

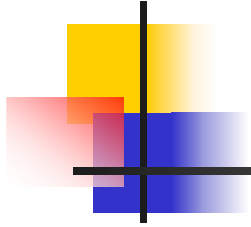
Dynamic Simulation of Grain Storage Facilities

Part # 2

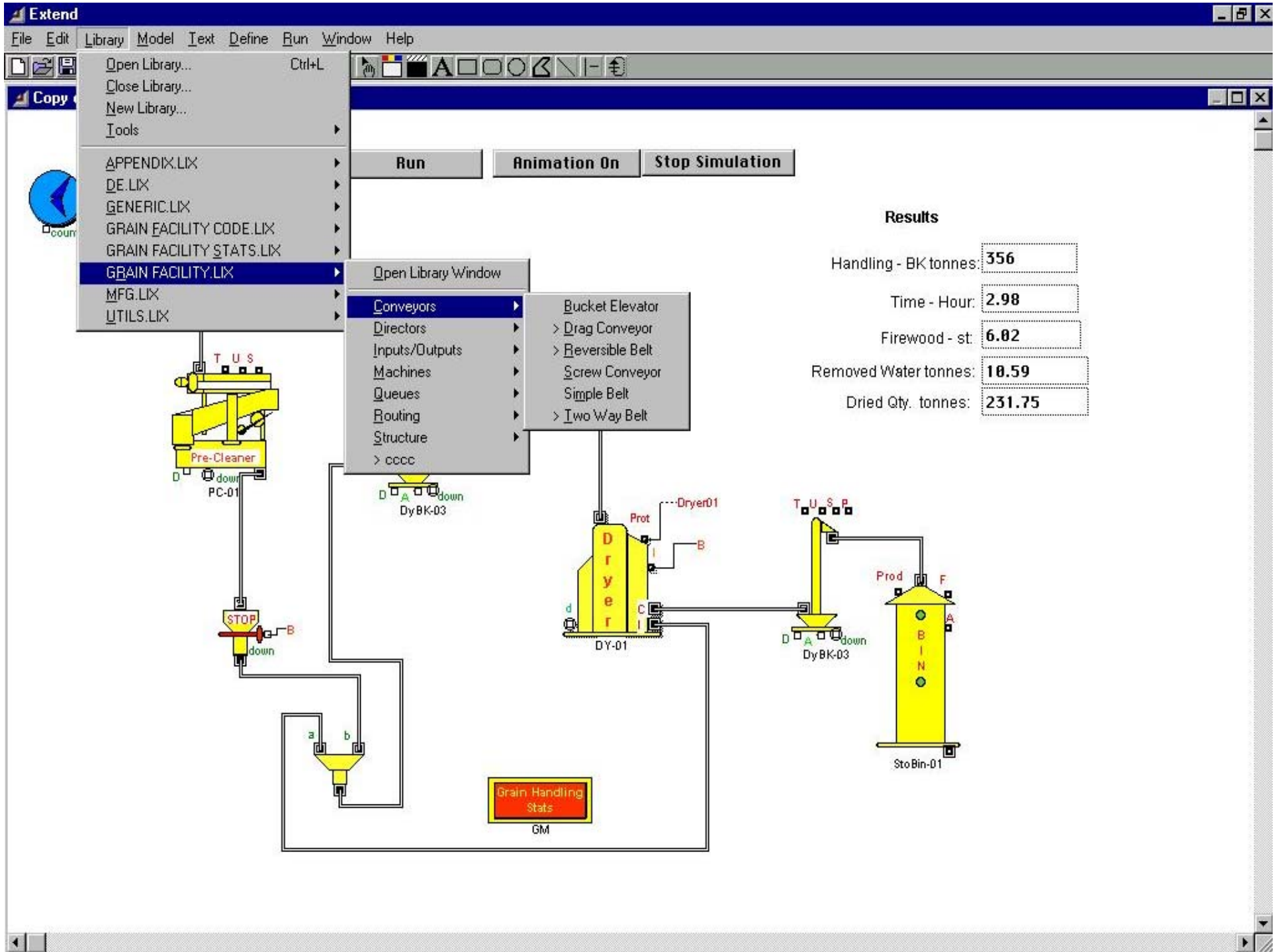
Grain Facility Library Application

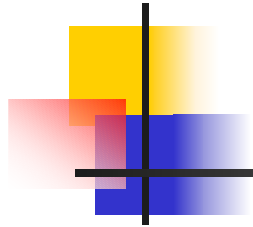
By

Dr. Luís César da Silva



Modeling a Small Grain Facility





Modeling a Commercial Grain Facility



Type of Information Required

- Flowcharts of grain storage facilities;
- Daily quantities of received products;
- Monthly quantities of dispatched products;
- Technical information about processing machines, conveyors and structures;
- Monthly electric energy consumption; and
- Firewood consumption.

