913,640.90	305,326.37
Installation materials	500,707.93	31,119.20
Expenses	36,004.83	2,237.72
CARE personnel		109,720.80
Furniture	19,800.00	1,230.58
Machines & Fixtures	6,926.50	430.49
Canteen Equipment	8,697.50	<u>540.55</u>
		\$1,268,739.30
Working Capital		<u>451,564.89</u>
Paid in Capital		<u><u>\$1,720,304.19</u></u>

Footnotes:

¹ GOSL valuation of land as of January, 1981, which is to be paid to the former owners.

4.0-4.1.1 Same as original Protocol, See pages 17-18.

5.0 Plant Capacity Experience

5.1 Rated Capacities: Normal January 1 - March 2, April 24 - June 1

Cleaning (day shift only)	15,000 kg/hr
Dehulling	1,000 kg/hr
Cooking Corn-Soy-Blend	900 kg/hr
Blending & packing finished product	3,000 kg/hr

5.2 Finished Product Performance:

kg per hour Scheduled	% of Rated Capacity	kg per hour Operated	% of Rated Capacity
2,40	80%	2,723	91%

5.3 Plant Reliability

Time Schedule
Actual Time Operated
Time Lost

Hours	%
1,327	100
1,170	88
157	1

5.4 Time Loss Breakdown

Total Time Lost
Time lost due to:
 Mechanical problems
 Power Failures
 Plant logistical problems

Hours	%
157	100
119	76
33	21
5	3

5.0 Plant Capacity Experience

5.1 Rated Capacities

Cleaning (day shift only)	15,000 kg/hr
Dehulling	1,000 kg/hr
Cooking Corn-Soy-Blend	900 kg/hr
Blending & packing finished product	3,000 kg/hr

5.2 Finished Product Performance: January 15, 1980 - January 14, 1981

kg per hour Scheduled	% of Rated Capacity	kg per hour Operated	% of Rated Capacity
1,982	66.0%	2,444	81.4%

5.3 Plant Reliability

Time Schedule
Actual Time Operated
Time Lost

Hours	%
3,741	100.0
3,041.5	81.3
699.5	18.7

5.4 Time Loss Breakdown

Total Time Lost
Time lost due to:
 Mechanical problems
 Material & water storage
 Plant logistical problems
 Power service failures

Hours	%
699.5	100.0
193.31	27.6
46.63	6.7
53.96	7.7
405.6	58.0

5.5 Two Brady Usage Reliability

Brady hours scheduled
Actual Brady hours recorded

Hours	%
7,482	100.0
4,367	58.3

6.0 Yield Data

6.1 Yield Material Balance Per Metric Ton of Thripasha:

	Finished kg	Offal kg	Loss kg	Purchased Raw Material kg
Maize	210.0	7.5	0.13	217.63
Soyabean	90.0	11.7	0.16	101.86
ICSM	700.0	.98	0	700.98
	1000.0	20.18	0.29	1020.47
Yield	98.9%	1.9%	0.1%	100.0%

6.2 Yield Material Balance Per Metric Ton of CSB:

	CSB kg	Offal kg	Loss kg	Purchased Raw Material kg
Maize	700.0	24.85	0.4385	725.29
Soyabean	300.0	39.15	0.5207	339.67
	1000.0	64.0	0.9592	1064.96
Yield	93.9%	6.0%	0.1%	100.0%

6.3 Yield Packaging Materials Per Metric Ton of Finished Product

	Units per M. T.	% Loss	Units Lost	Total Units Usage
Poly bags	1334	2.5	33	1367.00
Poly liners	12.5	25.3	0.3	15.50
*Master bags	44.5	0.06	2.7	47.26
454g poly bags	2205	0.0	0.0	2205.00
Boxes	2205	0.0	0.0	2205.00
Cartons	46	0.0	0.0	46.00
Insert Leaflets	2205	0.0	0.0	2205.00

* Includes Crepe Tape and Twine

7.0 Unit Costs and Expenses

7.1 Material Cost Prices, Delivered Plant --

Average January 15, 1980 - January 14, 1981

Maize	Rs. 2,618.71/MT	\$153.59/MT
Soyabeans	6,250.20/MT	366.58/MT
ICSM	6,275.10/MT	368.04/MT
750g Poly bag	160.50/1000	9.41/1000
Polyethene liner	920.00/1000	53.96/1000
Master bags	2,210.00/1000	129.62/1000
454g Poly bag	22.40/1000	1.30/1000
Boxes	830.00/1000	48.60/1000
Cartons	6,200.00/1000	36.30/1000
Leaflets	235.00/1000	13.70/1000
Gum tape	21.85/unit	1.28/unit
Glue	2,250.00/45 gal	131.96/45 gal

Note: 12 month exchange rate average

7.2 Total Operating Expenses -- Institutional Product

Period January 14, 1980 to January 13, 1981

Quantity Produced	340,100 master bags (30 x 0.75 kg packets)
Operating Expenses	\$227,990.65
Cost per master bag	\$ 0.670
Cost per kilogram	\$ 0.030
Cost per pound	\$ 0.014

7.3 Total Operating Expenses -- Commercial Product

Period August 8, 1980 to January 14, 1981

Quantity Produced	5,942 cartons (48 x 454g packets)
Operating Expenses	\$3,857.97
Cost per carton	\$ 0.649
Cost per kilogram	\$ 0.030
Cost per pound	\$ 0.014

Rs 17.05 = \$1.00

8.0 Unit Costs and Price Calculations -- Goods Sold

8.1 Thriposha Institutional Product

8.1.1 Thriposha distributed MCH Centers -- One master bag

Raw Material Cost

Maize	4.897 kg @ \$0.15359/kg	\$0.75
Soyabeans	2.292 kg @ \$0.36658/kg	0.84
ICSM	15.75 kg @ \$0.36804/kg	<u>5.80</u>

