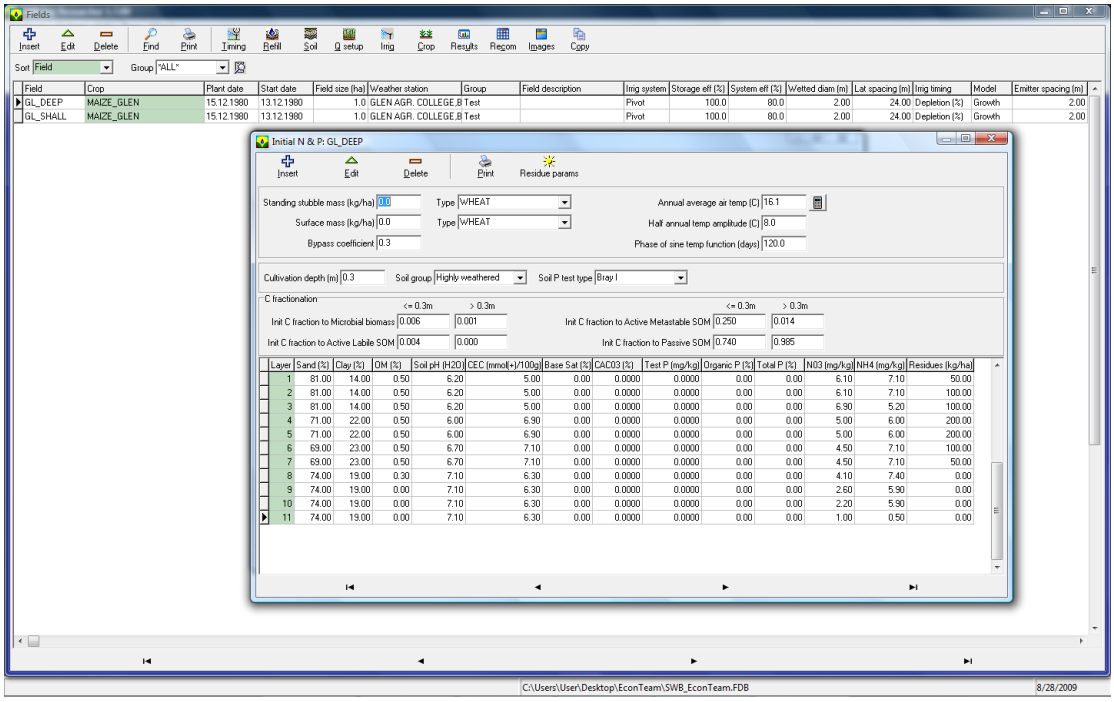
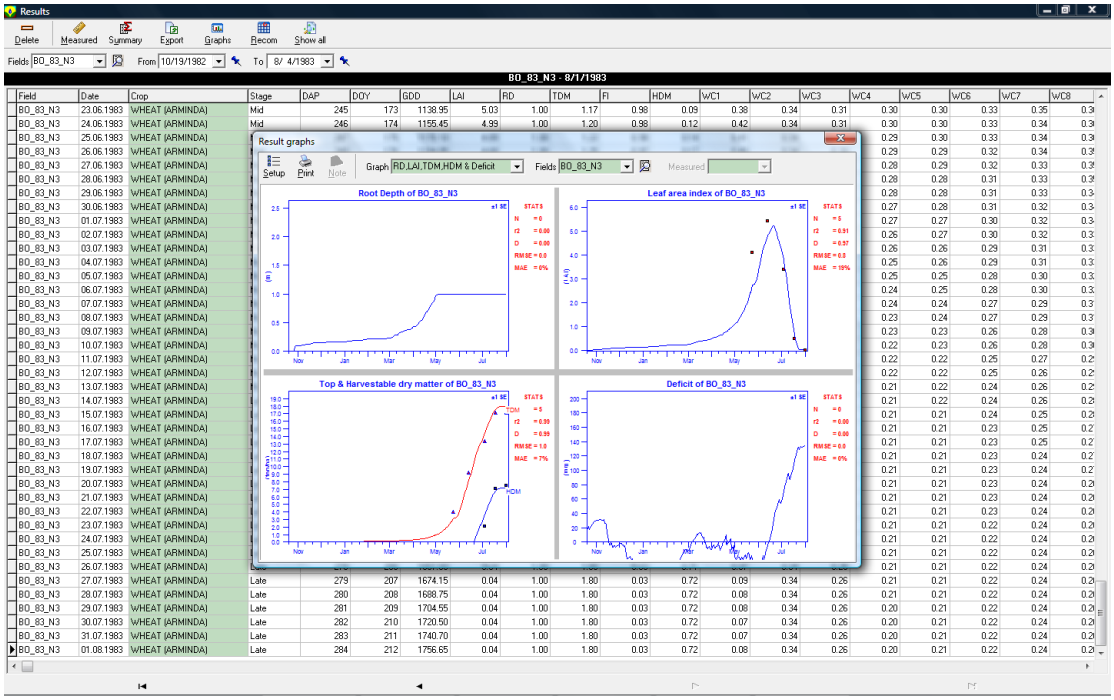
APPENDIX

