PROCEEDINGS OF A SEMINAR

ON ROAD TRANSPORT IN RURAL AREAS

HELD AT LINCOLN COLLEGE

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EDITED BY:

P.D. CHUDLEIGH

A.J. NICHOLSON

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THE AGRICULTURAL ECONOMICS RESEARCH UNIT

Lincoln College, Canterbury, N.Z.

The Agricultural Economics Research Unit (AERU) was established in 1962 at Lincoln College, University of Canterbury. The aims of the Unit are to assist by way of economic research those groups involved in the many aspects of New Zealand primary production and product processing, distribution and marketing.

Major sources of funding have been annual grants from the Department of Scientific and Industrial Research and the College. However, a substantial proportion of the Unit's budget is derived from specific project research under contract to government departments, producer boards, farmer organisations and to commercial and industrial groups.

The Unit is involved in a wide spectrum of agricultural economics and management research, with some concentration on production economics, natural resource economics, marketing, processing and transportation. The results of research projects are published as Research Reports or Discussion Papers. (For further information regarding the Unit's publications see the inside back cover). The Unit also sponsors periodic conferences and seminars on topics of regional and national interest, often in conjunction with other organisations.

The AERU, the Department of Agricultural Economics and Marketing, and the Department of Farm Management and Rural Valuation maintain a close working relationship on research and associated matters. The Unit is situated on the 3rd floor of the Burns Wing at the College.

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PREFACE

In 1978 the Road Research Unit of the National Roads Board commissioned the Agricultural Economics Research Unit (AERU) to undertake studies related to trip and tonnage generation associated with various land uses in N.Z. agriculture.

This research project was completed in 1981 and reports submitted to the National Roads Board. The results have been published as Road Research Unit Bulletin No. 59 in two volumes. Copies of Road Research Bulletin No. 59, on which the Seminar/Workshop was based, are available from the National Roads Board.

In May of 1982 a seminar/workshop was held at Lincoln College. The workshop was sponsored by the National Roads Board, AERU, and the Rural Development and Extension Centre of the College.

The objective of the seminar/workshop was to bring together local body engineers and councillors, regional planners, central government personnel, and road transport operators in order to elicit discussion on the usefulness of the results of the study. Further, it was intended to define areas for further research into rural roading and to provide a set of recommendations on further research to the Road Research Unit of the National Roads Board.

This publication presents the papers given at the seminar and includes a summary of the recommendations emanating from the working groups and sessions held during the seminar.

The AERU is publishing these proceedings as a record of the seminar and to stimulate further discussion of rural roading needs.

P.D. Chudleigh,
Director, AERU

A.J. Nicholson,
Traffic Committee,
Road Research Unit

LIST OF SEMINAR PARTICIPANTS

BECK, Kenneth H.P.,
Waimea County Council.

BLAIR, Duncan,
N.Z. Forest Owners Association.

BOULT, Harold A.,
Wallace County Council.

BRODERICK, Thomas,
H. Baigent & Sons.

BROWN, Terry J.,
Southland County Council.

CHUDLEIGH, Peter D.,
Agricultural Economics Research Unit, Lincoln College.

D'ARTH, Nigel,
Ohinemuri County Council

DOWRICK, Bernard George,
Ashburton County Countil.

EVANS, Royce,
Wallace County Council.

FARLEY, Peter,
N.Z. Forest Service.

GIBSON, John L.,
Piako County Council.

GREEN, Brian,
Paparua County Council.

GROGAN, John A.,
N.Z. Road Transport Association.

HABGOOD, John,
W.A. Habgood Ltd.

HARTE, Patricia,
Davie Lovell-Smith & Partners.

GRIFFEN, Lachie,
N.Z. Road Transport Association.

JOHNSTONE, Doug,
Geography Department, University of Canterbury.

KING, Russell,
Agricultural Economics Research Unit, Lincoln College.

LOVATT, Des R.,
Road Research Unit, National Roads Board.

McCHESNEY, Ian,
Joint Centre for Environmental Sciences, Lincoln College.

McKENZIE, Ian D.,
Tauranga County Council.

MITCHELL, Mary Ann.

NICHOLSON, Alan,
University of Canterbury (until recently with National Roads Board).

NORTON, Fred,
Private Consultant (until recently with Piako County Council).

RANKINE, R.M. (Dick),
Piako County Council.

ROBB, John,
Canterbury United Council.

SAMPSON, Paul,
Taupo County Council.

STEWART, Frank,
Ministry of Transport.

STEWART, Noel,
Ellesmere Transport Company Limited.

TROON, Jeff,
Southland County Council.

VALENTINE, John,
N.Z. Forest Service.

WALKER, W.A. (Bill),
Hobson County Council.

WHITE, John,
Canterbury United Council.

WOOD, D.R. (Ritchie),
Canterbury United Council.

FITZPATRICK, John,
Waikato County Council.

DES FORGES, Brooke,
Waikato County Council.

I. SUMMARY OF OPENING OF SEMINAR

Provided by D.R. Lovatt, National Roads Board

Professor Bruce Ross, council member of Lincoln College, welcomed participants to the seminar. He referred to the long-standing interest that Lincoln College had in rural transport as one of the many matters associated with rural activities.

He introduced the guest speaker, Ruth Richardson, MP for Selwyn. Ruth Richardson had, he said, a considerable interest in rural affairs, having been legal advisor to Federated Farmers for some years, and she also had a noted interest in rural transport, being at present a member of the National Party Caucus Transport Committe. Ruth Richardson is also a member of a number of other Caucus Committees dealing with subjects related to rural transport, namely, National Development, Regional Development, Agriculture, Lands, Forestry, and Economics.

Ruth Richardson thanked the organisers for the opportunity of being involved in the seminar. She confirmed she had a considerable interest in rural transport and held strong views on the subject. There were three propositions she wanted to stress for consideration by the Seminar. These were:

1. Need for a Good Data Base

There is an appalling lack of sound data available for decision-makers. In these circumstances gut feelings tend to be relied upon in many important decision areas.

The foreward to RRU Bulletin 59 referred to three volumes although the seminar was dealing with only the first two. Volume 3 dealing with the effect of Road User Charges legislation on rural transport would be of use in the reappraisal of the Act currently being considered.

2. Land Use

From the reports it was apparent that traffic generation depended on the type and intensity of land use. The effect of irrigation within Ashburton County showed that increased economic activity and job opportunities occurred when there was investment in aids to higher production. This raises a challenge - the desirability of increased irrigation facilities in Canterbury based, for instance, on the Rakaia River. The transport industry would benefit from greater productivity from the area and could be interested in legal hearings regarding the impact of such irrigation works in the area.

Forestry also raised thorny issues. In Taumaranui County there has been a long association between farming and forestry interests. The debate had been heard by the Planning Tribunal. The Council had sought to have forestry recognised as a conditional use in certain areas where the land was suitable, there would be no deterioration in community services, and the roading facilities between forestry and market were either already adequate or made so by the forestry interests. The Council was not able to gain a contribution towards roading costs and forestry was declared a conditional use.

It seemed that a study was desirable to identify more flexible means for funding roads required for forest access. It is apparent that undue strain on roads could be a reason for having forestry as a conditional use.

3. Delicensing of the Transport Industry

The Caucus Transport Committee is considering all modes of transport and is endeavouring to obtain a balance between them. In the road transport industry the time seems appropriate to abandon quantity licensing (i.e. numbers of vehicles and routes permitted) in favour of quality licensing (i.e. knowledge, efficiency, etc). These views were canvassed in the April edition of 'Transport News'. Licensing as now practised needed changing.

Transport makes up approximately 30¢ in every dollar of Gross National Product and hence is very important. Traditional systems which had been developed in earlier times deserve reconsideration in the light of changes in the fields of energy, environment, labour, vehicle types, industry structure, national production and many other factors. Very strong arguments would be required to demonstrate that the continuing of licensing was in the national interest.

The trucking industry should fairly contribute to the provision of roads as was intended by the Road User Charges legislation but it appeared that the industry, while it presently paid about $100M towards the National Roads Board's $281M budget, was still being subsidised by other road users to the extent of $32M per year.

II. ECONOMIC ISSUES IN RURAL ROADING AND AN INTRODUCTION TO THE RURAL ROADING RESEARCH PROJECT

P.D. Chudleigh, Agricultural Economics Research Unit,
Lincoln College.

1. Introduction

This address to you is in three parts. Firstly, I want to go over some of the objectives of this workshop and to try and set the scene on questions that we are addressing today and tomorrow. Secondly, I would like to make several generalised comments on what I see as the important issues and questions regarding land use and roading that may be a focus for later discussion and debate. Thirdly, I want to introduce the particular projects that led to the present reports by the National Roads Board and to this workshop.

2. Workshop Objectives

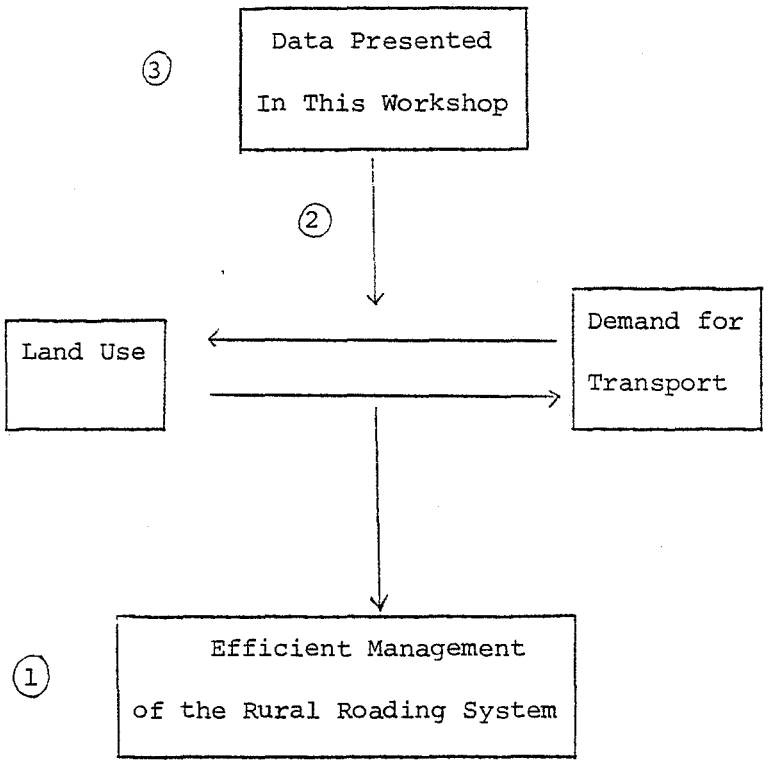
I see this workshop as attempting to answer three broad questions as related in Figure 1:

(i) Can relationships between rural land use and the demand for road transport be used in planning the efficient management of the rural roading system at county, regional or national level?

