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**Design and Evaluation of a Distance Education
Group Videotape Instructional Model for
Non-Formal Agricultural Education**

Stephen Gruber

**A Thesis
in
The Department
of
Education**

**Presented in Partial Fulfillment of the Requirments
for the Degree of Master of Arts at
Concordia University
Montreal, Quebec, Canada**

December 1990

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ISBN 0-315-64717-5

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**Design and Evaluation of a Distance Education Group
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Agricultural Education**

Stephen Gruber

Abstract

A distance education pilot project based on videotape, and supported by print and telephone conference call, was designed, developed, and evaluated in response to English-speaking farmers' learning needs in Quebec.

The videotape was of a group discussion between a professor in agriculture and five dairy farmers. The subject matter concerned the feeding of high producing dairy cows in first lactation. The tape was designed to be viewed by small groups of farmers in their own homes.

The methodology was to have learners pause the tape by way of inserted questions to promote discussion of the material viewed. Feedback was provided by way of the telephone conference call. A rationale for the media selected and the model's design is included.

The model was evaluated with two groups of farmers under the conditions for which it was designed. Learners responded positively to the model, and claimed to have made changes in their farming practices as a result of their use of it. Recommendations are made for the model's future use in agricultural technology transfer.

Acknowledgements

I would like to recognize, and sincerely thank, some of the many people who have encouraged and helped me in the completion of the work reflected in this thesis.

First, my wife, Susan Murphy, who has actively supported me throughout my graduate studies. I recognize that this was no small sacrifice on her part with both she and I working full-time, and raising our young son.

My thanks go also to Professor Elliot Block of the Macdonald Campus of McGill University, who has never in my experience refused a request to share his expertise with farmers. His participation as subject matter expert in this endeavour brought much to the project.

Finally, to many of the faculty members and fellow students whom I met and worked with in the Educational Technology program. The experience has truly widened my horizons and been a thoroughly enjoyable and satisfying process. Of the many, I would particularly like to thank Professor Gary Coldevin who provided the support and advice as my supervisor to bring this project to fruition, and Professor Jon Baggaley, who fostered my interest in video.

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Chapter 1

Introduction

The future provision of agricultural education and training in North America presents an exciting and positive role for educational technology. As King and Francis (1988) conclude, educational technologists will be required in agriculture to create and redesign messages in an innovative way to reach groups of learners that are not only becoming increasingly harder to reach, but who also have an increasing need for access to continued training. Such a situation has developed due to the interplay of several factors including:

a) the information revolution, which will continue to have an increasingly significant impact on agricultural producers (King and Francis 1988).

b) the shifting demographics of the North American farm community; the number of farmers are declining and, viewed as educational audiences, those that remain are increasingly fragmented into groups with special needs and interests.

Quebec's 3000 English-speaking farmers are no exception to these trends. With a continuing decline in the number of farmers in any one region of the province and a limited, relatively centralized, pool of available extension personnel, the provision of agricultural education to a significant number of these farmers through the traditional vehicle of the face to face lecture group method, grows physically and financially less feasible each year. Thus, the identification and evaluation of an educationally and cost effective instructional model for the non-formal agricultural education of this community is required.

In addition, a model is sought that ideally meets the following criteria:

- a) maximizes use of the available extension personnel resources.**
- b) provides an opportunity for group discussion amongst learners.**
- c) provides an opportunity for interaction between the appropriate extension professional and learners.**
- d) can be made available on a cost sharing basis between the extension organization and learners at a level deemed reasonable by both parties.**

This thesis reports the production and evaluation of a videotaped based learning model that is aimed to satisfy the above described needs.

Chapter 2

Design of the Learning Model

2.1 Context

Need for Agricultural Education.

Education is a key element in assisting farmers to keep up with the ever increasing rate of technological change that characterizes the present day industrial agricultural sector. In fact, it has been predicted that education will be the essential element in the agricultural industry of the future (Martin, 1986). Canadian data would indicate support for such a statement. For example, a recent correlation between formal agricultural education and the success of newly established young farmers shows that only 3.7% of those having had formal agricultural education had to give up their farms, compared to a figure eight times larger (28.8%) for those lacking a formal agricultural education (Couture, 1988).

Producers themselves appear to recognize the key role education should play in agriculture. A recent survey of 2000 Quebec farmers revealed that nearly three-quarters agreed with the statement that 'agricultural education is necessary to succeed as a farmer' (Couture, 1988).

There is a growing awareness of this need in the Quebec provincial ministry of agriculture (MAPAQ). The current policy trend of this department is to favour farmers with further agricultural education by way of advantageous access to agricultural programs, a trend that is likely to continue and grow more pronounced even in the short term.

It has been argued that the clear success of farmers in producing ever larger quantities of food with fewer and fewer workers could be taken as evidence that present levels of education are adequate. However, despite the spectacular productivity gains made over the last three decades in terms of output per man hour, industrial agricultural production is not always so successful when financial returns are compared to the cash cost of inputs, or when the increasing amounts of pesticides and fertilizers required for crop production are considered in relation to environmental costs. Significant changes in farming technology will be required to sustain future production and ensure adequate environmental protection. Such changes will require a farmer to acquire a variety of new skills (Lane, Morris, and Thompson, 1988).

Present Level of Farmer Education in Quebec.

The present formal educational level of Quebec farmers is low in relation to other sectors of Quebec society. For example, in the late 1980's, only 43% of beginning farmers who took over a farm had completed high school, let alone attempted any further education in agriculture; this compares to 73% of youngsters in the Quebec population at large who had completed high school (Couture, 1988).

Provision of Agricultural Education in Quebec.

Access to formal agricultural education for Quebec farmers in English is limited to only one institution in the province, Macdonald Campus of McGill University, and that is located in a metropolitan region, namely the Island of Montreal. Here, a two and one-half year vocational diploma in agriculture may be followed or a 3 year baccalaureate (taken after 2 years of CEGEP science). Both programs require full

time, on campus attendance. The diploma program, whose target population includes those wishing to manage farms, has an intake of approximately 30 students a year.

Responsibility for official extension services to farmers in Quebec rests with MAPAQ. However, noting that French is the only official language of provincial government services in Quebec, and that English-speaking farmers constitute approximately only 10% of the province's 40,000 farmers, services to the minority language community are minimal at best in most regions.

Partially in response to this void, the English-speaking farmers have developed their own provincial, voluntary association; the Quebec Farmers' Association (QFA). QFA holds, as one of its self-defined mandates, the provision of educational opportunities to the community with which it works.

Current Delivery of QFA's Non-Formal Agricultural Education Program.

At present the association is employing what may be termed traditional systems for the delivery of its non-formal educational program to farmers. These consist predominately of: a) regional and provincial group meetings at which 'experts' make presentations and respond to questions, and b) print media; a tabloid newspaper is published ten times a year, along with a series of information books. There exists a previous successful case history for the use of electronic media for the delivery of non-formal education with which the older members of the Association identify. It was in Quebec that the Radio Farm Forums were first established and run from the late 1930's to the mid 1960's. The success of this delivery system at the peak of its operations has been recognized, and the exportation of the model to

many developing countries has been widely documented (Jamison and McAnany 1978). However, changing life-styles and the introduction of television led to the decline in the use of the system in industrialized countries.

2.2 Description of learning model

The learning model developed to meet the needs described in this thesis is based on an adaptation of the successful experience of training engineers by Tutored Video Instruction or TVI (Gibbons, Kinchelo, and Down, 1977) as described below. A candid videotape was shot of a seminar conducted by a professor from Macdonald Campus with a group of five farmers on the campus. Questions from the farmers to the professor and resulting group discussions were included in the video. The video is intended to be viewed by small groups of farmers (5-8) in one of their own homes.

At several selected points the videotape was edited to include post-seminar produced shots of the professor providing questions formulated to promote discussion amongst the groups of farmer viewers. Instructions were also given to viewers to stop the tape at this point to allow discussion of the question by viewers. Also edited in following these instructions were "farm scenes" with no accompanying audio. This was intended to encourage discussion amongst those groups who might not take advantage immediately of the VCR's pause control feature. Accompanying the videotape was a short study guide containing information better suited to the print medium e.g. tables, graphs etc., along with a review of the instructional material contained in the video and a copy of the discussion questions that were introduced during the video. A viewing group was connected with the

professor by a speaker phone call to create an opportunity for feedback to the instructor and clarification of the instructional material for the learners.

2.3 Rationale of learning model

Media Selection

The attention of those responsible for the implementation of the non-formal educational programs at the QFA has been drawn to the increasing use of television in extension work and rural development, both in industrialized countries (Lane et al., 1988; Whiting, 1988) and less developed countries (Bessette and Tighe, 1988; Coldevin, 1988; Fraser, 1980). A review of the literature on the effectiveness of television as a teaching medium reveals thousands of experiments carried out to compare the effectiveness of this media to some other, notably the lecture.

Several reviews of this comparative research have been made. Schramm (1977) suggests from his review that there is much evidence to conclude that people learn from media, but very little as to which medium in any given situation brings about the most learning. Clark (1983) also notes from his review of research that there is no difference between television and other teaching media; what counts is the effectiveness of the instructional design used within whichever medium has been selected on a cost or administrative basis. Whittington (1987) notes from his review that "television is a technological device for transmitting communication and has no intrinsic effect, for good or ill, on student achievement" (p.54) and that "effective instructional design and techniques are the crucial elements in student achievement whether instruction is delivered by television or by traditional means" (p.55).

Bates (1981) has also reflected upon this research and points out that in many cases the lack of statistically significant differences in the comparisons between media does not mean that differences do not exist, but that the experimental methods used in the experiments were too crude to detect them. His conclusion is that research should address the question of defining the unique characteristics of television that promote learning; characteristics that learners would not be able to experience and benefit from when using another medium, such as print, when they are studying at a distance.