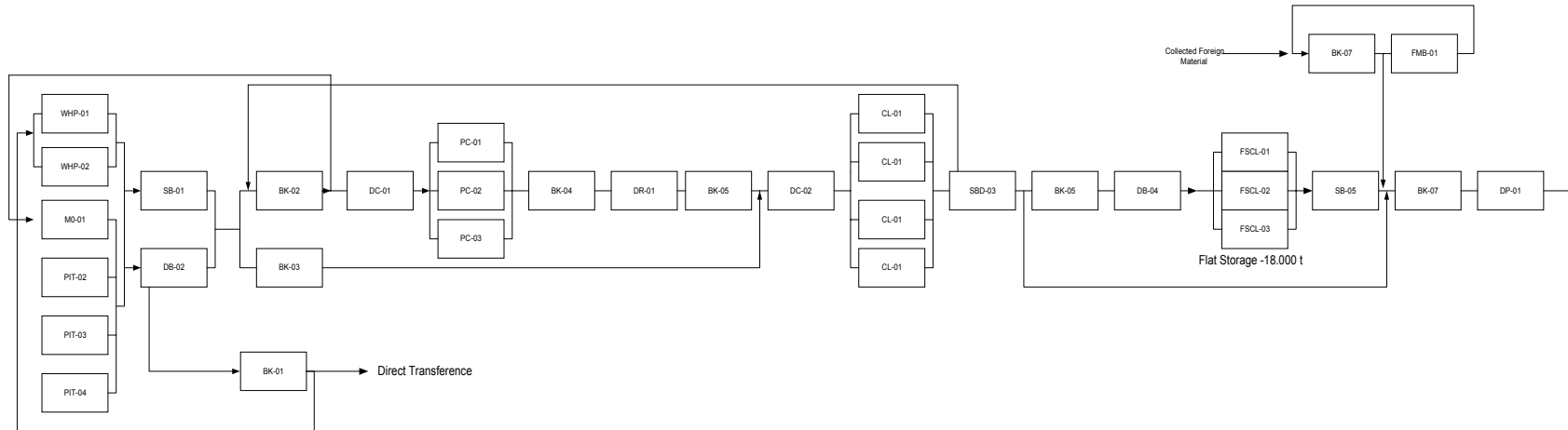
Example: Modeling of Grain Facility A

(Technical Information)

Structure	Quantity	Static capacity (t)
Receiving Pit	4	300
Wet Holding Bin	2	300
Flat Storage		
Cell-01	2	5,000
Cell-02	1	8,000
Cell-03		5,000
Processing machines	Quantity	Hourly capacity (t/h)
Pre-Cleaner	3	40
Dryer	1	80
Cleaner	4	30
Conveyors	Quantity	Hourly capacity (t/h)
Belt	4	120
Two way belt	1	120
Bucket elevator	7	120
Drag conveyor	2	120

Example: Modeling of Grain Facility A

(Flowchart)

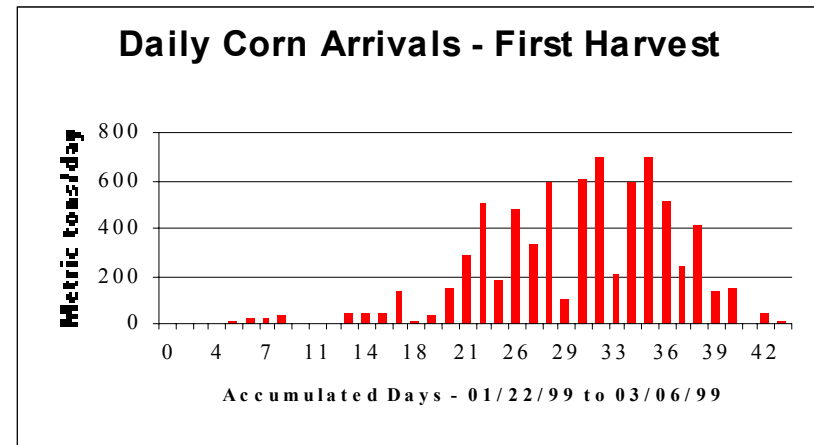
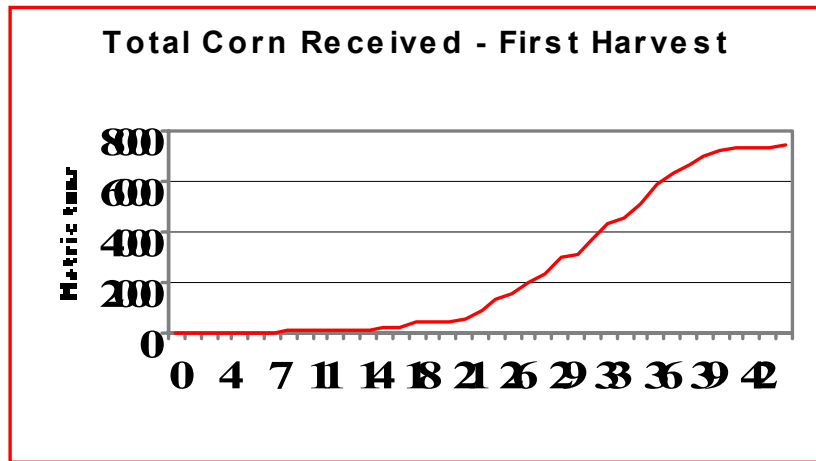


