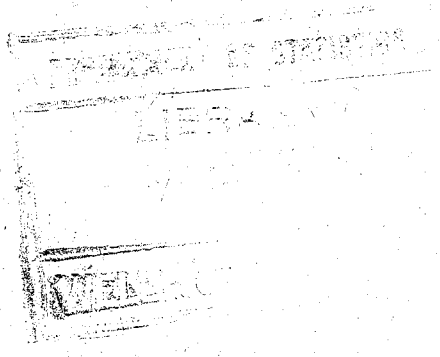
Volume 3

Number 2



the NEW ZEALAND STATISTICIAN

Published by The New Zealand Statistical Assoc. Inc.

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Volume 3 July 1968 Number 2

THE NEW ZEALAND STATISTICAL ASSOCIATION (INCORPORATED)

Nineteenth Annual Conference

in conjunction with

THE OPERATIONAL RESEARCH SOCIETY OF NEW ZEALAND

Venue : Shell Theatrette, The Terrace, Wellington.

Programme: Tuesday, 2 July, 1968.

9.30 am	Recent Developments in National Accounting
11.00 am	Consumer Research Projects
2.00 pm	Experimental Designs in Trials with Dairy Cattle
3.30 pm	Optimum Utilization of Weather Forecasts

Programme: Wednesday, 3 July, 1968.

9.00 am	An Objective Criterion for University Failure Rates
10.30 am	Education in Statistics in New Zealand
11.30 am	Annual General Meeting of the N.Z. Statistical Association
2.00 pm	Differences in Sales at Service Stations
3.30 pm	Time-correlated Observations (Part 2)
5.00 pm	Cocktail Party

Programme: Thursday, 4 July 1968.

9.00 am	O.R. and Statistical Application Programmes
10.30 am	Dipsomat
11.45 am	Scheduling of a Logging Fleet by Computer
2.15 pm	Scheduled Livestock Fattening Operations with Dynamic Programming
3.45 pm	Statistics in O.R.

Acknowledgement

The Executive Committee wishes to record its appreciation of the generosity of Shell Oil (N.Z.) Ltd. in allowing the Association the use of the Theatrette for the Conference, free of charge.

Results of "Time of Conference" Survey

Twenty-seven replies were received. This is hardly an adequate number to decide on a most convenient conference time for every body, but it is hoped that anybody who wanted to attend but found the usual time inconvenient would take this opportunity to make their protest. As there were only four of these it would seem that July is a good time for a conference.

For the record, 15 find both May and July convenient, 6 July but not May, 2 May but not July and 2 neither May nor July, 2 find July convenient and have no opinion about May.

In view of these results no attempt will be made to change the conference date.

TIME-CORRELATED OBSERVATIONS (Part 2)

Professor G.H. Jowett
University of Otago
Dunedin

This is a continuation of the paper delivered last year, on this subject, by Professor Jowett. It is not highly technical in form. Professor Jowett has sent the full text of this series to the N.Z. Statistician, and it will be published in the next issue.

AN OBJECTIVE CRITERION FOR UNIVERSITY FAILURE RATES

R. Marsh
Victoria University of
Wellington

"As a preliminary there will be some discussion of concepts used in mental measurement that are pertinent to this topic. This will be followed by a demonstration of how the region of the cutting point between pass and fail can be set by reference to the consistency between results at the first year level and those at the level of the second year."

RECENT DEVELOPMENTS IN NATIONAL ACCOUNTING

P. Frood
Department of Statistics
Wellington

For the last three years the Statistical Office of the United Nations has conducted a series of meetings all over the world to discuss the revision of its standard manual on national accounts.

To devise a system of national accounts to serve as a tool of reference for the internal policies of a variety of countries, as well as a basis of international comparisons presents many problems. Among the issues involved is the reconciliation of the national accounts of the western market economies with the material product system of the centrally planned economies. At the same time the needs and capabilities of both the advanced industrial countries and the developing countries must be accommodated.

At this stage of the consultations it is obvious that the end result will make heavy demands on national statistical services, as well as determine the main line of national accounting development for at least the next decade.

CONSUMER RESEARCH PROJECTS

D. Butler
Unilever New Zealand Ltd
Petone

The first part will concern research of basic fact finding nature, more commonly referred to by researchers as Research into Consumer Habits. Broadly this is concerned in establishing trend measurements concerned with both purchasing and product usage, and through this research we are able to observe product strengths and weaknesses in the various segments of the Consumer Market.

The second part will deal with:

1. The need for product testing with a brief explanation of the methodology.

2. Product Testing in its assistance to assessing Product Development.

The final stage concerns Advertising Research, and will devote a little time to the concept of pre-testing and finally post-testing, which is the measurement of the effect of the commercial in terms of communication after it has been subjected to the "hurly burly" of the highly competitive advertising market.