What can be concluded from the research of three decades into educational television is that, at a minimum, television can be as equally a satisfactory medium for learning as traditional ones, and possibly possess some unique characteristics that make it a preferred medium under certain circumstances. In addition to television's acceptability from an educational viewpoint, it also has the potential to meet the criteria of maximizing the use of the extension personnel in this project.

Delivery Selection

The next aspect reviewed with relation to this project were the possible ways of delivering television programming to the target learners. Major television delivery systems include terrestrial broadcast, cable, satellite, and videotape. The literature reveals an increasing amount of successful extension work being carried out in Canada and the United States using cable or, as is more often the case, satellite transmissions (Carver and Mackay, 1986. Whiting, 1988. Wilkins, 1989). Satellite delivered extension programs combined with live audio conferencing permit the medium to meet the criteria of

providing instructor/learner interaction. However, at present in Quebec there is no potential for access to satellite delivered television at an affordable cost, and the target learners generally lie beyond areas serviced by cable television companies. Access to quality time slots for terrestrial broadcasts of educational television is a major obstacle to the use of this delivery system.

Videotape was, in a 1984 survey, the most widely used technology in the education of American rural adults at the post secondary level (Barker, 1985). Extension workers in the United States have been using videotape for several years and more than 2000 titles exist in a national data base of the Cooperative Extension Service (Whiting, 1988). However, a literature search did not turn up any evaluations of these tapes.

In Canada, the Alberta Provincial Department of Agriculture recently published an evaluation of a pilot project to establish an agricultural video library for farmers located in five of the departments regional offices. Over the one year of the project period, videotapes were loaned more than 2000 times to farm families. Borrowers were requested to return a questionnaire after use of the tapes. From this questionnaire it was noted (Pettit, 1988) that 69% of the viewers planned to apply some of the information presented on the tapes, 79% felt they had learned new information, 61% responded that learning by video was 'quite effective' and 36% that it was 'very effective.' Interestingly, 58% responded that they needed 'more information' than was on the tapes. Demographic data of those surveyed was limited but it is known that 76% were full time farmers, and that 40% fell into the 31

- 40 year age group, 24% were between 41 - 50 years old and 14% between 51 - 60.

A further indication of growing interest in video for Canadian agricultural extension work is that the Independent Study section of Guelph University has completed a two year long pilot project in educational videotape production which has now received a recommendation from the Policy Advisory Committee to continue and expand videotape production . However, this decision was apparently not based on any formal evaluation (Clelland, personal communication, May, 1989). In short, although sparsely documented, there are indications that farmers will respond positively to the use of videotape as a delivery format. Videotape has brought a potential for profound change to the design and use of instructional television, although it is claimed that producers and users alike have not fully understood this (Ainsworth, 1988). Use of videotape, and the now widespread ownership of, or access to, VCRs in Canada not only allow learners to view programs at more convenient times, but has the potential to permit more effective learning through use of the control features that in turn permit more flexibility in instructional programming and learner control of the pace at which the program is viewed. The control feature of the VCR is an integral component of the proposed model.

Presentational Format

Arguments are found in the literature that indicate 'high quality' (which generally translates into 'high cost') programming is preferable, or necessary, for learners to benefit from television as a learning medium (Bates 1988, Whiting, 1988). While that may be true when

some of the unique presentational characteristics of television are to be exploited e.g. filming a field trip that learners could not experience for themselves, there are also indications that high cost productions *per se* are not necessarily the key ingredient for the production of successful educational television.

It is possible that the perceived requirement for high-cost productions was born out of the failure of the 'talking head' programming of the early days of educational television (Ainsworth, 1988. Strohmer, 1989). Advances in the instructional design of programming may now provide effective educational programming at relatively little cost (Strohmer, 1989). The candid taping and simple editing required in this learning model classifies it as 'low cost' video and permits it to meet the cost criteria outlined in the introduction.

Interaction

Thiagarjan (1978) has, amongst others, emphasized the importance of adult learners being able to have contact with peers and the instructor. His consideration of the 'loneliness of the long distance learner' is not one made on humanitarian grounds but for the improvement of the learning environment. Opportunities for learners to meet in groups at specific times induces a goal commitment by the learner to the learning opportunity. Even highly motivated learners are subject to distractions that can lead to postponement of the learning opportunity.

References are frequently found in the literature relating to the provision of interactive modes within the instructional design of distance education projects. Such provisions appear to be appreciated by distance learners. For example, 59% of 92 respondents

to questionnaires mailed to 138 students enrolled at home in a televised introductory psychology course in British Columbia, felt that the opportunity to phone in and receive answers live on air was important to their completion of the course, even if only 42% did attempt to phone in one or more times with only 20% actually being successful (Catchpole, 1988).

It has been recognized that the impact of educational television programming will be greater if an immediate opportunity for group discussion is possible. The lack of opportunity for learners to raise questions and participate in free discussion would seem to reduce the effectiveness of learning from instructional television (Gueulette, 1988). In fact, some workers believe that adults learn in small groups and any media presentation only serves as a supplement to the group process. Whether this extreme view holds up or not, some long-term reinforcement of program content is particularly appropriate for adult learners with limited recall ability (older adults) and those less confident of their academic ability (Fromer, 1980). The target learner group contains a significant number of members with both these characteristics. Conclusions from the British Columbia case study and the above discussion reinforce Thiagarjan's point that it is valuable to include an interactive component where possible in a distance education project. Indications from the study referred to above (Catchpole, 1988) were that the inclusion of an interactive component led to an enhancement of the student\instructor relationship which was a more important motivational and learning factor than elaborate television production techniques.

Fromer (1980) notes that when designing television programming for adults, peer group identification adds greater credibility and level of attention to the content. This effect may well be of particular importance with the target learner group in question because King and Francis (1988) observe that farmers have credibility with other farmers; group discussion amongst farmers on a particular topic may well lead to further reinforcement of the ideas being presented rather than when they are received from an 'expert' with little or no interaction. The same authors also recognize active farmers as sometimes being a key source of production information. Feedback to the presenter can not only indicate where clarification is needed, but potentially provide input to the orientation of agricultural research.

Lin and Creswell (1989) have summarized the literature on the use of inserted questions in the presentation of videotaped material. They note that inserted questions have been empirically shown to facilitate learning if a search for critical answers follows and conclude that the use of interspersed questions in a televised presentation may augment learning on the whole.

The proposed model recognizes the need for interaction and feedback, making provision for it through inserted questions. These questions are intended to promote group discussions amongst learners and provide an opportunity to obtain answers to questions raised via the teleconference hook-up to the professor and other learner groups.

Cognitive Learning Theory

Bonner (1988) notes that three major concepts of cognitive psychology are seen to have significant implications for instructional design. The three are the concepts of schemata, metacognition, and

stages of skill acquisition. The author believes that the concept of schemata has particular implications that support the design of this learning model. Schemata refers to how a knowledge base is perceived of as being structured, organized, or conceptualized in a learner's memory storage system (Wildman, 1981). They are formed by the active interplay of assimilation of new information, or its accommodation into a learner's existing knowledge structure. Assimilation refers to the addition of new information to an existing structure, and accommodation to the reorganization of an existing schemata in light of new information having been received. Viewed from this perspective, learning becomes a generative event controlled by the learner, and the act of learning itself is not viewed as the expansion of a body of unconnected facts, but a change in the form of a learner's knowledge (Shuell, 1986). A schemata can be viewed as having both an active and passive function in the process of information acquisition (Hewson and Posner, (1984). The schemata can function actively as sets of expectations which serve as a plan for the learner to seek new information, and they can function passively by providing a format into which new information is placed. Hewson and Posner also observe that lack of a schemata in a learner contributes to a rapid loss of information.

Di Vesta and Finke (1985) amongst others, argue that to encode new information into a learner's schemata, the information must be made meaningful to the learner. It is suggested that discussion groups formed by learners can help define and clarify a learner's schemata. Thus it is proposed that not only will the model's discussion group strategy provide opportunity for review, peer tutoring, and maintenance

of learner attention, but also of assisting to place the received information into a context that is meaningful to the learner, and thereby clarify his/her schemata.

Tutored Videotaped Instruction

Tutored Videotaped Instruction is one of several examples found in the literature (Ainsworth, 1988; Carver and Mackay 1986) that document the successful use of 'low cost' educational television production. It is an adaptation of the TVI model that holds significant promise to meet this project's criteria. TVI is an instructional method developed in the early seventies at Stanford University for the distance education of engineers. Essentially, a candid videotape of an on-campus class is made. The tapes are then mailed to students, along with printed instructional material. In the original case at Stanford, on-site learning infrastructure was supplied by the industrial firms for which the engineers were working. The tapes were viewed by groups of 3 to 10 students, assisted by a para-professional tutor, typically a senior colleague. The main role of the tutor is to foster group discussion by ensuring that the video's stop and playback features are taken advantage of. Experience at Stanford indicates that students learn best when the videotape is stopped every five to ten minutes for a period of 3 - 5 minutes. Such a process ensures that most problems are normally resolved by the group through discussion.

Questions unanswerable by the group are referred back to the course instructor by telephone for answers (Gibbons et al., 1977). It is also reported in the same study that the TVI model is at least as effective as either classroom instruction or live television with audio talk back. It is noted that in 1983 - 84, the association for Media Based Continuing

Education of Engineers, a consortium of 25 engineering universities, was using TVI to successfully provide more than 435 videotaped courses in 18 engineering disciplines to engineers working in industry and government all over the USA.

