Grazing Gazette

PENNSTATE
College of Agricultural Sciences in cooperation with USDA/ARS

USING COMPUTER MODELS TO HELP IN FARM PLANNING, DECISION MAKING

Rabi H. Mohtar
and
Dennis R. Buckmaster
Agricultural and Biological Engineering Department
Penn State

Computer models serve as powerful tools to simulate complex systems for the purpose of understanding the linkages and interrelations of the components of the system. These models offer the power to understand, analyze, and optimize these systems where traditional experimental tools fail.

During the last decade, ready access to computing power has increased, bringing a bigger need and practical use for these models.

Grazing systems are naturally cross-disciplinary; with these systems, soil, crop, animal, and machines affect each other in ways that can significanly affect profitability. Such a system is a typical example of a complex set of linkages that cannot be fully understood without the help of a model. These models, in general, are referred to as decision support systems (DSS), since they can help the user make more intelligent decisions through better information.

A typical example of such DSS is the comprehensive grazing model (GRASIM) that link all components of the pasture system. GRASIM was developed at Penn State to obtain a better understanding of the pasture system and determine management strategies that yield more efficient utilization of pastures. It can generate information suitable for estimating the financial and environmental consequences of alternative dairy management strategies including partial mechanical harvest in the context of the year round feed needs of the dairy herd. In addition, the model can evaluate the effect of stocking rate on needed supplementation and amount of harvested feed.

GRASIM simulates intensive rotational grazing systems by accounting for carbon, nitrogen and water budgets in the pasture environment. GRASIM requires input data regarding soils, plants, animals, and management. Among other things, the model predicts soil water level, soil nitrogen level, accumulated grazed intake, harvested yield, and nitrogen leaching. GRASIM simulates four components (grass growth, soil water, soil nitrogen, harvest/grazing) with a daily time step. It models multiple paddocks that share the same soil and weather information but can have a different grass species.

GRASIM is still under development; funding permitting, it will be outfitted with a user interface making it useful to farmers and farm advisors. The scenarios that could be evaluated by the model are widespread. Current plans are to make the model capable of addressing these questions:

- How much stored (supplemental) forage is needed with varying stocking rate on the grazeable land?
- How much can nitrogen fertilizer application to grass pastures help to economically increase herd size?
- How much forage will need to be harvested during spring growth and how does this vary among years and with soil type?
- Should I plant more or less corn?
- Am I better off with 50 cows each producing 21,000 lb milk/year or 60 cows each producing 17,000 lb milk/year?

GRASIM will not solve all the world's problems, but certainly will help agronomists, nutritionists, economists, and engineers pool their knowledge in a way which traditional experimentation has fallen short.

Development of GRASIM has been a collaborative effort among the Penn State Departments of Agriculture and Biological Engineering, Agronomy, Dairy and Animal Science, and Agricultural Economics and Rural Sociology. Development has been financially supported by USDA Special Research Grants and the Pennsylvania Agricultural Experiment Station.

Computer Committee

(Continued from Page A23)

The Quick Barnsheet program and Westfalia Dairy Plan are not intended to be a replacement for DHIA mainframe computing. Component analysis date can only be added into the reports after the samples have been tested in the lab.

Through partnerships of these two programs the dairymen may received action lists (pregnancy checks, dry dates, etc.) and rankings by test day milk for regrouping cows. Using these programs gives the dairyman an advantage in making quick accurate decisions.

Please feel free to contact Pa. DHIA at 1-800-344-8378, if we can assist with your dairy operation.

Examples of Westfalia Dairy Plan reports include the following:

COWS DUE TO CALVE

COW NAME	GP	L#	AI	LACTATION FRESH	DATE	DAYS	BRED BULL	DUE	STAT
782	0	4	4	6/24	11/26/93	340	8H2205	9/2/94	Dry
849	0	3	2	7/10	12/8/93	328	9H1360	9/14/94	Preg
794	0	4	8	2/7	1/13/94	292	8H2106	10/20/94	Dry
421	0	1	2	9/17	1/18/94	287	9H1360	10/25/94	Preg
705	0	5	4	7/11	1/19/94	286	9H136[illegible]	10/26/94	Dry
993	0	2	1	11/15	1/28/94	277	9H128[illegible]	11/4/94	Dry
851	0	3	2	10/18	1/29/94	276	9H138[illegible]	11/5/94	Dry
943	0	2	1	10/21	1/30/94	275	9H128[illegible]	11/6/94	Dry
407	0	1	1	11/17	2/2/94	272	9H1289	11/9/94	Dry
894	0	3	3	9/28	2/2/94	273	9H1289	11/9/94	Dry
875	0	3	2	10/15	2/3/94	271	8H1351	11/10/94	Dry
921	0	2	3	7/28	2/11/94	263	9H1360	11/18/94	Dry
792	0	4	3	10/9	2/15/94	259	8H2347	11/22/94	Dry
752	0	5	1	10/7	2/19/94	255	8H2106	11/26/94	Dry
999	0	1	3	9/18	2/22/94	252	9H1360	11/29/94	Dry