Gross Raw Material costs	\$7.39
Less Offal credit (0.0439 kg @ \$0.074/kg)	<u>0.03</u>

Net Material costs \$7.36

Packaging Cost

30.7 Poly bags @ \$0.00941	\$0.29
1.03 Master bags @ \$0.12962	0.13
.35 Poly liners @ \$0.05396	<u>0.02</u>

Net cost with packaging \$7.80

Operating Cost

Operating expenses	<u>\$0.68</u>
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Net cost \$0.030 \$8.48

Process Cost

Amount paid processing (profit)	<u>\$0.09</u>
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Net value of Thriposha master bag \$8.57

8.1.2 Thriposha Unit Value -- Institutional Product

Value per 750 gram packet	\$0.286
Value per kilogram	\$0.381
Value per pound	\$0.173

8.2 Commercial Thripsha

8.2.1 Thripsha distributed commercial -- One carton (48 x 454g)

Raw Material Cost

Maize	4.743 kg @ \$0.15359/kg	\$0.73	
Soyabeans	1.961 kg @ \$0.36658/kg	0.72	
ICSM	15.254 kg @ \$0.36804/kg	<u>5.61</u>	
	Gross Raw Material cost	\$7.06	
	Less Offal credit (0.166 kg @ \$0.074/kg)	<u>0.02</u>	
	Net Material costs		\$7.04

Packaging Cost

48 Poly bags @ \$0.0013	\$0.06		
48 Boxes @ \$0.0486	2.33		
1 Carton @ \$0.0363	0.04		
48 Insert Leaflet @ \$0.0137	<u>0.66</u>		
	Net cost with packaging		\$10.13

Operating Cost

Operating expenses (labor, utilities, etc.)			
\$0.030	<u>0.65</u>		
	Net cost with operating		\$10.78

Process Cost

Amount paid Ceylon Tobacco @ \$0.004/kg	<u>\$0.09</u>		
	Net value of commercial Thripsha carton		<u>\$10.87</u>

8.2.2 Commercial Thripsha Unit Values (Wholesale)

Value per box	\$0.226
Value per kilogram	\$0.499
Value per pound	\$0.227

9.0 Operating Statement -- January 14, 1980 to January 13, 1981

9.1 INCOME: Sales

	Value (\$ US)	Percent of Gross Value
340,100 Master bags Thriposha @ 8.57	\$2,914,657.00	97.1
5,942 Cartons Thriposha @ 10.87	\$ 64,589.54	2.2
226.52 Metric tons offal @ 74.27/MT	\$ 16,823.64	0.6
158,786 Empty containers @ 0.0267	\$ 4,239.58	0.1
Gross value of Thriposha	<u>\$3,000,309.70</u>	100.0

9.2 COST AND EXPENSE:

	Value (\$ US)	Percent of Total Cost and Expense
Material Cost:		
1,492.5 MT Maize @ \$153.59/MT	\$ 229,248.43	7.6
608.5 MT Soyabeans @ \$366.58/MT	\$ 223,063.93	7.4
5,473.1 MT ICSM @ \$368.04/MT	\$2,014,319.70	67.1
342,267 Master bags @ \$129.62/1000	\$ 44,364.65	1.5
10,460,910 Poly bags @ \$9.41/1000	\$ 98,437.16	3.3
57,351 Liners @ \$53.96/1000	\$ 3,094.66	0.1
Material cost	\$2,612,528.53	86.0
Expenses:		
Depreciation	\$ 78,160.19	2.6
Wages & Salaries	\$ 68,501.90	2.3
Employee Benefits	\$ 11,102.28	0.4
Insurance	\$ 5,408.28	0.2
Electricity	\$ 26,099.71	0.9
Telephone	\$ 495.74	0.1
Maintenance Materials & Service	\$ 6,918.02	0.2
Operating Supplies	\$ 3,245.37	0.1
Transportation & Expenses	\$ 14,839.76	0.5
Security	\$ 8,164.77	0.3
Equipment Spares	\$ 8,523.30	0.3
Total Expenses	\$ 231,848.62	7.9
Net Margin after Expenses	<u>\$ 155,932.58</u>	<u>5.2</u>
Total Cost and Expenses	<u>\$3,000,309.70</u>	100.0

10.0 Note: Balance Sheet could not be provided since inventories were unknown.

APPENDIX 2

JA-ELA PROTOCOL UPDATE

PERIOD: January 15, 1981 - January 14, 1982

JA-ELA THRIPOSHA PROCESSING FACILITY

Ministry of Health, Government of Sri Lanka/CARE-Sri Lanka

Managed and Operated by

CEYLON TOBACCO COMPANY LIMITED

PROTOCOL

January 15, 1981 - January 14, 1982

- 1.0-1.2 Same as original Protocol, See page 1.
- 2.0-2.6.2 Same as original Protocol, See pages 2-3.
- 2.7-3.0.1 Same as original Protocol, See pages 14-16.

3.0 Investment Costs

3.1 Fixed Assets

Land 2.84 hectares	\$ 117,302.05
Engineering technical services	63,300.00
Building - Processing	283,778.74
Building - Warehouse 1	275,000.00
Rail Siding	78,753.13
Equipment	442,207.41
Installation Materials and expense	31,119.20
Installation salary	2,237.72
CARE Personnel	118,966.80
Furniture	1,230.58
Machinery & Fixtures	430.49
Canteen Equipment	540.55
	<hr/>
	\$ 1,414,866.40
Working Capital	719,149.64
	<hr/>
Paid in Capital	\$ 2,134,016.04

- 4.0-4.1.1 Same as original Protocol, See pages 17-18.