Appendix 2.1 SWB-Sci N and P simulation soil initialization (a) and results (b) interface screens



(a)



(b)

Appendix 2.2 Incorporation and Mixing efficiencies of various tillage implements

Tillage implement	Incorporation efficiency	Mixing efficiency
Anhydrous ammonia applicator	0.05	0.05
Bedder--lister	0.95	0.05
Burn	0	0
Chisel	0.1	0.05
Cultivator--field	0.1	0.1
Cultivator--row	0.1	0.1
Digger--peanut	0.05	0.05
Digger--potato	0.15	0.05
Disk harrow--offset	0.85	0.6
Disk harrow--tandem	0.75	0.5
Disk tiller	0.3	0.05
Disk plough	0.8	0.4
Disk plough--one way	0.5	0.5
Do-all	0.1	0.25
Drill--deep furrow (dempster)	0.3	0.05
Drill--small grain	0.05	0.05
Harrow--spike tooth	0.05	0.05
Harrow--spring tooth	0.05	0.05
Moldboard plough	1	0.25
Paraplough	0.05	0.05
Planter--in-row chisel	0.05	0.05
Planter--knife, disk, sweep	0.05	0.05

Appendix 2.3 Soil organic matter (SOM) constants and fractions

Residue C to CO_2 fractions

C_Fraction_From_Fast_Cycling_Residue_To_CO2 = 0.6

C_Fraction_From_Slow_Cycling_Residue_To_CO2 = 0.7

C_Fraction_From_Lignified_Residue_To_CO2 = 0.3

SOM decomposition constants

Microbial biomass = 0.005 (d^{-1})

Labile = 0.01 + 0.00001 (d^{-1})

Metastable = 0.0003 + 0.00001 (d^{-1})

Passive = 0.00001 (d^{-1})

Appendix 2.4 Hard-coded C3 and C4 crop N concentration constants

Plant N concentration constants	C3	C4
N Maximum Conc. At Emergence	0.07	0.055
Biomass To Start Dilution Maximum N Conc.	1.5	1
Biomass To Start Dilution Critical N Conc.	1.5	1
Biomass To Start Dilution Minimum N Conc.	0.5	0.5
Scaling Factor Critical N Conc.	0.65	0.65
Scaling Factor Minimum N Conc.	0.45	0.45
Slope*	-0.45	-0.38
N Maximum Conc. At Maturity	0.0235	0.018
N Critical Conc. At Maturity	0.0152	0.0117
N Minimum Conc. At Maturity	0.0065	0.005

* Can be changed by the user in the interface

Appendix 2.5 Nitrogen:Phosphorus ratios of various crops used to determine P uptake

Crop type	N:P ratio		Crop type	N:P ratio
Alfalfa-seed	5.6		Spring oats-grain	3.5
Alfalfa-hay	5.6		Spring oats-grain+straw	3.5
Winter Barley-grain	5.6		Onions	5.8
Winter Barley-grain+straw	6.2		Orchardgrass	7.0
Spring Barley-grain	5.6		Peas	7.7
Spring Barley-grain+straw	6.2		Pepper, bell	11.7
Beans-dry	3.3		Peanuts	17.6
Beans-snap	10.6		Potatoes-Irish	8.2
Beets	6.0		Rape seed	8.5
Bermuda grass	6.7		Rice	4.8
Bluegrass	7.4		Winter rye-grain	5.7
Broccoli	16.5		Winter rye-grain+straw	5.7
Bromegrass	7.5		Spring rye-grain	5.7
Brussel sprouts	8.1		Spring rye-grain+straw	5.7
Cabbage	9.3		Safflower	4.5
Cantaloupes	6.2		Sorghum-grain	5.1
Carrots	5.8		Sorghum-forage	4.5
Cauliflower	9.3		Soybeans, row	5.3
Clover	5.0		Soybeans, broadcast	5.3
Maize-grain	5.9		Spinach	8.3
Maize-pop	5.9		Squash	6.0
Maize-silage	5.9		Sugar beets	6.0
Maize-sweet	7.8		Sugarcane	5.1
Cotton	5.8		Sunflower	4.5
Cowpeas-hay	4.3		Sweet potatoes	7.0
Cucumbers	6.0		Timothy grass	6.0
Eggplant	6.0		Tobacco	11.7
Lettuce-leaf	7.9		Tomatoes	8.6
Lettuce-head	7.9		Trees-conifer	4.5
Lespedeza	5.0		Trees-hardwood	4.5
Millet, row-grain	5.0		Turnips	8.3
Millet, row-grain+forage	5.0		Watermelon	6.0
Millet, broadcast-grain	5.0		Winter wheat-grain	5.3
Millet, broadcast-grain+forage	5.0		Winter wheat-grain+straw	5.3
Mustard greens	8.3		Spring wheat-grain	5.3
Winter oats-grain	3.5		Spring wheat-grain+straw	5.3
Winter oats-grain+straw	3.5		Weeds	7.0