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A SURVEY OF PRESENT AND POSSIBLE FUTURE SHEEP  
AND WOOL HANDLING PRACTICES  
OF  
NORTH ISLAND FARMERS RUNNING  
CROSSBRED SHEEP

by

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A thesis submitted in partial  
fulfilment of the requirements  
for the degree of

MASTER OF AGRICULTURAL SCIENCE

of

MASSEY UNIVERSITY

October 1967

## AUTOBIOGRAPHICAL SKETCH OF THE AUTHOR

The author was born at Dannevirke on 27th October 1941. He attended the Matamau country school from 1946 to 1954. From 1955 to 1959 he attended Dannevirke High School leaving after a year in the Upper Sixth form. Until 1959 he lived with his parents on a Dairy farm and spent most of the school holidays working on it.

Towards the end of 1959 the author was accepted as a Rural Field Cadet to study for a Bachelor of Agricultural Science degree. The author enrolled at the then Massey Agricultural College in 1960 and graduated B.Ag.Sc. in 1965. This period of study was broken in 1961 for a year of practical work on sheep and dairy farms at Hastings and Reporoa. Further training under the R.F.C. scheme was obtained on a cropping farm at Hawarden in the summer of 1962-63 and during a period of in-service training in the Rotorua office of the Department of Agriculture during the summer of 1963-64.

In November 1964 the author was appointed to the Sheep and Wool Section of the Farm Advisory Division. The author gained a Study Award which enabled him to study for a Wool and Woolclassing Diploma at Massey. Prior to commencing the Diploma course 14 weeks of required practical work were completed at a Wool Store in Napier.

The course was completed in 1965 and the author was awarded a Wool and Woolclassing Diploma in 1966.

In 1965 the author applied for a bursary to enable him to study for a M.Ag.Sc. degree. His application was approved on the understanding that the thesis topic would be concerned with a determination of the technical knowledge of, and practices used by North Island farmers running crossbred flocks when attempting to

improve the productivity of the animals in their flocks.

From October 1965 to April 1966 was spent in carrying out a survey to gain information for the thesis topic. From April to November 1966 was spent on course work and examinations. From December 1966 to August 1967 was spent in writing computer programmes, analysing data, and writing this thesis. Two courses each lasting a fortnight in May 1966 and May 1967 were attended by the author. These courses each lasting a fortnight in May 1966 and May 1967 were attended by the author. These courses were for Sheep and Wool Instructors and were primarily designed to increase their knowledge of animal breeding. The author undertook an evaluation of the progress made by those attending each course.

In February 1966 the author married Allison Jean Anderson of Dannevirke and in July 1967 a son was added to the family.

## ACKNOWLEDGEMENTS

The author wishes to express his appreciation to all of the people who have, in one way or another, contributed to the presentation of this report.

He particularly wishes to express appreciation to Mr. A.H. Hughes for the guidance and counsel given throughout the organisation, development and presentation of this thesis.

Sincere thanks are extended to Prof. A.L. Rae, Dr. T.S. Ch'ang and Mr. T.A. Meek for their helpful suggestions and guidance and Mr. W.G. Payne, Miss N. Gordon and Mr. L. Thomas for their assistance in the writing of computer programmes.

He is very grateful to the Department of Agriculture for financial assistance enabling him to carry out this study.

Thanks are also due to the Staff of the Massey University Library and Photographic Unit and the Department of Agriculture typing staff.

The author is also very appreciative to the consideration and assistance given in many ways by his wife, Allison.

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## CHAPTER I

### I N T R O D U C T I O N

#### PREFACE:

Any attempt to get farmers to adopt practices which will improve quantity and/or quality of production requires:-

- A. Techniques to be available which will achieve the improvement, and
- B. Farmers becoming aware of these techniques, gaining any skills required and actually using the practices.

Thus a campaign aimed at improvement in quantity and/or quality of production is dependent upon the results of a two phase attack on the problem.

- A. A Research phase to discover and make available appropriate techniques, and
- B. An Extension phase to look after awareness, gaining of necessary skills, and use of the techniques provided by research.

As will be shown later the research phase as far as sheep and wool improvement is concerned is sufficiently well advanced for the extension phase to begin.

A basic principle of extension is -

"Extension work is based on human needs and the proper way to approach the subject matter and the methods of dissemination knowledge is through the interest and need of the people. Dealing with known factors: what people think, their way of life, how they act, what they want and what they understand - this is the starting point of extension". (Penders 1960).

From a review of literature it was found that there was little documentation of the interests and needs of the North Island farmers running crossbred sheep.

This study will therefore attempt to determine present practices for sheep and wool improvement, together with likely response to new techniques as they become available.

STATEMENT OF THE PROBLEM:

How to improve the productivity of crossbred sheep in New Zealand is known sufficiently well for Rae (1963) to have made firm recommendations to farmers on this aspect of their work.

The factors which should be taken account of when deciding how to adequately prepare a wool clip for sale are known sufficiently well to make firm recommendations to farmers on what factors they should consider when making a decision on the method of preparation of their wool clip for sale. (Meek Pers. Com.)

As far as extension of this knowledge is concerned some work has been done. Bigham (1965) described the present work being done by, and the technical knowledge level of extension workers directly involved with sheep and wool improvement in New Zealand. An in-service training programme was set up for these workers aimed at overcoming some of the deficiencies he described.

The author was able to find little documentation of present sheep and wool improvement practices used by North Island farmers running crossbred sheep. Also the author was able to find little documentation of these farmers' awareness of or attitude towards, new practices for sheep and wool improvement.

Therefore what to extend, and how much of this information is known by Sheep and Wool Instructors is reasonably well documented, but "what people think, their way of life, how they act, what they have, what they do, what they want and what they understand - the starting point of extension" has as yet not been documented.

If the latter are in fact the starting point of extension then they need to be determined and documented. It was the problem of determination and documentation with which this thesis aimed to deal.

#### OBJECTIVES:

The objectives of the study were:-

To determine and describe for North Island farmers running crossbred sheep:

- A. Present practices used for sheep and wool improvement.
- B. Awareness of selected new techniques for sheep and wool improvement.
- C. Attitude to selected new techniques for sheep and wool improvement.

#### THE NEED OF THE STUDY:

If extension is based on and starts with the interests and needs of the people and this is unknown for North Island farmers running crossbred sheep, then before widespread extension of improved practices for sheep and wool can begin the interests and needs of the farmers must be determined and documented.

#### PROCEDURES USED:

In this study the following procedures were used:-

A. A review of literature was made to

- I. Determine what techniques were available for sheep and wool improvement that were applicable to North Island farmers running crossbred sheep.
- II. Determine what extension of available techniques had been done in the past, what was currently being done and what was planned for the future.
- III. Determine what was known about the interests and needs of North Island farmers running crossbred sheep.
- IV. Determine methods available for obtaining information on farmer knowledge, skills, and attitudes if the information obtained as a result of III above was insufficient to determine a basis for future extension of sheep and wool improvement practices.

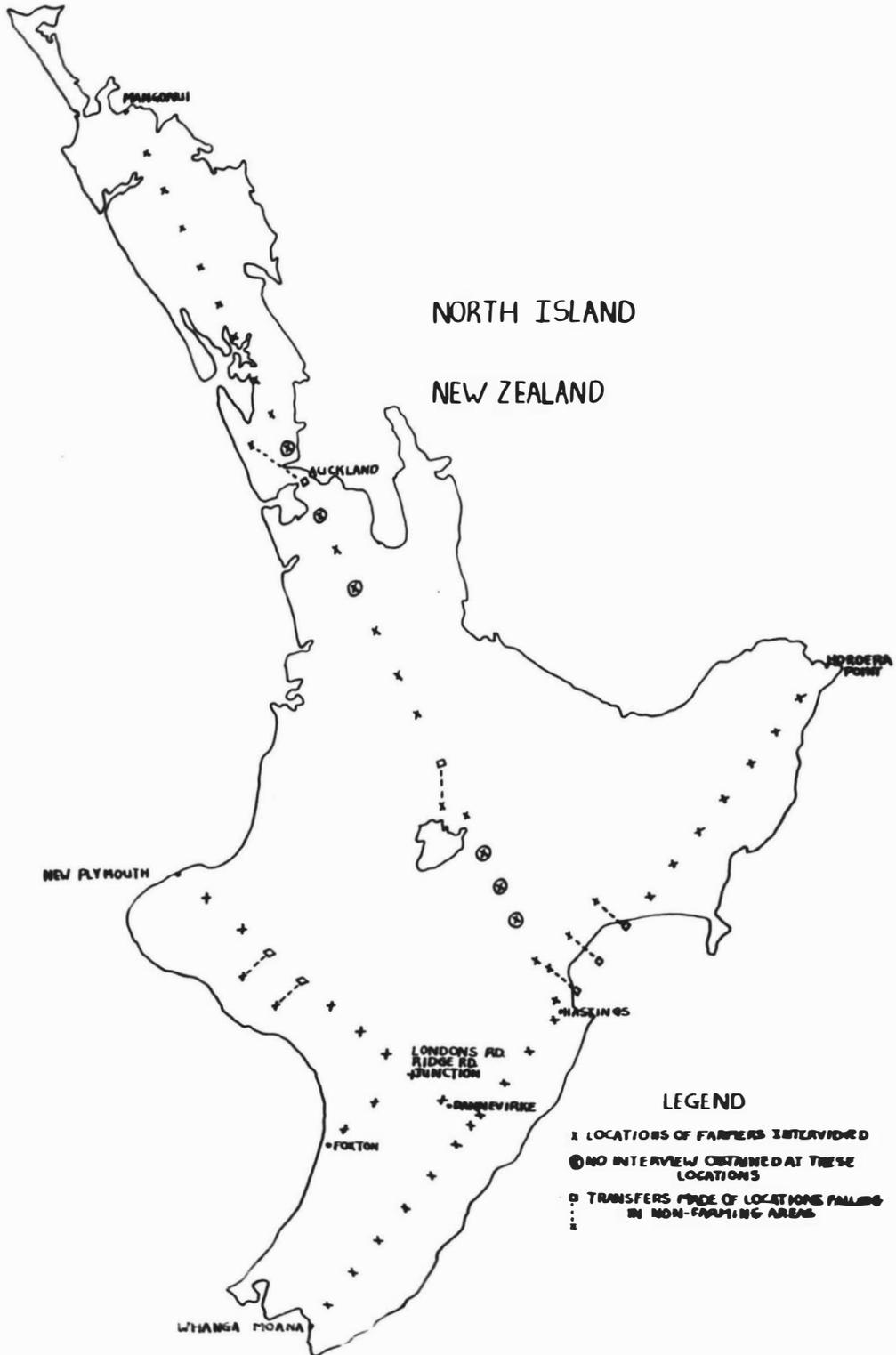
B. A Survey was undertaken

The review of literature showed that there was little or no documentation of farmers interests and needs in relation to sheep and wool improvement and therefore study of this aspect was considered to be necessary. A survey was undertaken to provide the necessary information. The survey took the form of a personal interview using an eight page pre-tested questionnaire.

I. Sampling -

The farmers to be interviewed were chosen by using a modified grid sampling technique. Lines were drawn on a Map of the North Island between the following points. (Map p.5)

LOCATION OF FARMERS INTERVIEWED



1. Mangonui in Northland and Hastings in Hawke's Bay.
2. Horoera point in East Coast and Whanga Moana in southern Wairarapa.
3. New Plymouth in Taranaki and Dannevirke in southern Hawke's Bay.
4. London's Road, Ridge Road Junction in Pohangina County and Foxton in southern Manawatu.

The lines were marked at fifteen mile intervals starting at the northern end of each line. Where points fell in Hawke Bay on line 2 the points were transferred fifteen miles west at right angles to line 2 from the original point. When points fell in non-farmland on line 3 the points were transferred seven and half miles south at right angles to line 3 from the original point.

Owners of sheep farms nearest to the points marked on the map were determined and wherever possible these farmers were interviewed. Adjacent sheep farmers were also determined so that one of these farmers could be interviewed if the first farmer selected was unavailable.

## II. Administering the Questionnaire -

The selected farmers were contacted by either:

1. Phoning the night before to make an appointment to interview, or
2. Calling on the farmer with no prior warning and asking for an interview.

A set introduction was used and the questions from the schedule started as soon after the introduction as possible. Questions were read directly from the schedule with repetition if necessary but no explanation of the questions or leads given as to the ideas being solicited.

Answers were written verbatim, with repetition ignored, unless this was stated as a major point, when that part of the answer was underlined. Comments not aligned with the question asked were noted in the margin.

C. Analysis

The I.B.M. 1620 computer at Massey University was used to check and tabulate data collected from the questionnaire.

I. Programmes -

Specifications for eight programmes were prepared by the author and Mr. A.H. Hughes for use in checking and tabulating data. The detailed writing of four of these programmes was done by Mr. W.G. Payne, two by Miss N. Gordon and one by Mr. L. Thomas.

The data checking programmes were -

1. Data correction. This programme checked serialised cards to determine that the correct number of items of data had been placed on each card.
2. Serialise. This programme enabled the computer to place a serial number in the last three columns of each data deck.
3. Serial Correction. This programme enabled the computer to reproduce a new set of data cards

without the serial number. This allowed re-ordering of the data cards.

The data tabulating programmes were -

1. Two-way table three times. This programme produced with each reading of the data three separate two-way tables of specified data and specified table intervals.
2. Column Search. This programme produced a running total of all numbers punched in each column of the data card except in those columns used for the farm and serial number.
3. Sum and Means. This programme produced for each item of data in a deck of data cards the sum of the items, the lowest and highest item found in any group, and the mean of any group of items. This programme could exclude zeros from the calculation and print the number of items used to calculate the averages.
4. Ratios. This programme punched a new data deck of up to eight ratios from pairs of specified data from original data cards.
5. Histogram. This programme produced as a histogram a frequency distribution of specified data.

## II. Coding -

Data in the schedules were coded at the margin of each schedule to allow for quick checking of any apparent anomalies or special cases.

Coding of data unsuitable for direct punching was arranged to suit the programmes and the range of the data.

DEFINITION OF TERMS:

The term 'crossbred sheep' refers in this study to sheep that produce crossbred wool.

The term 'sheep productivity' refers in this study to the relative quantities of the saleable products meat and wool produced by the sheep.

The term 'sheep and wool improvement' refers in this study to an improvement in 'sheep productivity'.

The term 'adjusted weaning weight' refers in this study to the weight of a lamb at the time of weaning suitably adjusted to allow for rearing rank, sex and age at weaning.

The term 'breeding value' refers in this study to the ability of a ram to pass on productive characters to his daughters.

The term 'preparation for sale' refers in this study to the steps taken to improve the presentation of wool to the buyer from the time the sheep is shorn until the wool is sold either privately or at auction.

The term 'wool quality bracket' refers in this study to a range of wool quality numbers in which the lower and upper quality numbers are bracketed, for example 46/48's.

## CHAPTER II

### REVIEW OF LITERATURE

#### INTRODUCTION:

This chapter contains a review of literature of sheep breeding and wool handling techniques, and a review of extension of these techniques carried out by the Sheep and Wool Division of the Department of Agriculture, Massey University, Ruakura Animal Research Station and through the New Zealand Journal of Agriculture. An appraisal of the foregoing review showed that a survey of sheep farmers interests and needs was required therefore a further review of literature of survey methods was undertaken. This chapter also outlines the hypotheses to be tested in the survey.

#### SHEEP AND WOOL IMPROVEMENT TECHNIQUES:

This section deals with techniques for sheep and wool improvement by sheep breeding and wool handling particularly those suitable for direct application by North Island farmers running crossbred sheep. Crossbreeding or farm management techniques for sheep and wool improvement is not discussed.

##### A. Sheep Breeding

It has already been stated that evidence was required to show that sheep breeding techniques were available that could be recommended by extension personnel to North Island farmers running crossbred sheep.

##### I. Ram Selection -

Rae (1958, 1963, 1964) advocated the use of records of rams and their relatives as a means of assessing the 'breeding value' of rams. Since the crossbred sheep is a dual-purpose sheep

the objectives in breeding for improvement can only be simplified to two or three characteristics which are selected for at any one time. Therefore some form of total score or index must be assessed to determine the relative breeding value of individual rams.

The New Zealand Flock Recording Scheme proposed by Rae and Clarke (1965) is based on an index method of selection. The index used in the scheme was originally devised by Rae and modified for the Recording Scheme.

$$\text{Index} = 10 \left[ \frac{n}{4(n+2)} (\text{Deviation of weaning weight}) + \text{fleece weight (lbs)} \right]$$

n = the number of lambings of the dam

The index takes into account -

1. Fertility measured by the weaning weight adjusted for rearing rank, sex and age at weaning of the lamb.
2. Wool Weight at the hogget stage.

The weaning weight also embodies milking and mothering ability. The accuracy of the prediction of breeding value increases with the number of lambings of the dam and is taken into account by the factor  $\frac{n}{4(n+2)}$ .

Rae (1963) has stated that "If enough commercial ram buyers keep demanding performance-bred animals, progress will be assured."

## II. Ewe Selection -

Edgar (1958) found that on hill country ewes that were dry as two-tooths were just as likely to lamb as four-tooths as those that lambed as two-tooths. Barton (1947) and Wallace (1958) however found that the later performance of dry two-tooths was distinctly poorer than those which had lambs.

Wallace (1958) considered that one could think of dry two-tooths as falling into one of these three groups.

1. Infertile - these two-tooths will have no lambs at later lambings.
2. Inherently poorly fertile - these two-tooths will have poorer performance than those which lambed as two-tooths.
3. Temporarily infertile - these two-tooths did not lamb due to management and environmental effects but will subsequently perform as well as those which lambed as two-tooths.

A further complication to the dry two-tooth ewe picture is the difference between ewes born as singles and those born as twins.

Rae (1963) summarised the position as it appeared from studies made on flocks run under differing conditions at Massey University. Briefly the situation was:-

1. Under poor hill country - ewes born as a twin had poorer lambing performances as a two-tooth, although their performance at later lambings was better. It was suggested that this may

be due to the ewe born as a twin not having overcome the handicap of being born and reared as a twin by tupping time.

2. Under better conditions - ewes born as twins had the same average weight at tupping as the ewes born as singles. In this case there is little difference between the lambing performance of the two types of ewe.
3. Under good conditions - ewes born as twins had overcome the handicap in less than twelve months of age and had on average a better two-tooth lambing percentage than single born ewes.

Both Rae (1963) and Wallace (1964) have suggested that the culling of dry two-tooth ewes should be undertaken when the percentage of dry two-tooths is low. However where two-tooths are not well grown and the percentage of them is high then they could be kept for a further lambing and culled if twice dry.

Rae (1963) has also suggested that twin ewe lambs should where possible be identified by ear-mark.

This information allows:-

1. Emphasis to be placed on selection of twin ewes to enter the flock at two-tooth selection.
2. Due allowance to be made for the handicap of being born and reared as a twin when assessing what to do about the dry two-tooth ewe.