Harvest Data – Facility A

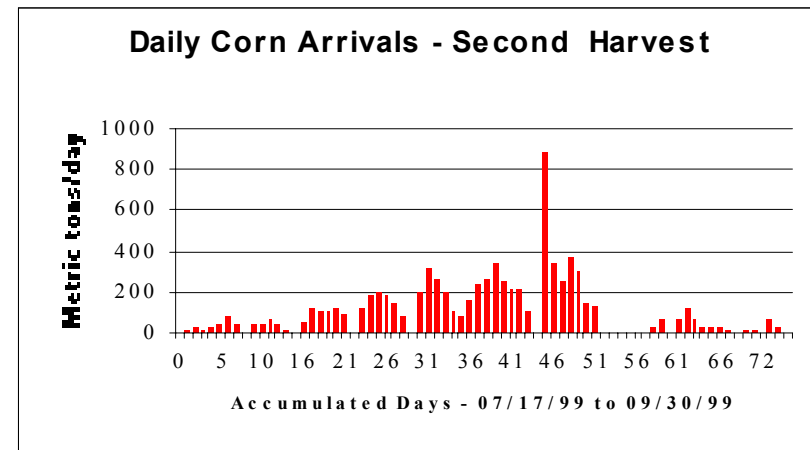
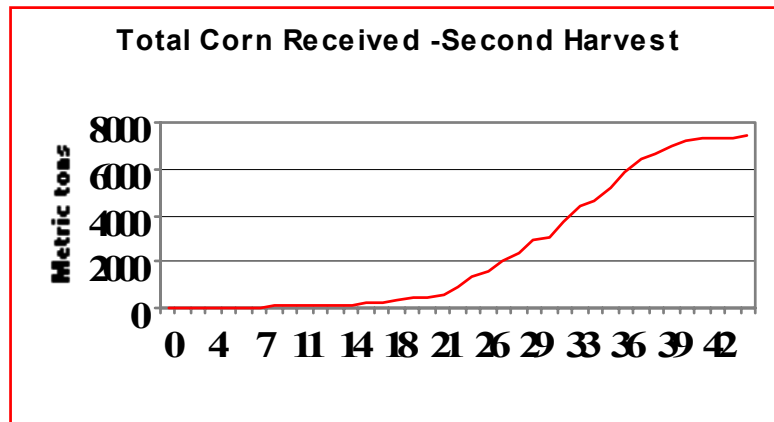
Total Quantities

Corn – Summer

Daily Quantities



Corn - Winter

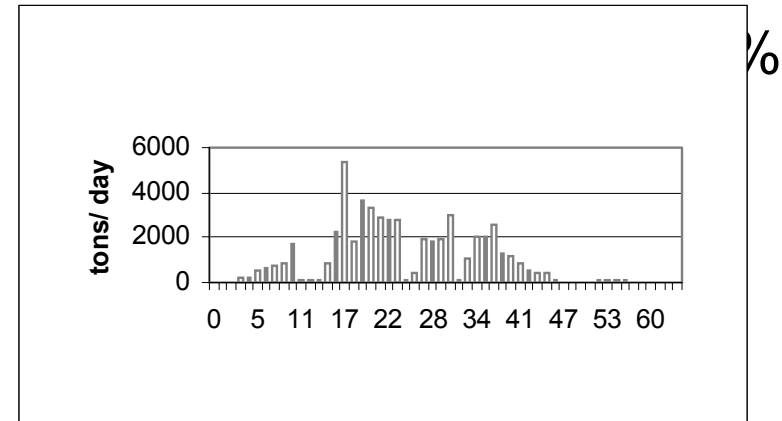
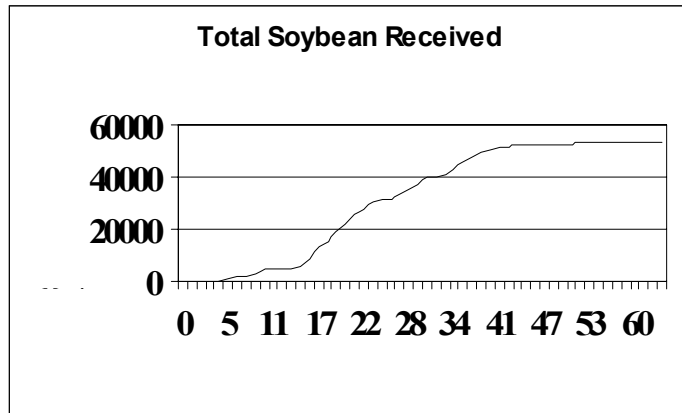


Harvest Data – Facility A

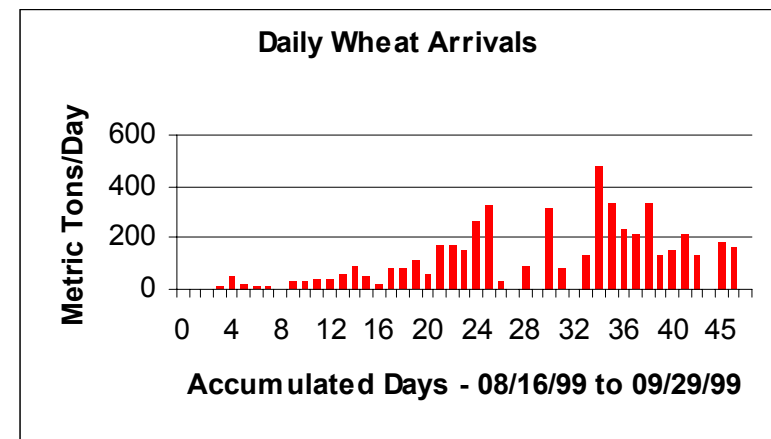
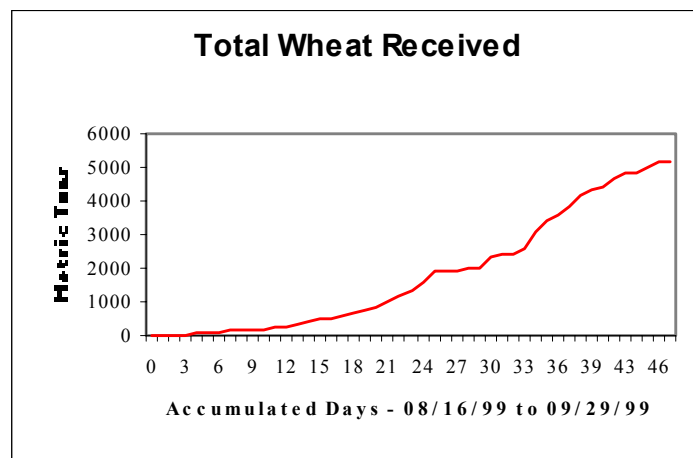
Total Quantities