OPTIMUM UTILIZATION OF WEATHER FORECASTS

D.C. Thompson
N.Z. Meteorological Service

It is well known that weather forecasts are sometimes incorrect, and recent theoretical work has suggested that to some extent this will always be so. Nevertheless, if properly used, they can still be of considerable economic value to the public for there is certainly a statistical relation between predicted and actual future states of the weather taken over a large number of cases, even if there is not perfect one-to-one correspondence.

Basically, forecasts as issued at present are of a categorical type in that the forecaster assesses the chances of possible alternative developments of the weather and then issues his forecast on the basis of the one which he considers most likely. It will be shown by an elementary analysis that economic decisions based on forecasts of this type may or may not be profitable over a period of time, depending on the skill of the forecaster and on the "cost-loss" ratio of the process involved.

If instead of issuing a categorical statement the forecaster issues an estimate of the probabilities that each of a set of mutually exclusive states of the weather will obtain, more information is conveyed to the user, for

there are times when the future course of the weather is more predictable than others. It will be shown that for a given degree of forecasting skill these "probability forecasts" have potentially greater economic value than categorical forecasts, and in addition are more readily adapted to a scientific approach to the question of economic decisions.

For optimum utility it is necessary to know the "skill" involved in forecasting. Various methods of measuring skill for both categorical and probability forecasts will be discussed, together with the difficulties involved.

EXPERIMENTAL DESIGNS IN TRIALS WITH DAIRY CATTLE

K. Jury
Ruakura Animal Research Station

Summary: Experiments with diary cattle may be classified into:-

(a) Long term or multiple lactation trials.
(b) Single lactation trials.
(c) Short term or part lactation trials.

Experimental designs used in these trials are discussed, in particular those of the changeover and incomplete split plot type.

EDUCATION IN STATISTICS IN NEW ZEALAND

G.H. Jowett
Otago University

H. Offenberger
Wellington Polytechnic

H.S. Roberts
Applied Maths Div. DSIR

Statistical education within New Zealand has shown tremendous strides since the end of World War II, and especially in the last decade. Before 1950 courses in Statistics were non-existent, except as an optional subject at Honours level at some Universities.

Secondary In the early 1960's the Statistical Association expressed its concern to the Education Department that the little mention of Statistics in the School Certificate Syllabus had been deleted. As a result of consultation with the Department, with Teacher Organisations, and with the University Entrance Board, the following have now been accepted:

(a) Inclusion of Statistics in the Mathematics Pilot Scheme - in 1967, out of a total of 5 questions in one paper of the School Certificate Examination, one was devoted to Statistics, i.e. about 10% of the whole examination.

(b) At the U.E. level, the old "Mechanics" paper has been renamed "Applied Mathematics", half of it being devoted to Mechanics and the other half to Statistics.

(c) Statistics has also been accepted at the Scholarship level and in 1969 there will be allowed a choice of Statistics questions amounting to up to one quarter of the additional Mathematics paper.

University Some Universities have been offering Statistics at Honours level for some years, but are now in addition giving courses at a much more elementary and practical level - first, second and third year courses. Otago University, is also offering a one-year diploma course at Post-Graduate level.

Technician The Technician's Certification Authority have included a subject containing elementary Statistics in the third and fourth year Science courses. The Statistical Association has, however, asked the Authority for a complete course to be known as the "N.Z. Certificate in Science (Statistics)" and this has been approved by the Science Committee of the Authority. The course will allow for a much wider range of people, e.g. workers in the Commercial and Social fields. The course consists of the following topics in the third, fourth, and fifth years: Elements of Statistics, Applied Statistics I and II, Numerical Analysis I and II, and Computer Methods. The Authority itself is now considering whether or not to adopt the course.

N.Z. STATISTICAL ASSOCIATION

President's Report

Membership There were 114 members at 31/3/68, but 10 of these lapsed because of unpaid subscriptions. 15 new members joined during the year. Corporate members numbered 8, and we thank them for their continued support.

Committee The committee met 7 times during the year. Officers for 1967-68 were:

President: H.R. Thompson (D.S.I.R.)

Sec-Treasurer: G.C. Arnold (Department of Agriculture)

Committee: S.S.R. Kuzmicich (Dept. of Statistics)
L.E. O'Brien (Unilever Ltd.)
H. Offenberger (Wellington Polytechnic)
W.A. Poole (N.Z. Institute of Economic Research)

Mr O'Brien was the corporate members' representative.

