Maintaining the Cutting Edge

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INTEGRATED DAIRY FARM MANAGEMENT

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The modern dairy farm firm is an extremely complex business. The author argues that previous efforts to model dairy farm businesses have not successfully integrated this complexity and in particular have not adequately reflected the role of management and the manager. The argument is developed using experiences from two Extension programs designed to teach management skills and a development effort to design an integrated dairy farm decision support system. Suggestions are provided concerning the integration of the premier importance of management into farm business management Extension programs and the development of decision support systems.

The modern dairy farm firm is a complex business that integrates crop production and livestock enterprises. The management of the typical business must have expertise in crop production, animal growth (replacements), milk production, business management, human relations, and marketing. In addition, the nature of the crop and livestock enterprises is such that the standard operating procedures for each are totally different and in both a year is often required before the direct results of productivity reducing errors are mitigated. The nature of the conflicts of the operating procedure eminates from the biological basis of production (Figure 1), the dairy enterprises have labor and other requirements that are almost constant so that a daily routine can be established while the crop enterprises' demands have no daily routine and are only partially predictable in advance. The year long impact of errors on productivity results from the annual cycle of crop production and the biological nature of the dairy cow where production recovery does not occur until the next lactation.

This is the environment faced by the management of the dairy farm business. In this paper I will argue that our approach to decision support system and dairy farm management Extension programs in general has failed to directly focus on the greatest need of most dairy farm operators which is to improve his/her management skills. I will discuss an Extension agenda (with complimentary research) for farm management programs with emphasis on the impact this agenda has on the development of decision support systems. I believe this agenda could be more helpful to these managers than our past agendas. The agenda has increased emphasis on management broadly defined and on tactical decision-making mechanisms. Many of the ideas for this agenda come from three interdisciplinary projects in which I have participated:

1. Cornell Minicomputer Dairy Management Project. A Kellogg funded project to develop an integrated data recording and analysis program for the dairy herd.[1]