Soybean

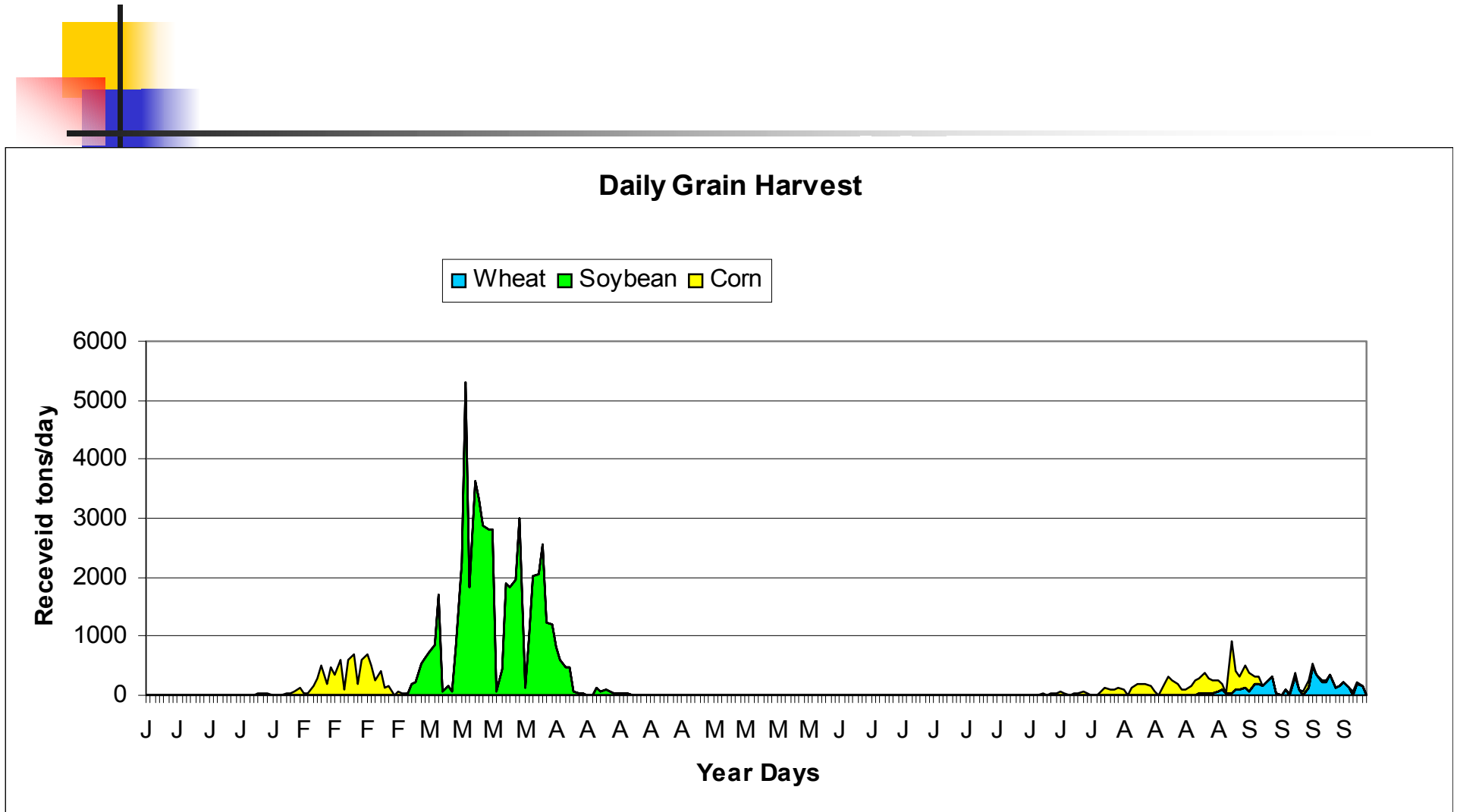
Daily Quantities



Wheat



Annual Harvest Seasons



Example: Modeling of Grain Facility A

(Harvest and Electric Energy Consumption)

- **Total Quantities of Received Products**

- Corn-Summer: 43 days - 7,376 tonnes
- Soybean: 63 days – 53 -179 tonnes
- Corn-Winter: 75 days - 7,804 tonnes
- Wheat: 44 days - 5,118 tonnes

- **Electric Energy Consumption**

- Total - On- Peak = 19,539 kWh Off-Peak 297,918 kWh
- R\$ 35,796.00 – US\$ 21,056.47