Fleece weight has a heritability of about 0.3 for Romney sheep. The repeatability of the hogget fleece weight is approximately 0.6.

Therefore the selection of ewes based on the hogget fleece weights could be successfully undertaken.

Two methods of selecting the hoggets based on fleece weight were considered.

1. Identifying each ewe hogget by means of an ear tag number; recording fleece weights beside the appropriate tag number on a shed sheet; ranking the fleece weights and culling by tag number according to the culling level desired, and
2. A method reported by Dun (1961) where a random sample of thirty ewe hoggets are shorn to determine four fleece weight groups.
  - (a) Definite selection
  - (b) Probable selection
  - (c) Probable cull
  - (d) Definite cull

The fleece weight groups are assigned a raddle mark position on the hogget. As each succeeding hogget is shorn and the fleece weight group determined the hogget is marked in the position specified.

Method (1) is the more accurate method of selection however method (2) overcomes the problem of identifying each individual sheep by means of an ear tag or other identification system.

B. Wool and Woolhandling

It was considered by Meek (Pers. Com.) that having produced a wool clip, a knowledge of wool and wool handling is required by the farmer if an adequate decision on the method of preparation of the clip for sale is to be made, or recommendations on preparation from brokers or extension workers concerning the clip are to be interpreted correctly.

The ways in which a wool clip may be sold are:-

- I. As classed lines under own brand
- II. As unclassified lines under own brand
- III. As classed lines under brokers' brand  
after re-classing or binning
- IV. As an interlot combined with other  
farmers' wool by the broker
- V. As scoured line or lines
- VI. As unclassified or classed lines in London
- VII. As classed or unclassified lines directly  
to an itinerant buyer
- VIII. As classed or unclassified lines by a  
farmers' co-operative
- IX. Combination of the above

The ways in which a wool clip may be prepared for sale are:-

- I. Shed classed by the farmer, the contractors  
or a competent classer employed by the farmer.
- II. Re-classed by the broker
- III. Binned by the broker

- IV. Interlotted by the broker
- V. Scouring prior to sale
- VI. Combination of these methods

Factors which influence the decision on the method of preparation for sale

1. The size of the clip
2. The style and variation in style of the clip
3. The variation in quality number of the clip
4. The variation in length of wool of the clip
5. The variation in soundness of wool of the clip
6. The variation in yield of wool of the clip
7. The end use through which the wool will pass after sale

It must be stressed that the farmer needs only sufficient knowledge on which to base a decision on how his wool can best be prepared for sale. He does not necessarily need to be able to carry out the preparation himself.

#### HISTORY OF EXTENSION OF SHEEP AND WOOL IMPROVEMENT PRACTICES:

This section describes information and advice on sheep and wool improvement originating from the Sheep and Wool Division of the Department of Agriculture, Massey University, Ruakura Animal Research Station and through the New Zealand Journal of Agriculture.

A. Sheep and Wool Section, Department of Agriculture

Prior to 1939 there were only two Wool Instructors in the Department of Agriculture. At that time they were personnel of the then Livestock Division. A Sheep and Wool Section of the Animal Health Division was set up in 1948 when six more Instructors were employed. In January 1963 the Section was transferred to the Farm Advisory Division. By 1964 the staff of the Sheep and Wool Section had been built up to twenty five. The Sheep and Wool Section became a separate Division of the Department of Agriculture in 1966.

Personnel employed as Sheep and Wool Instructors prior to 1964 were either holders of a Diploma in Wool and Woolhandling or were men with wide experience in the wool trade.

In 1965 a National Flock Recording Scheme was proposed and it was suggested that this would initially be operated by the Sheep and Wool Division. With the change in the type of work being undertaken by the Division it was decided that recruits to the field staff should be holders of a B.Ag.Sc. degree. On joining the staff these recruits were required to study for a Diploma in Wool and Woolclassing.

In 1967 the Divisional staff consisted of five graduates, twenty eight personnel with diploma or equivalent training and seven bonded recruits who were expected to graduate B.Ag.Sc., Dip. Wool and Woolclassing in 1968-69.

In 1965 a report (Appendix II) was submitted to the Director of the Farm Advisory Division giving a summary of the work carried out by the staff of the Sheep and Wool Section and an assessment of their knowledge of the principles and theories of animal breeding. The

report also made recommendations as to the type of in-service training required by the staff to enable them to perform their present job better and be prepared for their role in the New Zealand Flock Recording Scheme.

The report described the work carried out by Instructors and showed that Instructors varied widely in their individual approaches to flock improvement work. It suggested that this individuality was due to the lack of knowledge of just what was involved in selection for productivity in sheep. The outline for a suggested training programme for Sheep and Wool Instructors is given in the last section of Appendix II.

Since this report was submitted two in-service training courses have been held for staff of the Division. The courses were organised by the Director of the Division, Mr. E.A. Clarke in conjunction with Professor A.L. Rae of Massey University and conducted at the University. Professor Rae and Mr. Clarke were also the architects of the New Zealand Flock Recording Scheme.

The first course held from 9 - 20 May 1966 was aimed at providing Divisional staff with background information to the Flock Recording Scheme.

The major topics covered were:-

- I. Some of the statistical tools used in animal breeding studies.
- II. The elementary principles and theories of animal breeding.

The second course held from 8 - 19 May 1967 was aimed at:-

- I. Reiteration of the principles and theories given at the first course.
- II. Provide a background to beef husbandry and breeding for use in discussing the Beef Cattle Recording Scheme with farmers.
- III. A better understanding of cause and importance of major wool faults.
- IV. Suggested sources of obtaining information on farm management with special reference to higher stocking rates.

Over the period of the two courses the author conducted a three part survey. In the first part an attempt was made to determine from the participants their knowledge and the use made of statistical concepts and terms prior to their attending the course. The second part tested the increase in knowledge of the same terms immediately following the course while the third part tested the retention of this knowledge after one year. A full report of these tests appears in Appendix III.

B. University Extension

Massey University holds an annual Sheepfarmers Meeting which up to six hundred persons mainly farmers attend. The objective of the meetings is to keep interested farmers informed of new techniques and to interpret these techniques for farmers.

From 1950 to 1964 inclusive papers have been given on Sheep breeding techniques. Rae (1954, 1955, 1958, 1963, 1964) put forward the current ideas of selecting sheep for increased productivity with special reference to Romneys. Rae (1953) using Romney x Cheviot as an example and Clarke (1962) using Romney x Border Leicester as an example outlined what could be achieved and what were the pitfalls of crossbreeding to increase productivity. Cockrem (1958) outlined the progress that had been made in studies on Face Cover.

The emphasis has not been as great during the same years on Wool handling techniques. Watt (1955a) outlined skirting in crossbred wool and Meek (1962) gave some thoughts on the scouring of wool.

#### C. Research Stations Extension

An annual four day conference for farmers is held at Ruakura Animal Research Station. A programme designed for sheep farmers is held during the first day. A Field Day is held the following day and this is followed by programmes for all farmers and dairy farmers on the succeeding two days. The objective of the conference is similar to that of Massey University.

In the period 1950-64 eight papers have been given concerning sheep breeding. Wallace (1958a, 1964a) gave the current results of a twin selection experiment. Rae (1957) and Clarke (1962) considered crossbreeding as a means of increasing sheep productivity. Inkster (1955) outlined observations on face cover and productivity of sheep. Inkster (1958) summarised current ideas on raising the lambing percentage of sheep. Edgar (1958) reported on studies on the dry

ewe on the Whatawhata Hill Country Research Stations.

Wool handling again has received little attention. Watt (1955b) proposed a method of marketing of the North Island wool clip. In 1961 a symposium was held on Multiple Shearing and in 1963 the effects of shearing on sheep were reported.

D. The Journal of Agriculture

The New Zealand Journal of Agriculture is the official journal of the Department of Agriculture. Much of the material published is written by officers of the Department. A review was made of articles appearing during the period 1950-1965 inclusive.

There were five articles on sheep breeding.

Wallace (1958b, 1964b) reported on the twinning experiment covering the importance of selecting twins and culling dry ewes. Hansen (1962) outlined weighing of hogget fleece to assist selection of two-tooths. Hansen (1965) also reported on Australian trials on fleece weighing table. Inkster (1959) mentioned twinning and the effect of face cover on lambing percentage within strains of sheep.

There is greater evidence of recommendations on wool handling in this journal. Sixteen articles associated with handling or better amenities for handling of wool were found for the period 1950-1965. Lusk (1950) and Montgomery (1957) mentioned the care at shearing required to obtain better wool values. Duncan (1957a, 1957b, 1964) described what the buyer took into account when assessing wool and the reasons for this assessment. Henderson (1955) described faults in the New Zealand Wool Clip. Duncan (1958, 1959, 1961a, 1961b) carried out a campaign against branding of sheep.

So far from this review of literature it was concluded that techniques were available for increasing sheep productivity by breeding by North Island farmers running crossbred sheep. The techniques considered by the author to be the best available for this type of farmer were:-

- I. Farmers when purchasing rams should obtain production records of the rams to assist in selecting the best from those offered to him.
- II. Farmers should where the dry two-tooth ewe percentage is low cull those two-tooth ewes that are dry.
- III. Farmers should endeavour to mark twin ewe lambs so that -
  - (a) Selection for ewes born as twins may be practised at two-tooth selection.
  - (b) A better assessment can be made of dry two-tooth ewes.
- IV. Farmers should use hogget fleece weight to assist in selection of two-tooth ewes.

It was also concluded that farmers require a knowledge of wool, and wool handling techniques to be in a position to make an adequate decision on:-

- I. The method of preparation of his wool clip.
- II. What course of action to take having considered the brokers report or information from extension personnel.

As far as extension work was concerned it was concluded that:-

- I. Extension personnel were being retrained to enable them to extend information becoming available.
- II. Information on sheep breeding techniques had been extended to farmers on at least one occasion.
- III. Some information on the alternative decisions that could be made in wool preparation for sale had been extended to farmers.

As has been stated before little or no documentation of the interests and needs of North Island farmers running crossbred-flocks could be found. It was concluded that a survey should be undertaken to determine and document these interests and needs with particular reference to the sheep breeding and wool handling techniques considered most applicable to this class of farmer.

A further review of literature was considered necessary to cover the field of surveys of this type.

#### FARM SURVEYS:

This section deals with the types of survey, survey methods and the choice of survey method.

#### TYPES OF SURVEY:

Candler (1965) defines four types of Farm Management Survey.

- A. Descriptive or Explanatory Survey
- B. Research or Pre-Release Survey
- C. Post-Release or Early Adoption Survey
- D. Non Adoption or Behaviourist Survey

The Descriptive or Exploratory Survey should be used, he suggested:-

"to find out information about farmers."

" - the aim is purely descriptive. The authors of the survey feel that they need 'more information' about a particular topic, without any very clear idea who will use this additional information, or for what purpose it will be used. In this survey there is no 'hypothesis' to be tested, nor are there any very clear guide lines as to what information should be gathered, or how the information, once gathered should be arranged."

The Research or Pre-Release are he suggested:-

" - surveys designed to see whether there is a 'market' for a new product or management practice. That is, the investigator has a definite change in farming practice in mind, but as yet no farmers have made the change, so can be no question of learning from farmers' experience. What the survey can do, is to give a clear picture of what farmers are currently doing, and then attempt to synthesise a picture of the appropriate management system and profitability with the new product or practice."

The Post-Release or Early-Adoption surveys he suggested are:-

" - surveys where we are interested in farmers' experience with a new practice. To be useful this survey needs to be carried out after a few farmers changed to the new practice, but before the bulk of farmers have made the change. The importance is the timing of this type of survey."

The Non-Adoption or Behaviourist surveys, he suggested were:-

" - surveys in which we are interested to know why some farmers continue to refrain from adopting a new practice or product. Given that the experience of adopting farmers indicates a new practice is profitable."

In the last three types of survey, he suggests we are attempting to obtain facts from the farmers.

METHODS OF DATA COLLECTION:

Festinger and Katz (edit. 1953) define three broad methods of data collection.

- A. One can ask people questions.
- B. One can observe the behaviour of persons, groups or organisations, and their products or outcome.
- C. One can utilize existing records or data already collected for purposes other than ones own research.

It is by the first method that data for this survey was collected. This is data reported by individuals out of their own experience.

Byrn (edit. 1959) reported the following methods of collecting information by asking questions.

- A. Mail questionnaires
- B. Distributed questionnaires or check lists
- C. Case studies
- D. Group interviews
- E. Tape recorded interviews
- F. Systematic observation procedures
- G. Personal interview schedules

The use of the systematic observation procedure was advocated by Candler (1965) for obtaining information from farmers. The disadvantage of this method however is time taken by the interview compared with Personal-interview schedules. Festinger and Katz (1953) suggest that a questionnaire serves two purposes.

- A. The questionnaire translates the research objectives into specific questions, the answers to which will provide the data necessary to test hypotheses or explore the areas set by the research objectives.
- B. The questionnaire assists the interviewer in motivating the respondent to communicate the desired information.

Since these purposes were in line with those desired by the author the questionnaire method was chosen in preference to systematic observation procedures.

#### DESIGNING THE QUESTIONNAIRE:

Festinger and Katz (1953) devoted a whole chapter to questionnaire design. Payne (1951) wrote a complete book on the art of asking questions. Recommendations contained in these two references together with the Questionnaires used by Hockey (1962) and the New Zealand Meat and Wool Board Economic Service were used as a basis for the design of the questionnaire for this survey. A summary of the principles of questionnaire design outlined by Festinger and Katz (1953) appears in Appendix IV.

#### SUMMARY AND CONCLUSIONS:

Techniques for sheep breeding and wool handling were available.

Extension of these techniques has largely been carried out through conferences or publication in farm journals.

Workers directly concerned with extension of these techniques are undergoing in-service training with a view to improving their effectiveness.

Little reference could be found of the interests and needs of the farmers involved.

Methods to obtain the information on the interests and needs were reviewed and a personal interview survey decided upon

HYPOTHESES:

Based on the foregoing review of literature and the authors' personal experience in the field the following hypotheses were formulated for this study.

- A. That ram selection practices, if any, used by North Island farmers running crossbred sheep do NOT include selection based on an index of relatively high greasy fleece weight and relatively high adjusted weaning weights.
- B. That ewe selection practices, if any, used by North Island farmers running crossbred sheep do NOT include selection based on relatively high greasy fleece weight, relatively high multiple births, and relatively high lambing percentages.
- C. That North Island farmers running crossbred sheep do not select ewes on the above basis because they are NOT:-
  - I. aware of this method of selection
  - II. aware of its advantages

III. willing to change their present practices  
despite 'knowing better'

IV. able to change their present practices despite  
'knowing better'

D. That North Island farmers running crossbred sheep are NOT  
conversant with the various alternative ways in which  
their clip might be prepared for disposal and disposed of and  
are therefore NOT able to choose alternatives which may  
be more profitable than the one currently used.

## CHAPTER III

### M E T H O D S

#### INTRODUCTION:

This chapter contains descriptions of the methods used to obtain and analyse the data for this survey.

These descriptions will be dealt with under the headings of the questionnaire, pre-testing the questionnaire, sampling, contacting the farmer, interviewing and analysis.

#### THE QUESTIONNAIRE:

The questionnaire used in this study consisted of a five part schedule. Each part is described in the order it occurred in the schedule (Appendix I contains the complete schedule used).

#### SECTION I -

This section was designed to set the respondent at ease and allow him to gain confidence in the interview by asking questions which he could easily and correctly answer.

From these early questions basic farm information was obtained on acreage, distance from amenities, paddock numbers, land topography and condition, water supply, erosion, shelter, weeds and pests. This section then went on to determine attitude and present policy to stocking and fertiliser rates. A request for a calendar of farm operations was included to gain an overall picture of the timing of practices and major management points. Finally an indication of production over the 1964/65 season was requested.

It was thought that information from Section I would:-

1. Indicate whether a particular farmer might need to be considered as a special case.
2. Indicate if some future questions were to be omitted.
3. Provide background information which might assist in understanding and interpreting information supplied in answer to later questions.

SECTION II -

This section was concerned with respondents ram selection and management practices and was divided into three parts.

1. This group of questions was designed to determine
  - (a) Who selected the rams
  - (b) Where were the rams selected
  - (c) Why were the rams selected at the place stated
  - (d) How rams were selected, i.e. what characters and/or measurements were taken into account when actually selecting specific animals
2. These questions were designed to determine
  - (a) Whether production records of the rams or their parents were obtained to assist in the selection of rams

- (b) What emphasis was placed on such records if they were obtained
  - (c) Whether the farmer considered production records of rams were a good guide to the rams' ability to produce better offspring
3. These questions were designed to provide information on
- (a) Management of rams on the farm
  - (b) What potential there would be for increasing the ram selection differential
  - (c) The present methods of mating used by the farmers.

### SECTION III -

This section was concerned with respondents ewe selection and culling practices and was divided in two parts.

1. This group of questions was designed to determine the present policy of the respondents for ewe selection and the reason(s) for the policy.
2. This group of questions was aimed at determining the knowledge of, attitude to and use of practices for ewe selection proposed by the author.

SECTION IV -

The section was aimed at obtaining information on wool handling practices and was in three parts.

1. This series of questions was designed to determine the present methods of wool handling used by respondents and reasons for using their methods.
2. These questions were designed to determine the respondents knowledge of wool terms and price differentials associated with some of the wool terms. Based on the answers to these questions it was intended that an assessment of the farmers ability to understand brokers reports and/or press statements should be made.
3. The final set of questions was designed to determine
  - (a) Details of off farm handling and sale of wool
  - (b) Reasons for (a) above.
  - (c) The farmers attitude and response to the price set by brokers pre-sale.
  - (d) The farmers attitude to the brokers specifications schedule.

SECTION V -

This section aimed at obtaining information which could assist in formulating future extension plans and checking the sampling procedure. The section was in three parts.

1. This group of questions was designed to determine the farmers age, schooling, years spent farming and years on present farm together with age and schooling of family and labour if applicable.
2. This group of questions was designed to determine the farmers contact with mass media specifically radio, television, newspaper and journals.
3. This group of questions was designed to determine the farmers contact with extension personnel and other farmers by way of farmer meetings.

PRE-TESTING THE QUESTIONNAIRE:

The questionnaire for this study was pretested on three farmers previously unknown to the author.

The pre-test questionnaires were analysed. The changes made were:-

- A. Change of sequence of questions.
- B. Additional questions of a more specific nature.
- C. Alterations to wording of questions.

SAMPLING:

As mentioned in Chapter I, points on a map of the North Island were determined using a modified grid sampling technique.

Each point was then pin-pointed on the New Zealand M.S.1 (One Inch To One Mile) map and the map reference recorded. The map references were given to Field Officers of the Valuation Department and they kindly provided from their land holding maps the names of the sheep farmers nearest to the selected reference.

CONTACTING THE FARMER:

The names of the farmers were obtained from the area head office of each Valuation Department one to three days before the proposed visit. The two methods of contact were :-

- A. Telephoning the farmer the night before to make an appointment.
- B. Calling on the farmer to conduct the interview.