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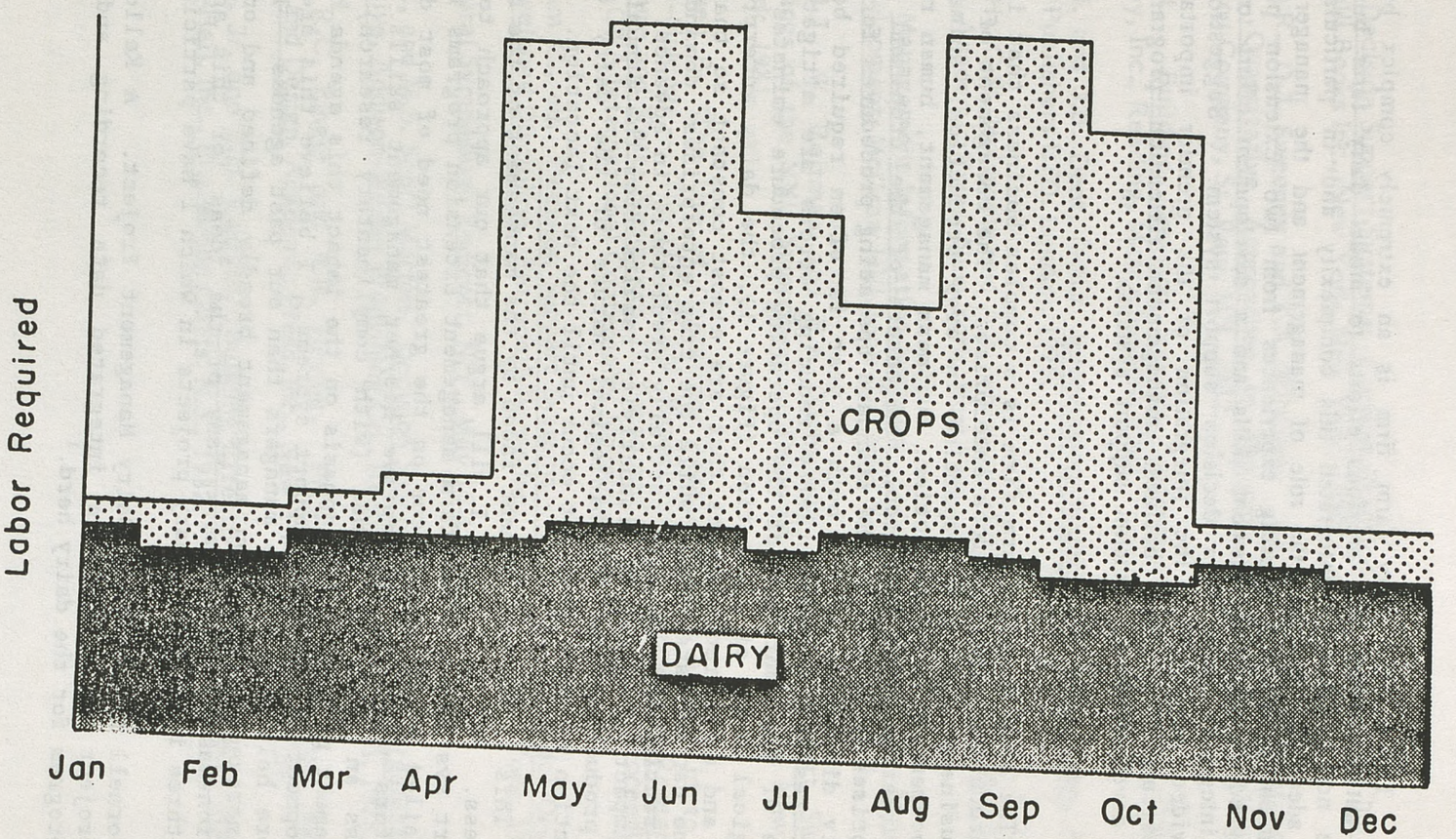
Figure 1. CONTRASTING LABOR REQUIREMENTS FOR DAIRY AND CROP ENTERPRISES



2. Northern New York Dairy Management Project. A three year project in the six northern New York counties to test the hypothesis that selected noninnovators could significantly improve productivity by utilizing recommended management practices. Based on improvements in milk production, somatic cell counts, and calving interval, the hypothesis was accepted.[2]

3. The Dairy Farm Audit. This ongoing Cooperative Extension funded program resulting from the lesson learned in the Northern New York Dairy Management Program, has the objective of teaching dairy farm managers management skills.[3]

The Premier Importance of Management

As indicated above, major productivity gains were achieved by cooperators in the Northern New York Dairy Management Project; unfortunately, the upward trend often slowed or was reversed as project personnel presence on the farms diminished. In analyzing these setbacks, I established the hypothesis that our traditional farm management approach of emphasizing the use of approved practices was treating the symptom of the problem rather than the problem itself. The real problem was the manager's failure to integrate the practices into the management routine. Out of the acceptance of this hypothesis grew an Extension program to help dairy farm managers examine their attitude toward management and to teach management skills.[4]

In the delivery of the program we emphasize two points: the premier importance of management and the development of mechanisms to monitor and control all aspects of the business. You probably are wondering why we think there is anything new about arguing that management is important. We are not; we are, however, arguing that many or even most farm managers, many Extension agents, and even some of our colleagues really are not totally convinced that management is of preeminent importance. I am concerned that we in farm management are at least partially responsible. In teaching farm management, we have repeatedly argued that management is important but other than tireless expositions about keeping records, we have had little to say about why or how to manage.