In addition to the significant cost saving of 'piggybacking' the videotape production onto the normal campus classes and the low cost of videotaping in this manner, it is suggested that the group learning sessions reduce course drop out rates and provide an educationally effective, as well as cost effective method for ensuring that students become more than passive observers of the production. Organizational lessons learned from the Stanford experience include:

- group size was important; 3 - 8 was optimal, greater than 8 - 10 tended to inhibit discussion and reduced the frequency with which the tape was stopped.

- active classroom participation in the live classroom is desirable.

Unrehearsed, unedited tapes appear to be more interesting to watch than professionally produced lectures (Rathore, 1988). As is unfortunately the case with other educational models, and despite the apparent widespread use of TVI in the engineering field, workers such as Bates (1988) note the great difficulty of finding many published evaluations of the learning effectiveness of TVI.

Conclusion to Rationale

The model as proposed, and represented in Figure I, utilizes several strategies that individually have a firm foundation in the literature, but have not, to this author's knowledge, been used previously in this combination and certainly not with this target population. It is believed

that the model has the potential to meet the criteria described above in the introduction.

The use of television and the speaker phone link maximizes the availability of extension personnel. The use of 1/2" videotape cassettes is economically

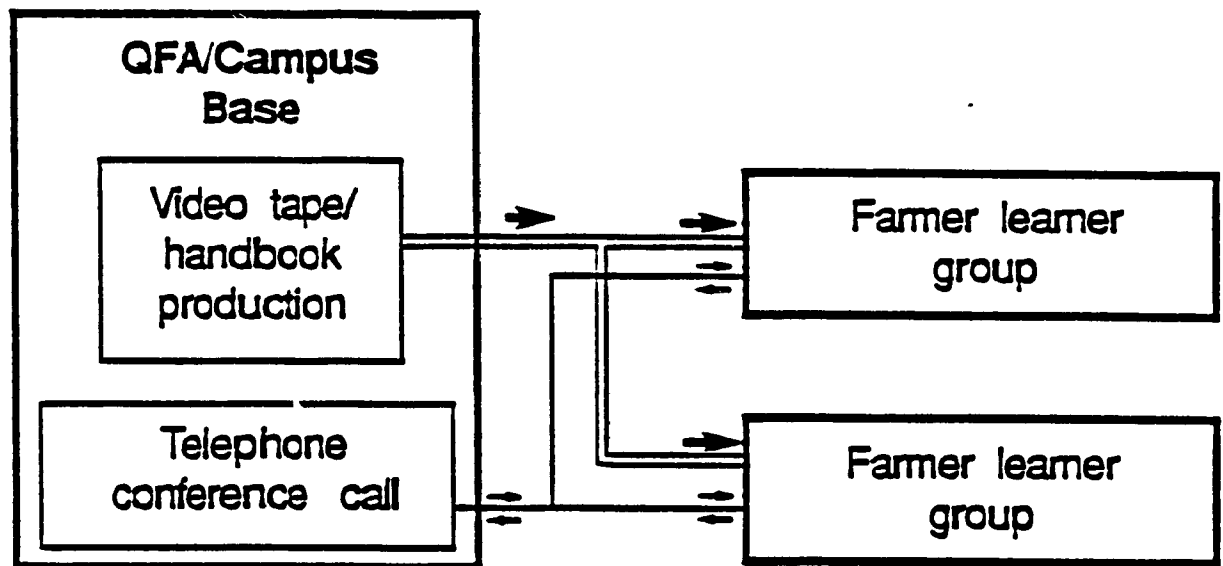


Figure 1. - Representation of learning model

feasible and they are easily distributed to the remotest parts of the province. Production of the tape is on a 'low cost' basis; beyond the editing in of questions and instructions, there is only a candid shoot of the presentation. It is on the point of substituting edited-in questions

and instructions to stimulate group discussions instead of using tutors, that this model differs substantially from TVI. Gibbons et al. (1977) show some work that provides an indication that a crucial point in the TVI model is the utilization of the tutors. However, as the authors point out, the comparisons between use of videotape with and without a tutor are far from rigorous. The argument could be made that although tutors appear instrumental in exploiting the VCR's control features (notably the 'pause' feature to permit discussion) in the TVI model, the proposed program design of edited in instructions on the tape, could conceivably substitute for the tutor with equal effectiveness. Brown (1984) reports feedback on an Open University course video cassette targeted to school teachers (EM235, 'Developing Mathematical Thinking') indicating that VCR control instructions contained on the tape were taken considerable advantage of by the learners.

The reason for the different strategy is that TVI is designed to be used in a structured environment in which the VCR control features are operated by a designated authority figure i.e. a senior colleague of the learners. From this author's experience in agricultural extension work, it is unlikely that such a figure will readily emerge from the informal group of farmers viewing the video; thus the necessity to edit in the instructions and the blank tape to encourage discussion. The discussion above has referred to the benefits of providing feedback/interaction mechanisms in general, particularly relating to farmers (peers as sources of knowledge etc.) In this regard it is also interesting to recall from the Pettit (1988) evaluation of the Alberta agricultural video library experience that 58% of the respondents to the questionnaires wanted more information after having viewed the video.

This is encouraging in that a) the model provides such an opportunity and b) indicates that the farmers may respond positively to the experience.

2.4 Selection of Evaluation Approach

Popham (1988) defines systematic educational evaluation as consisting of a "formal appraisal of the quality of educational phenomena" (p 7). Stufflebeam et al. (1971) views evaluation as a process of delineating, obtaining and providing useful information for judging decision alternatives. These two examples contain the essentials that make them representative of the wide array of definitions found in the literature; they both take the concept of evaluation out of the realm of informal, intuitive judgements and emphasise the requirement for a formal or systematic information gathering process, with the objective of the latter's presentation as a basis for making a decision about what has been evaluated.

A distinction is found in the literature between formative and summative evaluation. Scriven (1967) is recognized as being the first worker to formally define a difference between the two types of evaluation, although several others (e.g. Weston 1986, Cambre 1981, Cronbach 1980) have noted that, even if such a distinction had not been formally defined before, the difference between the two had been realized *de facto* years prior to Scriven's formulation of the terms. Scriven recognized a formative evaluation as being one which tries to improve a still-under-development instructional sequence, and a summative evaluation as one which assesses the merits of an already completed instructional sequence. Since then, many examples of refinements to this basic distinction are to be found in the literature,

along with its adaptation to a wider field than that of instructional evaluation to which Scriven had originally applied it. For example Steele (1975) views summative evaluation as that which describes the results of a program compared to formative evaluation which is conducted before and during a program and used to influence the program while it is in progress. Baggaley (1986) applies the distinction in the evaluation of educational T.V. production as formative evaluation being that which "aims to monitor and recommend modifications to the impact of a production during its formative process," and summative evaluation as 'that which is conducted when a production is completed and modifications are no longer possible (page 30).

Although, as Weston (1986) notes, the distinction has been widely embraced in the development of instructional material, some leading workers in the evaluation field are now questioning its usefulness. Popham (1988) observes that it is often difficult to draw a decisive division between formative and summative evaluation, noting that their 'roles are often merged, sometimes deliberately and sometimes unwittingly' (page 15). Cronbach (1982) views Scriven's (1967) terms as convenient, but notes concern that they in fact suggest a false division of evaluative studies. He states that evaluation, which focuses on outcomes can, and should, be used formatively. Providing an example from social program evaluation, he notes that when a program fails the social planner wants to know why and how to do it better next time. Baggaley (1986) provides a looped model of evaluation for educational T.V. production in that the 'summative' component feeds into that of the formative evaluation competent of the next production on the same issue. It is on this latter premise of "Feed Forward"

evaluation that the evaluation described in this thesis is primarily based.

Rationalistic and Naturalistic Research Paradigm

There exists considerable discussion, if not outright controversy, in the literature concerning the most suitable research paradigm on which to base disciplined inquiry, particularly in the social/behavioral sciences (Guba, 1981, Guba and Lincoln, 1982, Kirk and Miller, 1986, Patton, 1987). The two paradigms are known as the Rationalistic or Scientific method, and the Naturalistic paradigm.

Guba (1981) observes that there is a common misconception that it is the use of qualitative or quantitative research methods that define the paradigm on which an inquiry is based. It is important to note that the two paradigms are differentiated by the contrasting axioms on which they rest, and not on the specific methodologies utilised in an inquiry.

The essential axioms by which they are differentiated include the assumptions as to what constitutes reality (whether or not there is a single, knowable reality or multiple realities), whether or not objectivity can be maintained between a researcher and the object of his/her research, and whether or not context free truth statements can be discovered (Guba, 1981, Guba and Lincoln, 1982). The rationalist paradigm rests fundamentally on the axioms that there is a single reality which can be broken down to component parts which in turn can be independently manipulated. This process has the goal of converging on that assumed single reality. In addition, researchers using this paradigm maintain that an objectivity or neutrality can be maintained between the researcher and subject (usually by the placement of instrumentation between the two), and that through

careful experimental design, truths may be discovered that are generalizable to other contexts and over time.

Naturalists rest their process of inquiry fundamentally on the axiom that there exists not one single reality but rather a multiple of realities. Thus, rather than converging on a truth, the inquiry will diverge as it proceeds. The naturalistic paradigm is also based on the assumptions that the parts of whole are interrelated such that the study of any one part necessarily influences the whole. Also in contrast with the rationalistic stance is the naturalists' axiom that the researcher and object of research are interrelated or influence one another. The naturalistic paradigm will try and control for this factor, but does not recognize that it can ever be fully discounted. This leads to another axiom of this paradigm that conclusions from research can never be entirely context-free. Any generalisation of results requires a very careful mapping of the similarities from the originally researched situation to the one that it is being compared to.