Due to time and distance between selected farmers it was usually necessary for the farmer to be available for an interview at a time suitable to the interviewer. If the farmer was not available at this time then an interview with an adjacent farmer was sought.

A short set form of introduction was used to introduce the interviewer and the survey to and request an interview, from the selected farmer. The following introduction was used.

"Good ..... Mr ....., Malcolm Smith, Massey University. I am conducting a survey on farmers attitudes to, knowledge and present practices for Sheep and Wool improvement. Your name appears on my list of selected farmers and I would like to interview you ....."

#### INTERVIEWING:

After introduction or re-introduction the questionnaire schedule was proceeded with as quickly as possible. Questions posed by the farmer other than those seeking clarification of the question asked were deferred until the questionnaire had been completed. As has already been stated answers to the questions were written verbatim. This method of recording proved most helpful when coding.

While interviewing an attitude of learning from the farmer was adopted. Advice was not offered to the farmer although some of the practices mentioned in the interview schedule were discussed after the schedule had been completed.

Where possible the interviewer inspected the farmers' stock and/or farm.

#### ANALYSIS:

As already stated the I.B.M. 1620 computer at Massey University was used for checking and tabulating the data.

##### A. Programmes

It was found desirable to have programmes which would check the form of the data cards as the checking of a large number of data

cards by hand was found to be time consuming. The tabulating programmes were designed to reproduce the information of a large number of data cards in a form that could be interpreted easily or further analysis carried out. The programmes used have been summarized in Chapter I and some are reproduced in Appendix V.

B. Coding

The answers which could not be placed directly on the data cards were coded. Coding took into account for each question the programmes to be used and the range of answers expected. Some standard procedures were adopted to assist in coding.

- 0 = No answer
- 1 = No to the question
- 2 = Yes to the question
- 3 = Don't know
- 9 = Not applicable to this farmer

The codes were transferred from the margin of the schedule to Data Punch forms from which they were punched into data cards. The checking of any apparent anomalies was however directly with the schedule.

## CHAPTER IV

### R E S U L T S

#### INTRODUCTION:

Chapter IV contains a description of how farmers were contacted, how the interviewer was received by farmers and how the interviews were conducted together with details of the responses given to the questions during the interview.

#### CONTACT AND RECEPTION:

Telephoning the farmer the night before to make an appointment to interview was found more successful than calling on the farmer and asking for an interview because:-

- A. Time was saved by not calling at a farm or farms only to find the farmer or farmers were not available for interview
- B. Time was also saved by farmers giving the interviewer detailed directions to the farm

Farmers were generally keen to be interviewed. Farmers contacted but unable to grant an interview, due to prior commitments that day, expressed disappointment that another time was not able to be arranged. Some farmers questioned the length of the interview but no farmer refused to grant an interview because of this.

Although farmers were generally keen to be interviewed their attitude towards the interview ranged from one of wishing to help, through plain curiosity, to asking for technical advice from the interviewer.

Farmers who were not contacted by telephone beforehand seemed more guarded with their answers at the beginning of the interview. This showed the need to have questions which were easily answered by the respondent at the beginning of the questionnaire.

No bias due to the type of contact could be found when the data was analysed. This was probably due to the design of the questionnaire. However for ease of interviewing it is considered desirable to have made prior contact with the interviewee.

#### INTERVIEWING:

Interviews usually took place in the house although three farmers were interviewed in the woolshed and one in the hay paddock.

Time taken to complete the questionnaire varied from two to three and half hours with an average of two and half hours. However the time spent at each farm varied from three to six hours with an average of four hours. Many farmers were very keen to obtain more information on ideas discussed during the interview and the author was frequently invited to look over the farm.

#### QUESTIONNAIRE:

##### A. General Farm Statistics

Fifty sheep farmers were interviewed between January 1966 and April 1966. Thirty six of these were commercial farmers breeding their own female replacement stock and fourteen fat lamb farmers buying in their female replacement stock.

The area of the fat lamb farms included in the sample ranged from 247 acres to 1027 acres with an average of 529.9 acres. On average eighty three percent of each farm was flat to rolling and seventeen percent steep. One fat lamb farm consisted of fifty percent steep land.

The area of the breeding farms included in the sample ranged from 331 acres to 6700 acres with an average of 1528 acres. On average forty five percent of each farm was flat to rolling and fifty five percent steep. However these farms ranged from one hundred percent flat to rolling to one hundred percent steep.

Table I shows the range and average distances from amenities for fat lamb and breeding farms. The ranges shown are those that could be expected from the type of sample taken.

TABLE I  
DISTANCES FROM AMENITIES

	Farm Type	A m e n i t y					
		Rail	Sale Yards	Freezing Works	Fert. Works	Wool Centre	Main Town
Range Miles	Fat Lamb	1-18	2-22	7-60	5-186	18-120	2-20
	Breed- ing	1-81	1-78	10-140	20-212	18-178	1-78
Average Miles	Fat Lamb	8.0	11.8	29.5	53.4	68.1	10.6
	Breed- ing	18.9	20.6	43.5	85.2	86.2	20.0

Of the fifty farmers interviewed thirty six indicated that they were increasing their stock numbers. Five fat lamb and three breeding farmers did not think their land could carry more stock, the main reason being wide variation in seasonal conditions. One fat lamb and five breeding farmers said they could carry more stock but that labour and finance were limiting factors.

B. Selection and Management of Rams

I. On Breeding Farms -

1. Present Policy Selection

Of the thirty six farmers on breeding farms twenty eight selected their own rams. Five were assisted by a stock agent or wool adviser and three had rams selected for them, one of these at auction.

Diverse reasons were given by the farmers for selecting the stud from which rams were purchased. Eleven said because they liked the type of sheep offered, five because they got a reasonable number to select from, five because the stud was close to the farm, four because they had always patronised that stud, three because they wanted a particular blood line, and two said because they got the first pick. Of the six remaining two bred their own rams, two bought rams at auction and two had the stud selected by the brokers.

Excluding the two farmers who bred their own rams and the two who bought at auction; one quarter (8) farmers travelled more than 100 miles and up to 350 miles to obtain their rams. The average distance travelled was 92 miles.

Of the thirty six farmers on breeding farms one farmer obtained his rams from worse country than his own, four from the same type of country (usually from neighbours), eleven

similar country as their own, and sixteen better country than their own. The farmers who obtained their rams from worse or the same type of country as their own offered the comment that they thought this important while the remainder offered no comment to the question.

On average farmers were expected to take at least one out of each seven rams offered although this figure ranged from one out of two to one out of twenty. Four farmers reported buying last season at least one ram in ten that they did not subsequently use. The reason given for purchasing the rams not used was fear of offending the breeder.

Farmers mentioned from four to ten characters they looked for when selecting their rams and from two to six characters they did not like to see in rams. The main characters mentioned concerned points of conformation and constitution within a given wool quality bracket. Deformities of feet and jaws were mentioned but the characters most farmers selected against were simply the reverse of the characters selected for.

In answer to the question "Why have you chosen to select for these characters?" Ten said because they wanted to maintain the type of sheep at present in their flock, eight simply thought these were the correct characters to select for, eight claimed they would be able to maintain the wool type at present in their flock, five claimed that they would be able to obtain the right market types, two considered they

would be raising the standard of the flock, and two because they had been advised to select for the characters stated.

## 2. Production Records

Answering the question "What production records do you obtain to assist in selecting your rams?" twenty nine of the thirty six farmers asked said "none", although five thought that their stud breeder had the records available. Three farmers obtained fertility records (birth rank of the ram), one farmer obtained wool weights while three farmers obtained both. Of the seven farmers who obtained some records, five used these records to decide between sheep previously selected by eye and two used these records to select a group of sheep from which to select individual rams.

All thirty six farmers were asked "Do you think the records of the rams from which you pick your replacements are a good guide to the rams ability to produce better offspring?" Seventeen including the seven already using them said yes they did, seven said no they did not, and twelve had never considered the possibility before the interview. It became apparent to the author when analysing the answers to this section that the last question should have been followed by another which asked for the reasons behind their answers. This fact did not show in the pre-test results because all pretest farmers fell into the last category

### 3. Management Policy

When culling rams three factors were taken into account by sixteen of the farmers interviewed, two factors by eleven of the farmers interviewed and one factor by nine of the farmers interviewed.

Factors considered by farmers when culling rams were; age, condition of the mouth, general fitness, semen test result, wool, and rams ability to mark ewes (tested by harness).

Age was given as a factor by twenty farmers, fitness of the ram by seventeen farmers, semen test result by fourteen farmers, mouth by nine farmers, wool by four farmers and harness result by two farmers.

The percentage of rams to ewes used by farmers on breeding farms ranged from one to four percent. One farmer used one percent, four farmers used one and half percent, six used two percent, twelve used two and half percent, eleven used three percent, and two used more than three percent.

The thirty six farmers were asked "Into what age groups are the ewes split at tugging?"

Sixteen farmers ran two groups one consisting of two-tooths and one of mixed age ewes, eleven farmers ran four groups one consisting of two-tooths one of four-tooths one of six-tooths and one of four year ewes, three farmers ran three groups one consisting of two-tooths one of mixed age and one of five year ewes, three farmers ran three groups one consisting of two-tooths, one of four-tooths and one of older ewes and three farmers ran

only one group of ewes.

To the question "How are the rams allocated among these ewe age groups?" Fourteen farmers allocated four-tooth or older rams to the two-tooth ewes and any age rams to the four-tooth or older ewes. Eight farmers allocated the rams to ewes of the same age. Seven farmers made no allocation of rams based on the rams or ewes age. Four farmers allocated the two-tooth rams to the four-tooth ewes, four-tooth rams to two-tooth ewes, and older rams to ewes of the same age group.

Three farmers allocated half of the two-tooth rams to the two-tooth ewes and the remainder of the two-tooth, four-tooth and older rams to four-tooth and older ewes.

Nine farmers commented that they thought four-tooth or older rams were more efficient at finding two-tooth ewes which were on heat than the two-tooth rams. Seven farmers commented that they did not place old rams with young ewes as they wished to avoid inbreeding.

Of the thirty six farmers asked, fourteen put out all rams at the beginning of tugging, nine put out one third followed by the remainder when the ewes started to come into heat, six put out two thirds followed by the remainder when the ewes started to come into heat, two farmers put out half the rams and changed rams at regular intervals and five farmers put out the full percentage of rams to be used at any one time and changed rams for reserves when a ram appeared to be failing in health. Later analysis showed that these later farmers actually used a higher percentage of rams than they stated in answer to the question on the percentage of rams to ewes used.

Rams were left with the ewes from six to sixteen weeks. Fifteen farmers left rams out from six to eight weeks, thirteen from nine to twelve weeks, seven from thirteen to fifteen weeks and one for sixteen weeks. Nineteen of the farmers actually took the rams from the ewes after a predetermined time while seventeen took the rams from the ewes at a convenient time such as when ewes were mustered for crutching.

## II. On Fat Lamb Farms -

### 1. Present Policy

Of the fourteen farmers twelve selected their own rams, one was assisted by a stock agent and one had his rams selected for him by a stock agent.

The reasons given by the fat lamb farmers for selecting the stud from which they chose their rams were similar to farmers on breeding farms. Three farmers selected the stud because it was close to his farm, two had the stud selected for him by stock brokers, one because he obtained first pick, one to obtain a particular blood line, one because he was offered a good number to select from, two because of the type of sheep offered by the stud while three farmers bred their own and one selected his rams at auction.

On average fat lamb farmers did not travel as far as farmers on breeding farms to obtain their rams. Eight farmers travelled from five to one hundred and seventy miles to obtain rams and the average distance travelled was fifty three miles.

Fat lamb farmers selected for almost as many characters as farmers on breeding farms, however the emphasis was on either conformation or constitution except for three farmers selecting long wool fat lamb sires. Of the fourteen farmers, seven selected for conformation characters, four for constitution characters, two for wool and conformation characters and one for wool and constitution characters.

When the fourteen farmers were asked "Why they selected for these characters?" five said to obtain the right market type of lamb, four because they considered these the right characters to select for, three considered they would raise the standard of lambs produced by producing a constant type of lamb.

## 2. Production Records

Of the fourteen farmers only two obtained production records to assist them in selection of their rams. The two farmers who did obtain these records did so for the rams they purchased for their own stud flock. One farmer obtained fertility records (birth rank of ram) and one obtained wool weights and fertility as he had a long woolled fat lamb stud.

Of the fourteen farmers asked "Do you consider production records of rams, from which you pick your rams, are a good guide to the rams ability to produce better offspring?" Three said yes, they did, two said no they did not, while seven farmers had never considered the idea before the interview.

### 3. Management Policy

When culling rams three factors were taken into account by six farmers interviewed and two factors by eight farmers interviewed.

Factors considered by the fourteen farmers when culling rams were; age, general fitness, semen test result, condition of the mouth, wool and the rams ability to mark ewes (tested by harness).

Age was given as a factor by nine farmers, general fitness by seven farmers, semen test result by six farmers, condition of the mouth by five farmers, wool by two farmers and harness result by two farmers.

The range of percentage rams to ewes used by the fat lamb farmers was one to four percent similar to that of farmers on breeding farms, however the peak number of farmers using a particular percentage of rams to ewes was half a percent lower for fat lamb farmers. Of the fourteen fat lamb farmers two used one percent, seven two percent, two two and half percent, one three and one four percent rams to ewes.

Of the fourteen farmers asked "Into what age groups are the ewes split at tugging?" Nine farmers ran two groups one consisting of two-tooths and one of all older ewes, four farmers ran one group, and one farmer ran five groups each consisting of ewes at the same age.

To the question "How are the rams allocated among these ewe age groups?" eight farmers made no allocation of rams based on either the age of rams or age of ewes, four allocated

four-tooth or older rams to the two-tooth ewes and the remainder of the rams to four-tooth or older ewes, one allocated the rams to ewes of the same age group and one allocated half the two-tooth and half the four-tooth rams to two-tooth ewes and the remainder of the two-tooths, four-tooth and older rams to four-tooth and older ewes.

Of the fourteen farmers asked, two put out all the rams at the beginning of tugging, seven put out one third of the rams followed by the remainder when the ewes started to come into heat and four farmers put out the full percentage of rams to be used at any one time and changed rams for reserves when a ram appeared to be failing in health.

No difference was found in the range of length of time rams were left with the ewes between fat lamb farmers and farmers on breeding farms. Three of the fourteen farmers left rams out from six to eight weeks, five from nine to twelve weeks, four from thirteen to fifteen weeks and two for more than fifteen weeks. Four of the farmers actually took the rams from the ewes after a predetermined time while ten took the rams from the ewes at a convenient time such as when the ewes were mustered for crutching.

### C. Selection of Ewes

#### I. On Breeding Farms -

##### 1. Present Policy

Of the thirty six farmers on this type of farm only two did not do their own selecting of replacement ewes. One had had a wool classer select his ewes for him at a charge

of sixpence/head, and the other had his replacement ewes selected for him by a Sheep and Wool Instructor of the Department of Agriculture.

Eleven farmers carried out selection of the ewes as lambs. The range of the percentage of lambs culled by these eleven farmers was from one to fifty five percent with an average culling percentage of eighteen point two. Twenty nine farmers carried out selection of the two-tooth ewes prior to tuppung. The range of the percentage of two-tooth's culled by these twenty nine farmers was from one to forty five percent with an average culling percentage of twenty point one percent. Sixteen farmers carried out selection of the mixed age ewes. The range of percentage mixed age ewes culled was one to sixteen percent with an average of six point seven percent. All thirty six farmers cast ewes for age at five or six years.

A wide variation was found in the characters and number of characters selected for by the thirty six farmers asked. Three selected for conformation characters, sixteen for wool and conformation characters, seven for wool and constitution characters, six for conformation, wool and constitution characters, and four selected only those sheep that would survive.

The objectives given by farmers for selecting for these characters are summarised in Table II.

TABLE II

OBJECTIVES OF SELECTION : BREEDING FARMS

Objectives	No. of Farmers
To obtain 'better sheep'	13
To obtain an even line within the flock	8
To obtain better lambing percentage and wool weight	5
To obtain better wool weight	4
To feed only those that will survive and be productive	4
To obtain better lambing percentage	3

The characters selected against were in the main only the reverse of the characters selected for although some farmers did mention poor feet and jaws and black spots in the wool.

2. Practices to Obtain a Higher Lambing Percentage

Of the thirty six farmers asked "Have you ever culled to obtain a higher lambing percentage?" eleven said they had not, and thirteen said they had and twelve said they had not but on further questioning it appeared they actually did cull in a way which could increase their lambing percentage. This means in fact twenty five farmers attempted to select in some way for a higher lambing percentage.

Of these twenty five farmers eight identified twin ewe lambs either by marking (5) or separating from singles at lambing (3) so that allowance could be made for twin lambs being born and reared as a twin when selection of lambs or two-tooths was carried out.

Of these twenty five farmers no farmer used the information of whether the lamb was born and reared as a single or twin when deciding which dry two-tooths to cull.

Of these twenty five farmers twenty three culled dry ewes at various stages. The following are the stages at which the twenty three farmers culled dry ewes; ten farmers culled all dry ewes, six culled all ewes twice dry, six culled dry four-tooths that had been dry as two-tooths and one culled all dry two-tooths.

The eleven farmers who were not culling for a higher lambing percentage claimed they knew how, but gave the following reasons for not culling for a higher lambing percentage; seven because they were building up numbers, two because they claimed the dry two-tooth ewe lambed just as well at later lambings as those two-tooths that had a lamb as a two-tooth, one because of staff shortage and one because he felt the practices for culling for a higher lambing percentage had not been shown to be effective.

However when the seventeen farmers who did not practice culling of dry two-tooths or on steeper country twice dry ewes had the practice outlined to them twelve said they might try the practice and only five said they would not. The reasons given for not trying the practice were; four farmers wished

to keep all stock possible and one farmer was not convinced that the dry two-tooth ewe would not subsequently perform as well as two-tooth ewes which had lambs as two-tooths.

The thirty one farmers who did not practice twin marking had the practice outlined to them. Twelve said they might try the practice and nineteen said they would not. The reasons given for not trying the practice were; eight claimed they did not have the labour to put the practice into operation, three claimed they did not have the time to put the practice into operation, three considered they would disturb the sheep at lambing by trying the practice, three said they did not have the numbers to cull for singles as they were keeping all ewes and two had tried but abandoned the practice.

### 3. Practices to obtain higher fleece weights

Of the thirty six farmers asked had they ever culled to obtain higher fleece weights, thirty three farmers said "No" and three said "Yes". Of those that said "Yes" one sorted ewes into fleece weight groups by touch before shearing, one sorted the ewes down the race into fleece weight groups by eye before shearing, and one had ewes culled on fleece weight by a Department of Agriculture Instructor.