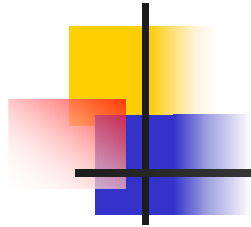
- **Firewood Consumption**

- 1,890 m³ – R\$ 26, 460.00 - US\$ 15,564.70

Example: Modeling of Grain Facility A

(Annual Dispatch Plan)

Month	Stock portions to be dispatched (%)		
	Corn	Soybean	Wheat
1	0	0	0
2	20.35	0	0
3	29.82	47.18	0
4	0.15	14.52	0
5	0	20.58	0
6	0	0.67	0
7	0	6.52	0
8	20.45	7.81	0
9	0.55	0.54	69.96
10	0.55	0	0
11	7.03	1.32	0
12	21.10	0.86	30.04



Model of Grain Facility A



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 Prof. Carlos Arthur B. da Silva, Ph. D., UFV

Dynamic Simulation of Grain Storage Facility

This model was developed by Luis Cesar as a part of his Ph. D. thesis.

Give a Double Click Here and See the Whole Model - Grain Storage Facility - A

*20 types of
reporters*

Current Time

Check List

Commands

Run Simulation

Stop Simulation

Animation

About This Model

Close

Inputs

Arrival Data

Dispatch Data

Arrival Management

Dispatch Management

Economic Inputs

Outputs

Receiv. Grain Stats

Proc. Grain Stats

Stored Grain Stats

Disp. Grain Stats

Direct Transference

Transference Dryer