By definition, one set of axioms ("agreed upon assumptions") is not true and the other false; rather it is suggested that the researcher should use a "best fit" of axioms as a guide to which paradigm is most applicable to a particular case (Guba, 1981). In the case being considered here, the set of axioms characterizing the naturalistic paradigm have been seen as the most relevant in the conceptualization of the evaluation approach. The present study is evaluating a learning model. In it, some of the issues to be identified, e.g. how the learners valued the learning model, will exist chiefly in the minds of people (the target group of learners) and, as Guba notes "there are as many realities as persons" (p.77). Secondly, despite the efforts made to

maintain objectivity at all stages of the inquiry, the author nevertheless remained the main instrument of inquiry, and does not consider himself impervious to inquirer-respondent interchanges. Finally, the object of the evaluation is not to produce a context-free, time enduring "truth statement" but rather the evaluation of a learning model in a defined context-specific situation.

Selection of methodological approach.

As noted above, the adoption of either the rationalistic or naturalistic paradigm does not dictate per se the methodology that a researcher should employ, although it is often wrongly assumed that proponents of the rationalistic paradigm will utilize quantitative methods and those of the naturalistic paradigm, qualitative methods. However, despite the frequency with which this particular coupling of paradigms with methodology is observed in practice, there is no technical reason why both methodologies should not be utilized within either paradigm, (Guba, 1981, Patton, 1987). The methodology selected depends on a variety of factors.

Patton (1987) has summarized twenty factors that should be considered when selecting the methodological approach for an evaluation. He notes that the summarization cannot be used in an algorithmic fashion, observing that "matching research methods to evaluation questions is a complex, creative process." (p. 42). However, having taken this into consideration, several of the factors that he notes do have direct relevance for the evaluation discussed here, and reflection on them has led to the conclusion that an essentially qualitative approach would be most appropriate in this particular case.

Of the points noted by Patton (1987), the following have contributed to the decision to employ qualitative methods:

1. The evaluation seeks to gain an understanding of the overall strengths and weaknesses of the learning model.
2. There is an interest in exploring the use of the model by a diverse range of learners.
3. There is a need for information on details as to how the model is implemented and used by the learners.
4. There is a need for unobtrusiveness in the evaluation process. It is foreseen that with the particular target group of learners that the administration of standardized measuring instruments would be perceived of as overly obtrusive in contrast to data-gathering through observation and interviews.
5. To elucidate all the required information in sufficient depth, there is a need to personalize the evaluation process for this particular target group by using methods that feel natural, informal and understandable to participants.

Other workers concerning themselves with distance education have also argued that at the current phase in the evolution of this area of inquiry, case studies are not only valid, but are in fact critical for pinpointing key variables for later study using quasi-experimental techniques (Catchpole, 1988).

Rigour and the naturalist paradigm.

Concurrent with, or extending from, the controversy to be found in the literature regarding the rationalistic and naturalistic research paradigms, is the discussion over the rigour afforded to research undertaken within the naturalistic paradigm that so predominately

utilizes qualitative methodology. The four concerns central to the rigour of rationalistic research are the concepts of internal and external validity, reliability, and objectivity. Considerable attention has been paid to these concerns in the literature over the past decades, and , and methodological techniques refined to deal with them; for example, see Campbell and Stanley (1963).

These concerns have implications for researchers who work in the naturalistic paradigm in that the results from their research will be assessed to a certain degree against these criteria of the rationalistic paradigm. Guba (1981) has drawn useful parallels between the issues and the way they are addressed in the two paradigms: Internal validity is compared to the credibility of the naturalistic research, external validity to the transferability of the results obtained to other situations, reliability as the consistency or dependability of the naturalistic research, and objectivity as its confirmability. However, Guba also emphasizes that it is inappropriate to apply the same criteria to both research paradigms under all circumstances as naturalistic inquiry can be considered as having its own set of criteria.

There are now a wide range of methodological techniques for attending to the "trustworthiness" of naturalistic research and the qualitative methodologies often utilized within the paradigm. For example, see Guba, 1981, Guba and Lincoln, 1982, Kirk and Miller, 1986, Patton, 1987. The evaluation of this learning model has used several of them to increase value of the results obtained. For example, the credibility of the research is enhanced by the use of different sources for obtaining data (SME and learners) and different methods used for obtaining that data (interview, questionnaire and observation).

As Guba notes the use of triangulation also serves to enhance the reliability or consistency of the evaluation as well as the confirmability of the results. Checking the author's perceptions arising from the data with both learners and the SME as the evaluation was proceeding (member checks) also provided further assurance of credibility. With regard to applicability, it is noted that the study was undertaken primarily to evaluate the use of the learning model with a specific target audience. However, for future use of these results and any potential transfer of them to other situations, the characteristics of the audience from which the learner groups were drawn was described, along with specific background data on the individual learners in the groups, and the author's observations of the context under which each group utilized the model.

Chapter 3 Production and Development of Materials and Evaluation Procedures

3.1 Production and development of materials

As described earlier, the learning model requires the production of a videotaped presentation/group discussion with inserted questions, and a supporting handbook. A brief description of the production of these materials follows.

Identification of Subject Matter

The subject matter for the presentation was agreed upon between Professor Elliott Block (presenter and SME) of the Animal Science Department of the Macdonald Campus of McGill University and the author. The subject matter's relevance was based upon an informal assessment of dairy producers' learning needs arrived at from extensive personal contact on the part of both the SME and author with the target learner group.

Instructional Objective

The instructional objective of the learning event was that the learner should maximise his profit from milk production by understanding the topics presented and discussed in the session and applying them where necessary to his/her feeding program.

The specific topics considered were as follows:

1. The importance of providing feed in the correct physical form.
2. Defining the ideal format and texture for providing grain in feeds.
3. Defining conditions under which the 40:60 grain:forage ratio should not be applied to ration formulation.

4. Defining Neutral Detergent Fibre (NDF), and the minimum requirement for it in a feeding program.

5. Defining the optimum number of feeding times/day and how much grain to be fed at each feeding.

The content to be presented was based on a lecture that the SME had made previously to several large groups (75+) of agricultural producers. Under these "face to face" conditions, the presentation was made, with slides, in about 45 minutes. The material to be presented was reviewed by the SME and author for logical order of presentation and the use of visual aids. Following recommended instructional design principles, an introductory segment in which the relevance and importance of the subject matter to the dairy producer was included to provide motivation and to maintain the learners' attention. This was achieved by reference to the problems occurring, and profits lost, when attention to the concepts contained in the videotape were ignored by the producer.

Video Production

The presentation/discussion was videotaped in the faculty lounge at Macdonald Campus. The decision to locate the session in the faculty lounge and forego the superior technical benefits of an available downtown studio was based on the rationale that the farmer participants would be more at ease in a location with which they could more easily identify and easily access. Five farmers participated in the taped discussion and technical assistance was provided by the Director of the Video Production Department of McGill University's Instructional Communications Centre.

All taping was recorded on half-inch VHS videotape. A simple three camera set up was used; one camera was set to record, unattended, an establishing shot that included the whole group, whilst two camera operators covered the presenter and one side each of the participants sitting around an oblong coffee table. One conference table microphone was used, centred in the middle of the table and connected via a split cable to the two side cameras so that the audio would be synchronised on both tapes recording close up shots of participants.

After the main taping session and its review by the author, a series of questions for insertion into the video were proposed to, and selected by, the SME. The SME was then taped at a later date explaining the purpose of the question breaks and reading the questions that appeared on the screen (see Appendix V). Also taped for editing into the video were a series of titles, credits, and graphics referred to by the presenter in the discussion, and the inserted questions. These were produced on Microsoft Word and printed on an Apple laser printer on dark yellow paper.

The author then edited the three original tapes onto one master. The master tape consisted essentially of 3 major segments, each followed by an insertion of the pretaped SME's introduction of the review questions. The tape content and associated recording times are summarized as follows:

Titles and introduction: 1 minute and 45 seconds.

Section 1; Problems associated with low feed intake, correct length for feeding forage and how to measure at harvest: 25 minutes and 35 seconds.

First set of inserted questions and interlude.

Section 2; Physical form re grains and definition of NDF and ADF; 17 minutes and 30 seconds.

Inserted break with directions to pause the tape and refer to handbook for table and example.

Section 3; Percentage of NDF in the ration in relation to rumen health; 21 minutes and 46 seconds.

Second set of inserted questions and interlude.

Section 4; How to incorporate what has been discussed into ration formulation and points on management of the feeding system; 33 minutes and 46 seconds.

Final inserted question.

Handbook production

A handbook was produced by the author to complement the video. It included a point summary of the presentation, graphic material referred to in the presentation, and an example developed by the SME after the experts review of the master tape. The handbook was prepared on a dot matrix printer, photocopied and bound with a spiral binding. An example of the handbook may be found in Appendix V.

3.2 Evaluation procedures

Purpose of the Evaluation

The evaluation had two major objectives. They were:

1) To evaluate the potential of the learning model to meet the learning needs of the target population, taking into consideration the cost and personnel criteria described in Chapter I.