Of the thirty three farmers who did not cull to obtain higher fleece weights, eleven claimed they knew how and twenty two said they did not know how to cull to obtain higher fleece weights. The eleven farmers who knew how to cull for higher

fleece weight gave the following reasons for not doing so; four claimed they did not have the sheep to cull, three claimed they did not have the labour available to operate the practice, two claimed there was too much work involved, one farmer said "I havn't finished culling my own way yet" and one was organising to fleece weigh hoggets the following year.

Thirty five of the thirty six farmers had the two methods, outlined in Chapter II, of determining the selection and cull groups of hoggets on fleece weights explained to them. Each method was put forward separately and the farmer asked if he might try the method. The farmers who said they might try one method also said they might try the other method. The farmers who said they would not try either method gave the same reasons for both methods.

Of the thirty five farmers asked, eleven said they would try either method but preferred the method reported by Dun (1961), twenty two said they would not try either method. The reasons given by these twenty two farmers for not trying the method were: nine thought the methods impractical, four considered the time involved not worthwhile, four claimed they would not have the labour to operate the methods, three claimed the shearers would not co-operate, and two claimed there was no financial return from the practices.

## II. On Fat Lamb Farms -

### 1. Present Policy

Of the fourteen farmers on this type of farm, ten bought two-tooth ewes as flock replacements and four bought five

year ewes as flock replacements, all farmers selected their own replacement ewes.

A wide variation was found in the characters and number of characters selected for by the fourteen fat lamb farmers when buying their ewes. The characters have been summarised under the following main headings: four farmers selected on conformation, seven on conformation and wool, and three on constitution and wool. All characters were judged by eye.

The objectives given by farmers for selecting for these characters are summarised in Table III.

TABLE III

OBJECTIVES OF SELECTION : FAT LAMB FARMS

Objectives	No. of Farmers
To obtain 'better sheep'	4
To obtain better lambing percentage	3
To obtain better wool weight	3
To obtain better wool weight and lambing percentage	3

2. Practices to obtain a higher lambing percentage

It should be realised that culling of dry two-tooth ewes will remove ewes which have been shown to have a poorer lifetime performance than those ewes which lamb as two-tooths. Therefore under fat lamb farming conditions only

a phenotypic gain could be expected because progeny of the ewes which have a better lambing record are sold as fat lambs on this type of farm. Also that twin marking is of no value for the same reason.

Of the fourteen farmers asked "Have you ever culled to obtain a higher lambing percentage?" nine said they had, three said they had not but on further questioning it appeared they actually did cull in a way which could increase their lambing percentage, and two said they did not. The reason given by the latter two farmers for not culling were cost of replacements.

Of the twelve farmers who were in fact attempting to cull in some way to obtain a higher lambing percentage, four were culling all dry-ewes, four were culling all twice dry ewes, three were culling ewes dry at two-tooth and again as four-tooths, one was culling dry two-tooths.

The method of culling dry two-tooth ewes was outlined to the seven farmers who had two-tooths but were not culling them if they were dry at that age. Five farmers claimed they would not try the method and two claimed they would try culling dry two-tooths.

Of the five farmers who said they would not try culling dry two-tooth ewes; three claimed the dry two-tooth ewes would perform just as well at later lambings as those two-tooths that had lambs, one claimed he did not have the time to identify the dry two-tooth ewes, and one considered that his lambing percentage was high enough.

### 3. Practices to obtain higher fleece weights

The fat lamb farmers were not asked to consider the practices to obtain higher fleece weights because:-

- (a) They were not able to obtain the hogget fleece weights.
- (b) It was considered by the author impractical to buy in additional two-tooth ewes so that culling on fleece weight could be practiced at pre-tupping shearing.

#### D. Wool Handling

The answers from farmers on breeding farms and farmers on fat lamb farms will be considered together in this section.

This section proved difficult for farmers to answer. Whereas most farmers answered questions about their farm and stock with little hesitation, in this section dealing with wool many farmers had to be encouraged to give any answer at all. This was done by convincing them that all information including a negative answer or a "don't know" was of value.

#### I. Present Shed Practice -

Of the fifty farmers questioned thirty four used contract gangs for shearing, fifteen used local shearers, and one used labour available on the farm.

Of the fifty farmers twenty one prepared the wool for sale themselves, ten left preparation to the contract gang, two employed qualified classers while seventeen claimed they did not prepare the wool for sale, although in some cases they may have skirted their wool.

The fifty farmers were asked how the wool was skirted. Eighteen farmers said they took all pieces off the fleece but skirting was light, twelve took all pieces off the fleece and skirting was heavy, nine took all pieces but did not indicate the degree of skirting, seven (farmers who second shear) skirted the wool on the board with a broom, and four farmers did not skirt as they considered it unnecessary.

Most of the fifty farmers found difficulty in defining the purpose of skirting. The following answers indicate what was taken from the fleece rather than the purpose of removing it. Twenty two said their purpose was to remove discoloured wool, thirteen to improve the main part of the fleece, six to make an even line of wool, one to obtain lines of even length wool, one to increase price received for the wool while two insisted that it was not necessary to skirt.

Only one farmer of the fifty asked could describe the line or lines that his wool was classed into, although thirty two farmers could say how many main fleece lines his wool had been classed into in the shed or by the brokers for sale.

#### 1. Knowledge of wool terms

The answers to questions in this group were split into three groups; Know, Don't Know and Some Idea. The first two groups are self explanatory. The Some Idea group was used to classify answers which were not strictly correct but in answering the question the farmer had been "along the right lines".

Of the fifty farmers ten knew the style grading of their wool, five had some idea and thirty five did not know the style grading of their wool clip.

To the question "How do you decide which method to use when preparing your wool for sale?" the fifty farmers asked gave the following answers. Twelve farmers left the decision to the broker, eleven were advised by the broker, nine estimated the likely financial returns using mainly the price difference between pieces and full wool, seven decided on the appearance of the wool, five had always prepared in the same manner and made no decision, four received advice from people other than brokers and two farmers left the decision to the contractor.

Farmers knowledge of wool terms used by brokers and the wool trade in general is shown in Table IV. The wool terms have been ranked according to the number of times the meaning of the term was given correctly. Farmers knew more about the specialty wool paper felts, which few would be producing, than they did about the terms which would be of greater assistance to them in deciding the method of preparation of their own clip or in interpreting advice.

Farmers were asked if they knew there was a price difference between wools of different styles. If farmers said they did know then they were asked what was the amount of this price difference. Of the fifty farmers thirteen knew there was a difference and could give an estimate of the difference, sixteen said they knew there was a difference but had no idea of what the amount of the difference was, twenty one farmers did not know that a difference existed.

TABLE IV

KNOWLEDGE OF WOOL TERMS

Term	Know	Some Idea	Don't Know
Yield	37	4	9
Type *	34	1	15
Paper Felts	16	19	15
Quality No.	9	13	28
Style	7	13	30
Count	4	30	16
Preparings	3	11	36
Cardings	0	12	38
Woollen Cardings	0	3	47

\* Breed Type

The same series of questions was asked for quality number. Of the fifty farmers asked twenty farmers knew there was a difference in price between quality numbers and could give the approximate value of the difference, twelve said they knew there was a price difference but had no idea of what the amount of the difference was, and eighteen did not know there was a price difference.

The same series of questions was asked for trade types. Of the fifty farmers asked; eleven said there was a price difference and could give specific examples of where price differences may occur, eleven said there was a difference but had no idea where price differences may occur and twenty eight

said they did not know price differences existed between trade types.

2. Off Farm Handling of Wool

Of the fifty farmers, thirty seven sold wool at local auction, six sold through the New Zealand Wool Marketing Co-operative, two sold to itinerant buyers or at auction and one always sold to itinerant buyers. Of the thirty seven who sold wool at local auction, nineteen sold as prepared in the shed, ten had the wool re-classed by the broker before sale, four had the wool classed in the shed before sale, and four had the wool binned by the broker before sale.

No pattern emerged from reasons given for selling wool in the manner stated compared with the manner of sale. The reasons given for selling wool in the manner stated were, thirty six farmers considered that they got the 'best price', seven farmers claimed that there was no other way to sell wool, four farmers claimed they were advised to sell in the manner stated, and three farmers claimed they were 'sure of the price' by selling wool in the manner stated.

Of the fifty farmers asked "Do you have records of wool sold and/or brokers reports?" twenty claimed they kept both, fifteen claimed they had records of wool sold but did not receive a brokers report, five claimed they did not keep records of wool sold and only got a verbal brokers report, three claimed they kept only the brokers report, three claimed they kept neither, while four farmers said they got a statement

which was a composite of the records of wool sold and a brokers report.

Of the fifty farmers asked "Do you always accept the brokers valuation as the reserve price on your wool?" Twenty four farmers said they did, eight farmers said formerly they increased the reserve price but now accepted the brokers valuation and fourteen said that they increased the reserve price from that set by the broker while six farmers who sold through the New Zealand Wool Marketing Co-op said that they discussed the price usually by phone with the broker.

All fifty farmers considered that the specification sheets given to farmers by brokers to describe their wool to the broker were adequate.

E. Personal Statistics, Contact with Mass Media, Extension Personel and Other Farmers

The answers from farmers on breeding farms and farmers on fat lamb farms will be considered together in this section.

I. Personal Statistics -

Of the fifty farmers, thirty six were owner/operators, six were the manager and major partner in a family partnership, five were managers, two were managers and major shareholders of a limited family company and one a manager of the family estate.

Of the forty five farmers on the family farm eighteen used their own money plus loan money to obtain the farm, thirteen inherited the farm from close relatives usually the farmers

father, thirteen obtained a farm through soldier rehabilitation while one farmer will inherit the farm when the estate is wound up.

The age of the fifty farmers compared with formal education undertaken by the farmers is shown in Table V.

TABLE V

AGE - FORMAL EDUCATION

Level of Formal Education	Age			Total
	< 35	35-50	> 50	
Primary School	0	5	3	8
1 - 2 Years Secondary	2	10	8	20
3 - 5 Years Secondary	5	11	5	21
Diploma Massey Ag.College	0	1	0	1
TOTAL	7	27	16	50

The fifty farmers had spent from eight to fifty years as farmers with an average of twenty eight years as farmers and from one to fifty years as farmers on the present farm with an average of sixteen years as farmers on the present farm.

## II. Contact with Mass Media -

All fifty farmers had radios. Fifteen farmers claimed they regularly listened to the farm sessions on the radio, thirty one claimed they listened sometimes and four said they never listened.

Of the forty six farmers who listened to farm sessions on the radio, forty four could name the station they listened to and the time the farm session was broadcast. Forty one farmers listened to the mid-day farm session, one to the evening farm session, one to the midday and Saturday morning farm session and one to the evening and Saturday morning farm session.

Of the fifty farmers thirty six had television sets, five claimed they were going to buy a television set and nine claimed they would not buy a television set.

All of the forty one farmers who had or were going to buy a television set claimed they liked or would like to see a farm programme on television. Of the forty one farmers who claimed they liked or would like a farm programme, sixteen claimed they preferred the programme to be shown between 7 p.m. and 8 p.m., twenty four between 8 p.m. and 9 p.m. and one after 9 p.m.

Of the fifty farmers fifteen purchased either a local or provincial newspaper, twenty nine purchased a local and a provincial newspaper and six purchased a local and morning and evening provincial newspaper.

Twenty eight of the fifty farmers claimed they regularly read the farming page in the newspaper, twenty claimed they

sometimes read the farming page and two said they never read the farming page.

The forty eight farmers who read the farming page were asked "What information do you get from the farming page?" Most farmers were very vague in their replies. Nineteen claimed they got 'general' farm information with nothing specific in mind, fifteen claimed they kept up to date on Stock and Wool values, four claimed they learnt a lot from success stories of farmers on land similar to their own, two mentioned that discussion on seasonal problems was helpful while five could give no firm comment as to what information they obtained from the farming page.

Of the fifty farmers three farmers purchased no farm journals, eleven purchased one, nine purchased two, ten purchased three, six purchased four, five purchased five, four purchased six and two purchased seven farm journals.

The forty seven farmers who received farm journals were asked "What type of article do you like best?" As with the newspaper response few farmers could give definite ideas to what type of articles they liked best. Fourteen farmers claimed they liked articles about successful farmers on land similar to their own, twelve simply stated they read most articles but could name no specific type, five claimed they liked articles of all types, five claimed they liked articles on farm management and breeding, two claimed they liked articles on farm forestry while five claimed they did not read much at all and in fact two of these said "I burn most of them (Journals) with the wrapping still on."

III. Contact with Extension Personnel and Other Farmers -

Of the fifty farmers fifteen had in the last two years requested a visit from a Farm Advisory Officer of the Department of Agriculture, five had requested a visit more than two years ago, and three had had a visit from a Farm Advisory Officer who wished to make himself known in the district. Of the fifteen farmers who had requested a visit five wished to have soil tests done and ten wanted general farm advice.

Of the fifty farmers six had in the last two years requested a visit from the Sheep and Wool Instructor of the Department of Agriculture and two had had a visit from a wool instructor wishing to make himself known in the district. Of the six farmers who had requested a visit, four required general wool advice, one had his two-tooths culled by the instructor and one had his hoggets culled on fleece weight by the instructor.

Of the fifty farmers, forty five had received visits from stock agents. The purpose of these visits was to obtain any business that the farmer had to offer.

Of the fifty farmers, forty had received visits from a wool canvasser from a Wool Brokers firm. The purpose of these visits was to ensure that the wool would be disposed of by the farmer through them and in some (eight were mentioned) cases offer advice on preparation.

Of the fifty farmers, six were visited by an officer from the State Advances Corporation to help draw up a budget and three had been assisted in the past in this manner.

Of the fifty farmers, three had requested a visit from a Catchment Board Officer to assist in drawing up a conservation programme and three had had in the last two years an officer inspect their property while inspecting the area.

Of the fifty farmers, five were members of a Farm Improvement Club, and one was to become a member the following month. Two of these farmers were now only on half membership and the remaining four full membership.

Of the fifty farmers, forty two had in the last two years requested a visit from a Veterinarian, six had had the Veterinarian call to inoculate heifers or semen test rams annually and two had had the Livestock Instructor of the Department of Agriculture inoculate heifers.

Twenty one of the fifty farmers had been to a farmers conference. Of these, ten went regularly, seven went occasionally and five had been in the past.

Thirty three of the fifty farmers attended field days for farmers. However ten of these complained that there were not enough field days on farm practices and they had only been to machinery demonstrations.

Three of the fifty farmers belonged to a Department of Agriculture Discussion Group. Of the remainder, seven said there were none in their district and five claimed no knowledge of discussion groups.

Fourteen of the fifty farmers claimed they attended Federated Farmers meetings regularly, fifteen said that they were members but did not attend meetings and the remainder did not belong to Federated Farmers.

When asked "What other gatherings of farmers do you attend?" Eighteen farmers mentioned Agricultural Shows, ten mentioned Dog Trials, five mentioned Stock Sales, three mentioned Dog Dosing, and two mentioned Ploughing Matches. Other gatherings of farmers mentioned were, sports meetings, Veterinary club, lamb competitions, Breeders meetings and local functions.

## CHAPTER V

### SUMMARY AND CONCLUSIONS

#### INTRODUCTION:

Chapter V contains the summary and conclusions of this survey and recommendations made as a result of this survey.

#### SAMPLE:

A sample of fifty North Island farmers running crossbred sheep were interviewed between January 1966 and April 1966.

The sample was drawn by using a modified grid sampling technique.

#### CONTACT AND RECEPTION:

Prior contact with the farmer was found to be desirable, although not essential for a successful interview, because of the time saved in locating the farm and the farmer to be interviewed.

Farmers were very generous in the manner in which they accepted the interviewer and responded to the questions asked.

For ease of interviewing prior contact should be made with the farmer.

#### INTERVIEWING:

An average of four hours was spent with each farmer of which an average of two and a half hours was spent completing the questionnaire schedule and the remainder in discussion with the farmer and looking over the farm.

Four hours spent with each farmer was sufficient to obtain the relevant information when using a questionnaire schedule.

QUESTIONNAIRE:A. General Farm Statistics

Thirty six of the farmers interviewed were on breeding farms with an average size of 1,528 acres. Fourteen of the farmers interviewed were on fat lamb farms with an average size of 529.9 acres. The breeding farms were on average half flat to rolling and half steep while the fat lamb farms were four-fifths flat to rolling and one-fifth steep. The ranges of distances from amenities were those that could be expected from the type of sample taken.

Seven-tenths of the farmers indicated that they were increasing stock numbers, one-tenth said they could increase stock numbers but other factors prevented them from doing so, while two-tenths claimed their land could not carry more stock.

The farms were, in the authors' opinion, a typical cross-section of North Island crossbred sheep farms.

B. Selection and Management of RamsI. Selection -

Four-fifths of the farmers interviewed selected their own rams while the remaining one-fifth had their rams selected for them or were assisted in selecting their rams by persons outside the farm.

Farmers gave diverse reasons for choosing the stud from which they selected their rams. In general however, farmers claimed they chose the stud because it suited their purpose. Purposes ranged from closeness to their farm, through liking the type of sheep offered or the wide selection they had offered to them to a requirements for a particular blood line.

An impression gained from many and actually stated by four farmers was that they thought that if they offended their particular breeder it would be difficult to find another breeder where they could get the same selection or personal attention.

Farmers were prepared to travel relatively long distances to obtain rams. The farmers on breeding farms travelling an average of ninety two miles to select their rams and farmers on fat lamb farms an average of fifty three miles.

Only those farmers who purchased rams from country which was poorer or the same as their own commented on the question of the type of country they selected rams from. These farmers considered that it was important for the rams to be bred on the same type of country as they were to be used on.

On average, farmers were required by the vendor to select one in seven rams offered but this ranged from one in two offered, to one in twenty offered.

Farmers selected rams on up to sixteen characters. This came about by farmers considering a number of points of conformation and/or constitution and, for farmers on breeding farms and fat lamb farmers who were selecting long wool fat lamb sires, wool characters.

Farmers were generally not positive in their reasons for selecting for these characters. One fifth merely wanted to maintain the type of sheep already present in their flock, almost one-fifth wanted to maintain the wool type already present in their flock while just over one-fifth merely thought these the right characters to select for.

Farmers on fat lamb farms were more concerned with obtaining what they considered to be the correct market type of lamb. However, overall, only one-fifth of the farmers considered that they were selecting rams to improve the progeny.

Only nine of the fifty farmers obtained production records to assist them in selecting their rams. Two of these were fat lamb farmers who did so when purchasing rams for their own stud flock. The records obtained by the farmers buying rams for their breeding farms were birth rank of the ram and/or the wool weight of the ram. In no case was it found that the records obtained were formulated into a selection index.

Five of the seven farmers who obtained production records used them only as the final criteria of selection of their rams.

Two-fifths of the farmers thought that records of the rams or their parents would be a good guide to selecting rams which would produce better offspring, one-fifth said they would not, while two-fifths could offer no comment as they were considering the idea for the first time.