5.0 Plant Capacity Experience

5.1 Rated Capacities

Cleaning (day shift only)	15,000 kg/hr
Dehulling	1,000 kg/hr
Cooking Corn-Soy-Blend	900 kg/hr
Blending & packing finished product	3,000 kg/hr

5.2 Finished Product Performance: January 15, 1981 - January 14, 1982

kg per hour Scheduled	% of Rated Capacity	kg per hour Operated	% of Rated Capacity
2107.3	70.2%	2618.1	87.3%

5.3 Plant Reliability

	Hours	%
Time Schedule	4366	100.0
Actual Time Operated	3514	80.5
Time Lost	852	19.5

5.4 Time Loss Breakdown

	Hours	%
Total Time Lost	852	100.0
Time lost due to:		
Mechanical problems	354	41.6
Plant logistical problems ¹	41	4.8
Power failures	452	53.1
Miscellaneous	5	0.6

Note: May figures were normalized to 16 hours but employees worked 24 hours per day. Processing time was always less than 16 hours total.

¹Includes Material shortages.

6.0 Yield Data

6.1 Yield Material Balance Per Metric Ton of Thriposha:

	Finished kg	Offal kg	Loss kg	Purchased Raw Material kg
Maize	195.6	7.6	2.89	206.1
Soyabean	72.7	5.1	1.70	79.5
ICSM	<u>731.7</u>	<u>1.9</u>	<u>--</u>	<u>733.6</u>
	1000.0	14.6	4.6	1019.2
Yield	98.1%	1.43%	0.5%	100.0%

6.2 Yield Material Balance Per Metric Ton of CSB:

	CSB kg	Offal kg	Loss kg	Purchased Raw Material kg
Maize	729	14.9	10.8	754.7
Soyabean	<u>271.0</u>	<u>14.1</u>	<u>6.3</u>	<u>291.4</u>
	1000.0	29.0	17.1	1046.1
Yield	95.6%	2.8%	1.6%	100.0%

6.3 Yield Packaging Materials Per Metric Ton of Finished Product

	Units per M. T.	% Loss	Units Lost	Total Units Usage
Poly bags	1334	2.4	32.5	1366.5
Master bags	44.5	1.1	0.1	44.6
454g polybags	2203	2.7	59.5	2262.5
Boxes	2203	.0	.0	2203
Cartons	46	0	0	46
Insert leaflets	2203	0	0	2203

7.0 Unit Costs and Expenses:

7.1 Material Cost Price, Delivered Plant:

Average: January 15, 1981-

Maize	Rs.	3484.43/MT	\$181.67/MT
Soybeans	Rs.	9568.14/MT	\$498.86/MT
ICSM	Rs.	8,249.70/MT	\$430.12/MT
Offal	Rs.	2,250.00/MT	\$117.30/MT
750g Polybag	Rs.	285.70/1000	\$ 14.90/1000
Master bags	Rs.	3,050.00/1000	\$159.02/1000
454g Polybags	Rs.	76.60/1000	\$ 3.99/1000
454g Boxes	Rs.	820.00/1000	\$ 42.75/1000
Cartons	Rs.	8,600.00/1000	\$448.38/1000
Leaflets	Rs.	250.00/1000	\$ 13.03/1000
Gum Tape	Rs.	33.25/100m	\$ 1.73/100m
Glue	Rs.	247.50/45g1.	\$ 12.90/45g1.
Empty Container	Rs.	635.53/1000	\$ 33.14/1000

NOTE: 12 month Exchange Rate Average of 19.18 Rupees/\$1.00 U.S.

7.2 Total Operating Expenses - Institutional Product

Period January 15, 1981 - January 14, 1982

Quantity produced	411,864	master bags (30x0.76 kg pkts)
Operating expenses	\$330,318.80	
Cost per master bag	\$	0.802
Cost per kilogram	\$	0.036
Cost per pound	\$	0.016

7.3 Total Operating Expenses - Commercial Product

Period January 15, 1981 - January 14, 1982

Quantity Produced	7,191	cartons (48x454g boxes)
Operating expenses	\$ 5,608.50	
Cost per carton	\$	0.780
Cost per kilogram	\$	0.036
Cost per pound	\$	0.016

8.0 Unit Costs and Price Calculations -- Goods Sold

8.1.1 Thriposha distributed MCH Centers -- One master bag

Raw Material Cost

Maize	4.863 kg @ \$0.18167/kg	\$0.88	
Soyabeans	1.747 kg @ \$0.49886/kg	0.87	
ICSM	16.776 kg @ \$0.43012/kg	<u>7.22</u>	
	Gross Raw Material costs	\$8.97	
	Less Offal credit (0.334 kg @ \$0.15/kg)	<u>.05</u>	
	Net Material costs		\$8.92

Packaging Cost

30.72 Poly bags @ \$14.90/1000	\$0.46	
1.011 master bags @ \$159.02/1000	<u>0.16</u>	
Net cost with packaging		\$9.54

Operating Cost

Operating expenses	<u>\$0.81</u>	\$10.35
Net cost \$22.5 kg @ \$0.036/kg		

Process Cost

Amount paid processing (profit) @ \$0.12/master bag	<u>\$0.12</u>	
Net value of Thriposha master bag		<u>\$10.47</u>

8.1.2 Thriposha Unit Value -- Institutional Product

Value per 750 gram packet	\$0.349
Value per kilogram	\$0.465
Value per pound	\$0.211