Transference - WHB

Arrival - Trucks

Dispatch - Trucks

Electric Energy Use

Fuel Use Stats

Water Removed Stats

Dried Grain Stats

Grain Handling Stats

Cleaner Stats

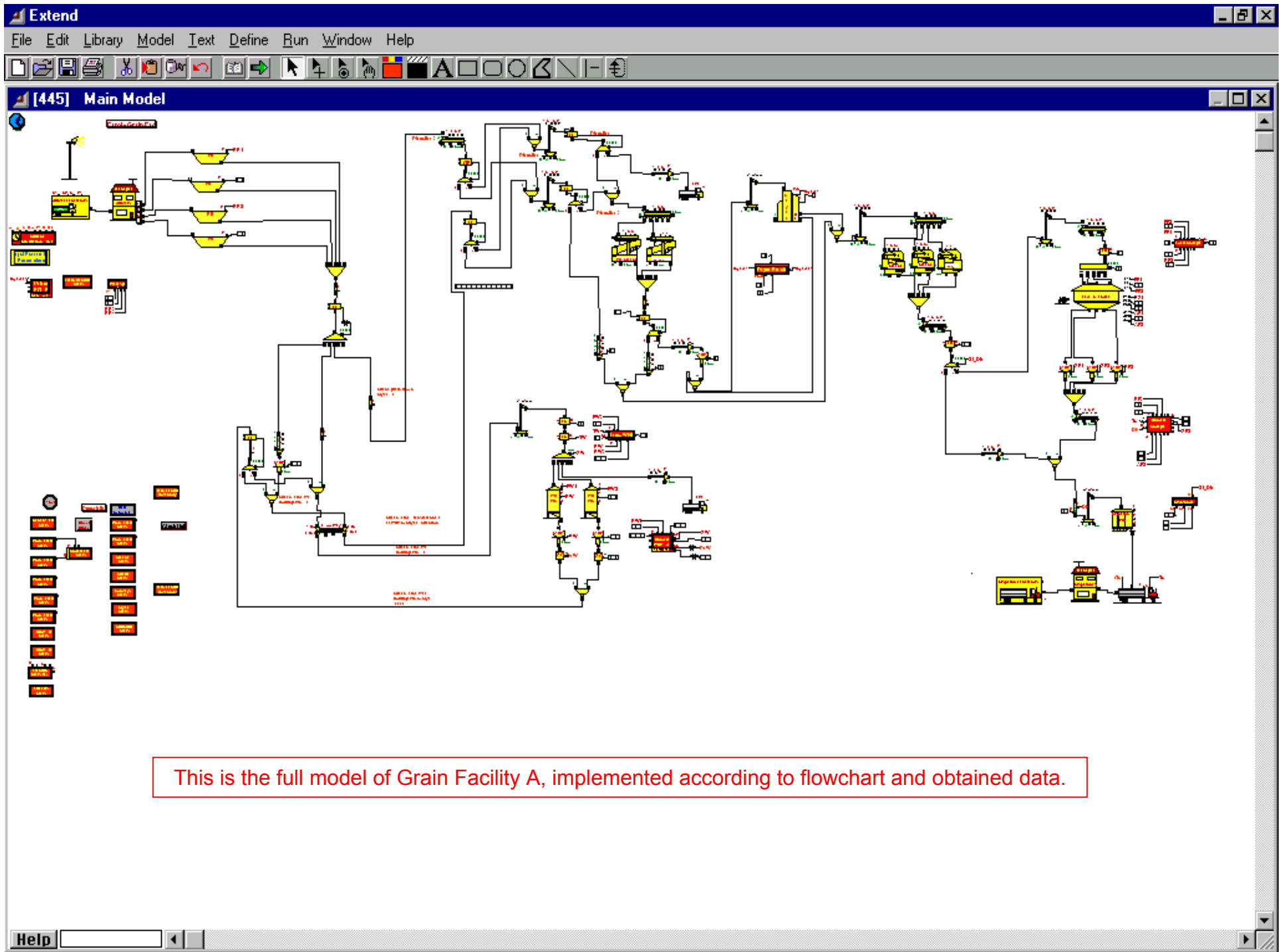
Queue Stats

Conveyor Stats

Dryer Stats

Structure Stats

Load Delivered



Model Reports

Received Grain Stats

[1751][328] Received Grain Stats

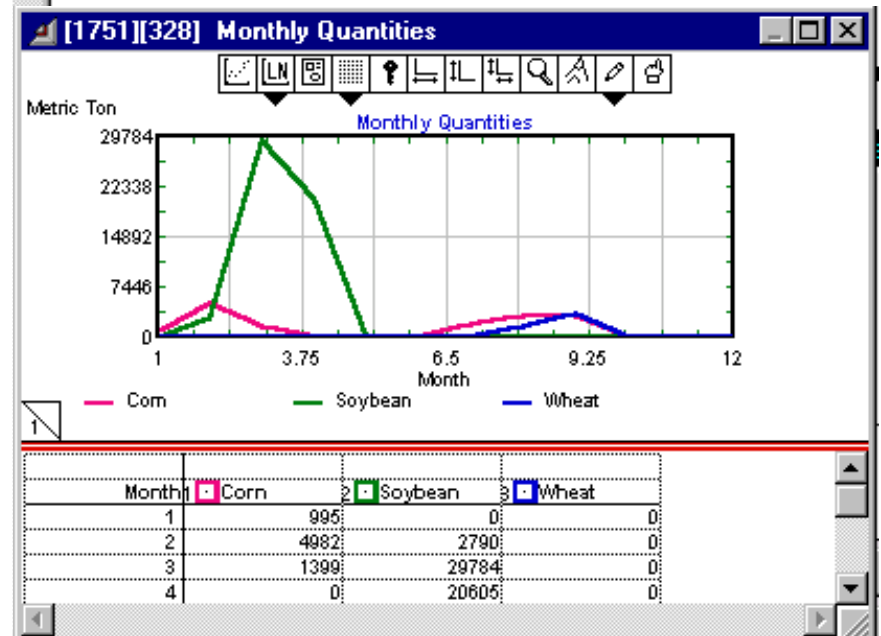
Item Stats | Grain Stats Acum. | Seek | Monthly Grain Stats

Received Grains [Update Now] [Cancel] [OK]

Month	Corn - t	Soybean -	Wheat - t	Total - t
0	1.00	995.00	0.00	995.00
1	2.00	4982.00	2790.00	7772.00
2	3.00	1399.00	29784.00	31183.00
3	4.00	0.00	20605.00	20605.00
4	5.00	0.00	0.00	0.00
5	6.00	0.00	0.00	0.00
6	7.00	1785.00	0.00	1785.00
7	8.00	3060.00	0.00	4671.00
8	9.00	2955.00	0.00	6462.00
9	10.00	0.00	0.00	0.00
10	11.00	0.00	0.00	0.00
11	12.00	0.00	0.00	0.00

[Plot]

Help | Received G



Model Reports

Stored Grain Stats

[1746][341] Stored Grain Stats

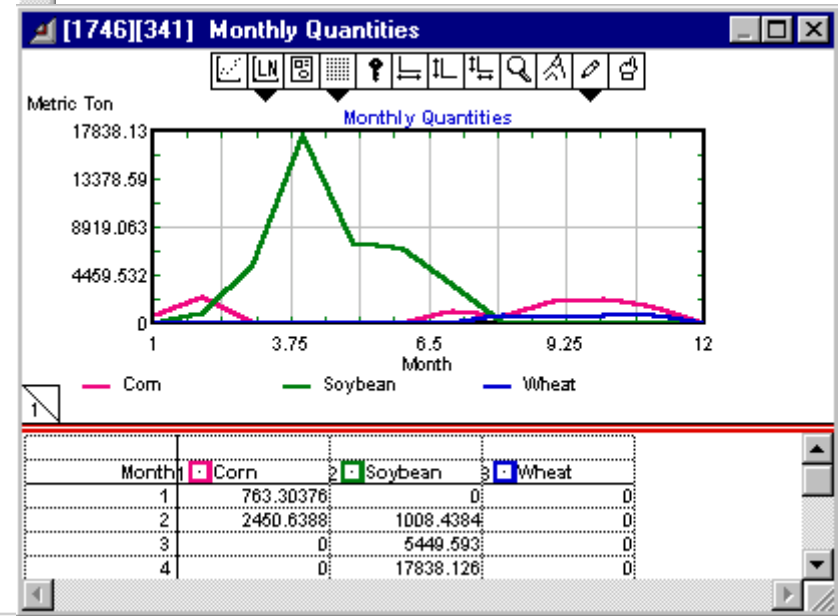
Processed Ac. (1) | Processed Ac. (2) | Dispatched Ac. | **Stored Stats**