Since farmers were selecting for a large number of characters and that these characters were generally assessed by eye then little improvement in the productive traits of the flock could be expected to come through the ram.

The hypothesis that ram selection practices, if any, used by North Island farmers running crossbred sheep do NOT include selection based on relatively high greasy fleece weight and relatively high adjusted weaning weights was therefore accepted.

Based on the present practices of farmers in selecting rams it was concluded that farmers need to be informed of the principles of breeding and selection, with special reference to selecting for productive characters and the need to select for as few economically important characters as possible to obtain worthwhile gains in any one character.

## II. Management Policy

Two-fifths of the farmers interviewed used two percent or less rams to mate ewes and almost half of these were fat lamb farmers. The remaining three-fifths used more than two percent rams to ewes and up to four percent were used for mating.

Farmers who split their ewe flock into groups at tugging based on the age of the ewe were doing so for two reasons:

1. The farmers felt that an older ram was required to seek out the two-tooth ewe on heat and by splitting the ewes older rams could be put with the two-tooth ewes.
2. The farmers did not like to risk inbreeding and wanted to make sure that no ram was mated with its' daughter. In this case four-tooth rams would be used with two-tooths if the farmer also required 1. above to hold.

The methods used for putting out the rams with the ewes varied widely as did the length of time that the rams were left with the ewes. A little over half of the farmers left rams out for a predetermined time while a little under half brought the rams in when the ewes were being mustered for another purpose - usually for crutching.

It was concluded by the author that too high a percentage of rams to ewes were being used by the majority of farmers - that is, above two percent of rams should only be needed in special circumstances such as extremely broken country. The reduction in the number of rams purchased each year could result in a considerable saving or enable the farmer to pay a higher price for his rams and perhaps obtain a better selection.

It was also concluded that terms such as inbreeding and crossbreeding should be explained to farmers to help them in decisions on breeding and overcome some of the falacies which have been shown to exist among farmers by this survey.

### C. Ewe Selection

#### I. Present Selection -

Farmers interviewed selected their ewe replacements on a large number of characters. These were mainly points of conformation, constitution and wool - most of which were determined by eye. Tables II and III presented the objectives stated by farmers when selecting for these characters. Half of the farmers stated their objectives as merely to obtain "better" sheep or to maintain an "even" flock and half considered they would improve lambing percentage, and/or wool weights by selecting for these characters.

Of the thirty six farmers on breeding farms eleven did some selection of lambs and twenty nine did some selection of two tooth ewes while sixteen farmers culled mixed age ewes.

When considering the practices proposed by the author to assist in selection or culling of ewes, eight farmers were found to be

identifying twin ewe lambs (five by marking) and allowing for the handicap of being raised and born as a twin when selecting lambs and/or two-tooth ewes, no farmers were using twin marking to help in a decision on the dry two-tooth ewe, twenty three farmers were culling dry ewes or twice dry ewes and one farmer was using the hogget fleece weight to assist him in selection of his replacement ewes. However, of the farmers who culled dry ewes or twice dry ewes almost half did not know that this could affect their lambing percentage.

Since farmers were selecting for a large number of characters and these characters were generally assessed by eye it was concluded little improvement in the productive traits of the flock could be expected to come through the ewes. The hypothesis that ewe selection practices, if any, used by North Island farmers running crossbred sheep do NOT include selection based on relatively high greasy fleece weight, relatively high multiple births, and relatively high lambing percentages could therefore in general be accepted.

## II. Selected Practices -

Only five of the seventeen farmers on breeding farms said they would not try the practice of culling dry two-tooth ewes when the practice was outlined to them. Four of these five farmers were keeping all available stock so that they could increase their stock numbers as quickly as possible without buying in replacement ewes.

The practice of marking twin ewe lambs to assist in selection of ewes to join the flock was not generally well received by the farmers interviewed. Only twelve of the thirty one farmers not

marking twin ewe lambs said they might try the practice. Shortage of labour, time and stock numbers were the main reasons given for not wanting to try the practice.

The practice of weighing the hogget fleeces to assist in selection of ewes to join the flock was also not generally well received by the farmers interviewed. Only eleven of the thirty five farmers not hogget fleece weighing said they might try the practice. Reasons given for not trying the practice were, impracticability of putting the practice into operation, shortage of time, shortage of labour, shearers would not co-operate and no financial reward from the practice.

Farmers on fat lamb farms were only asked to consider the practice of culling dry two-tooths. Of the seven farmers that had two-tooth ewes but were not using the practice only two said they might try the practice. The reasons for not using the practice were; the dry two-tooth ewe was as good a ewe as the two-tooth that had a lamb, at later lambings, no time to identify dry ewes and lambing percentage was high enough.

It appears likely that farmers would be willing to adopt the practice of culling dry two-tooth ewes, however the practices of marking twin lambs and hogget fleece weighing would be much harder to get farmers to adopt.

Farmers who did not cull dry two-tooth ewes did not do so because either they were not aware of this method of selection or aware of its advantages. A few farmers (4) were not able to change their present practices despite 'knowing better'.

Farmers who did not mark twin ewe lambs to assist in selection of ewes to join the flock did not do so because they were not aware of the practice and its advantages. Fifteen farmers were not able to change their practices and five were not willing to change their present practices despite 'knowing better'.

A similar pattern was found for the practice of hogget fleece weighing as the practice of twin marking ewe lambs.

The hypothesis that North Island farmers running crossbred sheep do not select ewes on the above basis because they are NOT:-

- I. aware of this method of selection
- II. aware of its advantages
- III. willing to change their present practices despite 'knowing better'.
- IV. able to change their present practices despite 'knowing better' was therefore accepted.

Based on the present practices of farmers in selecting ewes and an opinion formed by the author from answers given as to possible adoption of selected practices by farmers it was concluded that farmers should be made fully aware of the proposed practices and the advantages these practices possess. Also the idea that farmers should know of the principles of breeding and selection was endorsed by the results of this section.

#### D. Wool Handling

Farmers in general did not respond with confidence to the questions in this section.

##### I. Wool Handling On-Farm -

In the authors opinion only two farmers could adequately state the purpose of skirting, however in describing what was actually

done when skirting it was felt that many farmers in fact knew the purpose of skirting and may have been skirting with good reason.

Only one farmer could describe the lines his wool was classed into for sale although thirty two farmers knew the number of main fleece lines in their clips.

## II. Knowledge of Wool Terms -

The knowledge of the meaning of wool terms used by brokers and extension personnel was very limited as can be seen by the results in table IV. Added to this only ten farmers knew the style grading of their wool and more than half did not make the decision on the method of preparation of their wool clip.

Another area where the farmers were ill-informed was of price differences existing between wool of different styles, quality number or count and trade types. Approximately one quarter of the farmers knew price differentials existed and could state the approximate price differential between styles and between trade types and two-fifths of the farmers knew and could state price differentials for quality number or count.

## III. Wool Handling Off-Farm -

Almost four-fifths considered they sold their wool in the stated manner because they believed it was the way to get either the 'best price' or 'a sure price'. The remainder either knew of no other way of selling wool or had been advised to sell in the manner stated.

Almost three-quarters of the farmers received a brokers report of some sort but it seems doubtful that these would be

of much value to many of the farmers in view of their lack of knowledge of the wool terms contained in such a report.

Three-fifths of the farmers were willing to accept the brokers valuation as the reserve price, the remaining two-fifths discussed the price with the broker and sometimes set a higher reserve price.

It has been shown that the farmers in general lack a knowledge of wool and wool handling especially with respect to the wool terms used by brokers and extension personel. The hypothesis that North Island farmers running crossbred sheep are NOT conversant with the various alternative ways in which their clip might be prepared for disposal and disposed of and are therefore NOT able to choose alternatives which may be more profitable than the one currently used, was therefore accepted.

It was concluded that farmers need to know the meaning of wool terms before wool and wool handling could be discussed with the farmer to any great effect. Alternative methods of disposal and the preparation for each method of disposal could then be outlined to the farmer and he could then decide the method best suited to his clip.

E. Personal Statistics, Contact with Mass Media, Extension Personnel and Other Farmers

I. Personal Statistics -

Thirty-six of the farmers were owner/operators, six were the manager and major partner in a family partnership, five were managers, two were managers and major shareholders of a limited family company and one a manager of the family estate.

Eighteen farmers had bought their own farm, thirteen had inherited the family farm and thirteen were soldier rehabilitation.

Eight of the farmers only had primary school education, twenty had spent one to two years at high school, twenty one had three to five years at high school while one had completed a diploma in sheepfarming at Massey Agricultural College.

Seven farmers were less than thirty five years of age twenty seven were between thirtyfive and fifty and sixteen were more than fifty years of age.

On average, the farmers interviewed had been farming for twenty eight years and on the present farm for sixteen years.

The farmers interviewed were, in the authors' opinion, a typical cross-section of North Island farmers running crossbred sheep.

## II. Contact with Mass Media -

All farmers had radios, fifteen claimed they listened regularly to farm sessions, thirty one claimed they listened sometimes and four said they never listened. Most (42) of the farmers listened to the midday farm session.

All farmers who had or were going to buy a television set said they would like to see a farm programme. The majority said they would like the programme between eight and nine p.m.

Fifteen farmers purchased a local or provincial newspaper, twenty-nine purchased both newspapers and six purchased three newspapers.

Twenty-eight claimed they read the farming page regularly twenty claimed they sometimes read the farming page while two never read the farming page. Farmers were very vague as to the

information they obtained from the farming page. 'General' information, stock and wool reports, success stories and seasonal problems were mentioned in that order.

Forty seven farmers received from one to seven farm journals. Definite ideas as to the type of journal articles liked by the farmer were notable for their absence. Replies were classified as follows and appear in descending order of preference; success stories, most articles, all types, farm management and breeding, and farm forestry. While two actually burnt most of the journals with the wrappers still on.

Since most of the farmers listened to farm sessions on the radio and liked or would like a farm programme on television then it was concluded that contact with farmers via these media would be useful in making farmers aware of the principles and practices of sheep breeding. The use of these media for explanation of wool terms would be limited as it is felt that to give adequate descriptions of colour and comparative descriptions of wool could be technically difficult.

It appeared that newspapers could be a more fruitful media than farm journals because of the generally wider readership of the farming pages of newspapers compared with the readership of farm journals.

### III. Contact with Extension Personnel and Other Farmers -

Fifteen farmers had requested a visit from the Farm Advisory Officer in the last two years, five for soil test information and ten for general advice.

Six had requested a visit from the Sheep and Wool Instructor, four for general advice, one to select his two-tooth ewes and one

to cull hoggets on fleece weight.

Forty five farmers and forty farmers reported having been visited by a Stock Agent and Wool Canvasser respectively. These were mostly social calls to maintain business contact.

Six farmers were visited by an officer from State Advances Corporation who assisted in drawing up the yearly budget.

Six of the farmers were members of a farm improvement club two of whom were now on half membership.

All farmers had in the last two years seen a Veterinarian or Livestock Instructor of the Department of Agriculture. Stock health was the purpose of the majority of visits.

Twenty one farmers had attended farmers' conferences; ten farmers went regularly, seven occasionally and five had been in the past.

Thirty three farmers attended field days; ten farmers claimed that not enough field days were held.

Three farmers belonged to a Department of Agriculture discussion group, seven said there was not one in the district and five claimed no knowledge of discussion groups.

Fourteen farmers claimed they attended Federated Farmers regularly and fifteen were members but did not attend meetings.

It was concluded that farmers conferences and field days attract a large proportion of the farmers and these may be an avenue for extension of not only wool terms followed by wool handling procedures but also for extension of the principles and practices of sheep breeding.

RECOMMENDATIONS:

Based on the foregoing results and conclusions the author recommends that extension work in the field of sheep and wool improvement should concentrate on ensuring sheep farmers:-

## A. become aware of:

- I. Principles of sheep breeding and selection.
- II. Advantages of using a selection index based on productive characters to select rams.
- III. Advantages of culling dry two-tooth ewes.
- IV. Advantages of marking twin ewe lambs to assist in selection of ewes to join or remain in the flock.
- V. Advantages of hogget fleece weighing to assist in selection of ewes to join the flock.
- VI. The meaning of wool terms used by brokers and extension personnel followed by method of wool clip preparation and disposal.

## B. gain skill in:

- I. Using a selection index to select rams
- II. Culling dry two-tooth ewes.
- III. Marking twin lambs and allowing for these when selecting ewes.
- IV. Hogget fleece weighing and allowing for this when selecting ewes.
- V. Selecting between alternative methods of wool clip preparation and disposal.

At the awareness stage mass and group media appear the most useful

methods to employ. Field days, discussion groups, short courses and farmers' conferences would be the most useful methods to employ in ensuring farmers gain the required skills.

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## APPENDIX I

Appendix I contains the questionnaire schedule used in this survey. The author introduced himself and the schedule to the farmer by using the following set introduction.

"Good ..... Mr. ...., Malcolm Smith, Massey University. I am conducting a survey on farmers attitudes to, knowledge and present practices for Sheep and Wool Improvement. Your name appears on my list of selected farmers and I would like to interview you ....."

### QUESTIONNAIRE SCHEDULE

A survey of North Island Sheep farmers to determine attitude to knowledge and present practices of Wool Improvement.

Section I - The Farm Farm No. \_\_\_\_\_

A. Govt. Valuation: \_\_\_\_\_ Date: \_\_\_\_\_

Date of Survey: \_\_\_\_\_ Area: \_\_\_\_\_

Tenure: \_\_\_\_\_ Altitude: \_\_\_\_\_

Rainfall: \_\_\_\_\_ Paddock Nos: \_\_\_\_\_

Do you intend to subdivide more? Yes No

Railway: \_\_\_\_\_ miles Saleyards: \_\_\_\_\_ miles

Freezing Works: \_\_\_\_\_ miles Fertiliser Works: \_\_\_\_\_ mls

Nearest Main Town: \_\_\_\_\_ miles

B. Land and Condition

Contour	Area	Productive	Swamp	Scrub	Bush	Waste	Remarks
Flat							
Ploughable Hill							
Discable Hill							
Steep							

Water Supply

Erosion

Shelter

Weeds and Pests

C. What Fertiliser do you use?

Type: \_\_\_\_\_ Rate: \_\_\_\_\_/ac \_\_\_\_\_ Total

How applied: \_\_\_\_\_

Expected Increase: \_\_\_\_\_

D. Calendar of Operations

What are the main jobs on the farm during the following months (Management + Main operations + Sales).

July	_____	January	_____
August	_____	February	_____
September	_____	March	_____
October	_____	April	_____
November	_____	May	_____
December	_____	June	_____

E. Stock Nos. as at June, 1965

Breeding Ewes		Breeding Cows	_____
2th	_____	Wnr. Heifers	_____
4th	_____	1 $\frac{1}{2}$ year	_____
6th	_____	2 $\frac{1}{2}$ year	_____
4yr	_____	Wnr. Steers	_____
5yr	_____	1 $\frac{1}{2}$ years	_____
6yr	_____	2 $\frac{1}{2}$ years	_____
Other	_____	3 $\frac{1}{2}$ years	_____
Ewe Hoggets	_____	Other Cattle	_____
Wethers	_____	Bulls	_____
Rams	_____		
Other	_____		
T o t a l	_____/____/EE	T o t a l	_____/____/EE

F. Intended Stock Increases

Do you think the farm could carry more stock?    Y.   N.   I.

If yes - Why don't you carry more stock \_\_\_\_\_

If no - What are the factors limiting increase in stocking \_\_\_\_\_

If I - at what rate are you increasing your stock \_\_\_\_\_

When do you think you will be fully stocked \_\_\_\_\_

G. Wool Production 1964/65

<u>No. Sheep Shorn</u>	1/S	2/S
Breeding Ewes	_____	_____
Lambs	_____	_____
Hoggets	_____	_____
Rams	_____	_____
Dry Stock	_____	_____
2ths	_____	_____
Totals	_____	_____

Wool Produced \_\_\_\_\_ Bales \_\_\_\_\_ lbs.

\_\_\_\_\_/Breeding Ewe \_\_\_\_\_/Acre

Average Price \_\_\_\_\_ d. Sold When \_\_\_\_\_ Ewes \_\_\_\_\_ Hoggets

2/S Detail \_\_\_\_\_

H. Production Meat and Culls

Lambing % \_\_\_\_\_ How Calculated \_\_\_\_\_

Losses % \_\_\_\_\_ Ewes \_\_\_\_\_ Hoggets \_\_\_\_\_ Lambs \_\_\_\_\_

Sales

<u>Description</u>	<u>No.</u>	<u>Sale Dates</u>	<u>Average Price</u>	<u>How Sold</u>
Ewe Lambs	_____	_____	_____	_____
Wether Lambs	_____	_____	_____	_____
Ewe Hoggets	_____	_____	_____	_____
Wether Hoggets	_____	_____	_____	_____
2th Ewes	_____	_____	_____	_____
Wethers	_____	_____	_____	_____
M.A. Ewes	_____	_____	_____	_____
5yr Ewes	_____	_____	_____	_____
6yr Ewes	_____	_____	_____	_____
1yr Ewes	_____	_____	_____	_____
Fat Ewes	_____	_____	_____	_____
Other Sales	_____	_____	_____	_____

Section II - Attitude, Knowledge and Present Practice of

Wool Improvement

A. Selection of Rams for Replacements

Who picks your rams for replacement? \_\_\_\_\_

How do you select the Stud or Farm from which you pick your rams? \_\_\_\_\_

Where in relation to you is the stud or farm situated \_\_\_\_\_ mls.

What type of country is the stud(s) on? Same \_\_\_\_\_

Similar \_\_\_\_\_ Better \_\_\_\_\_

How many rams do you require each year and what choice do you have? \_\_\_\_\_ Rams bought No. per year \_\_\_\_\_

Picked from No. per year \_\_\_\_\_

What characters do you look for when picking your rams?

\_\_\_\_\_  
\_\_\_\_\_

What characters do you select against when picking your rams?

\_\_\_\_\_  
\_\_\_\_\_

Why have you chosen to select for these characters? \_\_\_\_\_

B. Production Records

What production records of the rams or their parents (sires and dams) do you obtain from the breeder to help you in picking of rams shown to you? \_\_\_\_\_

If obtained - What emphasis do you place on these records when picking rams? \_\_\_\_\_

Do you think records of the rams, from which you pick your replacements, are a good guide to the rams ability to produce better offspring? Y. N. DK.

C. Ram Management

What is your present system of culling the rams which you have on the property?

Age \_\_\_\_\_ Fertility \_\_\_\_\_ Tested \_\_\_\_\_ Harness \_\_\_\_\_

Other \_\_\_\_\_ Wool \_\_\_\_\_ Mouths \_\_\_\_\_ % Fittest \_\_\_\_\_

Other \_\_\_\_\_

What % age of rams to ewes do you use? \_\_\_\_\_

What Age groups is the flock split into at tuppung? \_\_\_\_\_

How are the rams allocated among these ewe age groups \_\_\_\_\_

How are the rams allocated during the tuppung period? \_\_\_\_\_

How long are the rams out? \_\_\_\_\_ dates.