In teaching the premier importance of management, we emphasize the attitude of the manager toward management, the role and functions of the manager, and then suggest that a mechanism to insure the top priority of management is to establish a time each day for management. We then suggest that this time be spent (1) making a "to do" list and assigning personnel to the high priority tasks, (2) evaluating the status of the dairy herd, and (3) completing activities and making management decisions for timely completion of activities that occur in a monthly or annual cycle. To assist in effectively using this time, we have developed a management calendar (see Maloney, et al.) for daily, monthly, and annual activities (Figure 2 is an example containing the monthly activities). In other words, we are trying to alter managers' attitudes toward management before or in addition to offering decision support systems.

Figure 2. MANAGEMENT ACTIVITIES FOR EACH MONTH

Date to complete	Check when complete	
__/__	____	- Evaluate performance on last month's goals and establish goals for the coming month.
__/__	____	- Pay bills, withdraw family living allowance, evaluate cash flow.
__/__	____	- Analyze accounts payable and consider borrowing to reduce interest charges; search for prepayment and cash discounts.
__/__	____	- Evaluate labor force relative to needs.
__/__	____	- Consider AIM reports from DHI to analyze weak links in herd performance.
__/__	____	- Search for less expensive sources of purchased feeds.
__/__	____	- Evaluate feeding management program - send in forage samples as changes are expected.
__/__	____	- Evaluate reproductive performance of heifers and milking herd, re-evaluate goals.
__/__	____	- Body tape sampling of heifers and cows.
__/__	____	- Check to be sure calfhood vaccinations/dehorning /extra teats removed - on schedule.
__/__	____	- Plan dry off decisions based upon expected calvings and animal numbers.
__/__	____	- Evaluate peak production and persistency of milking cows.
__/__	____	- Consider culturing high SCC and clinical mastitis cases.
__/__	____	- Evaluate sire selection, consider new sires.
__/__	____	- Inspect machinery and equipment (belts, lubrication, operating efficiency.
__/__	____	- Check the milking system including the following: operation and maintenance of vacuum pump, CIP system, inflations, etc.

The second emphasis is developing mechanisms to monitor and control all aspects of the business. In the context of this conference we are assisting farm managers in implementing a crude decision support system. In the program we assist the manager in assembling a complete (as possible) but not complex set of records on crops, dairy, and finances. An analysis of these records is then used to develop a control mechanism we refer to as "30 day goals":

1. Identify a small number of areas of the business that need immediate attention.

2. Select measures of performance to monitor progress in these areas.

3. Identify changes to make or tasks to accomplish to make improvements.

4. Set goals to be achieved within 30 days or identify tasks to be completed within 30 days to meet longer term goals.

5. Monitor progress, evaluate success in meeting goals in 30 days, and establish new goals.

In assisting managers develop these mechanisms, we have recognized that the human resource is so critical that a distinction is made between (1) monitoring and controlling the performance of personnel and (2) monitoring and controlling productivity, marketing, and financial performance. The second has been the traditional emphasis in decision support systems and is discussed after some thoughts on personnel.

I believe there are several implications of the premier importance of management for the development of decision support systems and more broadly for farm management programs:

1. Just as we teach how to keep records, how to manage income taxes, how to balance rations, etc.; we have to teach how to manage and before that why manage. Business schools have long taught management to nonfarm managers; we need to understand and adapt what they are teaching.

2. We need to conduct research on what skills and abilities are needed to manage a successful farm business.

3. In developing decision support systems we must consider the user of the system. Perhaps a less sophisticated system that is actually used on farms is better than a sophisticated system that never leaves the developer's office.

4. Decision support systems must be developed that assist the manager in using the information in addition to providing the information. Expert systems may have great potential in this area.

Management Organization

In working with large, progressive dairy farm managers, I have found their greatest challenge and their greatest limitation to expan-

sion is the area I call management organization. Management organization encompasses the management responsibility of each manager and the line of command of all personnel. Three activities can be helpful in specifying the management organization. The first is job descriptions for managers (as well as other personnel). The second is delineating the responsibilities of all positions into four categories: (1) general manager, (2) enterprise manager, (3) independent worker, and (4) laborer. The third is development of an organizational chart.