8.2 Commercial Thriposha

8.2.1 Thriposha distributed commercially - one carton (48x454g)

Raw Material Costs

Maize	4.710 kg @ \$181.67/1000 kg	\$0.86
Soyabeans	1.676 kg @ \$498.86/1000 kg	\$0.84
ICSM	16.248 kg @ \$430.12/1000 kg	<u>\$6.99</u>

Gross material costs	\$8.69
Less Offal 0.345 kg @ \$0.15/kg	<u>.05</u>

Net material cost \$8.64

Packaging Cost:

49.3 poly bags @ \$ 3.99/1000	\$0.20
48.0 boxes @ \$ 42.75/1000	\$2.05
1 carton @ \$ 448.38/1000	\$0.45
48 inserts @ \$ 13.03/1000	<u>\$0.63</u>

Net Cost with packaging \$11.97

Operating Cost:

Operating expense @ \$0.787/carton \$0.79

Net Cost \$12.76

Processing Cost:

Amount paid for processing @ \$0.12/carton \$0.12

Net Value Thriposha carton \$12.88

8.2.2 Thriposha Unit Value - Commercial Product

Value per box	\$0.268
Value per kg	\$0.591
Value per pound	\$0.269

9.0 Operating Statement -- January 15, 1981 to January 14, 1982

9.1 INCOME: Sales	Value (\$ US)	Percent of Gross Value
411,864 Master bags Thriposha @ 10.47	\$4,312,216.00	99.3
132.8 Metric tons offal @ 117.30/mt	\$ 15,577.44	0.4
453,514 Empty containers @ 33.14/1000	<u>\$ 15,029.45</u>	0.3
Gross value of Thriposha	<u>\$4,342,822.80</u>	100.0
9.2 COST AND EXPENSE:	Value (\$ US)	Percent of Total Cost and Expense
Material Cost:		
1910.0 MT Maize @ \$181.67/MT	\$ 346,989.70	8.0
736.7 MT Soyabeans @498.86/MT	367,583.83	8.5
6798.2 MT ICSM @ 430.12/MT	2,924,041.70	67.3
416496 Masterbags @ 159.02/MT	66,231.19	1.5
12,652,462 Polybags @ 14.90/1000	<u>188,521.68</u>	<u>4.3</u>
Material cost	\$3,893,367.90	89.6
Expenses:		
Wages & Salaries	\$ 76,955.02	1.8
Employee Benefits	\$ 20,436.91	0.5
Insurance	\$ 5,209.52	0.1
Depreciation	\$ 90,314.43	2.1
Electricity	\$ 36,341.78	0.8
Telephone	\$ 524.10	0.1
Maintenance Materials & Service	\$ 8,741.54	0.2
Operating Supplies	\$ 18,500.79	0.4
Transportation & Expenses	\$ 27,116.46	0.6
Security	\$ 10,733.70	0.2
Equipment Spares	\$ 17,819.36	0.4
Printing and Other Expenses	<u>\$ 17,535.19</u>	<u>0.4</u>
Total Expenses	\$ 330,318.80	7.6
Net Margin after Expenses	<u>\$ 119,136.10</u>	<u>2.8</u>
Total costs and expenses	<u>\$4,342,822.80</u>	100.0

9.2.1 Income Sales - Commercial Thripasha

	Value (\$ US)	Percent of Gross Value
7,191 cartons Thripasha @ 12.88/carton	\$ 92,620.00	99.4
2.26 metric tons offal @117.30/MT	265.10	0.3
7,843 empty containers @ 33.14/1000	<u>259.92</u>	<u>0.3</u>
Gross value of Thripasha	<u><u>\$ 93,145.02</u></u>	100.0

9.2.2 Cost and Expense - Commercial Thripasha

	Value (\$ US)	Percent of Gross Value
<u>Material Costs</u>		
33.297 MT maize @ 181.67/MT	\$ 6,049.07	6.5
12.458 MT soyabean@ 498.86/MT	\$ 6,214.80	6.7
114,960 MT ICSM @ 430.12/MT	\$ 49,446.60	53.1
354,488 Polybags @ 3.99/1000	\$ 1,414.41	1.5
345,168 Boxes @ 42.75/1000	\$ 14,755.93	15.8
345,168 Leaflets @ 13.03/1000	\$ 4,497.54	4.8
7,191 Cartons @ 448.38/1000	<u>\$ 3,224.30</u>	<u>3.5</u>
Material Costs	\$ 85,602.65	91.9
<u>Expenses:</u>		
Wages & Salaries	\$ 1,306.98	1.4
Employee Benefits	\$ 347.09	0.4
Insurance	\$ 88.48	0.1
Depreciation	\$ 1,533.87	1.6
Electricity	\$ 617.22	0.7
Telephone	\$ 8.90	--
Maintenance Materials & Services	\$ 148.46	0.2
Operating supplies	\$ 314.21	0.3
Transportation and Expenses	\$ 460.54	0.5
Security	\$ 182.30	0.2
Printing and other Expenses	\$ 297.81	0.3
Equipment and Spares	<u>\$ 302.64</u>	<u>0.3</u>
Total Expenses	\$ 5,608.50	6.0
Net margin after expenses	<u>\$ 1,933.87</u>	<u>2.1</u>
Total Cost and Expense	<u><u>\$ 93,145.02</u></u>	100.0

10.0 Balance Sheet (As of December 31, 1981)

Assets

A. Current Assets

Inventories	\$628,258.60	
Prepaid expenses	\$ 38,898.41	
Accounts receivable	<u>\$ 24,697.90</u>	
Total Current Assets		\$ <u>691,854.91</u>