Section III

A. Selection of Ewes for Replacements

Who does the selection of ewes to join or remain in the flock? \_\_\_\_\_

At what ages do you cull your ewes?

	<u>From</u>	<u>No:</u>	<u>%:</u>
Lambs	_____	_____	_____
Hoggets	_____	_____	_____
2ths	_____	_____	_____
M.A.	_____	_____	_____
5yr	_____	_____	_____
5yr +	_____	_____	_____
Other	_____	_____	_____

What characters do you select for when culling/buying? \_\_\_\_\_

Why do you select for these characters? \_\_\_\_\_

What characters do you cull against? \_\_\_\_\_

Why do you cull against these characters? \_\_\_\_\_

B. Selected Practices

Have you ever culled to obtain a higher lambing percentage?

Yes \_\_\_\_\_ No \_\_\_\_\_ if yes - How do you do it? \_\_\_\_\_

if No - Do you know how to cull for higher lambing % age among your ewes? Yes \_\_\_\_\_ No \_\_\_\_\_.

If yes - why don't you select for higher lambing % age. \_\_\_\_\_

If no told - Would you be willing to try these methods of selection. 1Y/N

If no - Why not? \_\_\_\_\_  
2Y/N

If no - Why not? \_\_\_\_\_

Have you ever culled for greasy fleece weight? Yes. No.

If yes - How do you do it? \_\_\_\_\_

If no - Do you know how to cull for greasy fleece weight? Yes. No.

If yes - Why don't you select for higher greasy fleece weight? \_\_\_\_\_

If no told - Would you be willing to try these methods of selection. 1Y/N

If no - Why not? \_\_\_\_\_  
2Y/N

If no - Why not? \_\_\_\_\_

#### Section IV

##### A. Handling

When do you shear?

<u>Age:</u>	<u>Time:</u>	( <u>s</u> )
Lambs	_____	_____
Hoggets	_____	_____
2ths	_____	_____
Mature	_____	_____
Rams	_____	_____
Other	_____	_____

Why do you shear at this (these) time(s)?

Ewes \_\_\_\_\_ Rams \_\_\_\_\_  
Hoggets \_\_\_\_\_ Lambs \_\_\_\_\_

Have you considered shearing at other times of the year? \_\_\_\_\_

- |                             |     |    |
|-----------------------------|-----|----|
| 1. Pre-Lambing              | yes | no |
| 2. Pre-Weaning              | yes | no |
| 3. Second Shear Whole Flock | yes | no |
| 4. Second Shear 2th         | yes | no |
| 5. Other _____              |     |    |

Why do you reject the idea of shearing?

1. Pre-Lambing \_\_\_\_\_
2. Pre-Weaning \_\_\_\_\_
3. Second Shear whole flock \_\_\_\_\_
4. Second Shear 2ths \_\_\_\_\_
5. Other \_\_\_\_\_

Who shears the sheep on your property? \_\_\_\_\_

Who prepares the wool for sale on your property? \_\_\_\_\_

How is the wool skirted on the farm? \_\_\_\_\_

What do you regard as the main purpose of skirting? \_\_\_\_\_

What lines is the wool classed into in the shed? \_\_\_\_\_  
(re-class or bin) in the store \_\_\_\_\_

What are the style grades of the fleece wool lines? A. BB.  
BB/B. B. B/C. C. D.

How do you decide which method to use when preparing your wool  
for sale? \_\_\_\_\_

B. Knowledge of Wool Terms

What do you understand by the wool terms?

Style \_\_\_\_\_  
Quality No. \_\_\_\_\_  
Yield \_\_\_\_\_  
Preparings \_\_\_\_\_  
Cardings \_\_\_\_\_  
Woollen Cardings \_\_\_\_\_

Paper Felts \_\_\_\_\_  
Count \_\_\_\_\_  
Type \_\_\_\_\_

Did you know there was a price differential between:-

Styles	yes	no
Quality No.	yes	no
Trade Types	yes	no

If yes - What would you say was the amount of this differential between:-

Styles	_____	d.	_____
Quality No.	_____	d.	_____
Trade Types	_____	d.	_____

C. Off Farm Handling of Wool

How is your wool sold?

As is in Auction _____	Classed Auction _____
Binned Auction _____	R/C Auction _____
London (detail) _____	Itinerant Buyer _____
Other _____	

Why do you sell your wool in this manner? \_\_\_\_\_

Do you have records of wool sold and/or brokers reports? \_\_\_\_\_

Do you always accept the brokers valuation as the reserve price. Yes. No.

If no - How much do you usually increase by \_\_\_\_\_ d.

Do you consider the brokers specifications adequate. Yes. No.

If no - How do you think these may be improved \_\_\_\_\_

Section V

A. Farmer and Family:

What is your status on the farm? Owner \_\_\_\_\_ Manager \_\_\_\_\_  
Farmer Wife Family Labour

Age: \_\_\_\_\_

Primary School: \_\_\_\_\_

Sec. School: \_\_\_\_\_

University or  
College: \_\_\_\_\_  
Course: \_\_\_\_\_  
Age Left: \_\_\_\_\_

Farm - Inherited, Bought, Own & Land, Rehab. Other.

Farmer - Experience \_\_\_\_\_ yrs. Present Farm \_\_\_\_\_ yrs.

B. Media

Radio -

Do you have a radio?

House \_\_\_\_\_ Car \_\_\_\_\_ Portable \_\_\_\_\_ Other \_\_\_\_\_

Do you listen to farm sessions?

Regularly \_\_\_\_\_ Sometimes \_\_\_\_\_ Never \_\_\_\_\_

Station \_\_\_\_\_ Time(s) \_\_\_\_\_

What Station(s) do you listen to for other programmes?

Station \_\_\_\_\_ Time(s) \_\_\_\_\_

T.V. -

Do you have a T.V. Set? Yes. No.

Would you like to see a farm programme? Yes/No. Time\_\_

What type of programme would you like to see? \_\_\_\_\_

Newspaper(s) -

What daily newspapers do you receive?

1. \_\_\_\_\_ 2. \_\_\_\_\_ 3. \_\_\_\_\_ 4. \_\_\_\_\_

Do you read the farming page: Regularly, Sometimes, Never.

What information do you get from the farming page? \_\_\_\_\_

Journals -

What farming journals do you receive? 1. \_\_\_\_\_

2. \_\_\_\_\_ 3. \_\_\_\_\_ 4. \_\_\_\_\_ 5. \_\_\_\_\_

6. \_\_\_\_\_

What type of article do you like best? \_\_\_\_\_

C. Contact with Advisory Officers and Other Farmers

What Advisory Officers have visited your property in the past 2 years?

Officer	Request or Come	How Often Time Spent	Reason for Visit	Achievement
FAO Dept. of Agriculture				
Wool Instr. Dept. of Ag.				
Stock Agent				
Wool Canvasser				
S.A.C.				
Catchment Brd.				
Veterinarian				
Farm Improvement Club				
Other				

Do you attend:-

		<u>Comments</u>		<u>Comments</u>
Farmer's Conferences	Yes	_____	No	_____
Field Days	Yes	_____	No	_____
Discussion Groups	Yes	_____	No	_____
Federated Farmers	Yes	_____	No	_____
Other Gatherings of Farmers	Yes	_____	No	_____

On what subjects do you obtain information at these gatherings? \_\_\_\_\_

## APPENDIX II

Appendix II contains a report submitted to the Director of the Farm Advisory Division of the Department of Agriculture on the work of Sheep and Wool Instructors based at; Dunedin (2), Christchurch (2), Blenheim (1), Feilding (1), Wanganui(3), Hastings (1) and Gisborne (2).

### REPORT ON THE WORK OF THE SHEEP AND WOOL

#### INSTRUCTORS

By M.L. Bigham  
Wool Advisory Officer

#### A. Introduction

During the last three months I have visited the following Sheep and Wool Instructors \_\_\_\_\_.

In general I spent most of the time in each centre with the Senior Sheep and Wool Instructor. The time spent with each varied from two to five days and in general this appeared to be sufficient to observe and discuss flock improvement work with each instructor.

#### B. Flock Improvement Work

##### (a) Introduction

Each Instructor appears to have his own particular approach to flock improvement work, be it on Stud properties or Commercial farms. The Instructors say that this individuality is dictated by the particular conditions prevailing in their area. In a few areas this may be so. However, I feel that the main reason for this individuality is the lack of knowledge of just what is involved in selection for productivity. Therefore, they have interpreted this in different ways with the result that they have different approaches to the problems.

##### (b) Commercial Flocks

###### 1. Returns per Sheep or Returns per Acre.

All Instructors appear to appreciate that the important factor that concerns the farmer is the returns he can make off a given area of land. However, I feel that in many cases the Instructors are thinking in terms of returns per sheep (especially from wool) rather than returns per acre. This is due to the fact that many of the Instructors are culling as heavy as is possible. This has caused sheep numbers to remain static or increase very slightly on the property. Better returns would be obtained if the Instructors worked in closer liaison with the Farm Advisory Officers to encourage farmers to build up their stock numbers. This would certainly increase returns/acre and if it was combined successfully with a selection programme for returns per

sheep (and I see no reason why this cannot be done) then both returns per acre and returns per sheep can be improved greatly.

## 2. Scope of Work

Most of the Instructors have concentrated almost entirely on the wool side of flock improvement and have not taken into account fertility aspects whatsoever. This approach I feel is very wrong and is likely to lead to trouble at an early stage. I feel that the approach should be one of combined selection for all productive characters rather than selection for only one, in this case wool. If fertility aspects are not considered there is likely to be a decline in lambing percentage because of the presence of the negative correlation between fertility and fleece weight. In a few cases the Instructors have shown an actual increase in lambing percentage in flocks which they have culled for fleece weight by visual appraisal. It is likely, however, that this increase in fertility is not a genetic increase and is confined to that particular generation.

## 3. Specific Problems

Each Instructor appears to have what he considers to be specific problems in his area. Generally speaking, however, I am of the impression that these problems really do not exist, but are of the Instructors own making. For instance one Instructor is culling heavily against sheep with broken back wool. He considers that such back wool will let water into the fleece which causes the fleece to be stained. The available evidence from experimental work at Lincoln College suggests that all wool will get wet whether the sheep has a nice thatched back or not. The important thing appears to be the speed at which the fleece dries out after rain. This determines whether the fleece will be stained. Therefore it is likely that this Instructor is spending a lot of time and energy culling for something which probably has a very, very low heritability and which is probably giving little or no result. During this heavy culling also he is probably culling sheep with heavy fleeces and could conceivably be actively selecting against fleece weight in some flocks.

Other instructors are culling heavily against hair and some are endeavouring to eliminate hair completely from the flocks they are dealing with. This policy of complete elimination of hair from the flock is in my opinion not a good one. It is felt by a number of people that to increase fleece weight genetically you have to tolerate some hair because of the known positive correlation between fleece weight and hair. This has happened in the Progeny Test flocks at Massey University. Fleece weight has increase and the fleeces have tended to become slightly hairier. However, I feel that the degree of hairiness should be controlled to some extent. It has been shown that Wool Buyers cannot detect hair in wool until the amount of hair gets to the level of about 15%. Therefore, I would suggest that this would be the level of tolerance for hair. It is likely that if this practice of culling hair from the flock is continued then fleece weights may decline due to the presence of the positive correlation.

It would appear therefore, that most of the Instructors lack the basic knowledge of what to select for or select against and what result to expect. The fleece offers them a wide variety of factors, some measurable and some not, to which they can apply selection pressure and hope for results.

#### 4. Fertility Aspects

Only two of the Instructors I visited were taking fertility aspects into account in their flock improvement work. One of these was actively selecting for fertility by getting farmers to mark their multiple birth ewe lambs while the other was endeavouring to raise the level of fertility in his area by drawing the attention of the farmers to the importance of having well reared hoggets. All other Instructors have appeared to concentrate entirely on wool improvement and in many cases this improvement appears to be in wool quality rather than wool quantity. It is likely that if fertility aspects are not considered a decline in lambing percentage may result in the long term.

#### 3. Method of Culling Used

##### (a) Visual appraisal of wool on the Sheep's Back

This method is used by a number of Instructors and appears to be based on the following factors.

1. Quality Number
2. Type and length of Staple
3. Bulkiness of Wool
4. Colour of wool to a minor extent
5. Economic faults such as handle and hair are also considered.

The idea behind this approach appears to be that the sheep with a good weight of wool (visually assessed as such) of good style is the sheep that has adapted itself to that particular property. For young sheep this is probably true but better and quicker results would be obtained by fleece weighing and culling on fleece weight. For older sheep this theory probably does not hold, however, as the ewe could have a high fleece weight because of a number of reasons. The ewe may have been dry that year or may have lambed but the lamb died at or soon after birth.

This approach of visual appraisal appears to correspond very closely to the approach of the professional sheep classers in Australia. Australian research workers have shown that the sheep classers are only about 60% efficient in selecting merino sheep for fleece weight. It is likely that this is so in New Zealand in the visual assessment of fleece weight in the Romney.

##### (b) Culling for Economic Faults

The main fault in all areas according to the Instructors is hair. As discussed above most Instructors are actively selecting against hair. Other "economic" faults being selected against are mushiness, weak back wool, kempy wool, harsh handle, short staple length, tippiness and spindly staples.

Some Instructors are dividing flocks into No.1 and No.2 flocks on the degree of fault. The sheep in the No.1 flock are those free of or relatively free of economic faults, while those in the No.2 flock are those rejected because of the degree of fault. All progeny of the No. 2 flock is sold off the farm. This technique markedly reduces the intensity of selection of replacement sheep. In the No.2 flock there will be sheep with high fleece weights but having some degree of economic fault. Whether or not it is economical to cull the progeny of these sheep is a matter of contention. I feel that a better approach to the problem of reducing the intensity of these faults would be by judicial selection of rams. For instance if rams were selected that were free or nearly free of hair and mated to ewes showing quite a high proportion of hair then the degree of hairiness would be reduced in the progeny to quite a high degree.

Farmers who have been mating a proportion of their ewes to fat lamb sires are also using this technique of a fault free flock and a flock with faults. The flock with faults is mated to the fat lamb sire. However, one problem here has been that many farmers have been putting a very high proportion of their ewes to the fat lamb sire. The result of this is that all or nearly all the white faced female progeny has to be kept to keep flock numbers up and this is causing a gradual decline in the productivity of their sheep. The Instructors concerned are endeavouring to get the farmers to mate a higher proportion of their ewes to the Romney ram.

#### (c) Fleece weighing

In most cases fleece weighing is being used primarily to establish the most suitable quality No. for a particular property. Fleece weights and quality No. are taken for one age group within the flock. The average fleece weight for each quality No. is then found and these averages are compared to Prof. Henderson's Economic Returns table. The results of this comparison are then used to decide what wool quality No. is best suited for a particular farm. I have three major criticisms of this approach.

1. The desired quality No. may vary from year to year because of changes in environmental conditions. In a year of bad weather conditions a quality of 50/48's may be desirable while in a year of good weather conditions 46/48's may be the most desirable quality. Usually only one fleece weighing trial is carried out and the results used in subsequent years in culling the 2 tooth ewes. It is likely, therefore, that in the years after the fleece weighing trial that desirable quality may change. This may be so particularly in the case of farmers developing their property and actively increasing their carrying capacity. Thus before the development programme was started the desirable quality may be 46's but by the time the programme has finished then 48's or 50's may be the desirably quality.

2. This technique is likely to lead the Instructors to cull individual sheep from the flock that are extremely fine or strong which could be returning more to the farmer than some individual sheep of the desired quality. This could happen in the following manner:- The desired quality No. found as a result of a fleece weighing trial was 48's. The Instructor comes back the following year to cull the 2 tooth ewes by visual appraisal. On seeing the results of the fleece weighing trial the Instructors are biased against individual sheep of 44's or 52's which may be returning more to the farmer than individual sheep of 48's quality. These strong and fine woolled sheep are usually culled from the flock by the Instructors.

3. It is likely that due to changes in wool prices the weighting given to the various qualities in the Economic Returns table will change. Therefore it is necessary to keep such tables up to date. This has not been done. The degree of fault in the wool also influences price to some degree and this has not been taken into account in the tables.

Only one Instructor is culling commercial flocks almost entirely on fleece weight and style grading. However, in the initial stages he is culling for economic faults such as hair, etc. This is carried on for a period of from three to five years, depending on the intensity of fault. After this period all replacement 2 tooth ewes are selected on fleece weight and style grading taken at hogget shearing. Before shearing, however, the hoggets are culled for skeletal faults such as over and undershot jaw, feet, etc.

This method of culling is by far the best I observed. However, I am not sure whether it is profitable in the initial stages to cull for economic faults. It would probably be more profitable to go straight into the flock with fleece weighing and not spend the initial years culling for wool faults. These economic faults could probably be eliminated or reduced in intensity by careful selection of rams.

#### (d) Face Cover

Most Instructors appreciate the importance of face cover and are actively selecting for open faced sheep.

#### (e) Ram Selection

All Instructors are selecting rams for commercial flocks. In most cases the Instructors are asking for fleece weights but usually this information is not available. Care is taken to select rams that are free or as free as possible from economic faults. In many cases the results of the fleece weighing trials are being used to determine the desired quality No. for the Rams. Generally the rams purchased have a quality No. 1-1 $\frac{1}{2}$  qualities below the desirable quality for the ewe flock. The discussion above on desirable qualities changing would also apply here.

C. Stud Flocks:

(a) Introduction

All Instructors are now working with Stud Breeders but I feel that most of the Instructors are not sure what they are striving for. In many cases this is due to the complex of characters that can be selected for. This can be adequately illustrated by listing some of the factors that the Instructors have included in selection cards for the selection of stud sires. Some of these are:

1. Crimp
2. Staple length
3. Style grading
4. Lock
5. Back Wool
6. Britch hair
7. Tip of staple

Most Instructors are using selection cards of some sort and each Instructor considers his to be the best for his area as he has evolved that particular card to suit local conditions. Before you can include a factor on a card you have to define the factor and be able to measure or score this factor successfully. This I feel is not being done as in my opinion some of these factors are undefinable and therefore should not be included in selection cards.

Only one Instructor is taking fertility aspects into account in Stud work and all other Instructors are concentrating entirely on Wool. I feel that it is of particular importance in working with Stud Flocks that the approach should be a broad one covering all productive characteristics and not confined to wool only.

(b) Method Being Used

1. Selection of Female Replacements

(a) At least one instructor is culling stud 2 tooth ewes by visual assessment of fleece weight. The technique used is the same as described for commercial flocks.

(b) One Instructor is supplying a fleece assessment service to the Stud Breeders in his area. He puts a quality No. on the fleece, scores crimp and staple on a 6-1 scale, and notes the handle of the wool. The Breeder records fleece weight and then makes use of all this information as he sees fit,

(c) Only one Instructor is using fleece weight and style grading for the selection of 2 tooth replacements. At hogget shearing fleece weight is recorded for all the ewe hoggets and a 5% correction factor is applied to the fleece weight of the twins to bring their fleece weight into line with singles. Style grading is also recorded at shearing. Fleece weight and style grading are then used in the selection of the 2 tooth replacements. The flock is culled for "skeletal" faults before the final selection is made.