2) To provide "feed forward" formative evaluation for future application of the model if a conclusion to proceed with further use of the model was arrived at. ***Primary Evaluation Questions Addressed***

Before any conclusions could be drawn regarding the value of the learning model in general, it was necessary to confirm factors such as the relevance of the subject matter, and evaluate the video production values, and reception over the speaker phone, of this specific learning event. It was foreseen that the participants' evaluation of these issues would have a direct impact on evaluation data gathered as to the value of the model in general. Thus, to meet the objectives of this evaluation, the primary questions addressed are divided into two categories:

A. Regarding the specific learning event.

1. Was the subject matter relevant, and new to the target learning group?

2. Was the knowledge level of information presentation appropriate for the learners?

3. Were the video production values (picture quality, sound) acceptable to the target learner group?

4. Were any problems detected relating to the SME's manner of presentation of the material?

5. Was the reception over the speaker phone acceptable?

B. Regarding the learning model in general.

1. What was the impact of the model? How did participants value the model, and did they learn from its use?

2. Regarding the inserted questions/home discussion sessions, did the learners value this opportunity to discuss the subject matter with peers in this setting? Did they find it helped to clarify and reinforce the material covered? If so, how often should the question breaks be inserted?

6. How much did the learners' value the speaker phone as a feedback mechanism?

7. Did the conference call clarify, modify or reinforce what had been seen and heard in the video and home discussion groups?

8. What was the value of the handbook?

9. Did the learning model meet the cost and personnel criteria detailed in the introduction?

Evaluation Procedures

The evaluation strategy consisted of the following activities:

1. Evaluation of presenter's on camera mannerisms prior by making a practice tape with the presenter and reviewing it with him prior to the group recording session.

2. Post-taping interview with participants in the recording session.

3. Post-taping interview with SME.

4. Review of edited tape and handbook with SME.

5. Evaluator's observations of both recording group and home viewing groups.

6. Post-viewing interview with home-viewing groups.

7. Short written questionnaire administered to participants several weeks after having participated in the learning event.

Chapter 4

Results and Discussion

4.1 Introduction

The evaluation results are reported in three sections as follows:

1) the results of the post-taping interview with the SME, and his later review with the author of the videotape and handbook,

2) the results relating to the selection of subject matter and production values of this particular learning event,

3) evaluation results relating to the learning model in general.

Included in this section is a consideration of the cost factors, and utilization of professional personnel time in relation to the model.

When the practice tape was suggested to the SME, the opportunity was declined on the grounds that this was not the first time he had been before a camera. The author thought it best not to press the point and, as evaluated by the learners, the presenter's on-camera manner was considered to be natural and not distracting.

4.2 Evaluation by SME

The SME reported a very positive response with regard to the level of the discussion and the points raised by the farmers in the post-taping interview. On reflection, he could not recall any points that he felt should not be included from a factual point of view.

In the SME's opinion, after having reviewed the entire master videotape with the author prior to it being evaluated by the learner groups, the information presented and arising out of the group discussion was correct and relevant. He suggested that the section on Neutral Detergent Fibre (NDF) and Acid Detergent Fibre (ADF) would benefit from further elaboration. An example was constructed by the

SME to provide the elaboration, and then included in the handbook, and a reference to it inserted in the videotape.

The SME did note that he had never examined the material in such depth before with learners, and felt that this way of presenting the material i.e. in a small group format, had allowed him to pace the presentation of his topic much better than he had done previously in lecture style presentations. He had been able to base the pacing on his perception of the learners' reactions and by allowing himself to be guided by the questions.

4.3 Evaluation of the specific learning event.

Participants in the evaluation process.

Appendix III presents a short profile of the participants in the learner groups. As can be seen from the profile, there is an interesting cross section of ages, gender and level of formal schooling.

Subject matter

The interview and questionnaire comments, and the author's observations of the three learner farmer groups, indicate a strong consensus amongst the learners that the subject matter presented was in general new, or previously not well understood by learners. With one section excepted, the subject matter was perceived by the learners to be relevant to the target learner group's needs. One section, that of the description of the constituent make up of NDF and ADF (as opposed to its role in feeding programs) was perceived as too theoretical by the members of both evaluation groups. It aroused direct comments from participants that the material presented should "stick to practical matters only." All participants from the recording and evaluation groups commented directly (either in the interviews or on the

questionnaire) that the session had presented both new information and clarified many points for them.

Another measure of the learners' interest in the subject matter beyond their comments was that the participants were enthusiastic to continue viewing the video despite there being an audio problem on the video (described below). Further to this, the learners desired either to copy, or have a copy, of the tape for further study on their own time.

Level of information presentation

Both written and interview comments reflected learners' concerns over the level at which information should be presented. Three of the farmers (all of whom could be categorized as well informed and had received post-secondary education in agriculture) expressed the concern that some farmers' entry level knowledge to the learning event may make it difficult for them to follow the video, e.g. "...I feel that a large percentage of the farmers are unfamiliar with many of the terms and concepts being discussed" (GH, recording group participant) although they themselves would not have wished the level of information presentation to have been lower than it was. The author's observation confirmed that there was, just within the two groups evaluating the model, a wide range in the background knowledge of the farmers. However, there was a recognition amongst all levels of learners evaluating the tape of a farmer's need to understand the material at the level it was being presented. The suggestion was made in both evaluation groups that tapes be made for farmers with differing entry levels of knowledge.

Quantity of information presented/duration of learning session.

Members of the original recording group expressed the desire to continue the discussion beyond the 4.5 hours that it lasted. However, both groups evaluating the tape reported the quantity of information presented as too much to process in a one day session. It is noted that neither evaluation groups finished viewing the third section of the tape. The author observed learners' concentration levels dropping off in both evaluation groups after they had finished the first two sections and the phone call. At this point they had been viewing and discussing the material for at least four hours, and it was getting close to milking time. Also, the speaker phone call perhaps had provided a sense of closure to the learning session.

Several suggestions were provided by the learners as to how the model may provide better pacing of the material in the future which are referred to in the recommendations chapter.

Video production quality:

Both evaluation groups expressed their entire satisfaction with the visual quality of the half-inch VHS videotape. However, all participants noted the electronic hum on the sound track referred to above. For much of the time this noise grew to distractingly loud proportions in the author's estimation. The author can only assume that it was due to the learners' interest in the subject matter that the noise did not deter them from continuing to view, or wishing to copy the tape. Such an observation would appear to support those who argue that appropriate selection of subject matter and instructional design techniques can compensate for low production values.

Telephone Speaker Call

Despite technical problems of connecting the phone in the host house of the first group, and the necessity to move the second group to another farm house to locate the correct type of telephone jack, all participants in both groups reported clear and adequate reception over the speaker phone. Use of the speaker phone requires a direct i.e. non party-line, and, unless the user is prepared to customize the phone hook-up him/herself, a jack into which the phone may be plugged in and out as opposed to being "hardwired". In the first case described here, one of the participants volunteered to hardwire the phone into the existing set up.

4.4 General Evaluation of the model

Impact of the learning model:

a) Participants' valuing of learning model.

All learners strongly endorsed the concept of the learning model. This is reflected in the direct comments made by learners, e.g. "very good idea" (NR), "Concept used for training was very effective" (DN, DN), "the video approach... holds tremendous potential to meet the most up to date research from the talented people direct to people who most need it, quickly, easily and at low cost" (ML). Secondly, in their willingness to pay for future sessions e.g. "I would not foresee sharing the cost of the telephone call being a problem," "I for one would love to be able to rent a copy of the video" (ML), "I would pay \$29.00 for the video," (DD). Finally the fact that they all wish to participate in future study groups using this model also supports this conclusion.

b) Participant learning from the model.

Difficulties in assessing whether, and how much learning has taken place during learning events is well documented (Bower and Hilgard, 1981). This is particularly so for non-formal learning situations.

However, several pieces of evidence are reported to indicate that learning did take place, and that the overall instructional goal was achieved in varying degrees by all the learners.

All participants from the original recording group and first evaluation group, barring a French-speaking couple, reported in their written responses either significant examples of concepts which they had learned and related to their operation, or actual changes they had made to their feeding program. Examples of these may be found in Table II. The second group's response to the questionnaire was not as complete. The author does not conclude that this is evidence of learning not having occurred, but rather is the result of circumstance or the specific characteristics of individuals in the group. For example, one questionnaire was reported mailed but never received by the author. Another couple, although reporting the "concept used for training was very effective" (DD,) left the changes in feeding program response blank. A written response was not to be expected from another couple in the group. However, the level of enthusiasm for the model expressed in the interview e.g. "it touches on the economics to a great extent, it is not trivial," (RT), was as high in this second evaluation group as in the other two groups. The observation that all learners in the second group expressed the desire to participate in a similar event again, that group members arranged to make their own copy of the video, and the number of suggestions they provided for future topics,

strongly indicated to the author that, despite the lack of written examples of behaviour changes, participants at a minimum, believed they were learning something of value from the learning event. In a non-formal voluntary adult education setting this last point is of particular significance. If the learners do not believe they are learning material of value then they will not continue participating in the learning event.

Use of VCR pause controls

It was on this important point that the two evaluation groups differed. The first group contained, as observed by the author, a natural "group leader" by virtue of his seniority personality and experience. The leader (who was also host) had expressed enthusiasm about the introduction of electronic technology for farm information transfer, and needed no encouragement to play something akin to the "tutor" role of the TVI group described above. In this role, he undertook to pause the tape to underscore what he thought was an important point, regularly checked the pace of the material presented with group members, and rewound the tape for review of more complicated sections. This leadership appeared accepted and welcomed by other group members.

When the need for breaks introduced by inserted questions was discussed in the post viewing group interview, members of this group thought that people would now be familiar enough with the operation of a VCR to automatically break in at any point. Nevertheless, it was noted that the breaks introduced by the inserted questions provided the lead into a wide ranging, 20 minute group discussion during which much of the material heard from the tape was related to individual participants'

experience. This group voluntarily paused the tape at least 4 times in the first section and ten times in the second.