(ii) Can useful and reliable data be assembled for such relationships; how should such relationships be expressed; and how should such relationships be used in roading management?

(iii) As a starting point, are the data and implied relationships presented at this workshop orientated in the appropriate direction? How can these data be improved, extended and disseminated?

FIGURE 1


3
Data Presented
In This Workshop
2
Land Use
Demand for
Transport
1
Efficient Management
of the Rural Roading System

You will note that the format for tomorrow's programme is orientated towards answering these questions via working groups. As the data are presented today, please keep these questions in mind as they are the principal reason for this gathering.

3. Relevant Economic Issues

(i) Land Use and the Market

The market (i.e. true prices of inputs and outputs) determines rural land use in New Zealand.

If we look about us, what are the major land use changes that have taken place recently? A few examples: increased horticulture at the expense of dairying and other pastoral farming, increased maize at the expense of dairying, less beef and more sheep, and increased forestry at the expense of pastoral farming. Externally determined prices have been an important influence in these changes but intervention policies by central and local government could be contributing (e.g. minimum sized economic unit concept, stumpages on trees, SMP's).

If we accept private ownership of land as the N.Z. norm, then distortion from market prices affecting land use should have clearly defined purposes and justification for such intervention should be made explicit in economic or social terms.

(ii) Roading and the Market

As opposed to land, most N.Z. roading is a public good.

How much to spend

Like any other public good, there is room for debate over how much money should be spent on roading compared to other public goods.

Who Pays

There are at least two complex questions regarding the financing of roads; the first is concerned with the respective contributions of users and non users; the second is concerned with the proportion of finance contributed by different users. Unless an extensive road toll system is used, general finance provided by road users or by general taxpayers has to be allocated back to specific roads.

But like most public goods, an individual road user's willingness to pay more for an improved road cannot be translated directly via the market mechanism to the providers of roads (NRB, county councils).

This means public bodies have to make decisions on road maintenance and investment based on other criteria. This is where national roading management becomes a difficult and complex undertaking.

(iii) Road Investment and the Demand for Transport

The degree of upgrading and road maintenance for specific roads should follow the demand for road transport which in turn follows land use patterns. Road user savings from roading investment should be greater than the costs incurred - perhaps a desired rate of return or net present value could be nominated to help allocate roading resources.

One question regarding road user savings relates to the distribution of these savings to transport operators, farmers or consumers.

Another question relevant to us today is whether and how producers respond to lowered transport charges or an improved standard of service. Because transport charges are very low in relation to total costs faced by farmers, it is likely that farmers'

responsiveness to lowered transport charges is likely to be small. Can we think of recent examples in N.Z. where improved roading has induced land use changes?

(iv) Lower Investment in Roading

We hear much of road upgrading and of road maintenance but why not of road disinvestment, i.e. maintenance of a particular road at a lower level than previously? Instead of a road being graded three times per year, what about two times per year? What about lowering standards for resurfacing etc. Are these options seriously considered in economic terms at county level or is such consideration only because finance may be becoming limiting.

(v) Social Policies and Roading

This is a large and controversial subject and is related to the 'who pays' argument. I would like to make only two points:

(a) Is it possible to specify a minimum standard of roading that should be provided by our society? (e.g. having road access to schools 98% of all school days; military vehicle access).

(b) I believe it important for a rural community to be given the opportunity of self-help in roading - to test their real commitment to get their roads upgraded. Is the present rating and NRB grant system ideal in this regard?

4. The Projects - Introduction and Methodology

(i) Introduction: The data collection for the NRB has been associated with two main projects. The 'distance tax' project objective was to assess the effects of the 1978 road user charges tax on rural road transport. The traffic generation project, the subject of this seminar, was aimed at identifying the different transport generation characteristics of a range of land uses. Because some of the data required for each project were similar, we set about the two projects simultaneously.

(ii) Selection of Areas for Study: Four counties were selected for intensive study. These counties were chosen as being representative of existing and important land uses, namely cropping, sheep/beef farming (low intensity), sheep/beef farming (high intensity), dairy farming, and forestry. Variation in remoteness from cities and service centres was also a consideration in choosing the counties:

Matamata - Mainly dairying - closely settled and serviced.

Wairoa - Mainly sheep/beef farming (low intensity).
- Less closely settled and serviced.

Ashburton - Mainly mixed cropping and sheep - closely settled.

Southland - Mainly sheep/beef farming (high intensity).
- Closely settled with large city within.

(iii) Data Collection: Five different data collection techniques were utilised for the two projects.

(a) Personal interviews of rural road transport operators in 1978, 1979 and in 1980; the major aim here was to collect data regarding the impact of the road user charges.

(b) Logging of representative rural carrier vehicles; the main aim here was to establish load factors and origin-destination patterns. These data were used mainly on the road user charges project.

(c) Roadside vehicle weighings; carried out over a one week period in 1978, these data were to be used as a check on the information obtained from the vehicle loggings.

(d) Survey of farmers; this was the data collection exercise most relevant to the traffic generation project. Carried out in 1978, the mail survey covered both household and freight transport generation for 1080 farms in the four counties.

(e) Finally, a series of mail surveys of input-output depots was undertaken mainly as a check on data collected from the transport operators and farmers.

(iv) Survey of Farmers: The questionnaire, covering farm characteristics, goods transport and personal transport was dispatched to 1080 farms; all households on the surveyed farms were covered in the survey. Sample sizes and response rates were as follows:

County	Sample Size	Net Valid Response Rate (%)
Southland	360	64
Ashburton	240	72
Wairoa	240	50
Matamata	240	59

The respondents' average farm size and distribution of farm size was checked against national statistics for the four counties and satisfactory results emerged.

It is interesting to note the discrepancy in farm size in the following Table between respondents and non respondents:

	Southland	Ashburton	Wairoa	Matamata
Average Farm Size of all Valid Respondents (ha) (from answers)	238	324	503	102
Average Farm Size of Non Respondents (from roll) (ha)	126	168	203	78
Average Farm Size (Official Statistics) (ha)	235	337	585	115

The explanation for the discrepancy is that farm sizes on the valuation rolls are underestimates, since they may have only referred to one parcel of land on the farm.

The representation of the sample with respect to farming type is not easily assessed. The farm type classification used in the survey was based on principal land use. An abbreviated version of the classification together with the proportion of farms in each class by county is given below:

	Southland (%)	Ashburton (%)	Wairoa (%)	Matamata (%)
Store Sheep & Cattle	17	15	46	5
Fattening Sheep & Cattle (Breeding Own Replacements)	42	26	28	7
Fattening Sheep & Cattle (Buying in Replacements)	25	8	17	9
Mixed Cropping	9	51	5	2
Dairy Farming	6	1	4	76

The principal farming type aimed at in each county seems well represented. The farm classification problem is not new to agriculturalists; in the present situation land use could be classified by broad level farming type or by specific enterprise type. We have opted for the former. For example, the present classification will not be capable explicitly of informing us how traffic generation patterns change when there is a swing from sheep to beef. However, it should be possible to build up individual commodity transport demand patterns, for example, beef versus sheep, from the information we have collected.

I have given you a brief background to the survey, how the information you are going to hear about soon was collected, and our confidence regarding representativeness of the sample.

In the data presentation that is to follow, I would ask you to listen with respect to how the data might be used in planning or how these data might be made more useful for such planning.

III. SURVEY RESULTS: HOUSEHOLD TRIP GENERATION

R.L. King, Agricultural Economics Research Unit, Lincoln College.

1. Introduction

In deciding what to say in these seminars, I am reminded of the man who, on the birth of his 14th child, considered he had a problem. It transpired his problem was due to his good wife being partially deaf. His customary question when jumping into bed "Do you want to go to sleep or what?" was usually answered "What?" and interpreted incorrectly.

My objective in opening this way is related to the expert and diverse group of participants at this seminar ranging from planners through engineers and foresters to economists and geographers and members of the road transport industry. I see my role as being an investigator who can say "We have done our investigations and your wife is deaf!".

This paper is devoted to trip generation associated with rural households. Detailed definitions of terms used are given in RRU Bulletin 59, Chapter 2.

2. Definitions

Households included all households on the surveyed farms and therefore included farm owners, managers, workers and households, who although renting the house, had no other ties with the farm. These households often generate daily work trips to the nearest town (up to 70 km each way was recorded). Table 1 illustrates the range of densities surveyed. Households were self defined; 75 per cent contained one or more children.

A vehicle trip is defined as being made when a vehicle crosses the farm gate to or from the tarseal. Trips are classified according to purpose. A vacuum cleaner salesman would make a hopeful trip when he arrives at the farm and another when he leaves with both trips classified according to purpose, i.e., service trips to the household.

TABLE 1

Household Densities

County	Farm Type	Households /1000 ha.	Farms/1000 ha.
Matamata	Dairy	23.4	13.4
Wairoa	Store Sheep	2.7	1.4
	Fattening Sheep with Breeding Own Ewes	2.0	1.2
Ashburton	Cropping	7.5	4.6
	Fattening Sheep with Breeding Own Ewes	4.6	3.5
Southland	Fattening Sheep with Breeding Own Ewes	5.2	4.1
	Fattening Sheep with Buying in Ewes	10.2	10.1

The vehicles involved are light vehicles of less than 3.5 tonnes.

3. Summary of Results

Table 2 is a summary of household trip generation. If we start at the 'bottom line' we see that all four counties are similar except for Wairoa. They are similar also to the reports of urban household trip generation rates (RRU Bulletin 15). Perhaps Wairoa households have fewer cars and so are unable to make trips. Table 3 shows that that is not so and it further shows that the average number of licences and cars held in the surveyed households was very similar in all counties. Access to vehicles does not appear to be a reason for decreased trip generation.

Trips can be placed into one of two major subgroups: those made by tripmakers who live in the household and those made by people who do not live in the household and whose trips are therefore made with the purpose of visiting the household.