(d) One Instructor is using Prof. Rae's Fertility table particularly in culling of older stud ewes. This table is also used however in selection of some 2 tooth replacements.

## 2. Selection of Stud Sires

(a) Most Instructors are using selection cards of some sort to "assist" them in selecting stud sires. In general the Instructors are including too many factors in these cards and as discussed above many of the factors are undefinable and these make most cards being used unusable,

(b) One Instructor is using fleece weight and style grading to pick out the top rams. From these top rams the Stud sires are selected after consideration of a number of factors.

1. Their dam's fertility record
2. Wool Type
3. Body Type

This Instructor is also endeavouring to get his Breeder to sell rams according to fleece weight gradings. Those rams selling for a high price being the rams with high fleece weights and those which sell for a low price are those with low fleece weights.

(c) Some Instructors are using a factor called breeding potential which is the estimate of fertility of the ram from its dam's performance (i.e. Prof Rae's fertility table) to assist them in the selection of stud sires.

## 3. General

Some Instructors are assisting Stud Breeders in matching of ewes with rams at tuppings. The approach here appears to be one of corrective mating with poor woolled ewes being mated with good woolled rams and vice versa. A lot of attention appears to be paid to a factor called "breed potential" which appears to be the score (6 to 1) for crimp. This factor is used as an index of how typical the wool is of the Romney Breed. This factor is used during matching and a ram of good "breed potential" would be mated with a ewe of poor "breed potential" and vice versa. The aim of matching appears to be to get uniformity of body and wool type within the flock.

The approach is probably alright so long as the selection of both male and female replacement stock is as efficient as is possible. This I feel is not the case and I feel that the Instructors tend to place greater importance on matching than they do on the selection of replacements.

## D. Points to come out of Report:

(a) The main problem that I feel is of major importance is the lack of uniformity between the Instructors in their approach to flock improvement work. The Instructors say that this is due to the conditions prevailing in their areas. I have suggested that this is

not so but that the individuality is due to a lack of knowledge of what is involved in selection. Therefore I feel that the first need is the need for an educational course for the Instructors. This course should be designed to illustrate clearly what is involved in selection and all its ramifications. This course should be followed by a series of lectures on Sheep Breeding and these should be given by N.Z. Authorities in this field (i.e. Prof. Rae, Prof. Henderson, T.S. Chang etc.). This I feel is the first essential but this should be backed up at all times by an adequate technical service on which the Instructors can call when they require additional information.

From such a programme I feel that the Instructors would have a better understanding of what their work really involves and therefore be able to carry out this work more efficiently.

#### (b) Stud Improvement

To get a more uniform approach to stud work I feel that it is necessary to set up a central performance - recording service. Prof. Rae has discussed this type of service for stud breeders in the 1964 Massey University of Manawatu Sheepfarming Annual, pg. 73-80. I feel that the essential points in his discussion should be included here.

If one analyses the results of methods used in the successful application of livestock then three essential features are apparent. These are:

1. The number of characteristics selected for are few and these are of major importance in controlling the economic merit of the animals.
2. The measurement and recording of the performance of the individual animals.
3. Analysing the records in an appropriate manner in order to make selection decisions.

Application of the above principles depends on answering three questions.

1. What characteristics are to be considered in the selection programme and how important is each of these characteristics?
2. How can they be measured and recorded?
3. What is the best way to use these records in deciding which sheep to keep for breeding.

#### Objectives

Prof. Rae has stressed the importance of keeping the objectives as simple as possible. The greater the number of characteristics of sheep which one set out to improve, the weaker is the selection for

each one of them and therefore the slower the progress in changing each characteristic. In many breeding programmes it is often advantageous to oversimplify the objectives in the interest of faster progress. However, even with oversimplification of the objectives it is still necessary to select for several characteristics and therefore one needs to know the relative importance of the characteristics one wants to improve.

Prof. Rae's work at Massey University has shown that in general, over a wide range of conditions, fertility ranks highest on the list of traits, followed by fleece weight which in turn is more important than style grading, while conformation makes a relatively insignificant contribution to economic merit.

#### Recording Productivity:

Taking records on the individual animal costs money. Hence, it is a basic principle that only those records which are to be used in selection should be included in a recording scheme.

Prof. Rae then outlines the information that should be included in any scheme for ram breeding within the N.Z. Romney breed. The information required is:

##### (a) Pedigree Details

Details of the sire and dam of each lamb and its date of birth are required. Naturally, this presupposes a permanent identification of each individual and this is preferably done with some form of ear-tag.

##### (b) Fertility Records

Although there are many ways in which fertility can be measured on the individual ewe, there are only two methods which can be used with comparative ease, at least in stud flocks. They are:

#### 1. The number of Lambs reared by a Ewe.

A ewe will rear none, one, two, or very occasionally, three lambs in any one year. Sometimes this can be divided further; for example, distinction can be made within the ewes having no lambs, between the true dry ewe and the ewe which has lost her lamb. This is the simplest measure of lamb production and the information on each ewe would be available from the records mentioned in (a) kept in a stud flock.

#### 2. The Total Weight of Lambs Weaned by the Ewe.

This measure is a refinement which requires weighing the lambs at weaning. It includes the information given in (1) above but in addition, the weight of the lambs gives information on the ability of the ewes to milk and rear the lambs.

From the viewpoint of improvement by breeding it must be noted that both number and weight of lambs weaned are characteristic of the ewe and can only be measured on the ewe. No direct information is available on the ram, the only indication of his likely ability to breed daughters with high lamb production coming from the performance of his female relatives. This feature of lamb production must be strongly emphasized because it differs markedly from most other characteristics of the sheep which can be measured on both the ewe and the ram and therefore can be selected directly in both sexes.

#### (c) Fleece Weight

Present information would suggest that fleece weights need to be recorded only for the ewe and ram hoggets in the flock. Recording of other fleece characteristics will depend on the particular requirements of the breeder and the particular flock. Quality number and fleece grade (style grading) are likely to be the two main traits considered, and in both cases subjective assessment is the only technique available at present.

(I feel it would be advantageous to include weight of wool per unit area as Dr Cochran has suggested that this may have a higher heritability than does fleece weight. If this is so then it would be advantageous to replace fleece weight of wool/unit area of skin.)

#### (d) Body weight

Body weights other than that at weaning are likely to be useful, not directly but because they are strongly associated at least on the phenotypic level with fleece weight and fertility. Present evidence would suggest that a weight of the hoggets after shearing is likely to be of value.

#### The Use of Records:

As noted above, the practical problem is to select for fertility, fleece weight and possibly additional traits at the same time. While there are several ways of doing this, the most efficient method is by the use of a total score or index which automatically balances the different characters so that the best prediction of the breeding value of each animal can be made. By adding together the measurements or scores for each character in the appropriate way, there finally results a single figure which represents the overall merit of the animal. Different sheep can then be compared and the decision whether they are to be kept, or culled, arrived at on the basis of this overall score, perhaps to some extent on looks. Thus the performance-recording service would select out say the top 10 rams on their production potential and from these the 3 stud sires would be selected by the breeder and the Instructor.

#### Organisation:

Prof. Rae considers that the present structure of the New Zealand ram-breeding industry cannot utilize the approach to selection as outlined above. The main essential in implementing such an approach is the development of a performance-recording service to assist the breeders with the problems of measurement and recording, to organize

the analysis of the records (not a difficult problem with modern data-processing machines) and to present the records in an appropriate form for the breeders to make selection decisions. These records would also be available for the breeder to present to ram buyers to assist them in their choice. The service would also help in the interpretation and follow-up analysis of the information obtained. It should be remembered that none of the techniques suggested by Prof. Rae are at all remarkable. Recording, central analysis of records, and the use of selection indexes have been commonplace in the dairy industry of this country for the last 30 years or more. In effect, the service suggested here would parallel in many ways that available to the dairy industry.

In answering the question of who should record, Prof. Rae has suggested that partly because of the present structure of the ram breeding industry and partly because many of the multiplying flocks are quite small, the most effective application of recording in the initial stages would be achieved if some 50 of the larger flocks (500 ewes or more) were included in the recording scheme as performance-bred flock.

I think that the Instructors are now working with the number of flocks needed to initiate the scheme suggested by Prof. Rae and all that remains is to get such a scheme organised and working.

In selection of female replacement for the flocks similar information to the above would probably also be needed. However, the intensity of selection for female replacements is quite low compared with that of the replacement sires and therefore the amount of genetic improvement from the ewe flock is much less than from the rams. Therefore the selection of female replacements is not nearly so important and could preferably be done by the breeder himself with the help of the Instructor with the records that are available. The records would include pedigree details, fertility records, fleece weight (perhaps weight/unit area) and body weight. The information being collected at the hogget stage.

(c) Commercial Improvement:

The only avenue available to the commercial farmer to improve his sheep is through the path ewes to breed ewes unless he starts to breed his own rams on his property. Therefore, it is important for the commercial farmer to understand the necessity of fleece weighing and fertility marking to assist him in the selection of female replacements.

This I feel is the job of the Instructors to educate the farmers and explain how this can be carried out. The information on methods of flock improvement in commercial flocks is available and just has to be put into practice. Thus fleece weighing methods and ways of identifying classes of sheep within a flock that differ in their lamb production potential are available and I feel that it is the Instructor's job to adapt these methods to their own local conditions and to implement them on as wide a scale as is possible.

(d) The Instructors' duties cover quite a large field. These duties are:

1. Flock Improvement Work
2. Wool Handling Demonstrations
3. Wool Judging - fleece competitions and wool handling competitions.
4. Advice to farmers
5. Field days
6. Wool sale reports
7. Radio Broadcasts
8. Designing Wool sheds, yards and dips

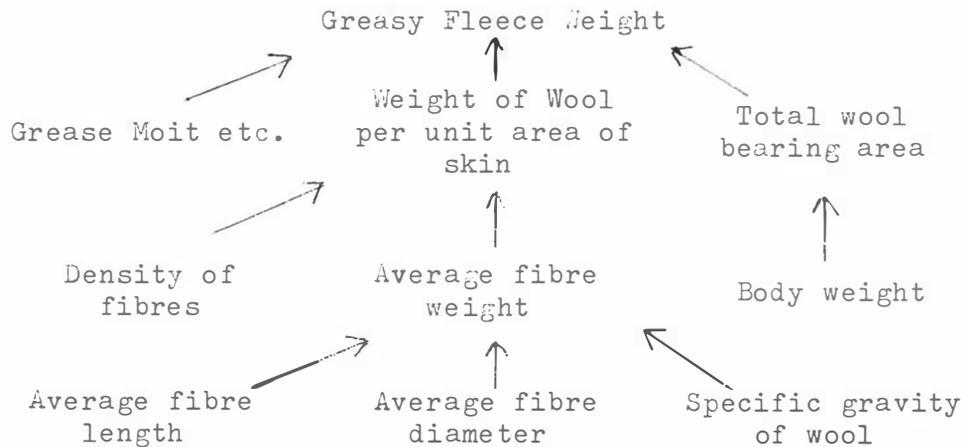
It is felt that there is need for a list of priorities to be drawn up for the Instructors to illustrate the importance of the various aspects of the work. It is obviously much more important to be working with a stud breeder than it is to be sitting in an office drawing a plan for a new wool shed. Unfortunately the three major sections of the work, flock improvement, wool handling and judging, require time prior to and over shearing. However, I feel that it is still of much greater importance to devote all the time to flock improvement than to spend valuable time with the other sections of the work.

## TRAINING PROGRAMME FOR SHEEP & WOOL INSTRUCTORS

### 1. Selection - what it is and how it operates.

- a) Genetic Constitution of a Population
  - 1) The gene and gene frequencies
  - 2) Changes in gene frequency
- b) Variance
- c) Heritability
- d) Selection
  - 1) Response to selection
  - 2) Measurement of selection
  - 3) Correlations
  - 4) Repeatability
  - 5) Methods of selection
- e) Mating Systems

2. Components of Fleece Weights and problems in interpreting fleece data. It is felt that many Instructors do not appreciate that a complex of characters make up fleece weight. The complex can be illustrated by reference to the following diagram.



This complex makes fleece data very difficult to interpret.

### 3. Extension Methods

It is felt that a period of time spent on extension methods would be well worthwhile.

### 4. Budgetting

Time spent learning and doing simple budgetting would be well worthwhile.

5. A Discussion on Genetic problems in increasing the productivity of the Romney.

6. Results of current research in Sheep & Wool.

1. Face cover
2. Effects of shearing
3. Fertility and Fleece Weight Selection.

APPENDIX III

Appendix III contains a description of the method used and the results of an evaluation carried out by the author to determine the increase in knowledge and retention of some basic statistical terms by members of the Sheep and Wool Division staff.

METHOD:

Tests of the knowledge of some basic statistical terms were carried out at the beginning and end of the first in-service training course and a year later at the beginning of the second in-service training course.

A questionnaire (shown below) was designed to test knowledge levels. The questions were designed to minimise guessing by the respondents. This was done by using multiple choice questions which consisted basically of two right answers, two feasible but wrong answers, a 'none of these' answer and a 'don't know' answer.

The answers which were taken as correct are shown thus ( $\bar{X}$ ).

SHEEP AND WOOL INSTRUCTORS IN-SERVICE  
TRAINING COURSE QUESTIONNAIRE SCHEDULE

NAME: \_\_\_\_\_

DISTRICT: \_\_\_\_\_

In Questions 1 - 9 put a CROSS in the box opposite the Answer OR Answers you consider correct.

1. In Statistics a population refers:-

- |  |                                 |
|--|---------------------------------|
| (a) to a collection of objects, individuals, numbers, or categories. | a. ( $\bar{X}$ )                |
| (b) only to a collection of people.                                  | b. ( <input type="checkbox"/> ) |
| (c) only to a collection of individual measurements.                 | c. ( <input type="checkbox"/> ) |

- (d) to None of These d.
- (e) Don't Know e.
2. A Variable refers to:-
- (a) a non-constant measurement a.
- (b) a changing situation b.
- (c) a source of variation c.
- (d) any quantity, character or measurement that varies d.
- (e) none of these e.
- (f) Don't Know f.
3. A Random Sample is a Sample where:-
- (a) all members of the population are included in the sample a.
- (b) all members of the population have an equal chance of being included in the sample b.
- (c) at least 10% of the population is included in the sample c.
- (d) individuals of the population are chosen at random d.
- (e) None of these e.
- (f) Don't Know f.
4. The Mean of a set of results is always:-
- (a) The number appearing most commonly a.
- (b) A value halfway between the highest and lowest results b.
- (c) the average of the results c.
- (d) a figure determined from the sum of measurements, and number of individual observations d.
- (e) None of these e.
- (f) Don't Know f.

5. The Variance is:-

- (a) a measure of the extent to which individual observations are scattered about the mean a.   $(\bar{X})$
- (b) a measure of the extent to which individual observations are scattered about the average b.   $(\bar{X})$
- (c) a measure determined from averaging the highest and lowest numbers c.
- (d) the range of the observations d.
- (e) None of these e.
- (f) Don't Know f.

6. What do Correlations indicate?

- (a) That an increase in the mean of one variate is always associated with an increase in the mean of the other variate. a.
- (b) the relationship between two characters b.   $(\bar{X})$
- (c) the extent which variance of one character depends on variation of another character. c.   $(\bar{X})$
- (d) None of these d.
- (e) Don't Know e.

7. The Heritability Estimates of the following for Romney lie between:-

- (a) Fleece Weight:-

I	0.2 - 0.40	I	<input checked="" type="checkbox"/> $(\bar{X})$
II	0.40 - 0.60	II	<input type="checkbox"/>
III	Don't Know	III	<input type="checkbox"/>
- (b) Fertility:-

I	0.05 - 0.20	I	<input checked="" type="checkbox"/> $(\bar{X})$
II	0.20 - 0.35	II	<input type="checkbox"/>
III	Don't Know	III	<input type="checkbox"/>

8. What does Heritability indicate:-

- (a) The proportion of variance passed to offspring a.   $(\bar{X})$
- (b) the correlation of offspring performance and parents' performance b.   $(\bar{X})$

- (c) The indication of the rate at which one character will change in response to selection for another character c.
- (d) none of these d.
- (e) Don't Know e.
9. Regression implies that:-
- (a) one variate is dependant on another variate a.
- (b) the variation in the dependant variate is greater than the variation in the variate upon which it depends b.
- (c) a change in one variate is associated with a corresponding change in the other variate c.
- (d) None of these d.
- (e) Don't Know e.

RESULTS:

The questions were marked in each of three ways.

- A. As questions - if all answers given in a particular question were correct then the question was marked correct and given one mark. Marked in this way the total possible score was ten.
- B. As correct answers - each correct answer given was allotted one mark. Marked in this way the total possible score was seventeen.
- C. Allowance for wrong answers - each of the correct answers were given one mark from which was subtracted one mark for each wrong answer. Marked in this way the total possible score was seventeen.

Twenty one of the staff of the Sheep and Wool Division completed the three questionnaires. The following is a list of the results obtained. Method of marking will be designated A, B and C as above, while I designates the scores obtained at the beginning of the first course, II the scores obtained at the end of the first course and III the scores obtained at the beginning of the second course.

RESULTS OF QUESTIONNAIRE

Respondent	A			B			C		
	I	II	III	I	II	III	I	II	III
1	7	6	8	7	8	8	4	5	6
2	3	10	8	3	11	8	-1	11	6
3	7	10	8	7	10	14	5	10	12
4	4	10	10	4	11	10	-1	11	10
5	4	7	9	8	7	9	1	4	8
6	6	9	9	9	14	12	6	13	11
7	5	10	9	7	10	11	2	10	10
8	7	9	8	7	9	8	4	6	6
9	8	7	8	8	7	9	8	4	7
10	7	8	10	7	11	11	5	10	11
11	4	9	9	4	9	9	0	8	8
12	4	7	6	4	7	10	-2	4	6
13	7	10	10	11	15	16	9	15	16
14	6	8	9	6	11	9	2	9	8
15	9	10	8	14	16	14	13	16	12
16	4	5	6	9	12	9	2	6	5
17	10	10	10	13	12	13	13	12	13
18	7	8	10	7	14	14	7	12	14
19	7	8	7	8	12	10	6	11	7
20	9	10	10	9	10	13	9	10	13
21	4	7	7	4	11	8	4	8	5

ANALYSIS OF RESULTS

	A			B			C		
	I	II	III	I	II	III	I	II	III
Mean	6.1	8.5	9.0	7.4	10.8	10.7	4.6	9.3	9.2
Variance	4.00	2.25	1.69	8.41	6.75	5.76	18.49	12.25	10.69
Regression I/II	0.22			0.45			0.43		
I/III	0.23			0.53			0.46		

The differences between the A and B test figures and A and C test figures, irrespective of the method of marking were highly significant ( $P = 0.001$ ).