Such a natural leader did not emerge within the second evaluation group and consequently there was only one pause in the first section (requested over a remark heard in the video about the adjustment of a piece of farm machinery) and twice in the second. The inserted questions were the key to generating discussion with this second group. After a slow start in response to the first inserted questions break, an animated discussion finally developed for fifteen minutes. During it, the host brought a sample of his own silage to show group members and compare it with that which they had seen on the video. The inserted questions after the second section were also successful in stimulating discussion. Considerable peer tutoring was observed during the discussions, as those who had understood the concepts fully (two farm wives who both had received basic biochemistry in their nurses training, and the one farmer with a BSc. in agriculture) provided explanations to other group members. The content of the discussion breaks of both evaluation groups was directed at placing the information received within the farming context of the participants and providing elaboration of the information received.

Participants from all three groups strongly valued the opportunity for group discussion whether it was in the recording group session or the evaluation groups at home. Many comments were made in the post-viewing interview that reflected this, e.g. "we didn't listen to one person, we listened to six people," (KH) "small groups are always more effective," (PR) "You can compare your level of management with other

people involved," and "It is always interesting to hear other peoples' points of view on the different subjects that arise" (FS).

The author concludes from the evaluation that the inserted questions served the educational purpose for which they were intended, and were valued by the learners. This appeared to hold true for the group that paused the tape voluntarily as well as for the group which required the introduction of breaks by inserted questions as the only way to promote any group discussion.

It appears to this author that the inserted questions are probably playing two roles. First, they are promoting an active cognitive processing of the material being viewed and secondly, they serve to maintain the learner's attention to the material. Thus the optimal timing of the breaks may be a function of either the complexity of the material being presented, or the amount of time that the learners actively attend to the material on the tape. However, the practical question remains of deciding how many breaks should be inserted, and at what point in the video this should be done.

It can be concluded that "any breaks are better than no breaks." However, when taking into consideration the desire for smaller chunking of the material expressed by participants, and Gibbon et al's (1977) report from the TVI experience where the most effective results were obtained when the tutor stopped the tape every ten minutes, the author would recommend that future productions evaluate the use of inserted questions at intervals of no longer than every 15 minutes, and more frequently if the natural flow of the taped material permits.

Speaker phone

Both evaluation groups enthusiastically endorsed the use of the speaker phone as part of the learning session. All learners displayed an eagerness to participate and after a single demonstration of its use by the author, eagerly took over control of it.

In both cases however, the use of the telephone time became closer to that of an individual consultation between each group member and the SME, as opposed to group discussion. By mutual agreement arrived at within each group, each farm represented in the group was to have about 10 minutes to talk to the SME. All members paid close attention to the points made by the SME. However, each learner wanted, understandably, to relate the feed recommendations referred to in the videotape to their individual feeding program. To do this required the learner to provide an extensive amount of detailed data to the SME, who was then put in the position of making individual recommendations as opposed to answering general questions about the concepts discussed on the tape. Telephone time became a limiting factor for both groups in this scenario. Both sessions were ended only through the intervention of the author (who was responsible for the telephone budget if not the SME's time!). Clearly the learners showed no reluctance to utilise the technology or inhibition in addressing the SME in this way.

The author also observed the difficulty of group interaction around the speaker phone as opposed to the successful one on one exchanges between the SME and an individual group member. The technology simply does not appear to lend itself to anything but a well ordered (chaired) meeting. This description does not characterise the typical

dialogue between six farmers, in which often one or more conversations will be occurring simultaneously.

Given this experience, it was considered futile to attempt the original strategy of linking up several groups of learners and the SME at the same time.

Handbook

Learners comments on the handbook were solicited in both interviews and the written questionnaires. As examples of the written comments shown in Table II show, the handbook was clearly perceived by participants as a necessary adjunct to the video and home discussion groups for learning. Learners responded positively to the layout and reported no difficulties in following the material contained in it. No suggestions were received for changes to it. Several comments referred to its importance as a vehicle for review of what had been viewed on the tape and its necessity for being able to understand the graphs presented on the video.

Cost and Personnel Factors:

Two criteria to be included in the evaluation were referred to in chapter one regarding costs and use of extension personnel time.

Specifically these were:

- 1) that the learning model maximise use of the available extension personnel resources and
- 2) that the cost factors involved in the production of the materials and administration of the model be on a level that is deemed reasonable on a sharing basis between the sponsoring organization (QFA) and the learners.

Clearly it is impossible to generalize the cost factors involved in the production of materials in this experience because each organization or institution using the model will have different advantages with regard to the availability of experienced personnel, equipment rental etc. In the case considered here the sponsoring organization has access to university video equipment at departmental rates. However, costs can be extrapolated to other situations by consideration of the following factors.

Equipment requirements:

2 - 3 VTR cameras, lights and Mikes: 1 day

Equipment for producing on screen titles, credits and inserted questions and voice overs for introductions etc.

Editing facilities: approx 15 - 20 hours

Desktop publishing facilities for handbook, titles etc.

Professional requirements:

Project coordinator to:

- plan learning needs identification,
- identify and contract with SME,
- identify and liaise with an instructional designer to work with SME,
- liaise with Video production team,
- organize for the publication of the handbook, administer distribution of learning material to learners.

Subject matter expert/presenter

In this instance and, the author suspects, many others in which this model may be applicable to, one person is available to function as coordinator, instructional designer and video editor etc. Obviously costs rise considerable if many individuals have to be hired to complete

all the necessary tasks described here. The implementing organization had the agreement of Faculty members at the Macdonald Campus to participate as SME's as part of their community service mandate, and the author, as a staff member of the Quebec Farmers' Association, carried out the duties of the project coordinator, instructional designer and video editor etc.

Even if such advantageous arrangements are not available, the alternative of organizing face to face meetings over long distances for several groups is likely to be considerably more expensive, both financially and in terms of the SME's time, than implementation of the model. In the study described here, such is the case; recognizing the significant in kind contribution of professional time, the actual financial outlay for the production of one video was estimated at less than \$500.00, which has allowed for producing 5 copies of the videotape for learner groups to use.

An alternative source of revenue would be to sell the tapes and handbooks. Agricultural instructional videos produced by the University of Guelph are currently on sale for \$35.00 each and learners in the evaluation groups indicated they would pay for the tape they had viewed. Taking this as a reference point, sales of fifteen copies would cover costs. Such a sales target would be easy to reach and avoid administrative chores and problems associated with rental or loaning of tapes.

Chapter 5.

Conclusions and Recommendations

This chapter summarises conclusions and recommendations made as a result of this evaluation. The conclusions are presented in two parts; first those that are summative followed by those that are considered formative in nature.

The major conclusions from the evaluation that may be considered summative in nature are:

1. The instructional material provided in the instructional unit was relevant, and either new or previously not well understood by the target learner groups.

2. The visual and audio quality of the tape was acceptable to the learners despite the presence of an electronic hum.

3. The handbook was considered by the learners to be an essential component for the instruction contained in this unit.

4. Learners placed high value on the feedback obtained by the speaker phoneconference call.

5. Significant learning was reported by learners from the instruction provided.

6. The videotape ran too long to be covered in the proposed one day session.

7. The inserted questions edited into the videotape did promote discussion of the material amongst learners, and was valued by them.

The following are the formative or "feed forward" conclusions and associated recommendations from the evaluation.

1. Use of half inch VHS format is quite acceptable to learners. More important than high production values is attention to basic instructional

design considerations starting with accurate identification of learning needs that are perceived of as important by the learners.

2. Inserted questions should be used to facilitate review and discussion of the material by learners. It is recommended that breaks should be inserted at least every 15 minutes into the tape, the timing decision being dependent upon the complexity of the material being presented and naturally occurring conclusions to sections of the material being presented.

Methods may be sought to reduce the arbitrariness of the decision of where to insert the questions. Two alternative suggestions are offered as to how this may be achieved.

First, the unedited tape may be viewed by a group of learners and, after the viewing, an interview be held to guide the instructional designer as to which points are likely to require review by learners, and also those issues contained on the tape which are considered not relevant by the learners. A problem that might arise with this approach is that the unedited tapes tend to contain too much material (in the case reported here there were over 2.5 hours of originally recorded material) to expect a group to view in one sitting, recalling that not only is there viewing time but interviewing time as well.

A second, more systematic, and potentially significantly more powerful method is suggested for evaluation for those designers who have access to the PEAC (Program Evaluation Analysis Computer). It is suggested that a representative group of learners be invited to view the unedited tape in a morning session. During the viewing they would operate the PEAC audience reaction units. Two questions would be posed to the viewers for their continuous response during the viewing

of the tape; the first being, "press button A at any point that you would have wished to rewind the tape for review of the material you have seen on the tape," and secondly, "press button B any time you feel the material on the tape is not relevant to your learning needs." Over a lunch break, the recorded reactions could be analyzed with reference to the points on the tape which elicited the reactions. During an afternoon session in the presence of the SME and instructional designer, a discussion would be facilitated with the group by rerunning the points at which a majority of the learners indicated they would have rewound the tape for review. The group would be asked why they had wished to review the tape at the point. Similarly, elaboration from the group would be sought on the points at which they thought the material did not meet their learning needs. Such an approach, although still leaving the final decision in the hands of the instructional designer as to when to insert the questions, would provide a significant amount of information which could serve to reduce the arbitrary nature of such decisions. It is not thought that time and cost considerations would be prohibitive for those with access to the PEAC. However, the length of originally recorded material, if it is too lengthy, may be problematic with this approach.

3. Allowance must be made for the considerably increased amount of time that presentation of the material takes when presented in a small group format as opposed to lecture style. When combined with the time taken for discussion groups at home as well a 45 minute lecture may easily extend into a 3 to 4 hour session. Learners in this evaluation appeared to be comfortable with no more than a three hour session in

total. This would translate into no more than one to one-and-a-half hours of videotaped material.