B. Fixed Assets

Depreciable Assets	\$1,266,888.00	
Less Depreciation	<u>\$ 91,848.30</u>	
Undepreciated balance		\$1,175,039.70
Non depreciable assets		<u>\$ 118,966.80</u>
Total Fixed Assets		<u>\$1,294,006.50</u>
Total Assets		<u><u>\$1,985,861.40</u></u>

LIABILITIES

A. Current Liabilities

Accounts Payable	\$ 13,791.59	
CPS, CTC, Moosajee Sons	<u>\$ 21,692.00</u>	
Total Current Liabilities		\$ <u>35,483.59</u>

B. Capital Liabilities

Paid in Capital		<u>\$1,950,377.90</u>
Total Liabilities		<u><u>\$1,985,861.40</u></u>

APPENDIX 3

JA-ELA PROTOCOL UPDATE

SPECIAL SUPPLEMENT

PERIOD: January 15, 1982 - May 31, 1982

NOTE: Includes information on 100% indigenous - 22 hr/day operation

March 3 - April 24, 1982

P R O T O C O L

January 15, 1982 - May 31, 1982

Special Supplement: March 3 - April 24, 1982 for
100% Indigenous - 22 hr/day production

NOTES:

Vitamin/Mineral addition began during this period. Figures given in the following section for vitamin/minerals are averaged over total period. When ICSM was added in some instances vitamins and minerals were not. Statistics for time when vitamins and minerals were added to the blend show that the levels were those required in the PL480 specifications.

- 1.0-1.2 Same as original Protocol, See page 1.
- 2.0-2.6.2 Same as original Protocol, See pages 2-3.
- 2.7-3.0.1 Same as original Protocol, See pages 14-16.
- 4.0-4.1.1 Same as original Protocol, See pages 17-18.

5.0 Plant Capacity Experience

5.1 Rated Capacities: Normal January 1 - March 2, April 24 - June 1

Cleaning (day shift only)	15,000 kg/hr
Dehulling	1,000 kg/hr
Cooking Corn-Soy-Blend	900 kg/hr
Blending & packing finished product	3,000 kg/hr

5.2 Finished Product Performance:

kg per hour Scheduled	% of Rated Capacity	kg per hour Operated	% of Rated Capacity
2,400	80%	2,723	91%

5.3 Plant Reliability

	Hours	%
Time Schedule	1,327	100
Actual Time Operated	1,170	88
Time Lost	157	1

5.4 Time Loss Breakdown

	Hours	%
Total Time Lost	157	100
Time lost due to:		
Mechanical problems	119	76
Power Failures	33	21
Plant logistical problems	5	3

5.2.1 Rated Capacities: March 3 - April 24, 1982 (Indigenous)

Cleaning (day shift only)	15,000 kg/hr
Dehulling	1,000 kg/hr
Cooking Corn-Soy-Blend	900 kg/hr
Blending & packing finished product	900 kg/hr

5.2.2. Finished Product Performance: March 3 - April 24, 1982

kg per hour Scheduled	% of Rated Capacity	kg per hour Operated	% of Rated Capacity
737.26	81.9%	854.31	94.9%

5.2.3. Plant Reliability

Time Schedule
Actual Time Operated
Time Lost

Hours	%
823	100
710	86.3
113	13.7

5.2.4. Time Loss Breakdown

Total Time Lost
Time lost due to:
Mechanical problems
Power Failures
Plant logistical problems

Hours	%
113	100
74	65.5
27	23.9
12	10.6

6.0 Yield Data

6.1 Yield Material Balance per Metric Ton of Thripasha

	Finished kg	Offal kg	Loss kg	Purchased Raw Materials kg
Maize	201	3.17		207.95
Soybean	197	3.79	2.76	103.55
Vitamins ¹	0.31	0	0	0.31
Minerals ¹	4.575	0	0	4.575
ICSM	695	1.4	0	696.4
	<u>1000.00</u>	<u>8.36</u>	<u>6.54</u>	<u>1012.79</u>
Yield	98.7%	0.8%	0.6%	100%

¹Vitamin/Mineral additions only - ICSM contains vitamins and minerals also.

6.2 Yield Material Balance per metric ton of C.S.B.

	CSB kg	Offal kg	Loss kg	Purchased Raw Materials kg
Maize	660	10.4	13.4	683.8
Soybean	320	11.8	9.1	340.9
Vitamins	1	0	0	1.0
Minerals	15	0	0	15.0
	<u>1000.00</u>	<u>22.2</u>	<u>22.5</u>	<u>1044.7</u>
Yield	95.7	2.1%	2.2%	100

6.3 Yield Packing Materials per metric ton of finished product

	Units Per MT	% Loss	Units Lost	Total Units Usage
Polybags	1334	2.4	32	1366
Master bags	44.5	0.5	0.2	44.7
454g poly- bags	2203	1.6	35	2238
Boxes	2203	0	0	2203
Cartons	46	0	0	46
Insert Leaflets	2203	0	0	2203

7.0 Unit Costs and Expenses

7.1 Material Cost Prices, Delivered Plant - Average January 15 - June 1, 1982

Maize	Rs. 3,294.62/MT	\$ 159.55/MT
Soybeans	Rs. 8,590.85/MT	\$ 416.02/MT
Vitamins	Rs. 298.60/kg	\$ 14.46/kg
Minerals	Rs. 30.56/kg	\$ 1.48/kg
ICSM	Rs. 8,249.70/MT	\$ 430.12/MT
750 g Polybag	Rs. 285.70/1000	\$ 14.90/1000
Master bags	Rs. 3,050.00/1000	\$ 159.02/1000
454 g Polybag	Rs. 76.60/1000	\$ 3.99/1000
454 g Boxes	Rs. 820.00/1000	\$ 42.75/1000
Cartons	Rs. 8,600.00/1000	\$ 448.38/1000
Leaflets	Rs. 250.00/1000	\$ 13.03/1000
Gum tape	Rs. 33.25/100m	\$ 1.73/100m
Glue	Rs. 247.50/45g1.	\$ 12.90/45g1.
Offal	Rs. 2,250.00/MT	\$ 117.30/MT
Empty Containers	Rs. 726.14/1000	\$ 35.16/1000