This area of management organization has major implications for decision support systems because it will determine who is actually utilizes these systems. In a Masters research project recently completed more than half of 15 early adopters of a remote access herd management system employed a herd manager; however, in only one of these herds was the herd manager the primary user of the system (Andrew). We believe two factors were primarily responsible for this result: (1) the herd manager was not qualified to use the sophisticated information system and (2) the computer was located with the general manager.

I believe there are several implications of management organization on the development of decision support systems and more broadly of farm management programs:

1. Management structure and increasing the role of middle management must become important Extension topics.

2. Research is needed to determine optimum organizational structures with particular emphasis on middle management. Again we may be able to learn from business schools.

3. We need to consider the role of each manager in designing decision support systems.

4. Decision support systems need to be designed recognizing the management organizations on dairy farm firms.

Decision Support System for Dairy Production and Finance

Almost seven years ago we embarked on a five year project, titled the Cornell Minicomputer Dairy Management Project (CMDMS), to develop a decision support system for the dairy herd. The objectives of the project were:

1. To develop an integrated interdisciplinary recordkeeping system that will monitor the farm financial status, impact the nutrition program, feed inventories, and the health and reproductive status of individual cows and the herd.

2. To develop microcomputer based management decision aids which use above data to assess production and profitability consequences of management decisions.

3. To develop the capacity for the on-farm minicomputer to interface with existing mainframe forward planning models.

4. To develop an interface between the on-farm minicomputer and New York Dairy Herd Improvement Cooperative (NYDHIC) and Cornell Agricultural Management Information System (CAMIS). For exchange of data and to provide the dairy farmers with increased analysis capacity.

5. To develop a system by which the user can accurately and efficiently enter information and perform needed analyses.

Figure 3 (CMDMS 1984, 1984a) is a diagram of the proposed CMDMS. The system was to integrate data collection on the dairy farm including feed acquisition and feeding, herd management, and accounting. The system was designed to be integrated in the sense that all portions of the system share a common data base.

Two computer decisions, which seemed correct when made in 1980, were to use Digital Equipment Corporation (DEC) minicomputers and to use the UCSD p-System. Neither the DEC hardware or the p-System operating system lived up to their early promise as industry leaders. In retrospect, we were laggard in that recognition and in switching to more promising alternatives. In an attempt to accommodate all components of the dairy herd, we included too much in our design. The "overdesign" of the system and the failure of our computer selection to expand with other systems resulted in an inability to complete the entire decision support system.

We were, however, more successful in the decision support system integrating feed inventories and availabilities, herd characteristics, and economical ration formulation (Figure 4; Rasmussen 1986, 1986a). The detail in the input is illustrated in Figure 5. The CMDMS Farm Accounting output can be divided into five categories: farm financial summaries, enterprise analyses, account outstanding summaries, and payroll reports. Three financial summaries reflect whole farm transaction records; these are: Farm Profitability and Cash Flow, Farm Receipts and Capital Sales, and Farm Expenses and Capital Expenditures. Each of these reports has two columns of numbers reflecting two user defined time periods. These management reports may be used for tax management purposes, as IRS capital and noncapital receipts and expenses are explicitly separated. Farm income can be adjusted to a cash basis by using 'Change in Noncapital Accounts Payable' and 'Change in Noncapital Accounts Receivable'. These two values are displayed on the receipts and expenses output reports. The CMDMS allows you to partition the farm business into 13 enterprises for analysis: Dairy Cow, Heifers, Nondairy Livestock, and 10 crop enterprises of your choosing. The enterprise analyses provide detailed cost and return information about each of the important parts of your farm.