Cancel OK

Month	Corn - mt	Soybean - mt	Wheat - m t	Total - mt	
0	1.00	763.30	0.00	0.00	763.30
1	2.00	2450.64	1008.44	0.00	3459.08
2	3.00	0.00	5449.59	0.00	5449.59
3	4.00	0.00	17838.13	0.00	17838.13
4	5.00	0.00	7486.93	0.00	7486.93
5	6.00	0.00	6800.42	0.00	6800.42
6	7.00	1123.75	3517.98	0.00	4641.73
7	8.00	585.23	0.00	751.82	1337.05
8	9.00	2127.72	0.00	628.11	2755.82
9	10.00	2321.64	0.00	655.15	2976.78
10	11.00	1404.90	0.00	655.15	2060.05
11	12.00	0.00	0.00	0.00	0.00

Plot

Help



Model Reports

Truck Traffic

Receiving Sector

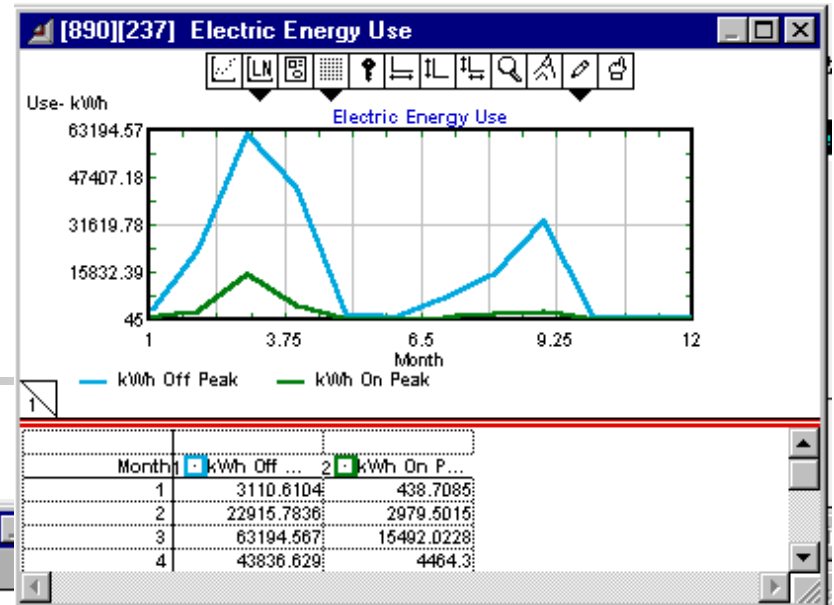
Month	Corn	Soybean	Wheat	Total
1	68	0	0	68
2	345	188	0	533
3	96	1999	0	2095
4	0	1387	0	1387
5	0	0	0	0
6	0	0	0	0
7	119	0	0	119
8	204	0	114	318
9	197	0	248	445
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0

Dispatch Sector

Month	Corn	Soybean	Wheat	Total
1	0	0	0	0
2	150	0	0	150
3	184	1020	0	1204
4	0	323	0	323
5	0	450	0	450
6	0	30	0	30
7	25	150	0	175
8	150	161	25	336
9	30	0	150	180
10	22	0	0	22
11	59	0	0	59
12	78	0	43	121

Model Reports

Electric Energy Consumption



[890][237] Monthly Electric Energy

Main Results | **Monthly Results** | Annual Results | Seek

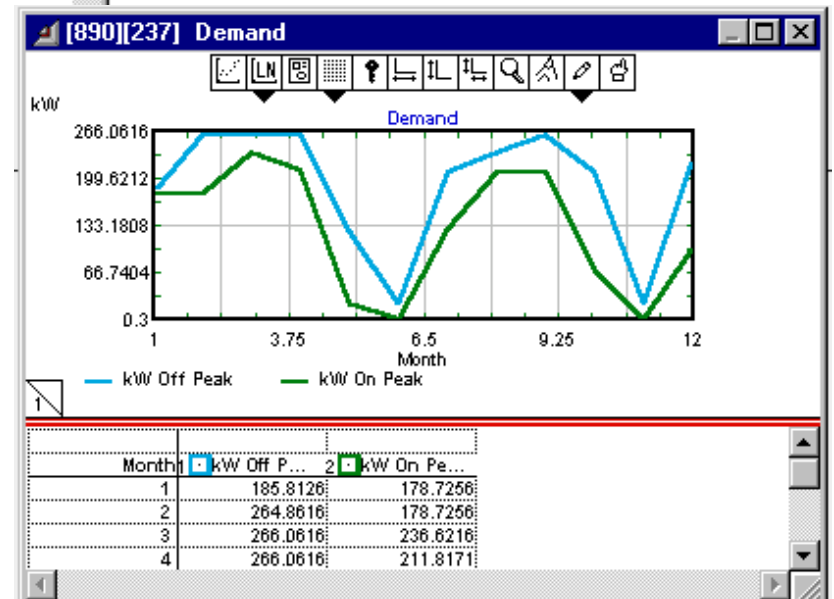
Records statistics on all electrical consumer blocks in the model.