Average Exchange Rate: Rs. 20.65 = US \$100

7.2 Total Operating Expenses - Institutional Product

Quantity Produced:	161,438 masters (30 x 750g)
Operating Expenses:	\$141,786.38
Cost per master bag:	\$ 0.878
Cost per kilogram:	\$ 0.039
Cost per pound:	\$ 0.018

7.3 Total Operating Expenses - Commercial Product

Quantity Produced	2,767 cartons (48 x 454 g)
Operating Expenses	\$ 2,305.49
Cost per master bag	\$ 0.833
Cost per kilogram	\$ 0.038
Cost per pound	\$ 0.017

8.0 Unit Costs and Price Calculations -- Goods Sold

8.1 Thripasha Institutional Product

8.1.1 Thripasha distributed MCH Centers -- One master bag

Raw Material Cost

Maize	4.68 kg @ \$0.15955/kg	\$0.75
Soyabeans	2.33 kg @ \$0.41602/kg	0.97
ICSM	15.7 kg @ \$0.43012/kg	6.75
Vitamins	0.69 kg @ \$14.46/kg	1.00
Minerals	1.3 kg @ \$ 1.48/kg	<u>1.92</u>

Gross Raw Material costs	11.39
Less Offal credit (0.18 @ \$.1173/kg)	<u>.02</u>

Net Material costs \$11.37

Packaging Cost

30.7 Poly bags @ \$14.90/1000	\$0.46
1,005 Master bags @ \$159.02/1000	<u>0.16</u>

Total Packaging \$0.62

Net cost with packaging \$11.99

Operating Cost

Operating expenses \$0.88

Net cost with expenses \$12.87

Process Cost

Amount paid processing (profit) \$0.11

Net value of Thripasha master bag \$12.98

8.1.2 Thripasha Unit Value -- Institutional Product

Value per 750 gram packet	\$10.433
Value per kilogram	\$ 0.577
Value per pound	\$ 0.262
Value per master bag	\$12.98

8.2 Commercial Thriposha

8.2.1 Thriposha distributed commercial -- One carton (48 x 454g)

Raw Material Cost

Maize	4.53 kg @ \$ 0.15955/kg	\$0.72	
Soyabeans	2.26 kg @ \$ 0.41602/kg	0.94	
ICSM	15.19 kg @ \$ 0.43012/kg	6.53	
Vitamins	0.067 kg @ \$14.46/kg	0.97	
Minerals	1.26 kg @ \$ 1.48/kg	<u>1.86</u>	
	Gross Raw Material cost	\$11.02	
	Less Offal credit (0.17 kg @ \$.1173/kg)	<u>.02</u>	
	Net Material costs		\$11.00

Packaging Cost

48.8 Polybags @ \$3.99/1000	\$0.20		
48.0 Boxes @ \$42.75/1000	2.05		
1.0 Carton @ 448.38/1000	0.45		
48.0 Insert Leaflet @ \$13.33/1000	<u>0.63</u>		
	Net cost with packaging		\$14.33

Operating Cost

Operating expenses (labor, utilities, etc.)	<u>\$0.83</u>	
Net cost with operating		\$15.16

Process Cost

Amount paid for processing	<u>\$0.107</u>	
Net value of commercial Thriposha carton		\$15.27

8.2.2 Commercial Thriposha Unit Values (Wholesale)

Value per box	\$0.318
Value per kilogram	\$0.701
Value per pound	\$0.319

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9.0 Operating Statement -- January 15, 1981 to June 1, 1982

9.1 INCOME: Sales	Value (\$ US)	Percent of Gross Value
161,438 Master bags Thripasha @ \$12.98/master bag	\$2,095,465.20	99.6
29.1 Metric tons Offal @ \$117.30/MT	3,413.43	0.2
153,488 Empty containers @ \$ 35.16/1000	<u>5,396.64</u>	<u>0.2</u>
Gross value Thripasha	<u><u>\$2,104,275.27</u></u>	

9.1.2 Cost and Expense

Material Cost

755.3 MT Maize @ \$159.55/MT	\$ 120,508.11	5.7
376.1 MT Soybean @ \$416.02/MT	156,465.12	7.4
11.3 MT Vitamins @ \$ 13.78/kg	155,714.00	7.4
166.1 MT Minerals @ 0.87626/kg	145,546.78	6.9
2251.5 MT ICSM @ \$430.12/MT	968,415.18	46.0
1622.45 MT Master bags @ \$159.02/1000	25,800.20	1.2
4959375 Polybags @ \$ 14.90/1000	<u>73,894.69</u>	<u>3.5</u>
Material cost	\$1,646,343.90	78.1

Expenses:

Wages & Salaries	26,573.90	1.3
Employee Benefit	6,500.30	0.3
Insurance	8,222.30	0.4
Depreciation	19,748.75	0.9
Electricity	24,460.27	1.2
Telephone	214.51	0.1
Maintenance Materials & Services	2,136.26	0.1
Operating supplies	15,709.56	0.8
Transportation & Expense	9,820.32	0.5
Security	4,636.61	0.2
Printing and Other Expenses	12,876.62	0.6
Equipment and spares	<u>10,886.98</u>	<u>0.5</u>
Total Expense	\$ 141,786.38	6.9
Net Margin after expenses	<u>316,144.89</u>	<u>15.0</u>
Total costs and expenses	<u><u>\$2,104,275.27</u></u>	100.0