TABLE 2

Monthly Household Trip Generation

	Matamata	Wairoa	Ashburton	Southland	$\bar{x}$
Trips to:					
Household Service	3.5	4.8	4.3	4.6	4.4
Farm Service	7.3	12.6	18.9	12.6	13.1
Social	16.7	11.6	14.5	17.1	15.4
Sub Total:	27.5	29.0	37.7	34.3	
Trips From:					
Closest Shopping	22.6	16.4	16.7	14.7	17.1
Town Trips	35.4	19.4	27.1	29.2	29.2
City Trips	5.8	3.2	7.1	6.9	6.1
School	1.4	1.0	1.0	1.0	1.1
Sub Total:	65.2	40.0	51.9	51.8	
TOTAL:	92.7	69.0	89.7	86.1	86.4
S.D.	59.2	48.0	51.6	55.2	

TABLE 3

Household Statistics

	Matamata	Wairoa	Ashburton	Southland
Average No. Vehicles in H/H	2.5	2.5	2.7	3.0
Average No. Licences in H/H	2.2	2.1	2.4	2.4

3.1 Trips to the Household

Looking again at Table 2 we can see that Wairoa households are roughly as attractive places to visit as any other households so if anyone from Wairoa was about to do me an injury they can desist.

Social visits to Wairoa households were less frequent than in other counties. Social visits to households were found to correlate with the number of children in a household (Pearson correlation significant at 1% level), although there was no correlation with children under 15 years of age. Wairoa was no different in this respect. The county which attracted fewest social visits was the county with the lowest household density and therefore requiring longer trips.

It is possible that households in Wairoa, being more isolated, have their over 15 year old children living apart from the household as they gain further education or have left home to work. The few exceptions were households involving young unmarried men who apparently entertain entire football and netball teams (frequently).

Trips to the household for farm purposes were analysed only for distance from the farm to town or large town. Neither revealed any 'deafness'.

3.2 Trips From the Household

Trips made by people living in the households represent two thirds of all light vehicle trips. Our questionnaire suggested trips might be made to a nearest shopping area, a town and a larger town or city. This was the trip generation pattern of a portion of

"LET'S LIVE IT UP AND STAY IN TOWN TONIGHT?!"

Matamata households but very few others. Some farmers live in town and travel out to the farm each day. Those located close to a major town may do all their shopping there and apparently never leave the county. Table 2.17 in Bulletin 59 suggests the latter total may be 55 per cent of Matamata, 38 per cent of Wairoa, 65 per cent of Ashburton and 98 per cent of Southland households.

Trip generation predictors were identified with Pearson correlation coefficients being significant for number of vehicles and trip distances.

3.3 Factors Associated with Trips From the Household

Table 4 demonstrates the impact of increasing vehicle numbers on the generation of trips. Three per cent of households have no vehicle but still make a trip from the house every second day. From our survey we are unable to ascertain if this is additional traffic, e.g. taxi or using a farm vehicle, or alternatively utilising existing traffic by hitching a lift with a neighbour.

TABLE 4

Vehicles Held by Household and Trips From the Household

No. of Vehicles	0	1	2	3+
No. trips/month	29.0	46.6	59.8	61.2

Trips to the nearest shopping place (Table 2.14, RRU Bulletin 59) are influenced in Wairoa to a greater extent by the increasing numbers of cars available after the first, than is the case in any other county. However, the most frequent trips to the nearest shops were made in the county with the shortest distance to travel. In each of the other counties, a not inconsiderable proportion of households (Wairoa 20%, Ashburton 19%, Southland 13%) reported they have more than 45 kilometers to travel to the nearest shopping place; these households make considerably fewer trips than those who have less than 20 kilometers to travel.

It is possible that some of those reporting they have to travel more than 45 kilometers are travelling past closer shops. A full analysis of 'deafness' would require this line of investigation to be pursued.

In making trips to town or a large town/city, Wairoa trip generation levels are again lower than for other counties (see Table 2) but occupancy rates for vehicles are a little higher (Table 5).

TABLE 5

Vehicle Occupancy Rates

	Matamata	Wairoa	Ashburton	Southland
Town	2.1	2.6	2.1	2.1
City	2.4	2.8	2.2	2.5

The limited regression analysis carried out but not published indicated that, at the county level, distance was the major explanatory factor (variable) in predicting trip generation. My limited search for deafness has therefore concentrated on trip length and I have shown it to correlate with trip generation from the household. Wairoa households need to make longer trips and make them less frequently.

3.4 Other Trips

You will be thinking of generators of rural trips that we have missed, getting kids to school, Federated Farmers and Young Farmers Clubs meetings, trips from the farm to work elsewhere, door to door salesmen, meter readers etc. Where did they all go? The latter type were classified as household servicemen. Also, if you have seen the questionnaire appended to Volume I (RRU Bulletin 59) you will recall that the town trips also sought the reason for the trip and added prompts such as pub or club, church or farm business, shopping, visiting etc. Another small scale but intensive study carried out

"I SEE HE STILL REMEMBERS YOU AS THE SALESMAN WHO SOLD US THE WEEVILY DOG BISCUITS."

from Lincoln[1] among Taieri Plain dairy farmers found, like this one, that farmers make multi-purpose trips and the longest trips have an element of recreation associated with them (23% of all distance was solely recreation, 14% domestic and recreation). Trips to school, Federated Farmers etc. become lumped according to destination (i.e. usually town). We also found that while some respondents crossed out hotel and ticked church, no-one did the reverse. Music lessons, gymnastics, ballet, scottish country dancing, cubs and scouts were all mentioned, particularly in Southland, and are included by destination. Many Wairoa returns mentioned religious proselytizers. Ashburton respondents commented on school bus inadequacies.

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1 W.J. Adam, "The Car in Rural Society: A Survey of the Use of Cars by Dairy Farm Households in Henley, Otago", Unpublished major project in Rural Development and Extension Course, Lincoln College, 1981. Trip generation from 25 households was 85 trips per month per household.

In this mostly descriptive exposition, I hope that 'deafness' has been to a large extent explained in terms of 'noise' decreasing with distance.

IV A COMMENTARY ON HOUSEHOLD TRIP GENERATION

D.C. Johnston, Department of Geography, University of Canterbury.

Publication of Road Research Bulletin 59 Rural Transport Studies marks an important step in the move to put rural transport planning and decision-making on a rational and equitable footing. This brief commentary will focus on three main points: (i) the value orientations implicit in the report, (ii) the social context of household trip generation, and (iii) the modelling of rural trip generation.

A reading of Rural Transport Studies soon reveals value orientations that put freight transport significantly ahead of personal travel in importance. The report provides much more information on freight transport, going into issues such as the seasonality of flows, the spatial pattern of flows (including possible changes in the pattern) and modal split. Furthermore, the reader is encouraged to have much greater faith in the quality of the freight data as they were collected in terms of the separate consignments (if not truckloads) whereas the personal trip data were sought in terms of the number of trips in an "average" month. In particular, the number of trips to school (or is it to "school activities"?), averaging between 1.0 and 1.4 per household per month, looks suspect. Finally, the two sets of results are presented in a way that discourages comparison: household generation figures are reported as vehicle trips per household per month whereas freight generation appears as vehicle trips per 1000 hectares per annum. An uncritical reading of the report could lead to the conclusion that freight trip generation rates were much higher and that household generation was therefore an unimportant component of rural road transport. The situation is not quite so simple. An attempt has been made to render the two sets of results comparable by using the information given in Table 2.5 of Volume 2 to estimate an average number of households per 1000 hectares of farmland for each county. The calculations are summarized in Table 1 in terms of vehicle trips per 1000 hectares per month. For each county the number of household vehicle trips greatly exceeds the number of freight vehicle trips: the difference ranges from a factor of 6 for Matamata to almost 18 for Southland.

TABLE 1

Household and Freight Trip Generation: A Comparison

		Matamata	Wairoa	Ashburton	Southland
(i)	Freight trips per 1000 hectares per annum	4271	146	442	414
(ii)	Freight trips per 1000 hectares per month	355.9	12.2	36.8	34.5
(iii)	Households per 1000 ha.	23.4	2.4	6.5	7.1
(iv)	Vehicle trips per household per month	92.7	69.0	89.7	86.1
(v)	Vehicle trips (household) per 1000 ha per month	2169.2	165.6	583.1	611.3
(vi)	Ratio household trips to freight trips	6.1	13.6	15.8	17.7

Sources and Method:

(i) Table 3.5, page 29, Volume 2.

(ii) Derived by dividing row (i) by 12.

(iii) Estimated from Table 2.5, page 11, Volume 2 by weighting the figures given by the number of farms in each farm type.

(iv) Table 2.23, page 19, Volume 2.

(v) Derived by multiplying row (iii) by row (iv).

(vi) Derived by dividing row (v) by row (ii).

Given appropriate assumptions on the average weight and speed of each vehicle it would, no doubt, be possible to calculate the relative impact of the two types of trips on road pavements and hence to derive the relative contribution of each to the need for maintenance. The essential point to be made here, however, is that household trip generation is not an insignificant aspect of rural road transport.

My second topic concerns the social context of household trip generation. According to the foreword of Rural Transport Studies, the production of our rural households generates a high proportion of New Zealand's overseas income. Yet those rural households are declining, both in absolute numbers (since the 1960's) and in relation to the population in urban areas. In 1926, 32.8 per cent of New Zealand's population were classified as living in rural areas (settlements of less than 1,000 people); by 1976 the proportion was 17.0 (Neville, 1980, p. 264). Several reasons can probably be given to account for this trend, of which two of the more important would be (i) increased mechanisation requiring less labour, and (ii) dissatisfaction with the quality of life in rural areas. One of the important effects of rural depopulation, however, is to reduce the range of facilities available to those who remain in rural areas. This long term decline in rural facilities has been compounded by the recent petrol price increases, which tend to raise the prices of goods and services at rural outlets relative to those at urban ones and so encourage rural dwellers to make efficient use of their transport resources by multi-purpose trips to, and bulk-buying in, urban centres.[1] The amount of trade going to local businesses is thereby diminished further, thus increasing their chances of following many other rural establishments into closure or transfer to a larger centre (see Cant, 1980, p. 7 for the example of Eketahuna). Even without the progressive loss of local amenities, the rural dweller has much further to travel, has to spend more time travelling and has fewer choices with regard to mode of

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1 A recent survey of 141 households in the Springfield, Oxford, Hororata and Methven areas indicated that 24% of the households bought groceries most frequently in Christchurch. In all, 38.3 per cent of the households purchased their groceries in localities other than the one with the nearest grocer outlet.

transport than the urban resident.[2] Rural households become acutely aware of their dependence on "their" road: the condition of that road assumes great importance in the perceived quality of life. In contrast, the urban dweller will rarely notice the condition of the road past his gate, though he may be aware of the volume of traffic that it carries. Rural households also tend to regard the private motor vehicle as a necessity imposed by their residential location; that they just have to bear the costs and sacrifice other aspects of their preferred lifestyle in order to do so.[3]

These comments lead to the conclusion that the private car and the condition of rural roads are essential and inescapable elements of the quality of life in rural areas. If we wish to retain sufficient population in rural areas to produce the primary goods that our economy depends upon then, at the very least, we must take steps to ensure that the rural travel problem does not deteriorate further. Planning and rating procedures, could be developed to minimize the effects of the ongoing centralization of facilities in larger towns by, for example, promoting the establishment of mobile and/or part-time amenities. Another approach could lie in the rethinking of procedures for allocating maintenance and construction funds so that the rural dweller is not perpetually penalized for living on the land at the end of the road.