The means all showed an increase irrespective of the method of marking indicating an increase in knowledge.

The variance showed a decline in all methods of marking indicating that the group became more homogenous.

Since the variances altered, due to the method of marking, the interpretation of the regressions between marking methods is difficult. However, there seemed to be at least a twenty two percent increase in knowledge of the "basic statistics" tested and that this knowledge was retained by the respondents for at least one year.

Judged by the minimum increase of twenty two percent in knowledge, the retention of this level of knowledge and the reduction in variance between members, the course could be described as a success.

## APPENDIX IV

Appendix IV contains a condensed version of some basic principles of questionnaire design and the reasons for these principles as outlined by Festinger and Katz (edit. 1953).

### A. Language

The primary criterion for the choice of language is that the vocabulary and syntax should offer maximum opportunity for complete and accurate communication of ideas between interviewer and respondent. Simply stated the language of the questionnaire should approximate the language of the respondent. Language should have the element of simplicity so that the interviewer can communicate successfully to the least sophisticated of the respondent population and at the same time, avoids the appearance of oversimplification.

### B. Frame of Reference

The questionnaire must introduce each topic in a form which ties into the perceptions of the respondent and is consistent with the respondent's notions of what is and is not salient to the topic under discussion. The development of the topic from one question to another must not only meet the researcher's criteria for reasonableness and logic; it must also meet those of the respondent. The researcher must begin at the point "where the respondent is" it must be respondent-orientated.

### C. Information Level

A question must be worded so that it ties into the respondent's present level of information in a meaningful way. No unrealistic assumptions should be made about the expertness of the

respondent or the amount of information he possesses. The importance of this lies in the fact that when the interviewer, with the authority of his role, asks the respondent a question, there is an implication that the respondent should be in possession of an adequate answer and that if he cannot answer, he is somehow discredited. This may not only lose the answer to a question, but may decrease motivation to communicate. Questions however are not necessarily limited to questions which every respondent knows the answer, but caution in wording questions must be used when we anticipate that a considerable proportion of respondents will not be in possession of the answer.

D. Social Acceptance

No question should confront the respondent with the necessity of giving a socially 'unacceptable' response. If respondents are to answer freely and spontaneously then we must help him to feel that the entire range of possible responses are acceptable - acceptable not only to the interviewer but also in terms of the respondent's own standards for himself. A respondent should not be required to give an answer which he feels is socially unacceptable or feel less well informed than he should be.

E. Leading Questions

Questions should be phrased so that they contain no suggestion as to the most appropriate response. The respondent should not feel by giving either a favourable or unfavourable answer that he is contradicting the interviewer. The use of words which have become emotionally "loaded" should be avoided. Associating a particular

response, of the alternatives available, with a goal so desirable that it can scarcely be denied should be avoided except in special cases.

F. The Single Idea

Questions should be limited to a single idea or to a single reference. Many answers to questions with more than one idea do not permit the researcher to determine whether the respondent is answering one, some or all of the item(s) mentioned in the question.

G. Question Sequence

Questions should be so arranged that they make most sense to the respondent, that is the sequence of ideas in a questionnaire should follow the logic of the respondent. A well designed questionnaire facilitates the easy progress of the respondent from item to item. The sequence of questions may be determined by what is called the "funnell approach". The procedure is to ask the most general or the most unrestricted question first and follow it with successively more restricted questions. Thus the frame of reference is gradually narrowed within the topic under consideration.

The first two or three questions on a particular topic in a questionnaire may have a dual function. On the one hand they are included to obtain information on specific research objectives, but they also help to educate and motivate the respondent.

H. The Form of the Question

The form of the response should be taken into account when wording questions. The form of the response falls into two categories; and "open" or "unrestricted" response where the respondent is to reply in his own words and a "closed" or "restricted" response where the

respondent is to select from a series of preassigned categories the response coming closest to his own opinion.

Generally speaking, the closed question is well adapted to situations in which (1) there is only one frame of reference from which the respondent can answer the question; (2) within this single frame of reference there is a known range of possibilities; and (3) within this range, there are clearly defined choice points which accurately represent the position of each respondent.

The open question generally speaking is adapted to situations whereby the respondent constructing his answer as he wishes (1) he can state his own frame of reference; (2) indicate to the interviewer his degree of expertness and (3) indicate to the interviewer whether he clearly understood the question.

The advantages and disadvantages of coding each of these types of response should also be known.

#### I. The Pretest

No matter how astute the researcher has been in wording his questions and designing his questionnaire, he needs to try them out with respondents before launching into the actual field studies. The function of the pretest is (1) to see whether by analysis of pretest questionnaires the responses fulfil the research objectives; and (2) to determine the extent to which the questionnaire meets the criterion of respondent orientation in all its aspects.

## APPENDIX V

Appendix V contains source programmes designed by the author and Mr. A.H. Hughes for tabulating data from interview schedules on the I.B.M. 1620 computer. The ratios, sums and means and two way table programmes were written by Mr. W.G. Payne, Senior Research Assistant of the Economics and Farm Management Department and the histogram programme by Mr. L. Thomas, Junior Lecturer of the Mathematics Department.

All programmes are written in AFIT and the object deck is compiled using AFIT Non-Skip Compiler. The object deck produced is then used between an AFIT Loader and AFIT Non-Skip Subroutines.

### A. Ratios Programme

This programme determines up to eight ratios from pairs of data from the original data cards and punches a new data deck with farm number, up to eight ratios and serial number. Care should be taken that original data cards are all present and in serial order as the punching of the serial number is automatically consecutive for all ratio cards punched.

A lead card is required before the data card and after the programme stating number of items on the data card(s) (including serial number), number of ratios to be punched, followed by pairs of numbers indicating the items from which the ratios are to be determined with the divisor last of each pair. If less than eight ratios are required then the pairs should be completed with zeros to make a total of eight pairs.

```

C      PUNCHING RATIOS FROM DATA TO NEW CARDS WITH SERIAL
C      KEEP DATA IN SERIAL ORDER
      DIMENSION S(100),R(10)
41    READ,N,L,M1,L1,M2,L2,M3,L3,M4,L4,M5,L5,M6,L6,M7,L7,M8,L8
      1 DO 10 J=1,N
10    READ,S(J)
      LR=1
      MS=M1
      LS=L1
      DO 20 JJ=1,L
      IF (S(LS))43,43,13
13    IF (S(MS))44,44,11
43    R(JJ)=0.
      GO TO 12
44    R(JJ)=0.
      GO TO 12
11    R(JJ)=S(MS)/S(LS)
12    IF (LR-8)50,27,27
50    GO TO (2,3,4,5,6,7,8),LR
      2 MS=M2
      LS=L2
      GO TO 9
      3 MS=M3
      LS=L3
      GO TO 9
      4 MS=M4
      LS=L4
      GO TO 9
      5 MS=M5
      LS=L5
      GO TO 9
      6 MS=M6
      LS=L6
      GO TO 9
      7 MS=M7
      LS=L7
      GO TO 9
      8 MS=M8
      LS=L8
      GO TO 9
      9 LR=LR+1
20    CONTINUE
      IF(L-2)16,17,18
18    IF(L-4)19,21,22
22    IF(L-6)23,24,25
25    IF(L-8)26,27,27
16    PUNCH 30,S(1),R(1)
      PRINT 30,S(1),R(1)
      GO TO 42
17    PUNCH 30,S(1),R(1),R(2)
      GO TO 42
19    PUNCH 30,S(1),R(1),R(2),R(3)
      GO TO 42
21    PUNCH 30,S(1),R(1),R(2),R(3),R(4)
      GO TO 42
23    PUNCH 30,S(1),R(1),R(2),R(3),R(4),R(5)
      GO TO 42

```

```

24 PUNCH 30,S(1),R(1),R(2),R(3),R(4),R(5),R(6)
   GO TO 42
26 PUNCH 30,S(1),R(1),R(2),R(3),R(4),R(5),R(6),R(7)
   GO TO 42
27 PUNCH 30,S(1),R(1),R(2),R(3),R(4),R(5),R(6),R(7),R(8)
30 FORMAT(F9.0,8F8.2)
42 IF(SENSE SWITCH 9)40,1
40 PAUSE
   GO TO 41
   END

```

#### B. Sums and Means

This programme determines and prints the sum of the items, the range of the items, the average of the items, and the number of items in the average excluding zeros. The changes required to include zeros in the average are shown in the programme. A lead card showing the number of items on the data card (including serial number) is required.

```

C      SUMS AND MEANS PROGRAM ZEROS EXCLUDED
      DIMENSION S(100),T(100),X(100),Y(100),Z(100),R(100)
      1  READ,N
        PRINT 24
      2  DO 10 I =1,100
          S(I)=0.
          T(I)=0.
*1      R(I)=0.
          X(I)=0.
          Y(I)=9999999.
      10  Z(I)=0.
      222 DO 20 I =1,N
          READ,S(I)
*2      IF(S(I))20,20,12
      12  R(I)=R(I)+1.0
      20  CONTINUE
          DO 30 I =2,N
            T(I)=T(I)+S(I)
            IF(S(I)-X(I))3,3,4
      4   X(I)=S(I)
      3   IF(S(I)-Y(I))5,5,30
      5   Y(I)=S(I)
      30  CONTINUE
          IF (SENSE SWITCH 9)7,6
      6   GO TO 222
      7   DO 40 II=2,N

```

```

*3      Z(II)=T(II)/R(II)
        IF(T(II)-10000000.)40,40,9
          9  T(II)=T(II)/1000.
        40  CONTINUE
          DO 50 K=2,N,8
            PRINT 23,T(K),T(K+1),T(K+2),T(K+3),T(K+4),T(K+5),T(K+6),T(K+7)
            PRINT 23,X(K),X(K+1),X(K+2),X(K+3),X(K+4),X(K+5),X(K+6),X(K+7)
            PRINT 23,Y(K),Y(K+1),Y(K+2),Y(K+3),Y(K+4),Y(K+5),Y(K+6),Y(K+7)
            PRINT 21,Z(K),Z(K+1),Z(K+2),Z(K+3),Z(K+4),Z(K+5),Z(K+6),Z(K+7)
*4      PRINT 23,R(K),R(K+1),R(K+2),R(K+3),R(K+4),R(K+5),R(K+6),R(K+7)
*5      24  FORMAT(/23HAVERAGE EXCLUDING ZEROS/)
        50  PRINT 22
          PAUSE
          GO TO 1
        21  FORMAT(/8F10.2/)
        22  FORMAT(////)
        23  FORMAT(/8F10.0/)
        END

        CHANGES TO INCLUDE ZEROS
*1      R=0
*2      20  READ,S(I)
          R=R+1
*3      Z(II)=T(II)/R
*4      DELETE
*5      24  FORMAT (23/HAVERAGE INCLUDING ZEROS/)

```

### C. Two Way Table

This programme will determine a two way table from pairs of data with a maximum of one hundred cells per table. Three tables can be produced from one reading of the data.

Lead cards are required showing the number of items on a data card and three sets of cards showing the table to be printed on one card and the instructions on the other. The instruction card requirements are shown in the comment cards.

```

C      TWO WAY TABLE
C      NC = HORIZONTAL AXIS NNC = VERTICAL J= COLUMNS (NO.) M= ROWS
C      SK = CLASS INTERVALS FOR NC SKK FOR NNC SS=STARTING POINT NC
        DIMENSION S(70),P(100),P1(100),P2(100),O(100),Q(28),TT(8),T(8)
        2  READ,NO
          READ 14
          DO 190 I=1,8
190     READ,Q(I)
          IF(SENSE SWITCH 1)101,102

```

```

101 READ 15
    DO 180 I = 11,18
180 READ, Q(I)
    READ 16
    DO 200 I = 21,28
200 READ,Q(I)
    DO 10 I = 1,100
        P2(I) =0.
        P1(I) =0.
    10 P(I)=0.
102 NC=Q(1)
    NNC = Q(2)
    J = Q(3)
    M = Q(4)
    SK = Q(5)
    SKK =Q(6)
    SS=Q(7)
    SSS = Q(8)
    DO 20 I=1,NO
    20 READ,S(I)
        LB =1
201 A=S(NC)
    B=S(NNC)
    JK=J*M
    X=1.
    K=J-2
    A=A-SS
    IF(A)21,21,25
    25 X=X+1
        DO 120 I =1,K
            A=A-SK
            IF(A)21,21,22
    22 X=X+1
120 CONTINUE
    21 A=X
        Y=1.
        KM=M-2
        B=B-SSS
        IF(B)23,23,26
    26 Y=Y+1,.
        DO 130 I=1,KM
            B=B-SKK
            IF(B)23,23,24
    24 Y=Y+1.
130 CONTINUE
    23 B=Y
        KA=A
        KB=B
        KK=KB*J+KA-J
        IF(SENSE SWITCH 1)103,104
103 GO TO (105,106,104),LB
105 P1(KK)=P1(KK)+1.
    LB=2
    NC=O(11)
    NNC =Q(12)
    J = Q(13)
    M = Q(14)

```

```

SK = Q(15)
SKK = Q(16)
SS=Q(17)
SSS=Q(18)
GO TO 201
106 P2(KK)=P2(KK)+1.
LB=3
NC=Q(21)
NNC=Q(22)
J=Q(23)
M=Q(24)
SK=Q(25)
SKK=Q(26)
SS=Q(27)
SSS=Q(28)
GO TO 201
104 P(KK)=P(KK)+1.
IF(SENSE SWITCH 9)4,102
4 PRINT 12
IF(SENSE SWITCH 1)5,111
5 LG=1
PRINT 16
GO TO 117
111 PRINT 12
PRINT 14
117 PRINT 12
TOT = 0.
GTOT=0.
L = 1
DO 50 I=1,JK
50 GTOT=GTOT+P(I)
DO 60 I=1,JK
60 O(I)=P(I)*100./GTOT
JJ=J
JA=1
DO 30 I=1,M
DO 40 II=L,JJ
TOT = TOT+P(II)
PTOT = TOT*100./GTOT
40 PRINT 11,P(II),O(II)
PRINT 11,TOT,PTOT
PRINT 12
L=J+J
JJ=JJ+J
30 TOT =0.
DO 330 I = 1,8
TT(I)=0.
330 T(I)=0.
LN=1
DO 170 LL=1,J
DO 150 IL=LN,JK,J
TT(JA)=TT(JA)+P(IL)
150 T(JA)=TT(JA)*100./GTOT
LN = LN+1

```

```

170 JA=JA+1
DO 160 I = 1,J
160 PRINT 11,TT(I),T(I)
TNT = 100.
PRINT 11, GTOT,TNT
PAUSE
IF(SENSE SWITCH 1)109,116
109 PRINT 12
GO TO (112,113,116),LG
112 J = Q(3)
M = Q(4)
JK = J*M
DO 220 KK = 1,JK
220 P(KK) = P1(KK)
LG = 2
GO TO 111
113 PRINT 15
J=Q(13)
M=Q(14)
JK = J*M
DO 230 KK = 1,JK
230 P(KK)=P2(KK)
LG = 3
GO TO 117
116 GO TO 2
11 FORMAT(F6.0,F7.2)
12 FORMAT(//)
13 FORMAT(F12.0)
14 FORMAT(49H
15 FORMAT(49H
16 FORMAT(49H
END

```

D. Histogram

This programme produces as a histogram a frequency distribution of specified data.

A lead card is required giving the name of the histogram to be produced. All other directions are entered through the typewriter. Firstly the number of items on a data card and the number of the item required in fixed format. Secondly by turning on Sense Switches 2 and 3 the graph intervals can be determined by entering the lowest and highest numbers appearing in the data in floating point format and the number by which the difference of the first two must be divided by to give equal graph intervals in fixed format.

```

C      HISTOGRAM
      DIMENSION A(500),B(64),D(64)
4     DO II=1,500
1     A(I)=0.
      DO 12 I=1,64
      D(I)=0.
12    B(I)=0.
      I=0.
      READ 15
      ACCEPT,N,M
8     DO 6 J=1,N
6     READ,D(J)
      I=I+1
      A(I)=D(M)
      DO 3 J=1,N
3     D(J)=0.
      IF(SENSE SWITCH 9)5,8
5     N=I
400   IF(SENSE SWITCH 2)85,86
85    ACCEPT, CMIN,CMAX,L
      GO TO 87
86    L=60
      CMAX=-.9E49
      DO 2 I=1,N
      IF(A(I)-CMAX)2,2,9
9     CMAX=A(I)
2     CONTINUE
      CMIN=.9E49
      DO 10 I=1,N
11    CMIN=A(I)
10    CONTINUE
87    XL=L
      SCAD=(CMAX-CMIN)/XL
      L1=L+1
      DO 70 I=1,L1
      XI=I-1
70    D(I)=CMIN + XI*SCAD
      YSA1=SCAD/2.
      M=L1+1
      DO 310 I=M,64
310   D(I)=.9E49
      DO 53 J=1,N
      K1=32
      K2=32
306   K2=K2/2
      IF(A(J)-D(K1))303,53,305
303   IF(ABS(A(J)-D(K1))-YSA1)53,53,50
50    K1=K1-K2
      GO TO 306
305   IF(AJ)-D(K1)-YSA1)53,52,52
52    K1=K1+K2
      GO TO 306
53    B(K1)=B(K1)+1.
      DMAX=-.9E49
      DO 21 I=1,L1
      IF(B(I)-DMAX)21,21,29
29    DMAX=B(I)
21    CONTINUE
      IF(SENSE SWITCH 1) 200,606

```

```

606 IF(DMAX-70.)600,600,200
600 IF(DMAX-35.)601,601,602
602 E=1.
    GO TO 201
601 IF(DMAX-17.5)603,603,604
603 E=.25
    GO TO 202
604 E=.5
    GO TO 202
200 E=DMAX/70.
202 DO 90 I=1,L1
  90 B(I)=B(I)/E
201 TYPE 61
    PRINT 15
  15 FORMAT(49H )
    TYPE 61
    PRINT 100,E
100 FORMAT (26HSCALE      1 SPACE ACROSS = ,F8.4/)
    PRINT 102,SCAD
102 FORMAT (26H      1 SPACE DCWN = ,F8.4/)
    DO 560 I=1,11
560 TYPE 561
561 FORMAT(1H )
    DO 551 I=1,7
551 TYPE 550
550 FORMAT (10H1234567890)
    TYPE 61
    DC 59 I=1,L1
    M=B(I)
    TYPE 18,D(I)
  18 FORMAT (F10.2)
    TYPE 60
  60 FORMAT (1H )
    IF(M) 7,59,57
  57 DO 64 J=1,M
  64 TYPE 19
  19 FORMAT (1HX)
    GO TO 59
  59 TYPE 61
  61 FORMAT (/)
    PAUSE
    IF(SENSE SWITCH 3)80,4
  80 DO 399 I=1,L1
    D(I)=0.
399 B(I)=0.
    GO TO 400
  7 STOP
    END

```