9.2 Comercial Thriposha

9.2.1 Income

	Value (\$ US)	Percent of Gross Value
2,767 cartons Thriposha @ \$ 15.27	\$ 42,252.09	99.7
0.48 metric tons Offal @ \$117.30/MT	56.30	0.1
2,496 empty cortainers @ \$ 35.16/1000	<u>87.76</u>	<u>0.2</u>
Gross Value Thriposha	\$ <u><u>42,396.15</u></u>	

9.2.2 Cost and Expense

<u>Material Cost</u>	Value (\$ US)	Percent of Gross Value
12.5 MT Maize @ \$159.55/MT	\$ 1,994.38	4.7
6.2 MT Soybean @ 416.02/MT	2,579.32	6.1
.18 MT Vitamins @ 13.78/kg	2,480.40	5.9
2.76 MT Minerals @ 0.87626/kg	2,418.48	5.7
36.6 MT ICSM @ 430.12/MT	15,742.39	37.1
134,941 Polybags @ 3.99/1000	538.42	1.3
132,816 Boxes @ 42.75/1000	5,677.88	13.4
2,767 cartons @ 448.38/1000	1,240.67	2.9
132,816 leaflets @ 13.03/1000	<u>1,730.59</u>	<u>4.1</u>
Total Material Costs	\$ 32,845.14	77.5
<u>Expenses</u>		
Wages & Salaries	\$ 432.00	1.0
Employee benefits	105.70	.3
Insurance	133.70	.3
Depreciation	321.12	.8
Electric Power	397.73	.9
Telephone	3.49	
Maintenance Materials & Service	34.74	.1
Operating supplies	255.44	.6
Transportation & Expenses	159.68	.4
Security	75.39	.2
Printing & Other Expenses	209.38	.5
Equipment and Spares	<u>177.02</u>	<u>.4</u>
Total Expenses	\$ 2,305.49	5.4
Net Margin after Expenses	\$ <u>7,245.52</u>	<u>17.1</u>
Total Costs and Expenses	\$ <u><u>42,396.15</u></u>	100.0

APPENDIX 4

SUPPLEMENTAL INFORMATION SUMMARY
ON SPARE PARTS USAGE

PERIOD: February 2, 1980 - June 7, 1982

JA-ELA SPARE PARTS USAGES AND COSTS

February 2, 1980 - June 7, 1982

Production Over Period: 20768.549 MT
CSB Production: 6230.6 MT
Hours Worked: 8297

SUMMARY OF SPARES AND COSTS BY PLANT AREA

PLANT AREA	COST/MT THRIPOSHA	COST/MT CSB	COST/HR
Cleaning	\$0.004	\$0.013	\$0.010
Dehulling	0.015	0.051	0.038
Processing	0.922	3.073	2.308
Packaging	0.100	-	0.333
Total Plant	\$1.041	\$3.137	\$2.689

CLEANING

DESCRIPTION	Quantity Required	Hr/Part	Unit Cost	Total Cost
<u>SCALPER</u>				
1. Mounting	1	8297	4.00	4.00
2. V-belt 4L370	1	8297	4.00	4.00
3. Rubber mounting	3	2766	3.84	11.52
4. 8440 bolt	2	4149	1.16	<u>2.32</u>
TOTAL SCALPER				\$ 21.84
<u>DESTONER</u>				
1. 4L370 V-belt	1	8297	4.00	<u>4.00</u>
TOTAL DESTONER				\$ 4.00
<u>BUCKET ELEVATOR</u>				
1. V-belt A47	4	2074	4.50	18.00
2. V-belt A48	6	1383	4.50	27.00
3. Bucket	4	2074	1.60	6.40
4. Bolts	3	2766	.50	1.50
5. Cushion	2	4149	1.00	<u>2.00</u>
TOTAL ELEVATOR				\$ 54.90
TOTAL CLEANING				\$ 80.74
COST/MT THRIPOSHA				\$ 0.004
COST 1 MT CSB				\$ 0.013
COST 1 HR				\$ 0.010

DEHULLING

DESCRIPTION	Quantity Required	Hr/Part	Unit Cost	Total Cost
<u>GRAVITY TABLE</u>				
1. Chain link	3	2766	0.13	0.39
2. B56 Belt	2	4149	6.00	<u>12.00</u>
TOTAL GRAVITY TABLE				\$ 12.39
<u>SCOURER/ASPIRATOR</u>				
1. Belts	15		5.50	82.50
2. Upper bearing	1	8297	10.00	10.00
3. Screw conveyor bearing	1	8297	10.00	10.00
4. Rotar pins	25	332	81.00	81.00
5. 10A20 Bearing	2	4149	12.00	<u>24.00</u>
TOTAL SCOURER ASPIRATOR				\$207.50
<u>BUCKET ELEVATOR</u>				
1. Belts B45	2	4149	6.00	12.00
2. Buckets	2	4149	1.60	3.20
3. Bolts	2	4149	0.50	<u>1.00</u>
TOTAL BUCKET ELEVATOR				\$ 16.20
<u>ERIEZ SCALPER</u>				
1. Bearings	4	2074	15.00	60.00
2. Springs	18	461	1.06	<u>19.08</u>
TOTAL ERIEZ SCALPER				\$ 79.08
TOTAL DEHULLING				\$315.17
COST/MT THRIPOSHA				\$ 0.015
COST/MT CS3				\$ 0.051
COST/HR				\$ 0.038