The last point in this section concerns the easy assumption that all rural households have private vehicles and therefore have control of their transport situation. Studies in Rural Transport reveal, however, that 3.2 per cent of the households had no vehicle and 3.4 per cent had no driving licence.[4] Those figures cannot be

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2 See Table 2.1, page 9, Volume 2 for average distances to post offices, nearest shop and large town for the surveyed households. Sparrow (1979) has some revealing data on these points, particularly on the length of school day for school children.

3 McLean, 1978, p. 66, indicates that the burden of the situation falls more heavily on non-farm households because farmers were able to claim a large part of their car expenses for tax purposes (cited in Sparrow, 1979, p. 97).

4 Constraints on household travel are even more apparent when one considers that 8.4 per cent of the households had only one licence and 42.1 per cent had only one vehicle (Appendix 1 and Appendix 2, p. 66, Volume 2).

explained away as unfortunate aberrations of the sampling procedure followed by this study: a 1975 survey indicated that 10 per cent of rural households had no private car to visit the doctor (Department of Statistics, 1980, p. 15). Over the whole of the country the proportion of rural households that do not have access to private transport is undoubtedly small. But there are households in such a situation and numbers could well increase as the age structure of the population gets older. Interestingly enough the report makes no mention of public transport even though school bus services are of considerable importance in most rural areas. Were the 29.0 trips per month made by households without vehicles provided by generous neighbours?

Finally, I wish to make some comments on the specification of a rural transport generation model. My earlier comments on the different presentation of the household and freight results lead to the question of the base unit that could be used for an integrated model. The farm and the county were both rejected by the report which settled for standardization of freight movements in terms of trips per 1000 hectares of farm land. It is possible to translate household generation to the same base but the areal unit does not provide a logical link to the stated objective of developing a model that could relate changes in traffic generation to changes in type or intensity of land use. An alternative procedure could be to stratify the model by levels of population density. Population figures are readily available from the five yearly census and trends and forecasts are relatively easily obtained. Furthermore, the density base would provide a link to the intensity and, perhaps, type of farming activity, thus facilitating the prediction of changes in transport generation from changes in land use intensity.

It is also necessary to query the decision to develop a rural transport model solely in terms of the trips generated by households located on farms. Even if one ignores the impact on the road network of through traffic, there is still the question of the role of non-farm dwellers in rural areas. Some figures from the 1976 Census attempt to put this point in context. The total population of Ashburton County (excluding Ashburton Borough) was 11,091: 17.6 per cent of that population resided in the three townships of Methven, Rakaia and Hinds, and there are several other settlements in the county which

clearly include non-farm households (Department of Statistics, 1977a, p. 34). Some 37 per cent of those actively engaged in Ashburton County (excluding Ashburton Borough and Methven) were employed outside of agriculture, hunting, forestry and fishing (Department of Statistics, 1977b, p. 21). Nearly half (47.1 per cent) of the actively engaged population in the same region worked at a location other than their own home or property (Department of Statistics, 1977b, p. 38). There is therefore a substantial non-farm population in rural areas that should be included in a rural transport model. Furthermore, there would appear to be a significant amount of movement from farm households to off-farm employment that was not explicitly allowed for in Rural Transport Studies. Basing the sampling procedure on all households resident in rural areas would (i) resolve the problems highlighted above, (ii) remove the difficulty of an arbitrary hectarage value used to define what is/is not a farm (Volume 1, p. 50) and (iii) generate a realistic data base for the discussion of rural transport in toto.

Finally one should note the variability of household trip-making behaviour and the need for a coherent model of household trip generation if any attempt is to be made to predict future transport patterns. Table 2.23 in Volume 2 summarizes household trip generation for each county in terms of the mean number of trips per household and the standard deviation. In each case the standard deviation is large (coefficients of variation range from 57.5 for Ashburton to 69.6 for Wairoa) indicating that individual household figures vary substantially around the mean. The report states that vehicle ownership and distance are the most important determinants of household trip generation. However, the precise nature of the relationship is far from clear and could do with further attention particularly if, as seems possible, trips to school and off-farm work were not included in the analysis. Further studies of rural household trip generation are needed to investigate possible relationships with farm type and population density (which were not explored in the report) and to examine the stability of household trip behaviour over time - a crucial element if future behaviour is to be predicted.

In conclusion, the three major points made in this commentary can be summarized briefly:

(i) Household trip generation is a significant component of rural transport.

(ii) The social context of rural households requires the identification and implementation of procedures to ensure that the rural travel problem does not deteriorate further.

(iii) Further work is required on the specification and testing of a model of rural household trip generation.

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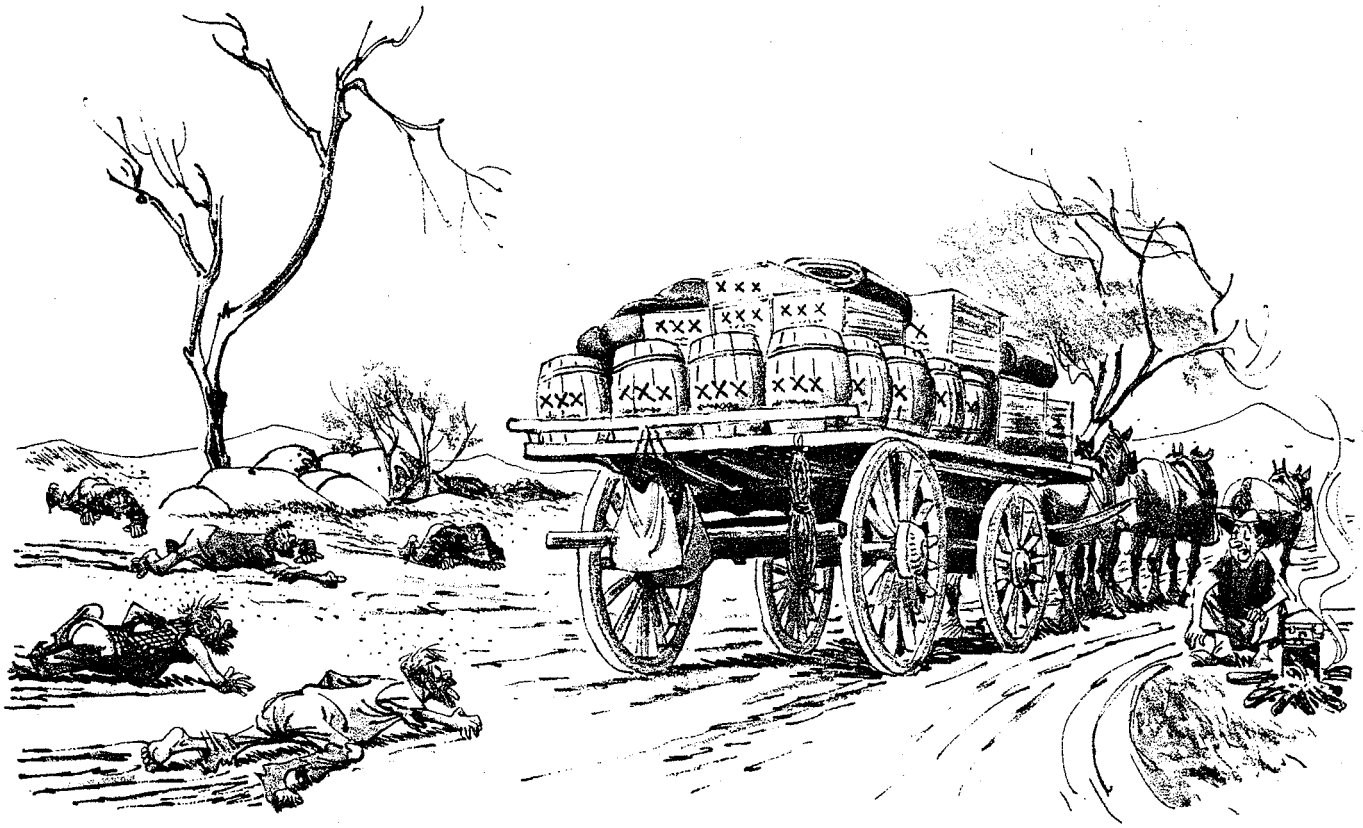
V. SURVEY RESULTS: FREIGHT TRIP GENERATION

R.L. King, Agricultural Economics Research Unit, Lincoln College.

In this session we are discussing the trip generation of heavy vehicles (greater than 3.5 tonnes gross) moving commodities on and off farms.



"YOU CAN ALL CUT THE PLAY ACTING - IT'S WEED KILLER!"

1. Quantity by County

A good starting point is the weight of commodities moved on and off farms on a county basis (see Table 1). The totals are similar in intensively farmed areas and vary from extensive to intensive by a factor of about 3. It is worth noting in relation to the Ashburton figures that the pilot survey[1] found the quantities moved on to farms equalled the quantity moved off. This was not

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[1] T.I. Ambler, Use Made of Transport by Farmers: A Pilot Survey with Findings Relating to Ashburton County, New Zealand. Discussion Paper No. 30, October 1975, Agricultural Economics Research Unit, Lincoln College, University College of Agriculture.

TABLE 1

Weight of Commodities by County

(Tonnes/1000 Ha.)