4. Use of a complimentary handbook as a tool for review and for provision of graphic material and tables and review of major instructional points is considered to be essential by learners.

5. Learners valued the feedback provided by the speaker phone, however if this model were to be introduced on a wide scale, the constraints encountered in the use of the speaker phone for group discussion would call for group by group communication with the SME. The SME's time would soon become a limiting factor here and interaction and feedback between other groups of learners would be lost. Thus it is recommended that other vehicles be explored for the provision of learner feedback. For example, the potential for the establishment of an electronic bulletin board may be evaluated.

Alternatively, or in combination with a bulletin board, learners may view a series of videos, submit written questions to the SME and then meet as a large group, face to face with the SME. This suggestion was made by the second evaluation group. However, it of course depends on the availability of the SME.

The results obtained in this pilot project provide very encouraging indications that the TVI model, or adaptations of it as was explored in this agricultural extension context, holds significant promise for application beyond that of its current use in the field of engineering education. The model as evaluated here certainly provides the basis for an important new tool in agricultural extension education which will be pursued further by the Quebec Farmers' Association. It is hoped by the author that the model will be evaluated by workers for use in other

fields, and that resources will be made available to implement a larger scale evaluation in its agricultural application, thereby permitting the use of a quantitative evaluation techniques to enable further "fine tuning" of the model.

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Appendix I. Example of Questionnaire.

1. Can you think of any actual changes you have made or plan to make in your farming practices as a result of the information you learned from the tape and discussion?

2. How useful do you think it was to have the notebook that accompanied the videotape?

3. Are there any changes (improvements) that you would like to see made to the notebook?

4. Do you have other comments that you would like to make on any aspect of the your experience with the tape and discussion group?

Please return in the stamped, self-addressed envelop as soon as possible. Thank You.

Appendix II. Examples of model's effect as reported in written responses by participants.

1. Recording group.

Question asked: "Can you think of any actual changes you have made or plan to make in your farming practices as a result of the information learned from the discussion group with Elliot block?"

PR: Yes. Introduction of heat treated soya beans into TMR in place of feed company concentrates.

KH: At Hodsondale we have enjoyed a marked increase in the production of our fresh cows when using the lead feeding recommendation of Dr. Block.

GH: No, just a better understanding of the inter-relationship of protein and energy sources and need to respect the forage to grain ratio.

**MD: Yes. This year we are changing from mixing wheat and barley in the dairy ration to just barley.
More care on mineral balancing.
Never feeding dairy ration in a bare manger.**

DD: We have not and do not plan to make any major changes in our feeding program but I feel I am better/more aware of the "inner workings" of a cow and can make better decisions concerning our feeding practices than before. The information is certainly helpful in looking at general practices and as we look ahead at trying to be more efficient while improving our herd's performance. Its the details that are making the difference. Our herd finished in '89 with a 9300 vg average at 3.8% fat and we find it tougher each year to get that average higher. Going over notes from the information day will over time help us to that little extra.

First home discussion group.

Question asked: "Can you think of actual changes you have made or plan to make in your farming practices as a result of the information learned from the tape and discussion?"

NR: I am looking more closely at the % grain in the total ration which I am feeding, and trying to get more intake of dry matter in the cows. It has reinforced my opinion of the quality of feed that the pellet salesmen promote as being substandard.

FS: The importance of top quality forage cannot be over-looked. With 10,00kg. herd average, we have been feeding good forage but the tape

makes one aware that there are higher levels within reach, along with new research data i.e. NDF and silo preservatives.

ML: Yes, very important in that when getting low in one feed I can better balance within limits, learned from the meeting with Elliott to avoid getting into trouble when changing feeds and limits on quantities etc.

Second group:

DT: I want to try feeding barley as 1/2 of my grain ration. Now I am only feeding cracked corn and protein supplement. I also plan to feed more haylage and less dry hay. It is easier to make and to handle. It always tests better. Elliot reassures me that it is safe to do so.

Appendix III : Learner profiles.

Recording Group:

Initials	Gender	Age group	Education
PR	Male	40 - 54	MSc.
MD	Male	20 - 39	Dip. Ag
DD	Female	20 - 39	High School
KH	Male	40 - 54	Dip Ag
GH	Male	20 - 40	Dip Ag

First Evaluation Group:

ML	Male	55 - 65	High School
DL	Male	20 - 39	High School
FS	Male	40 - 54	Dip Ag
NR	Male	20 - 39	Dip Ag
GL	Male	20 - 39	High School
LL	Female	20 - 39	High School

Second Evaluation Group:

HT	Female	40 - 54	High School
DT	Male	20 - 39	High School
DN	Male	20 - 39	BSc.(Ag.)
DN	Female	20 - 39	Trained Nurse
RT	Male	20 - 39	High School
BT	Female	20 - 39	Trained Nurse
KN	Male	20 - 39	High School
SN	Female	20 - 39	High School

Appendix IV Evaluator's observations

A. Observations on the recording session.

1. Farmer participants were not previously known to each other, but all previously knew, or knew of, Prof Elliot Block.
2. Warm up session, first among just the farmers, later joined by the Prof. Block, over sandwich lunch was very useful to establish the aimed for "tenor of dialogue."
3. Presentation material was introduced into the post-lunch general farm discussion. Participants had been sat at their places for taping and cameras had been rolling prior to start of the material intended for presentation.
4. All participants displayed attentiveness to the presentation and discussion throughout the entire session.
5. Despite the relaxed atmosphere, and invitation by SME to interject at any point, farmer interaction for first section of presentation became somewhat inhibited. Evaluator sensed participants were seeking their role in the process. However, after about twenty minutes into the presentation, a very good dialogue process was established. For the first time in over a decade of organizing farm workshops the author heard, after a lull in the proceedings, one participant voice the feelings of the group that "he hadn't understood what had been said at all and could it please be explained in another way!"
6. Several times farmers related the material presented to their practical experience.
7. The session was brought to a close after 4.5 hours, only because the professor had an appointment elsewhere. Farmers wished to continue.
8. Daylight slide screen was not looked at very often by farmers or SME except to refer them to tables in their handbooks.
10. No discomfort was observed amongst the participants with regard to the use of the video equipment.

B. Observations on evaluation group sessions.

A. From first session:

1. Not only does speaker phone require a direct, non-party telephone line, but also a jack type connection. Farmer's "fix it" expertise saved the speaker call to Prof Block!

2. First evaluation group consisted of five male farmers and one female farm partner. The couple were Francophone and not completely bilingual. They were helped at certain points by the others.
3. The session was clearly viewed as an "event." Important social aspect to the session. Participants sat around kitchen table to use as work table for note taking etc. Extensive lunch had been prepared by host farmers' wife! Coffee etc. served at the beginning. Farmers knew each other previously but more at a professional level than social level.
4. The host farmer took on a group leadership function from the outset. This role fell to him not only because it was his house and he the senior and a respected member of the group, but prior to farming he had a career outside farming in which he had developed leadership skills. He assumed from the start the role of pacing the video, stopping it at several points to ask for opinions and underscore what he thought were important points. The other groups members seemed to accept this naturally and to appreciate it. Several discussions were started around their opinions as to what they had viewed that only arose due to the group leader stopping the video. Four such breaks were made in the first section. Video was rerun over certain points.
5. First session ran 40 minutes with their breaks, followed by a fifteen minute discussion stimulated by the inserted questions although not confined to them.
6. Second session was interspersed for lunch, an opportunity for further discussion on what had been heard. In the second session the tape was halted ten times for comment from the group.
7. Speaker phone connection to SME made by author and handed over to group. The group had decided that members would each have a 'session' with the SME. Although all discussion was on the subject matter of the video, it was all in relation to how it should be adapted to the feeding of their particular cows so that at times it took on the nature of a 'consultation' process.
8. Clarity of audio on the speaker phone was more than adequate, and all group members had no inhibitions about using it.
9. The amount of time allotted to each group member became an organizational problem as all the farmers wanted to spend more than their allotted time talking to the SME and tended to ignore the mutually agreed upon time limit.
10. The three sections of the tape were clearly too much to be viewed in one day. They wished to see it all, but the time was already near 'milking time' and so the third section could not be given the detailed attention of the first two.

From second session:

1. Held at a more distant location with a group of farmers who had (felt?) less direct contact with the SME and QFA/Macdonald Campus.
2. No natural group leader emerged as in the previous group. Feeling of a certain 'formality' amongst this group initially. Evaluator could not account whether this was due to his presence, or just the make of the group.
3. Group had to contend with certain number of household distractions e.g. two young children, pets etc certain group participants responsible for preparing lunch etc.
4. Their initial reaction was to "sit and view." Nobody asked for the tape to be run, or suggested the video be stopped prior to the first break.
5. First break enforced by the inserted questions finally generated good group discussion for 20 minutes. Valuable assistance afforded by more knowledgeable members of the group who elaborated on some points for other group members. Host stimulated to fetch his own sample of silage to show group and compare with that shown on the video.
6. Second discussion session of inserted questions brought to lunch table. Third section of tape not viewed at that session due to lack of time.
7. Participants made a copy of the tape.

Appenix V: Example of Handbook

Quebec Farmers' Association

Farmer's notebook for use with the video:

FEEDING HIGH PRODUCING DAIRY
COWS IN EARLY LACTATION

With

Professor Elliot Block, Ph.D

Project Director
Steve Gruber
QFA
Box 80
Ste. Anne de Bellevue
Qc. H9X 3L4

Tel: 514-457-2010

Introduction

This notebook is for use by farmers when they are viewing the accompanying videotape and participating in the group discussions arising from it. There are a couple of times during the video when you are asked to refer to certain pages in the notebook.