The major functions of the nutrition part of the program are:

1. Maintaining a feedstuff inventory, which is automatically reduced as the cows consume feed over time and costing the value of the feed to the appropriate group and livestock enterprise;

2. Analyzing a ration entered and displaying where the specified ration exceeds or falls short of the cow or group's nutrient requirements; and

FIGURE 3: CMDMS INTEGRATION FLOW CHART

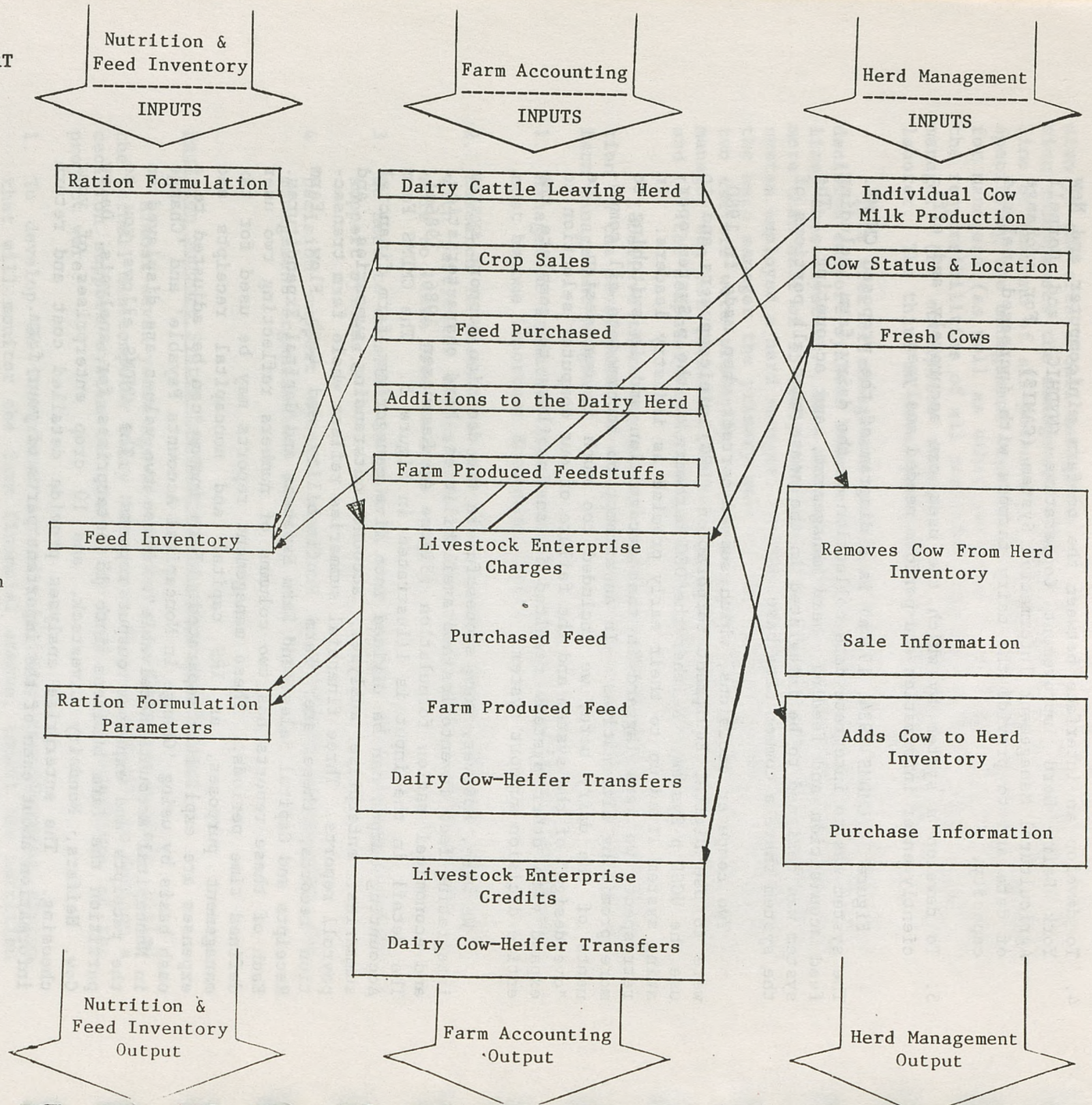


Figure 4.
HERD MANAGEMENT
DATABASE STRUCTURE

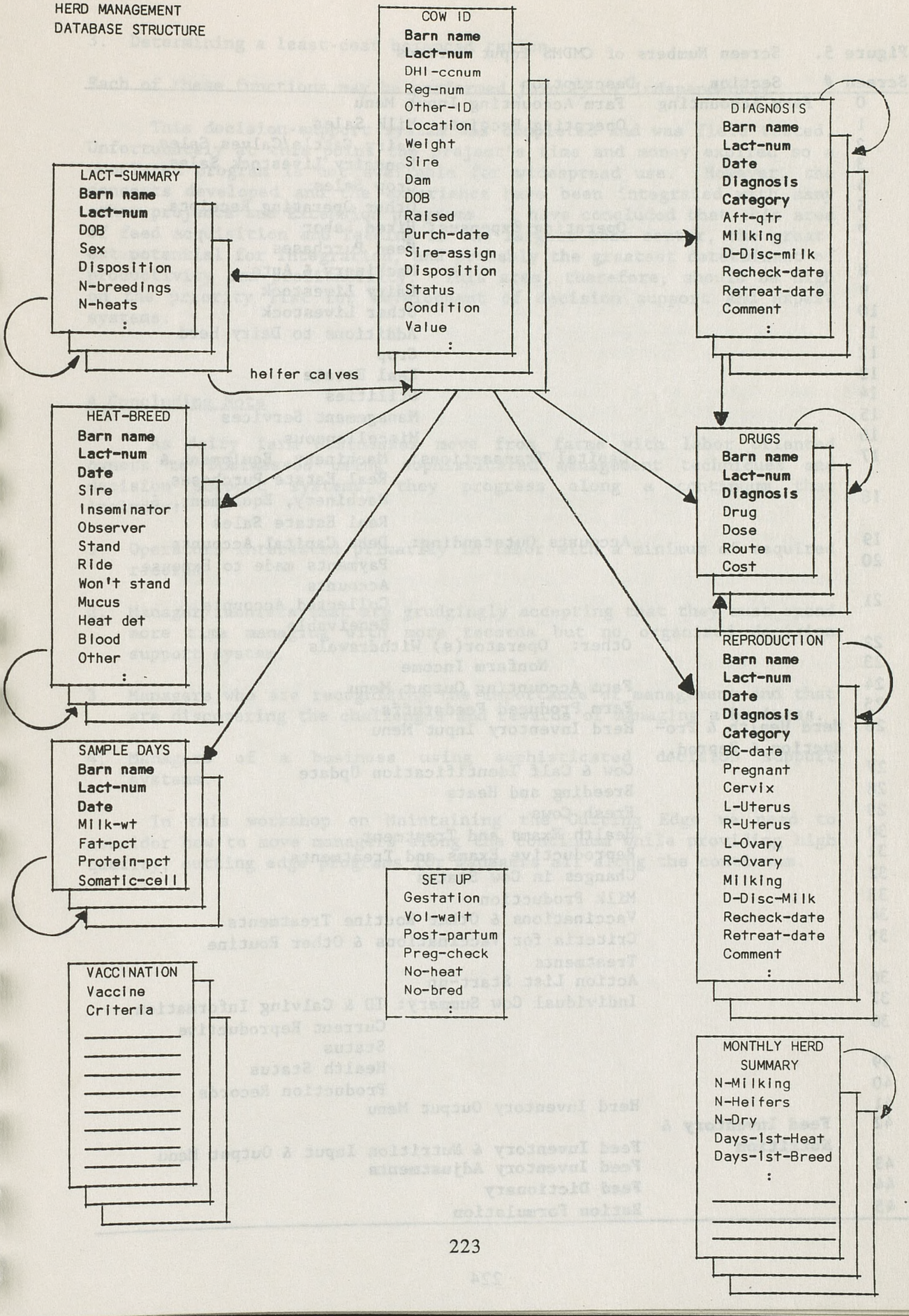


Figure 5. Screen Numbers of CMDMS Input Screens

Screen #	Section	Description
0	Farm Accounting	Farm Accounting Input Menu
1		Operating Receipts: Milk Sales
2		Dairy Cattle/Calves Sales
3		Nondairy Livestock Sales
4		Crop Sales
5		Other Operating Receipts
6		Operating Expenses: Hired Labor
7		Feed Purchases
8		Machinery & Auto
9		Dairy Livestock
10		Other Livestock
11		Additions to Dairy Herd
12		Crop
13		Real Estate
14		Utilities
15		Management Services
16		Miscellaneous
17		Capital Transactions: Machinery, Equipment & Real Estate Purchases
18		Machinery, Equipment, & Real Estate Sales
19		Accounts Outstanding: Debt Capital Accounts
20		Payments made to Expense Accounts
21		Collected Accounts Receivable
22		Other: Operator(s) Withdrawals
23		Nonfarm Income
24		Farm Accounting Output Menu
25		Farm Produced Feedstuffs
26	Herd Health & Production & Reprod.	Herd Inventory Input Menu