Commodity	Matamata	Wairoa	Ashburton	Southland
To:				
Fertiliser	506	177	549	524
Livestock	157	48	59	188
Total	663	225	608	712
From:				
Milk	268			10
Livestock	513	184	260	368
Crops	80	20	580	144
Wool	11	18	33	30
Total	972	222	873	552
Total Weight:	1535	447	1481	1264

so for Ashburton in this survey and in total over all counties, 54 per cent of all commodities moved off farms. The heavy vehicle trips moving those quantities average slightly more than six tonnes per loaded trip plus the associated empty trip. Heavy vehicle trips by county therefore correlate closely with tonnage by county (Table 2).

TABLE 2

Trips by Commodity by County

(Commodity Trips/1000 Ha./Annum)

Commodity	Matamata	Wairoa	Ashburton	Southland
To:				
Fertiliser	190	46	185	171
Livestock	71	17	21	57
Total	261	63	206	228
From:				
Milk	3773			11
Livestock	211	68	100	127
Crops	15	4	117	30
Wool	11	11	19	18
Total	4010	83	236	186
Total Trips:	4271	146	443	414

2. Trips by Farm Type

Dairy farms generate the most trips on a per farm basis. Milk transport in Matamata generates 26.8 daily trips per 1000 ha. each day of the season (256 days). The articulated tanker and trailer units visit about four farms (Morrinsville Dairy Co.) to complete a load before they return to the factory. Similar multi-pickup circuit trips include bobby calf pools and for delivery, the rural delivery service cars. After dairy farms, cropping farms (Table 3)

TABLE 3

Heavy Vehicle Trips Generated by Farm Type

(Number/1000 Ha./Annum)

County	Crop	Dairy	Store Sheep	Fatten Sheep Breed Ewes	Fatten Cattle	Fatten Sheep Buy Ewes
Matamata	1362	7312	599	462	926	450
Wairoa	304		108	130	927	684
Ashburton	529	3191	252	391		392
Southland	489	2592	356	364	546	487

are the next biggest generators of commodities requiring transport and hence trips. Individual cropping farms may produce large quantities to be transported a long distance in a short time period.

Cattle fattening is another enterprise type that is a large trip generator because few animals can be transported in each vehicle trip and stock is usually bought in for fattening. Insufficient numbers of these farms were encountered in the survey to draw significant conclusions about their trip making.

Farms buying in ewe replacements and fattening stock generate more traffic than do farms breeding their own ewes and fattening stock. Farms that buy in could be buying young two tooth ewes or aged ewes. Initial separate analysis of these two groups revealed no consistent trends so they were lumped together.

Store sheep enterprises are generally the lowest traffic producing enterprise types. Most important are the large commercial units. In the three southern counties, the survey did include retired farmers managing up to 40 ha. on this system, some of them apologetically explaining they were not 'real' farmers and hoping they had not upset the survey. These smaller units were also less intensive producers and trip generators.

3. Variation in Trip Generation by Size of Enterprise

Variation in trip generation by size of enterprise was assessed from visual examination of the tables published as Appendix 4 in RRU Bulletin 59. If we assume that farmers are profit maximisers, then it follows they will try to minimise transport costs by minimising the number of trips and the length of each trip.

As Matamata dairy farms quadruple in size the quantities of commodities (milk excluded) increases at nearly the same ratio but the trips generated increase by only 10 per cent indicating that substantial economies of scale exist in the transport of fertiliser, bobby calves, boners, fencing materials etc. Because of the farm gate definition, trips per 1000 ha. drop dramatically because each farm has one milking shed. Considerable analysis of dairy processing plant location has been undertaken in New Zealand so, to avoid duplication of effort, we did not investigate beyond recording numbers of trips.

Wairoa farms fattening sheep and breeding ewe replacements revealed economies of scale in trip generation per unit area as farms increased in size up to 500 ha. Beyond this size, productivity and trip generation per unit area both declined. This was also the case as store sheep farms increased in size.

Ashburton results are characterised by large standard deviations. My personal interpretation is that we have two populations, a dryland farm population and an irrigated farm population. We did not collect information about whether or not irrigation is used.

However, the deviations are lower in store sheep farms and these would all be dryland farms.

Similar trends to those observed in North Island counties were observed in all Southland farming types. A small number of Southland farms appear to be managed as staging posts for trading activities rather than the more customary agricultural practices. (One 200 ha. farm generated 20,000 stock head trips).

Most farmers appear to endeavour to minimise transport generation and do so by cutting down on number of shipments by increasing shipment size.

4. Trip Distribution

4.1 Seasonal

Increasingly southerly location tends to increase the dominance of the peak trip generation period (Figure 1). Matamata has an uneven nine month base level (7% of annual trips each month) with a three month autumn peak. Wairoa has a four month winter trough (4-5% per month) and a seven month summer plateau (10-11% per month). Ashburton has a late summer peak and a six month low plateau (5% per month). Southland traffic generation progressed from a trough (2.2% September) to a peak (March 17.6%) and back again. Southland is the region with major utilisation of farmer owned trucks as well as being climatically different.

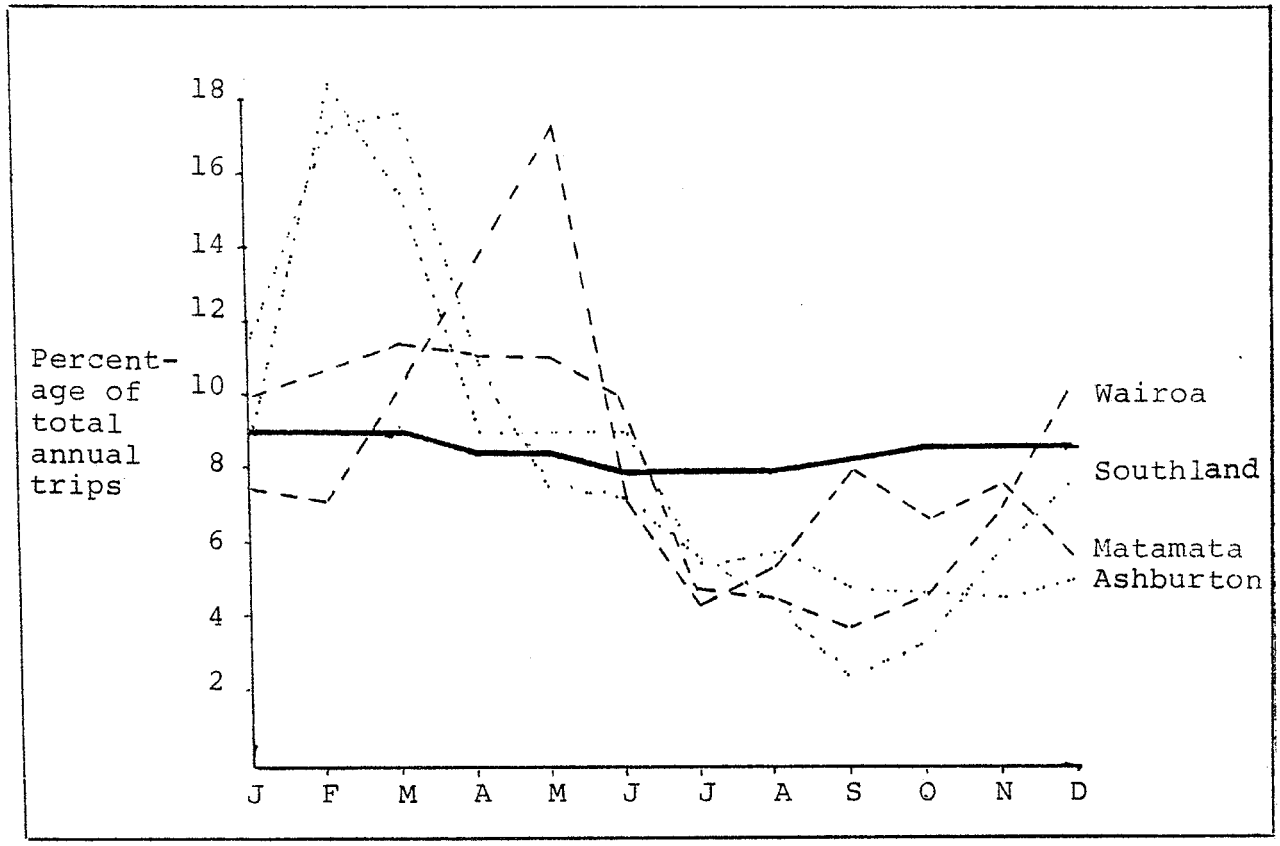
A graph is given in RRU Bulletin 59, Vol. 2, p. 34 that compares the 1973 trip generation with 1978. A major snowstorm in August 1973 generated many trips as livestock were moved from inland farms to coastal farms for grazing and later moved back again.. Nearly 11% of that year's livestock movements were a response to that storm and these would be additional traffic. This graph indicates therefore the variation that can be found within the seasonal generation cycle.

Figure 1 has included a forestry trip generation pattern derived from a brief survey I did of all N.Z. registered sawmills (response rate 42%) late last year for the Road Research Unit.

FIGURE 1

Monthly Distribution of Heavy Goods Trips

Key --- North Island counties farm traffic
... South Island counties farm traffic
___ Forest traffic generated by forest processing plants



Notice that traffic generated by traditional agriculture is at a low level in winter when road strengths are most likely to be affected by water while forestry traffic generation does not decline as much. One forest conservancy did mention that production areas do vary with the season and that in winter, private millers tend to draw from state forests because roads are better.

4.2 Spatial

Spatial trip distribution was investigated from the profit maximisation viewpoint, i.e., farmers would prefer to buy from and sell to the closest possible point to minimise transport costs. Exceptions could be wheat which is sold f.o.r. and export sheep for which the farmer is charged freight only to the nearest port freezing works.

Livestock moving to farms is not a major trip generator. The source of supply for most farmers buying stock was saleyards (Table 4) and the trip length involved is therefore a function of saleyard density. Small shipments of stud stock often generated much longer trips.

TABLE 4

Sources of Livestock Moving to Farms

(% Wt)

	Matamata	Wairoa	Ashburton	Southland
Saleyards	68	69	70	82
Farmers	30	23	30	18
Others	2	8	0	0

The quantity of fertiliser applied varied by approximately 25 per cent between highest and lowest years during the 1970's while stock units remained fairly constant. The distribution of fertiliser is detailed in RRU Bulletin 59, Vols 1 and 2. In summary it would appear to be rationalised with spreader vehicles collecting from phosphate works or lime crushing plants if their on-road trip can be made in approximately an hour or less. Longer on-road hauls are made by large truck and trailer units operating with high load factors

carrying to depots. Spreader trucks then operated from this depot network. In Wairoa, rail was extensively used to move fertiliser into the county and road transport then moves approximatly 80 per cent to airstrips for aerial spreading or spreads the remaining 20 per cent.