The videotape is of a discussion between five dairy producers and Prof. Elliot Block of Macdonald College. They are talking about how to feed high producing dairy cows in early lactation.

There are three sections to the videotape. Each section is about 30 minutes long.

To get the most out of this video, it is suggested that after each section the viewing group at home stop the VCR to discuss and review the points that have been made on the video. Specific breaks in the video will be made for you to be able to do this. However, don't forget that the big advantage of the VCR is that you can stop it ANYTIME and rewind the tape to check a point that you missed or did not get the first time round.

After the video and discussion at home, there will be a chance for the group to use the speaker phone to talk directly with Elliot at Macdonald College. To take full advantage of this phone session, it is suggested that you note down during the video and discussions, any points you did not understand, disagreed with, or would like further comment on. As this is a new way of communicating with farmers, we are very interested in any opinions and suggestions you may have on it. After the session is finished we would like to spend a few minutes to ask your opinion about the tape etc. It is from your comments that we will decide to either make changes to future versions of the tape or to make more of them in a similar way.

THE FIRST 60-90 DAYS

POSTPARTUM

IDEAL: High milk yield, high feed intake,
and cows conceiving.

PROBLEM: Cows cannot consume enough feed
to maintain body condition and health.

RESULT: Considerable loss of body
weight and condition

- ====> Reproductive difficulties
- Rations become dense with grains
- ====> Low milk fat test
- ====> Acidosis
- ====> Anorexia
- ====> Ketosis
- ====> Displaced abomasum
- ====> Milk Fever

STRATEGY

- Balance a diet that can maintain health and maximize FEED INTAKE
- Be sure that protein, vitamin, and mineral requirements are met
- Do not be overly concerned about energy concentration if high energy grains and forages are used

QUALITY OF RATION**Physical Form**

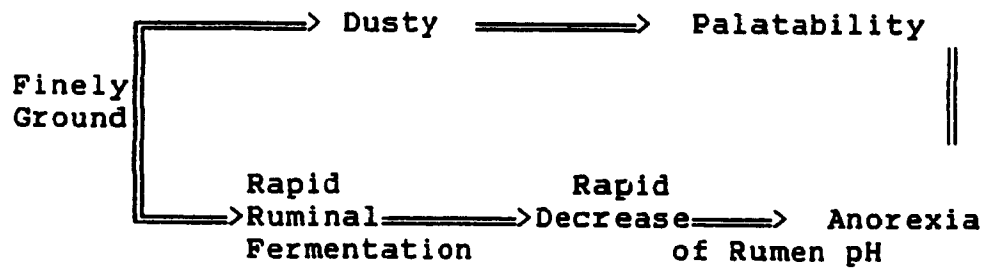
- The correct physical form will maximize feed intake and maintain ruminal pH (acidity).

Fine forages are more digestible and allow cows to consume more feed because rumen volume is reduced.

If forages are chopped too fine ruminal pH decreases due to rapid fermentation

- * Cellulose digestion
- * Rumen motility
- * Feed intake
- * Milk fat percent
- * Displaced abomasum

Grains only need limited processing



Proportion of Forage and Grain

-Often it is stated that a minimum of 40% of the dry matter must be forage to maintain feed intake and rumen pH and to prevent a milk fat depression

Generally this is true but as forage quality increases its value as a forage decreases!

A new concept is the intake of
Neutral Detergent Fibre (NDF)
instead of forage

PLANT CELLS

CELL WALL (NDF)

-cellulose

-lignin

-hemicellulose



(Slowly digested)

CELL CONTENTS

-protein

-carbohydrates

-vitamins

-minerals



(Rapidly
Digested)

What NDF and ADF levels can mean in practice; an example.

	Alfalfa	Timothy
ADF%	32	32
NE _i (mcals/kg)	1.4	1.4
NDF%	40	60

From the example above we can see that alfalfa and timothy (that were cut at the same level of maturity) have the same level of ADF and therefore, the same energy content. However, they have different levels of NDF, with timothy having more NDF than alfalfa. Therefore, cows can consume more dry matter from alfalfa than timothy with same ADF and energy.

On a dry matter basis CORN SILAGE
is 50% grain and 50% forage, which
must be taken into account!!

A ration with 80% corn silage
only contains 40% forage

26-28% NDF in the total ration
dry matter is the minimum required
to maintain rumen health and intake
assuming that the correct physical
form of the forage exists

MILK (kg/d)	NDF (%)	NE _t (Mcal/kg)	NRC Req. (Mcal/kg)	NDF (%)
<14	47	1.33	1.42	42
14-21	40	1.45	1.52	38
21-28	35	1.54	1.62	33
28-36	31	1.60	1.72	20
>36	28	1.66	1.72	20
			-insufficient fibre	
			-Too dense	
			-Low intake	
			-Accentuate deficiency	

EXAMPLE: 650 KG COW AT 45 KG MILK/DAY

Required Energy = 44.4 Mcal/day NE

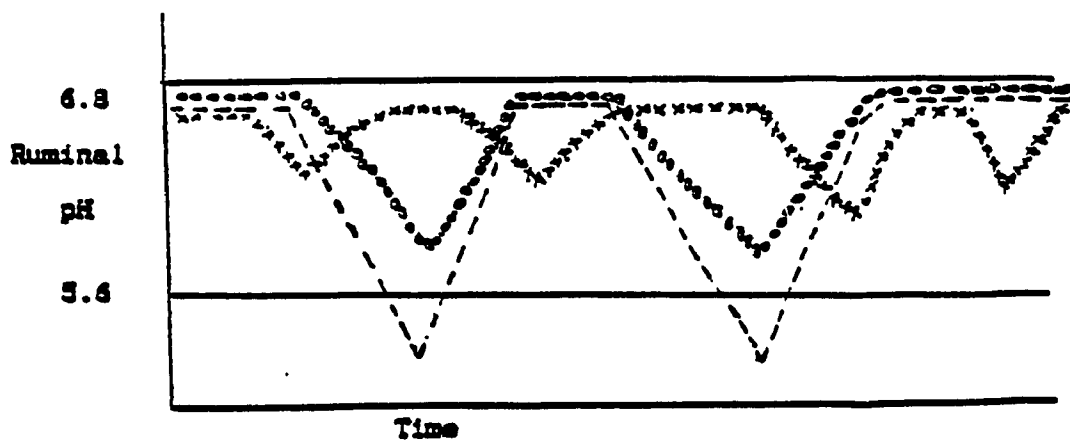
RATION 1: 1.72 Mcal/kg with 20% NDF
 and 38:62 forage:grain ratio
Intake = 3.2% body weight = 20.8 kg/day
Energy intake = 35.8 mcal/day -8.6

RATION 2: 1.66 Mcal/kg with 28% NDF
 and 45:55 forage:grain ratio
Intake = 3.6% body weight = 23.4 kg/day
Energy intake = 38.8 Mcal/day -5.6

FEEDING MANAGEMENT

The feeding system can affect the health, production, and total feed intake of cows

-when forages and grains are offered separately, the frequency of feeding grain is critical



Intake = 3.2% Body Weight 2x/ d grain

Intake = 3.6% Body Weight 2x/ d with buffer

Intake = 3.7% Body Weight 4x/ d grain (no buffer)

Intake = 3.75% Body Weight TMR

- Not recommended to feed >3.5 kg.
grain at any one feeding
- Clean mangers once per day
 - *more frequently in hot weather
- Silage should not be out of the
silo for more than 4 hours

PROTEIN DEGRADABILITY

	% protein deqradability		
	70	63	56
Crude protein,%	16.6	16.5	16.5
NE, Mcal/kg	1.7	1.7	1.7
Total protein, g/day	3135	3135	3135
-non-degradable	941	1160	1379
-degradable	2194	1975	1758
Protein in the			
sm. intestine, g/day	2164	2834	2643
Milk, kg/day	30.5	33.7	31.5

DRY MATTER CONTENT OF THE RATION

-Maximum dry matter intake occurs
at 60% dry matter

-Water itself does not limit intake
but ruminal buffering capacity is
reduced with high water intake

PAGINATION ERROR.

ERREUR DE PAGINATION.

TEXT COMPLETE.

LE TEXTE EST COMPLET.

NATIONAL LIBRARY OF CANADA.

BIBLIOTHEQUE NATIONALE DU CANADA.

CANADIAN THESES SERVICE.

SERVICE DES THESES CANADIENNES.

A cow has 2 weeks before entering
peak lactation

USE IT WISELY

-It is better to have a delayed peak
by a few days than to have a high
peak and a short lactation

-On the day of calving;

-cows do not eat much feed

-offer forages only

-After 1-2 days increase grain by

.5-.8 kg/day until the full diet is fed

-TOTAL MIXED RATIONS

- work backwards from high forage ration
(low producers) to the low forage
ration (high producers)
- other changes should be gradual (1 week)
- base ration changes on milk production

AND BODY CONDITION SCORES

- dry cows should not receive more
than 0.5% of body weight in grain

OBJECTIVES:

High milk production with optimum levels

of fat and protein without sacrificing;

- longevity, productive life
- reproductive capacity
- health

Discussion Questions for Section One

Why is that forage
length has such an
effect on milk production?

What is the best
forage length for
maximum milk production and storage?

How will you ensure that you obtain
the correct forage length
next season?

Discussion Questions for Section 2

What points would you
consider if you tried
to "balance the rumen"
instead of the ration?

Do you think it
makes sense to talk of
NDF rather than percent forage
in the ration?

Discussion Question for Section 3

What percentage range
of protein degradability
would you aim for
in your ration and why?