Hon. Auditor: A.W. Graham

Conference The annual conference was held at the Shell Theatrette on July 4 and 5, 1967 with the operational Research Society providing a day of papers on July 6. The Association is grateful to Shell Oil (NZ) Ltd. for allowing us to use the Theatrette free of charge, and the venue as well as the programme contributed to the success of the conference. Over the years we have come to expect

much from Professor Jowett, and again he did not disappoint us, "spinning a yarn" with his usual verve. The cocktail party was adjudged a success by those who attended, even if they were mainly contributors of papers and therefore non-payers.

Technicians' Course in Statistics The excellent response to a survey of organisations carried out to assess the demand for technicians with qualifications in statistics was partly instrumental in encouraging the Technicians' Certification Authority to go ahead with setting up a N.Z. Certificate in Science (Statistics). Several meetings of the Committee and sub-committees were devoted to this topic, and the results will be presented at this Conference. I must pay tribute here to the efforts of John Offenberger, without whose persistence the scheme would have remained earthbound, and to the work of Stan Roberts and Mike Randal in developing syllabuses.

N.Z. Statistician Bill Warren, who pioneered the production of our journal, left New Zealand to take a job with the Canadian Department of Forestry. Our thanks and best wishes go to him. Bill Poole has very ably carried on the editorial work and produced 2 issues. He is however sadly short of material.

H.R. THOMPSON

INCOME and EXPENDITURE ACCOUNT

(1966-67 figures in brackets)

EXPENDITURE ($)		INCOME ($)	
N.Z. Statistician	88.00 (40)	Subscriptions	167.90 (146)
Administration	15.19 (12)	Interest	6.20 (1)
Cocktail Party Loss	1.54 (3)		
Conference Loss	26.69 (25)		
Conference Badges	3.00 (4)		
Depreciation on Glasses	1.00 (1)		
Income Surplus	38.68 (55)		
Polytech Library	- (7)		
	174.10(147)		174.10(147)

BALANCE SHEET

as at 31st March 1968
(1966-67 figures in brackets)

LIABILITIES ($)		ASSETS ($)	
Accumulated Funds	148.23 (94)	Drinking Glasses	7 (8)
Surplus Income over Expenditure	38.68 (54)	Depreciation	1 (1)
			6 (7)
		Badges	3 (6)
		Bank Balance	177.91(132)
		Cash in hand	- (3)
	186.91(148)		186.91(148)

I have examined the books and accounts of the New Zealand Statistical Association (Inc.). for the year ended 31 March 1968. In my opinion the accompanying receipts and payment accounts give a true and fair view of the transactions of the Association for the year ending on that date and the accompanying balance sheet represents a true and fair view of the financial position of the Association on 31 March 1968.

A.W. GRAHAM, B.Com., FRANZ, FCI
Hon. Auditor

RECEIPTS and PAYMENTS ACCOUNT

RECEIPTS ($)			PAYMENTS ($)		
Balance (last year)		135.23	N.Z. Statistician		88.0
			Vol 2, No.1	50.50	
Subscriptions		167.90	Vol 3, No.1	37.50	
Ordinary	103.90				
Corporate	64.00		Cocktail Party		41.34
			Food	6.86	
Cocktail Party		39.80	Liquor	34.48	
Tickets	19.20				
Sale of Surplus	20.60		Conference		45.74
			Speakers Tickets	6.40	
Conference		19.05	Catering	5.84	
Tea Money	13.15		Statistician		
O.R. Society	5.90		V.2 No.2	33.50	
Interest		6.20	Administration		15.19
			Stamps	10.80	
			Stationery etc.	4.39	
			Balance		177.91
		368.18			368.18

Financial Report

The costs for the 1967-68 financial year include the full cost of producing three copies of the N.Z. Statistician and of a survey of demand for the NZCS in Statistics. A small increase in membership and a round up of arrears increased subscription receipts by $20. Interest from the 30th September 1966 to 31st March 1967 was omitted from last year's accounts and so has been credited this year. The cost of providing free cocktail party tickets to conference speakers has been debited to the conference rather than to the party itself.

Overall the income surplus of almost $40, although less than last year, shows that subscription levels are more than adequate to support the Association's present level of activities. This of course is dependent upon the conference venue being available at no cost.

"WHY ARE THE SALES AT ONE SERVICE STATION DIFFERENT TO THOSE AT ANOTHER?"

T.H. Lewis
B.P. (N.Z.) Ltd.

The aim of this exercise was to answer the above question by determining an equation which related the sales of a Service Station with factors measured at the Service Station. Some 300 factors were measured at a sample of 130 Service Stations in Southern Sweden. The data was analysed by using multivariate techniques but it was found that a straightforward application of these techniques gave meaningless answers. A new approach of combining such techniques with model building and commonsense gave answers which proved useful for prediction and experimental purposes.