Most wool goes to auction and almost exclusively to the nearest auction centre (Table 5). Wool and fertiliser can thus be regarded as generating minimum distance trips despite the fact that wool, of all products, could best absorb transport charges incurred beyond the closest point of sale.

TABLE 5

Wool Sold at Auction

Matamata	Wairoa	Ashburton	Southland
47.5	92.4	84	86.2

Auction Centres Used

County	Centre	Percentage
Matamata	Auckland	100
Wairoa	Napier	100
Ashburton	Timaru	28
	Christchurch	70
	Unknown	2
Southland	Invercargill	97.1
	Dunedin	2.2
	Timaru	0.4
	Unknown	0.3

Crops generate the longest trips even though farmers frequently do not know the final destination of the crop. For example, wheat is consigned to the nearest rail store and that is it as far as the farmer is concerned (and the roading engineer also). An impression was gained that many of these long range linkages involved personal relationships that could be broken if farms were sold. Detailed crop movements are given in RRU Bulletin 59, Volume 2.

Livestock movements from farms are dealt with in some depth in RRU Bulletin 59. Most go to freezing works (the closest) or the closest port freezing works. Taking Ashburton as an example, 55.6 per cent of stock go to local works but 98.8 per cent is processed at either Christchurch, Ashburton or Timaru which involves no extra transport if it is to be exported.

Farmers are dependent on an efficient transport system to give their products value. In the vast majority of cases farmers, acting as rational economic decision makers, are purchasing from the closest suitable source of supply or consigning to the closest place of sale or processing point.

5. Mode of Transport Used

Overwhelmingly the mode most used is commercial road carrier (Table 6). Exceptions are bulk milk which is a market the carrier has almost entirely lost, and dry products in Southland. In that county 52.6% of crop trips, 50.6% of wool trips and 42.6% of fertiliser trips are made in farmer owned vehicles. Farmers do not appear to be purchasing livestock crates. Less than 20% of livestock trips are made in farmer owned vehicles.

TABLE 6

Tonnes Conveyed by Each Mode

(%)

	Matamata	Wairoa	Ashburton	Southland
Commercial Road + Rail	2	21	3	0
Farm Truck + Rail	0	1	1	0
Commercial Road	88	68	78	70
Farm Truck	11	8	17	30
Droving	little	1	2	0

Farms in Separate Blocks

(%)

Matamata	Wairoa	Ashburton	Southland
22	40	51	49

In Ashburton, between the two surveys 1974-78, rail usage dropped from 10% to 4% (wool 60% to 1.7%) and farm truck usage increased from 6% to 17%. Approximately 28% of the counties' wool and fertiliser were carried on farm trucks.

Droving was mentioned only in connection with the moving of stock to sale. It was found to be a fairly common practice for farms located close to Ashburton freezing works. Elsewhere it was rare.

Very few farmers mentioned moving stock for agistment and even fewer mentioned moving stock on roads between separate blocks of the same farm. Most county engineers will agree that this is a relatively common practice and Table 6 indicates that in non-dairy areas, 40-50% of farms could be generating this traffic (more a safety than a wear problem).

6. Farm and Forest

A 'broad brush' approach to forestry was adopted following discussions with N.Z. Forest Products and several state forest conservators to gain an indication of relative traffic generated by traditional agriculture and forestry.

To relate forest trip generation to agriculture, production from a forest at normality was used. Trips were based on vehicles in use on the Napier-Taupo highway in 1980, i.e., three axle trucks and two axle trailers working within 36.3 tonnes gross weight on class 1 roads. Only final forest production traffic was considered but this is the major traffic generator.

Table 7 indicates that at the county level, forestry does outproduce agriculture on both a tonnage and a trip basis.

TABLE 7

Farm and Forest: Tonnage and Trips

	Matamata	Wairoa	Ashburton	Southland
Farm Tonnes	1,545	463	1,506	1,341
Forest Tonnes	23,300	23,300	11,133	16,740
Farm Trips	4,232	124	384	376
Forest Trips	1,866	1,866	890	1,116

Table 8 indicates the relative traffic generated from farming and forestry.

This exposition has been a summary of RRU Bulletin Vol. 2. That volume should therefore be referred to where further details or analysis are required.

TABLE 8

Farm and Forest Transport Generation/1000 ha/Annum[c]

Land System	Typical Area	Transported Tonnes		Heavy Vehicle Trips	
		Farm	Forest	Farm	Forest
South Island High Country	McKenzie	17	9,500[b]	18	760[b]
South Island Hill Country	Cheviot	138	15,000	62	1,200
North Island Hard Hill Country	Taumaranui	394	16,575	140	1,326
North Island Hill Country	Raglan	579	23,300	186	1,860
North Island Intensive Fattening[a]	Hawkes Bay	1,415	33,960	449	2,717
South Island Intensive Fattening	Southland	1,455	14,000	462	1,120
South Island Fattening Breeding	Waimate	861	14,000	254	1,120
South Island Mixed Fattening	Ellesmere	1,169	11,133	409	900
South Auckland Dairying	Matamata	6,820	23,300	7,312	1,860

[a] This figure from the Esk Forest probably represents the peak production level. The Hawkes Bay Average, all species, is 23,447 tonnes (1,876 trips). Equivalent intensive fattening land in the Manawatu-Wanganui area gives forestry yields of 21,600 tonnes (1,728 trips).

[b] Forestry figures are projections from trial plots at the Craigieburn Range, Canterbury (900-1300 m altitude). They are Corsican pine and Pinus ponderosa harvested in totality (20 tonnes per trip) for conversion to ethanol.

[c] These figures are from effective area. Production from total area would be slightly lower.

VI. PLANNING FOR GOODS MOVEMENT IN RURAL AREAS

A.J. Nicholson, Department of Civil Engineering, University of Canterbury.

1. Introduction

This paper has essentially two purposes. Firstly, it is intended to serve as a commentary upon the goods movement aspects of the rural transport study, reported in Road Research Unit Bulletin 59 'Rural Transport Studies', especially Volume 2, 'Traffic Generation'. As well as commenting upon the methodology of the study, the paper is aimed at high-lighting selected study results.

The second purpose of this paper is to discuss certain aspects of currently used methods for planning road networks in rural areas, and how they may be improved, using the data obtained from the rural transport study.

2. Study Methodology

The study methodology has been based very much upon the planning procedures and techniques of urban transportation planning. Those procedures and techniques have evolved over a period of about 25 years, with about 30 urban transportation studies having been carried out in New Zealand to date (1982). The study reported in Bulletin 59 is, to my knowledge, the first effort ever made to assess the nature of the demand for transport in rural areas, as has been done so frequently for urban areas. It seems logical to have made use of the considerable body of knowledge acquired in the course of urban transportation studies.

This rural transportation study does, however, differ markedly from previous urban studies in the emphasis placed upon goods (or freight) movement relative to personal travel. Urban transportation studies to date have almost invariably dealt primarily with person-trips, with goods-trips being given very little attention. During this study, goods movement has clearly been given more attention than personal travel. This change in emphasis is very largely due to the

concern about the effects of land use changes upon the rural road system. Changes in goods movement, manifested by a change in heavy vehicle movement, will obviously have greater impacts upon the road network than will changes in the pattern of personal travel. Whilst in urban areas traffic congestion is generally the major concern, in rural areas pavement and bridge strength and durability are generally of greater concern to roading authorities.

One may be inclined to question the appropriateness of urban transportation planning methods applied to rural transport. Such doubts may be based upon the feeling that the role of transport in rural areas is intrinsically different to that in urban areas. However, the purpose of a transportation system is simply to serve the needs of the activity system (what people do and want to do), and it is becoming increasingly apparent that people living in rural areas have aspirations more similar to those of urban dwellers than one might have imagined. 'Urban versus rural' comparison has been made easier as a consequence of adopting a similar methodology.

Urban transportation planning techniques and procedures are being subjected to increasing scrutiny and criticism, because they appear to be ill-suited to addressing some crucial issues concerning urban transport (in particular, the environmental impacts). Those techniques and procedures have been developed largely by traffic engineers who, 'with a predominantly civil and highway engineering background (have) brought a rural philosophy, methodology and practice to the urban transport scene' (Blunden, 1982). Blunden also suggests that 'the right of eminent domain is easy to justify in the country', with 'the interaction with the land use through which the rural highway passed (being) virtually non-existent'. It may very well be that the procedures and techniques of urban transportation planning are better suited to rural transport planning.

It is worth noting that as part of this study, land uses in rural areas have been classified largely according to their transport requirements. This differs from land use classification in urban areas, where the land use classification system is geared towards

the achievement of an adequate separation of 'incompatible' land uses (i.e., 'obnoxious' activities, such as industry, are separated from certain other land uses, such as residential). In view of the strong relationship between land use and transportation, the land use classification system should differentiate land uses on the basis of their transport requirements (as well as the other factors), as in this study.

3. Study Results

Goods movement generation rates have been given in both 'trips/year/1000 hectares' and 'tonnes/year/1000 hectares'. The latter information is more basic and probably more useful in the longer term. The number of trips required to service the transport requirements of a particular land use may change as a result of changes in the rural transport fleet and its mode of operation, without there being any change in the quantity of goods transported. 'Trips' are derived from 'tonnes', and there is greater scope for change in 'trips/year/1000 hectares' than in 'tonnes/year/1000 hectares'. That is, the former is more volatile, perhaps, and is therefore less reliably predicted. Recent research on urban goods movement indicates that goods generation data in terms of 'tonnes' are more useful to transportation planners (Smith and Douglass, 1982).

The goods generation rate of farms in Wairoa County, whether in 'trips' or 'tonnes', is about 1/3 of that of the other three Counties, which have remarkably similar goods generation rates when milk is excluded. Wairoa County is more remote (or less accessible) than the other Counties. It seems that with traditional (pastoral) agricultural activities, there is a good balance between transport demand (i.e., the transport required to serve the chosen activity) and transport supply (i.e., the transport service which is or may be available). Such activities generally developed at a time when transport was relatively expensive.