PROCESSING

PART DESCRIPTION	QUANTITY REQUIRED	HR/PART	BRADY HRS PART	UNIT COST	TOTAL COST
<u>BRADY EXTRUDER</u>					
1. 1 3/4 NWT	1	8297	16594	40.90	40.90
2. PTO yolk	2	4149	8297	59.65	119.30
3. Cone Collar Weldment	5	1659	3318	119.55	597.75
4. Cone bolt	106	78	156	0.47	49.82
5. 1/2 lock washer	79	105	210	0.04	3.16
6. Cone	64	130	260	62.95	4,028.80
7. Cup	28	296	592	16.55	463.40
8. Rotor weldment	8	1037	2074	747.85	5,982.80
9. Bearing housing Assembly	4	2074	4184	375.45	1,501.80
10. Cup retainer bolt	120	69	138	0.21	25.20
11. Cylinder rib	57	146	292	10.60	604.20
12. Plow bolts	109	76	152	0.21	22.89
13. Sprocket	1	8297	16594	29.95	29.95
14. Brake assembly	23	361	722	43.90	1,009.70
15. Brake adjustment rod	3	2766	5532	8.20	24.60
16. Center parts kit	3	2766	5532	50.25	150.75
17. Woodruff key	1	8297	16594	1.60	1.60
18. 3/8 hex nut	91	91	182	0.07	6.37
19. 3/8 lock washer	130	64	128	0.04	5.20
20. Flinger	4	2074	4148	2.65	10.60
TOTAL BRADY COST					\$14,678.79
COST/MT THRIPOSHA					\$ 0.707
COST/MT CSB					\$ 2.356
COST/BRADY HR					\$ 0.879
COST/OPERATING HR					\$ 1.769

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PROCESSING

<u>PART DESCRIPTION</u>	<u>QUANTITY REQUIRED</u>	<u>HR/PART</u>	<u>UNIT COST</u>	<u>TOTAL COST</u>
<u>MODERN MILL</u>				
1. Drive belts (Assortment)	37		3.53	130.60
2. Mill shaft blowing	5	1659	18.00	90.00
3. Hammer sets	9	9222	15.10	135.90
4. Screen	7	1185	18.00	126.00
5. Shoulder pin	10	830	0.25	2.50
6. Spacer	34	244	0.10	3.40
7. Hinge pins	12	691	0.70	8.40
8. Bearing 10A9	2	4149	18.00	36.00
9. Beater hub weldment	1	8297	25.60	25.60
10. Cover plate assembly	2	4149	2.55	5.10
11. 5/8 bearing	2	4149	6.90	13.80
12. Bearing 7A22	2	4149	11.20	22.40
13. Flange bearing	4	2071	6.90	27.60
14. Shear pin	15	553	0.01	0.15
15. Bearing 10A20	1	8297	18.00	<u>18.00</u>
TOTAL MODERN MILL				\$645.45
COST 1 MT THIRPOSHA				\$ 0.031
COST 1 MT CSB				\$ 0.104
COST 1 HR				\$ 0.078
<u>COOLER</u>				
1. Drive belt	1	8297	30.00	<u>30.00</u>
TOTAL COOLER				\$ 30.00
<u>SWECO SEPARATOR</u>				
1. Screen	4	2074	134.00	536.00
2. Bearing	1	8297	7.50	<u>7.50</u>
TOTAL SWECO				\$543.50
<u>MIKROPUL</u>				
1. Hammer set	3	2766	700.00	2,100.00
2. Screen	22	377	35.00	770.00
3. Dust seal	2	4149	25.00	<u>50.00</u>
TOTAL MIKROPUL				\$2,920.00

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PROCESSING

<u>PART DESCRIPTION</u>	<u>QUANTITY REQUIRED</u>	<u>HR/PART</u>	<u>UNIT COST</u>	<u>TOTAL COST</u>
<u>BAGHOUSE</u>				
1. Set bags	1	8297	144.00	144.00
2. Blower belts	4	2074	6.50	26.00
3. Rotary valve bearing	2	4149	2.70	5.40
4. Delrin blades	8	1037	5.75	<u>46.00</u>
TOTAL BAGHOUSE				\$ 221.40
<u>INFESTROYER</u>				
1. Belts	19	437	4.00	76.00
2. Bearing 6205	3	2766	10.00	<u>30.00</u>
TOTAL INFESTROYER				\$ 106.00
TOTAL PROCESSING				\$19,145.14
COST/MT THRIPOSHA				\$ 0.922
COST/MT CSB				\$ 3.073
COST/HR				\$ 2.308

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PACKAGING

<u>PART DESCRIPTION</u>	<u>QUANTITY REQUIRED</u>	<u>HR/PART</u>	<u>UNIT COST</u>	<u>TOTAL COST</u>
<u>HEAT SEALER</u>				
1. Heater Element	3	2766	8.25	24.75
2. Upper teflon	172	48	2.75	473.00
3. Lower teflon	144	58	7.25	1,044.00
4. Compression rubber	60	138	4.25	255.00
5. Cam	25	332	8.00	<u>200.00</u>
TOTAL HEAT SEALER				\$1,996.75
<u>BAGSTITCHER</u>				
1. Loop retainer	11	754	3.20	35.20
2. Screw 87A	2	4149	0.80	1.60
3. Lock nut 41071G	1	8297	0.50	.50
4. Looper 2108A	3	2766	14.35	<u>43.05</u>
TOTAL STITCHER				\$ 80.35
TOTAL PACKAGING				\$2,077.10
COST/MT THRIPOSHA				\$ 0.100
COST/HR				\$ 0.333