COWS TO CHECK FOR PREGNANCY

COW NAME	STATUS	CALVING DATE	INSEMINATED DATE	BULL	DAYS	EXPECTED DUE DATE	CALVING INTERVAL
501	Bred	4/18/94	9/19/94	9H1057	43	6/26/95	434
411	Bred	10/12/94	9/21/94	9H1289	41	6/28/95	624
940	Bred	7/5/94	9/23/94	8H2205	39	6/30/95	360
494	Bred	2/15/94	9/24/94	8H1986	38	7/1/95	501
892	Bred	2/10/94	9/26/94	8H2347	36	7/3/95	508
452	Bred	2/15/94	9/27/94	8H1986	35	7/4/95	504
712	Bred	1/26/94	9/28/94	8H1968	34	7/5/95	525
480	Bred	7/1/96	9/28/94	8H2205	34	7/5/95	369
975	Bred	2/27/94	9/30/94	9H1360	32	7/7/95	495
995	Bred	3/17/94	10/2/94	9H1289	30	7/9/95	479
461	Bred	5/3/94	10/2/94	9H1293	50	7/9/95	432
500	Bred	4/17/94	10/4/94	8H2459	28	7/11/95	450
936	Bred	5/1/94	10/4/94	8H2459	28	7/11/95	436
473	Bred	6/21/94	10/7/94	9H1057	25	7/14/95	388
485	Bred	3/9/94	10/7/94	9H1293	25	7/14/95	492

MILKING COWS BY TEST DAY MILK <bT

COW	NAME	GP	LB	DIM	THIS MILK	PREV	LAST FAT	TEST PROT	SCC	FCM	CURR STAT	XS BR
1351	809	0	5	84	103.4		2.20	2.90	1	0.0	Ready	0
1443	303	0	3	48	102.0	54.4	3.90	2.80	3	0.0	Early	0
1389	864	0	4	44	97.2		3.60	2.80	2	0.0	Open	0
1413	301	0	4	35	95.7		4.40	3.00	2	0.0	Open	0
1419	302	0	3	227	95.6	82.7	2.90	3.10	1	0.0	Bred	5
1438	310	0	3	50	94.6	80.0	3.40	2.90	16	0.0	Ready	0
1518	996	0	2	128	93.9	91.4	3.50	3.00	6	0.0	Bred	1
1266	715	0	6	41	93.7		4.20	3.30	3	0.0	Open	0
1398	869	0	4	141	93.5	87.7	4.60	3.30	1	0.0	Preg	1
1510	991	0	2	58	93.0	99.5	3.20	2.90	1	0.0	Ready	0
1296	733	0	6	52	92.8	79.2	4.10	3.30	2	0.0	Ready	0
1514	406	0	2	43	92.8	0.0	4.20	2.60	5	0.0	Open	0
1465	939	0	3	23	89.8		5.10	3.90	3	0.0	Open	0
1447	916	0	3	58	88.7	58.0	3.80	3.20	1	0.0	Ready	0
1450	920	0	3	173	85.9	77.7	3.80	3.50	2	0.0	Preg	1
1547	445	0	1	285	85.3	83.4	3.10	2.80	3	0.0	Preg	3
1519	410	0	2	22	84.9	55.0	3.90	3.60	8	0.0	Open	0
1297	744	0	6	52	84.8	72.3	3.50	3.10	3	0.0	Ready	0
1394	832	0	3	316	84.6	90.6	3.50	3.50	2	0.0	Preg	4
1582	500	0	1	198	84.6	80.6	4.40	3.30	11	0.0	Bred	3
1478	958	0	3	31	84.5		3.90	3.40	6	0.0	Open	0
1577	488	0	1	209	84.2	79.0	3.90	3.60	1	0.0	Bred	3
1457	922	0	3	169	82.8	109.2	3.50	3.60	6	0.0	Bred	3
1374	839	0	4	46	82.2		3.90	3.10	3	0.0	Early	0
1410	897	0	3	332	82.0	61.6	3.60	3.40	5	0.0	Bred	5
1529	411	0	1	385	81.7	76.5	4.20	3.20	5	0.0	Bred	4
1527	989	0	2	43	81.5	48.0	4.00	2.90	1	0.0	Open	0
1477	936	0	2	184	81.0	90.7	2.60	3.10	1	0.0	Bred	3
1437	306	0	3	245	80.4	77.1	3.90	3.50	3	0.0	Bred	3
1309	732	0	6	52	79.9	35.1	3.60	3.20	6	0.0	Ready	0
1565	519	0	1	47	79.7	43	[illegible]	3.60	1	0.0	TBCul	0