In recent times, however, transport has been relatively inexpensive and has been largely taken for granted. Consequently, decisions regarding forestry development, and perhaps some horticultural activities, have involved a less-than-adequate consideration of the transport supply situation. Had the total cost of certain developments been considered at the beginning, then their economic attractiveness may have been substantially less and they may not have proceeded.

The problem confronting us now is to decide what ought to be done, firstly, to correct the current imbalance in certain areas (and the extent to which public funds should be used) and, secondly, to reduce the likelihood of such imbalances recurring.

The analysis of the spatial distribution of goods movement has revealed that less than 5% of trips carrying stock to processing plants are not 'maximum efficiency trips'. It seems that this proportion is substantially lower than an earlier study suggested, and one wonders about the extent to which this change is due to a greater awareness of transport costs.

The study results indicate that the spatial distribution of goods movement and the mode of transport are both much more reliably predicted for rural areas than for urban areas. Given the more sparse nature of road networks in rural areas compared with urban networks, it is expected that the assignment of vehicles to the rural network (to produce link volumes) could be done with reasonable confidence.

The study has revealed that with pastoral land uses, there are very pronounced seasonal effects, with the bulk of goods movement generally occurring during the summer, when road pavements are less likely to be affected by moisture and are better able to cope with the loads upon them. However, a more recent study (King, 1982) has revealed that with forestry traffic there is very little seasonal variation. Consequently, the ratio of the impact of forestry to that of pastoral land use may well be very much greater than the simple ratio of tonnes/year/1000 hectares of forestry to tonnes/year/1000 hectares of pastoral land use. That simple ratio appears to range

typically from 10 to 40. The results of the two studies have confirmed that the concern regarding the impact on the roading system of converting land use from pastoral to forestry is well justified.

4. Rural Transport Planning

Roading design currently entails predicting the number of equivalent design axles (EDA) that will traverse a section of road during the chosen design life of that section of road. The prediction of number of EDA is generally based upon:

(i) wheel load surveys, to determine load factors for each commodity and/or vehicle type, and EDA-rate; and

(ii) commodity surveys, to determine EDA-rate, using the load factors determined by previous wheel load surveys.

The predicted number of EDA in the design life is based upon the observed EDA-rate in the base year and a growth factor (if appropriate). This procedure, which involves extrapolating from the current situation, does not readily enable changes in land use to be taken into account.

The information provided by the rural transport study enables one to use an alternative approach, which would take account of land use changes, as follows:

(i) predict land use for the study area;

(ii) predict goods generation (tonnes) rate for each commodity;

(iii) predict goods distribution for each commodity;

(iv) assign goods to trucks (tonnes to trips), giving EDA per truck; and

(v) assign trips (trucks) to road network (existing and alternatives), giving EDA for each link in network.

A test of this alternative approach would be worthwhile. If successful, this approach should then be put into use for rural transport planning.

One should beware of becoming obsessed with predicting the number of EDA, as there is more to road design than simply ensuring a pavement depth appropriate for the predicted EDA. For instance, some rural roads may carry very few trucks, and the minimum pavement depth (e.g. to ensure frost heave does not occur and result in an unacceptable surface for use by cars) may exceed that required for the expected number of EDA.

Rural transportation would, I believe, benefit considerably from the adoption of a roading hierarchy. This concept has been in use in urban transportation planning for a considerable time, and a hierarchy has been devised for much of the rural road network in New Zealand. That hierarchy ought to be reviewed, in the light of the information obtained during this study of rural transport. It may well be that some of the assumptions, regarding which links in a network are really important, should be revised. For instance, links between some rural centres may be assigned a greater importance, while some links between rural and urban centres might be reduced in importance.

Adoption of the roading hierarchy concept will require acceptance of the principle that some roads may be considered worth maintaining at a lower standard than at present, while others warrant up-grading. It may well be that roads which are important with respect to goods movement are not the ones which are important with respect to personal travel. With the former, pavement strength and durability would govern, while with the latter, the road surface condition would govern. Depending upon the financial situation, it may be necessary to decide upon the relative importance of goods movement and personal travel when allocating roading funds.

5. Conclusion

The rural transport study reported in RRU Bulletin 59 is the first such study of the demand for transport in rural areas. A considerable amount of very useful information has been obtained, and it opens the way to more extensive studies of the demand for rural transport, using the procedures and techniques of urban transportation planning.

Rural transport planning would enable a thorough assessment of the transport impacts of alternative land use patterns, so that the present imbalance between transport demand and supply in certain areas does not recur (except as a planned transitional phase). Extensive planning is undertaken for urban areas. Given the importance of the rural sector in New Zealand, it is felt that rural planning (especially planning for the transportation of goods and people) is warranted.

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VII. IMPLICATIONS FOR THE DEVELOPMENT AND MAINTENANCE OF THE RURAL ROADING SYSTEM

F.W. Norton, Private Consultant.

Urban traffic and land use planners have for many years studied the traffic generation characteristics of individual urban land uses. These studies have for the most part been inspired by the techniques of land use zoning and the legal procedures used by 20th century town planning to regulate the changing of established land uses.

Urban land use zoning with its consequent separation in towns of the places where people live, work, play and shop, has created the journey to and from work and led to the modern transportation study and the subsequent definition of the traffic arteries needed to accommodate the cars that carry the many individuals that make that daily journey.

The procedures established in planning law to deal with proposals to change existing land uses and establish more intensive uses generally require those proposals be exposed to public scrutiny and give some right of objection to concerned parties. This exposure usually results in any adverse effects on neighbours being thoroughly ventilated. The most common of these effects is usually that of increased traffic hazard which has led traffic engineers and planners to undertake many studies of the possible environmental effects of various individual land uses. These studies have given the practitioner at least an authoritative guide to such things as the demand which will need to be met for off-street parking or for extra on-street carriageway capacity or for traffic control devices and has transferred much of the argument about the proposals being studied from an emotional to a factual basis. It also enables the road controlling authority to allocate the cost of any resultant changes required to the roading infrastructure by the proposed land use change to the developer should that be desirable or necessary. Recent changes to legislation - particularly those changes relating to development plans for large industrial complexes - may well make such factual knowledge of vital importance to local authorities seeking to shift the burden of infrastructure costs of "big" projects from their ratepayers.

The predominantly "single-use" type of development of urban sites and the aggregation of such uses into zones in towns has both emphasised the need for and facilitated the carrying out of traffic generation studies in towns with the result that we have acquired considerable data on the effects of specific urban uses on our urban streets - which make up about 15% of our total roading system.

In contrast to the urban scene, site usage in rural areas is often multipurpose, particularly when the land concerned is being farmed. There is also a vast difference between many undertakings that may be all described as "farming". Indeed farming may range from the large sparsely stocked runholdings of Central Otago to smallholdings completely covered with concrete and wastewater plants where pigs or poultry are battery reared and all feedstuffs imported. The roading demands of these extremes are patently different - but what are those demands and where have they been quantified?

Rural roads usually carry comparatively small numbers of vehicles. With the exception of some special purpose roads built for specific extractive industries or forestry these roads are multi-purpose and serve both the industrial and social needs of the districts they service. It is not usually possible to permanently direct heavy vehicles on to or away from particular roads and indeed controlling legislation seems to have been designed specifically to prevent this.

The width of carriageway required to provide safe passage of vehicles depends on the number of vehicles using the road concerned and the type of topography over which it is built. On low volume country roads it is not the total volume of vehicles that is important once the topography becomes undulating but the number of heavy vehicles. The many signs on country lanes giving warning of the use of those lanes by school buses bears witness to this fact and illustrates the sensitivity of rural roading requirements to even minor changes in traffic on those roads.

Any pavement capable of supporting Class 1 or Class 2 axle loadings (or even the now abolished Class 3) is capable of carrying an indefinite number of cars indefinitely without distress. This, combined with the elastic behaviour of pavements and the limitations this places on the life of those pavements, clearly makes the depth, durability and cost of both construction and maintenance of all-weather rural pavements dependent on, and a function of, the numbers of heavy vehicles using those roads and as total volumes are generally light in the rural scene, the number of cars can safely be ignored for pavement design purposes.

The demand for dust free surfacing of those same pavements may however well be a function of the total number of vehicles using the road and may even be independent of the number of people living alongside the road if crop or pasture damage by dust causes serious concern in intensively farmed areas.

The depth and type of pavement required to carry any specified number of design axles for the design life of the pavement depends on the type and bearing capacity of the subgrade materials over which it is built. It also depends on the amount of moisture present in the subgrades when the loads are applied to them.

It has been my experience that often the more fertile are the soils of a district the poorer are the bearing values of the sub-grades. If this observation is true and if more fertile soils lead to more intensive farming and this in turn results in more and/or heavier axle loadings on the roads of the district, then roading costs may well form a larger and more significant part of the cost of farming and farm produce from those districts than is the case in more marginal districts because this combination of factors would have a multiplier effect on costs far greater than that resulting from increased axle loadings alone.

Modern design approach to pavement design uses soaked CBR values to fix the bearing value of the subgrades and this value fixes the depth of metal used. It is thus the fundamental factor in the cost of the pavement. I am aware that some pavement designs have been used which make allowances for the drainage effect of sand-layers or other factors which provide good subgrade drainage and values greater than those arising in the fully soaked state have been used without adverse effect. I am also aware that it is possible in areas where seasonal subgrade moisture fluctuations make it worthwhile for the road controlling authority to reduce its maintenance costs and extend the life of its pavements by applying seasonal loading restrictions to the heavy vehicles using its roads. This of course is dependent on production and the demand for cartage being in phase with the subgrade moisture cycle. It is also very difficult to apply under the present legislation which, while retaining an appearance of preserving the autonomy of local authority, actually centralizes the control of such decisions to such an extent in practice that this type of control is now seldom used.

It is at present fashionable for land-use seminars considering future rural land usage and for political pressure groups concerned with capital gains to call for the widespread and unrestricted establishment of esoteric rural land uses on our limited stock of farmable land. This call is often accompanied by a demand for subdivision of that land into ever smaller lots without hindrance or enquiry by the local authority concerned.

If it can be clearly shown that such policies would result in diversification into products which are marketable and which will result in a net increase in the national product, there can be no real argument with those policies and it can be held that they serve the national interest even if they damage established users.

The cost of establishing such changes does however clearly include any costs of servicing the proposed new land uses and if the precedent provided by legislation relating to intensification of land use for industrial purposes is followed, they should be borne, at least in part, by the developer.