Accumulated Totals per: Hour Day Month

Time	Off kWh	On kWh	Off kW	On kW	Cost R\$	
0	1.00:	3110.61	438.71	185.81	178.73	0.00
1	2.00:	22915.78	2979.50	264.86	178.73	0.00
2	3.00:	63194.57	15492.02	266.06	236.62	0.00
3	4.00:	43836.63	4464.30	266.06	211.82	0.00
4	5.00:	2101.10	175.26	123.71	21.56	0.00
5	6.00:	431.60	45.00	22.76	0.30	0.00
6	7.00:	7033.02	717.52	207.07	126.86	0.00
7	8.00:	15191.13	1935.16	235.42	207.07	0.00
8	9.00:	32994.82	2476.90	266.06	206.73	0.00
9	10.00:	1542.33	182.93	208.27	69.04	0.00
10	11.00:	532.80	45.00	22.76	0.30	0.00
11	12.00:	730.90	45.00	218.83	96.14	0.00

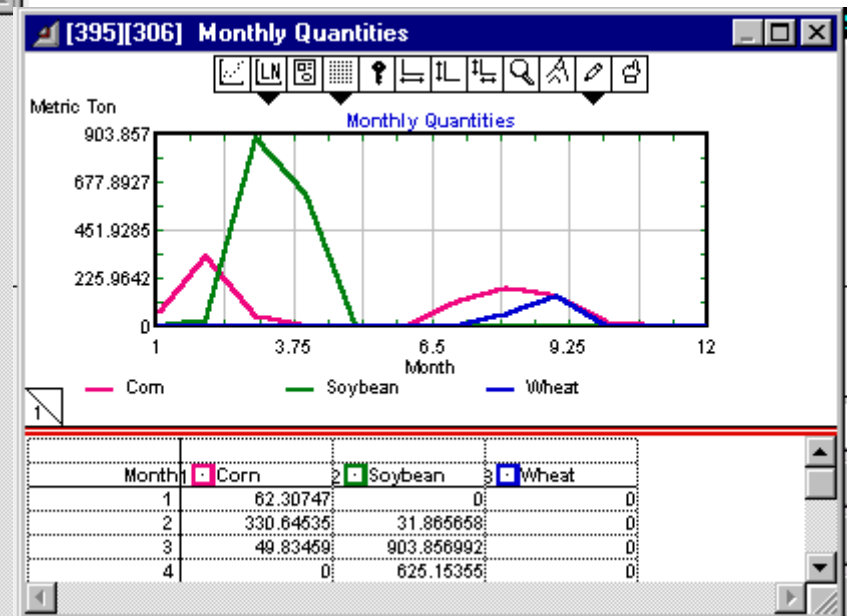
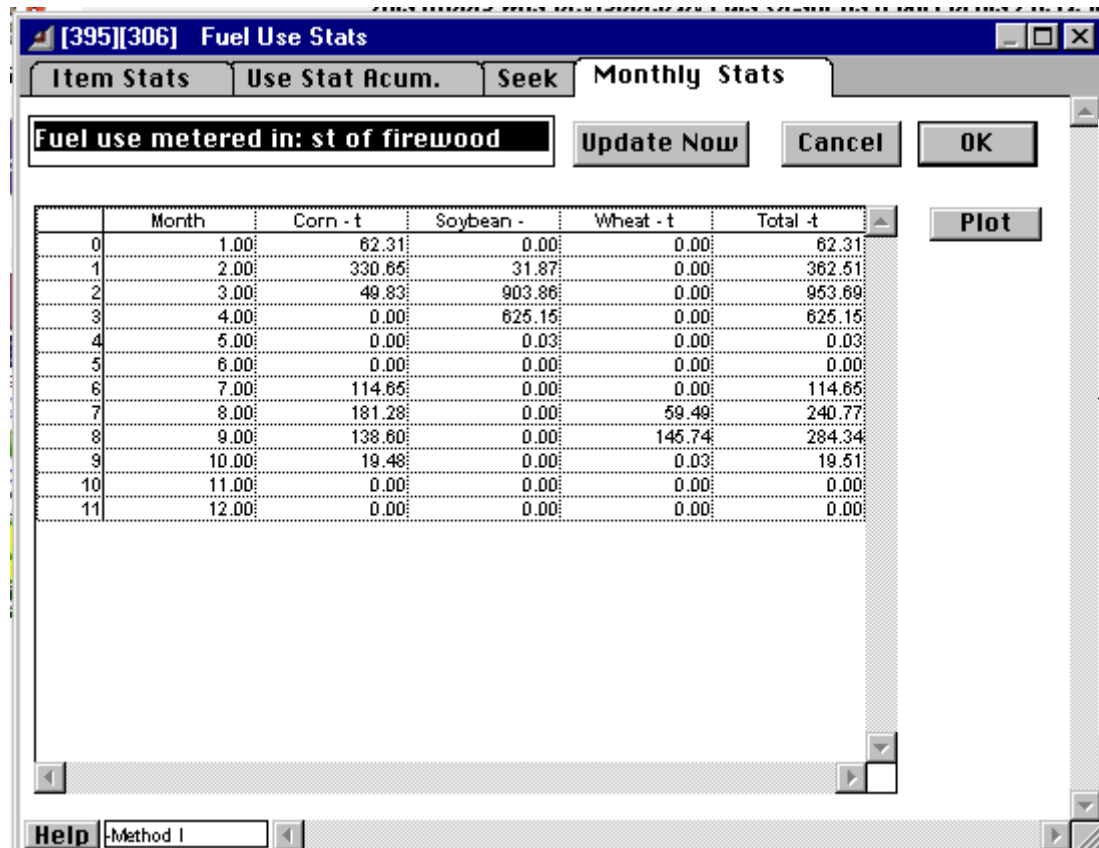
Plot Use - kWh | Plot Demand - kW

Help



Model Reports

Firewood Consumption – Warm drying air



End – Part # 2

Grain Facility Library Application

Please feel free to contact me:

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