27		Cow & Calf Identification Update
28		Breeding and Heats
29		Fresh Cows
30		Health Exams and Treatment
31		Reproductive Exams and Treatments
32		Changes in Cow Status
33		Milk Production
34		Vaccinations & Other Routine Treatments
35		Criteria for Vaccinations & Other Routine Treatments
36		Action List Start-up
37		Individual Cow Summary: ID & Calving Information
38		Current Reproductive Status
39		Health Status
40		Production Records
41		Herd Inventory Output Menu
42	**Feed Inventory & Nutrition**	**Feed Inventory & Nutrition Input & Output Menu**
43		**Feed Inventory Adjustments**
44		**Feed Dictionary**
45		**Ration Formulation**

3. Determining a least-cost balanced ration.

Each of these functions may be performed jointly or independently.

This decision-support system was completed and was field tested. Unfortunately at this point the project's time and money expired so a completed program is not available for widespread use. However, the concepts developed and the experience have been integrated with many other projects and Extension programs. I have concluded that this area of feed acquisition and feeding is the largest cost center, the greatest potential for integration, and probably the greatest determinant of productivity and profitability. This area, therefore, should be high on the priority list for development of decision support and expert systems.

A Concluding Note

As dairy farm businesses move from farms with labor oriented owners to businesses using sophisticated management techniques and decision support systems, they progress along a continuum that includes:

1. Operators interested primarily in labor with a minimum of required records.

2. Manager/laborers that are grudgingly accepting that they must spend more time managing with more records but no organized decision support system.

3. Managers who are recognizing the importance of management and that are discovering the challenges and rewards of managing a business.

4. Managers of a business using sophisticated decision support systems.

In this workshop on Maintaining the Cutting Edge we need to consider how to move managers along the continuum while providing high quality, cutting edge programs for managers all along the continuum.

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FOOTNOTES

[1]Project leaders included Agricultural Economists Wayne A. Knoblauch (Project Director) and myself, Animal Scientists R. David Smith and Larry E. Chase, and Veterinarian Michael A. Brunner. All are Cornell faculty members.

[2]Project leaders included Animal Scientists R. David Smith, Charles J. Sniffen, and David M. Galton and myself (Project Director). All are Cornell faculty members.

[3]Project leaders include Animal Scientist Terry R. Smith, Agronomist W. Shaw Reid, and myself.

[4]The teaching outline for this program is contained in Milligan, et al.