"SCHEDULING LIVESTOCK FATTENING OPERATIONS WITH DYNAMIC PROGRAMMING"

W.R. Schroder
Wool Research Organisation
of New Zealand
Christchurch

The problem of scheduling livestock sales and purchases in fattening operations is treated as a special type of "warehouse problem" and a dynamic programming model is developed which obtains a maximum return over time for a given fattening capacity. The approach used is to divide the planning horizon into a number of discrete periods and the decision variables are the number and weight of animals bought, sold, and held as inventory in each period.

The problem context in which the model was developed was the management of a big feedlot in Central Indiana, U.S.A. The question was: Would it be profitable for an individual farmer to use the dynamic programming model? Obtaining an answer to this question involved developing estimates of the costs, to a commercial farm management advisory service, of model development, computer programming, data collection etc. and comparing these costs with the difference in annual returns between the farmers present policy and a policy based on the dynamic programming model.

OR AND STATISTICAL APPLICATION PROGRAMS

I. Paul Bieleski
I.B.M. World Trade Corporation

Application or 'package' programs enable computers to be a useful tool in OR and Statistical work. Package programs fall into 5 types:

1. Fixed Form in which the input is rigidly defined and the user has control only over numerical values entered.

1. Subroutine/Macro Package. The user writes a program using the available subroutines or Macros to do the kernel of the work.

3. Language Compiler. The user writes instructions in a problem oriented language. The compiler translates this into a usable program.

4. Command Interpreter. The user feeds the program user-commands which are interpreted and executed by the program.

5. Conversational System. By using suitable output devices the user conducts a dialogue with the machine.

An example of the first type is the 1130 Project Control System (1130 PCS) which produces a number of analyses based

on the critical path method of planning. Another example is the 1130 Statistical System which does stepwise regression, factor analysis, analysis of variance, and polynomial curve fitting.

A widely used example of the second type is the 360 Scientific Subroutine Package (360 SSP) which consists of some 200 statistical and mathematical routines from which can be built a wide variety of technical programs.

The General Purpose System Simulator (360 GPSS) compiles programs written in the GPSS language. This is a block structured language which is used to represent discrete systems for simulation.

Linear Programming is an important Operations Research tool and one computer program designed to find solutions and do parametric programming uses a command type system. This is the 1130 Linear Programming and Mathematical Optimisation Subroutine (1130 LP-MOSS).

The 1130 Continuous System Modelling Program (1130 CSMP) is a program designed to simulate continuous systems. It uses digital techniques to do an analogue type simulation. The scientist can sit at the console and watch the simulation output. At any stage, he can alter parameters or blocks and continue the simulation in an experimental fashion.

All these programs are being used in New Zealand for solving technical problems.

"DISPOMAT"

T.H. Lewis
B.P. (N.Z.) Ltd.

The Dispomat is a simple mechanical device which can be used as a simulator. It has been applied so far to the areas of stock control and the Critical Path Method. In stock control, it provides a visual indication of the stock levels of various commodities at various locations. It has been used in the Oil Industry for predicting the levels of main products at retail outlets to facilitate the more efficient scheduling of Road Tankers. In critical path planning the Dispomat is used to show how the job is progressing. It can handle a job which has up to fifty simultaneous activities during any time period and its main advantage is that it is extremely easy to replan if something goes wrong. It has helped to meet the objection that the Critical Path Method is more suitable for planning than for control because of being so easy to operate.

SCHEDULING OF A LOGGING FLEET BY COMPUTER

R.N. Ford
N.Z. Forest Products Ltd.
Tokoroa

Transportation of materials from source to destination is a major factor which contributes to the cost of nearly all finished products. Such transportation problems have been studied overseas mainly in determining the optimum route that vehicles should take in order to minimise such things as distance travelled, operating costs etc.

This paper presents a case study involving the transportation of logs from varying sources to varying destinations with several different vehicle types available. The principal objective of the study was to optimise this transportation in order to minimise lost time at source and destination and also to minimise the number of vehicles required. The solution was obtained by use of Multiple Regression, Linear Programming, Simulation and a digital computer.

STATISTICS IN O.R.

V.J. Thomas
Applied Mathematics Division
Palmerston North

The paper will consider the broad range of application of statistical techniques to Operational Research. In general, the approach will deal with practical applications or little known facets, rather than the general background. Topics will be:

Common distributions - normal, gamma, sampling distributions, Pearson distributions.

Curve fitting - tolerances in choice of curve.

Stochastic models.

Statistical tests and decisions.