The largest pressure group making the loudest call for rural land use change at present is that made up of forestry interests comprising both state and private developers who have a common commercial interest in that development. They can and do make a very strong case for the massive development of commercial forests on lands at present being farmed as well as on scrub covered land and lands at present covered with native forests. In the more developed districts, "scrub" can mean many types of cover and that description generally covers anything from regenerating native bush to gorse and weed infested wilderness. It should therefore be treated with suspicion until its meaning is established because one man's "scrub" may be another's "native bush" and be a thing of beauty and worth preserving.

Commercial forestry is for the most part large scale and new commercial forests will involve large changes to rural land use. It will also require large changes to the infrastructure serving the districts where that change takes place and those changes will be costly. Unless fundamental changes are made to legislation to either permit road controlling authorities to tax or charge forestry concerns directly, or such power is given to the National Roads Board, and that body deals with the problem regionally via District Roads Councils or their successors, rural ratepayers will inevitably have to meet the bill. Should that prove to be the case, rural local authorities will have to be given some means of collecting roading development and maintenance contributions from foresters possibly for forests planted outside their territorial district, or in some cases face virtual bankruptcy. Undoubtedly some means of applying differential rating to forests will be required and it will be necessary to collect roading funds in time to forestall damage by logging traffic if the other rural road users are not to be adversely affected by that traffic.

Acceptable and satisfactory predictions of traffic flows from such usage, capable of use as a basis for such solutions, can only come from authoritative and provable data.

The study which forms the basis of this seminar has been based on data collected in four Counties selected for their predominantly rural character. These Counties are not close to any metropolitan area and therefore do not suffer the phenomena of "peri-urban" demands to satisfy the rural aspirations of urban workers for "hobby" farms. The land usage in these Counties is mainly some form of traditional farming or forestry. Despite this, the traffic generation of each County differs so much from the others as to earn the authors' description of each being "unique".

There are, however, some factors which do appear common to all:

(a) The number of "light vehicle trips" generated per household, when some allowance for the length of trips caused by the geography of the situation is applied, is in each case similar, and similar to the urban household generation rate.

(b) Farming uses display a marked seasonality in their transport demands. There is, however, no indication that this necessarily applies to forestry, there being insufficient information to establish this.

(c) Different rural land uses do have markedly different traffic generation characteristics. Dairy farming causes a much greater demand than meat, wool or grain farming. Forestry creates a much greater demand than any other rural use and causes more and heavier loads than any of the farming uses studied.

These findings bear with them the implications that extensions to this study to assess the traffic generating characteristics of specific rural uses could give information justifying differing planning approaches to different rural uses. I suggest that as there are varying degrees of intensity of urban land uses which justify the "zoning" approach and the levying of "development" charges on them, there are similarly more intensive uses in the rural scene which require similar differentiations be made.

To make the differentiations mentioned above would enable some rationalizing of roads and the establishment of a roading hierarchy for the heavy demands of the rural "heavy industries" identified and taxed for their creation. It would also require the extension of the urban research and planning techniques available in the metropolitan areas to rural New Zealand.

Whatever is done, and in this context doing nothing is a possible political choice, it is inevitable that rural land use change will result from the present pressures on our farmable land and it will happen soon. This change will have very great impact on our roads which can only be supportable if the roading infrastructure is developed in step with the change and the increased demands it brings.

It seems self evident to me that this will only be achieved if rural land use planning ensures an orderly transition from present usage to whatever follows. Such planning must include the power to raise the necessary finance and should consider the benefits and demands on the developer, the national taxpayer, and the local ratepayer, and allocate the responsibility to pay accordingly.

This study and those to follow are the only tool we are likely to have to enable the least painful development of our future rural roading system.

VIII. A VIEWPOINT ON RURAL ROAD NEEDS

K.H.P. Beck, Waimea County Council.

Transport is essential to rural living and no facet of rural transport receives more attention from rural people than the road itself. It is part of the fabric of the country way of life to which its importance must not be underestimated.

In considering rural roads, or for that matter when any existing road or roading network is considered, there emerges out of the great number of variables that can be taken into account two dominant factors. These are:

(i) The ability of the road (or the roading network) to meet the needs placed on it by its users at a particular time.

(ii) The ability of the roading authority concerned to meet the costs of satisfying those needs at that time.

The words "at that time" are important because needs continually change. They may alter, increase, decrease or vanish, so future needs (as well as the needs of the time) will influence determinations of the maximum economic return for roading expenditures made.

The ability of a road to meet needs is determined by all sorts of criteria but in the rural context the dominant need (when viewed from the rural users point of view) can be stated simply; that the dominant need is for a road of load bearing capacity adequate to meet the day to day requirements of the area, and having a sealed surface.

This may sound like an oversimplification but in the rural context I do not believe so. Rural roads are not too much troubled with traffic jams. Their users as a general rule are not over-fussed about technically correct geometrics and so on. In fact they are not too much worried about the whole science of roading so long as the roads provided for them allow them to get about their business with a minimum of restriction and discomfort. I believe that rural ratepayers are quite prepared, provided they can see the results, to pay for an adequate standard of roading in their localities because to

them this is one of the basic needs of their day to day existence. To me, it is a matter of some regret that the increasing pre-occupation of Local Authorities with the plethora of theories being put forward by all sorts of people on how Local Authorities should conduct their affairs, has resulted in a lowered emphasis on this fundamental basic need of rural communities. In the roading context this change in emphasis could be interpreted as a diminished interest in roading matters and I can't help wondering if this is part of the reason for the diminished amount of effective roading finance now available to the National Roads Board.

1. The Changing Rural Roading Scene

Today, great changes are occurring in the rural scene. The emergence of horticulture is changing traditional farming patterns. Many of the big industrial complexes tend to be sited in rural localities. Forestry is becoming a major industry in some rural areas. The rural dweller is becoming better educated, more sophisticated and more aware of the value of good roads as an integral factor of farming and associated operations. At the same time as these changes are occurring, the life of the roads built in the road building boom of the 1950's to the early 1970's is beginning to be used up, and more and more of those roads are requiring costly rehabilitation works to keep them in service. Rural roading authorities, as a result, are faced today with three dominant problems. These are:

(i) The need to meet the increasing costs associated with the rehabilitation and maintenance of their existing roading assets.

(ii) The need to cater for the costs of satisfying the changes mentioned above.

(iii) The need to meet the cost of normal demands for road improvement in any area.

All of this is occurring at a time when roading finance is at a premium, and this discussion will not have served its purpose unless it points the way to prove that an increased investment in rural roading in particular is essential, as road transport represents a substantial part of the 29% of the value of New Zealand's gross national product figure which transport costs represent. Finance for roading can only be obtained in competition with other demands on available funds, so a fully researched document is essential to demonstrate the need for increased funding for roading. This immediately opens up a wide area for research into the economic return of investment in good rural roads. Some individual areas of need are as follows.

1.1 Horticulture

The prime requisite for roads fronting a horticultural development is for a smooth dust free surface, as the export viability of many of the horticultural products is badly affected by dust or bruising on the way to market.

There are also side effects that emerge from changeovers in the farming scene that affect roads. When a dairy farm (say) is being converted to a horticulture usage, there is a considerable input of heavy loads (kiwifruit poles and the like). Many of these are carted on farmers' two axle trucks, and these can cause very severe road damage, particularly where there are low strength sealed roads that served the previous farming requirement quite happily. A survey I conducted in Waimea County indicated economic loss to growers from these causes. This may be very significant viewed nationally.

1.2 The Heavy Industry Move into Rural Areas

New heavy industries tend to be special cases requiring top grade roads for the input of raw materials and the outgoing processed materials. Fortunately such industries are usually a one-off situation in any locality. The investigations into the siting of such an industry invariably include detailed investigations into all manner

of services needed including roading. Some financial arrangements for necessary roading made with the industry itself can result. The development levy such an industry attracts can represent another avenue of assistance. The impact on a rural community of this type of development is always fairly severe. A rural Local Authority is usually not geared up to handle this sort of development adequately. It has neither the financial nor physical resources of major industrial concerns. It seems to me that its best strategy in such a situation is to require the concern to provide at its cost for an independent consultant to evaluate the roading impact of the proposed industry. Once this is done, roading options can be discussed, together with funding alternatives before final commitments are made. There is an increasing amount of this sort of thing today. A simple set of guidelines for rural Local Authorities' information in these situations, based upon experiences to date, could help significantly in sorting these problems out fairly and expeditiously.

1.3 Forestry

Forestry has always attracted publicity, mostly adverse, in the roading scene. This industry is a responsible and important part of our economy. As the appendices attached to this paper will show, forestry as an industry will continue to increase in New Zealand. The transport needs of the forest industry nationally were highlighted at the Forestry Conference of 1981 in the report of the Working Party on Transport. That group's conclusions, together with some tables extracted from its report are appended. At the local scene the effects of forestry are many and varied. Where the forestry is confined in a finite block, the problem is perhaps not so severe in that the haul roads can be defined and traffic largely confined to them. Where forestry is scattered through an area in different ownerships with different growth patterns, the problem becomes much more difficult. The movement of heavy forestry traffic is then more widespread. It may concentrate on a particular route, perhaps once in 30 years when the trees are milled. What are the economics of upgrading roads in this situation?

There is the social aspect of forestry traffic. People simply don't like logging trucks, nor their noise and dust. Where, as is often the case, one route may be attempting to serve the needs of forestry, horticulture, and possibly even large industries simultaneously, the problems become very complicated. My own view is that the solution on the local scene is initially for all the parties concerned in this business to sit down round the table and hammer out some sort of policy that will meet the needs of the area until such time as funds permit the construction of a roading network of sufficient capacity to handle all requirements. The key factor in this discussion is goodwill, and it has been my experience that given this, and given a reasonable willingness of everybody to pull together, that workable arrangements can be made. This also enables those involved collectively to promote the roading needs of their area.

On the national scene the overall conclusion to be drawn from all of this is that there is a need for road controlling authorities to get together on these and like roading problems, to research the overall situation, and to present to Government, through the National Roads Board, the facts of the present roading situation and the part that roading plays in the national economy.

The main thrust of such a proposition must be the return of a higher percentage of road tax to roading than the approximate 40% being returned at present.

2. The Road Classification System

The road classification system provided a means whereby damage to road pavements and to bridges by heavy vehicles could be minimised. This system has worked reasonably well, but in rural areas, changes and natural progress resulted in the needs of rural road transportation outstripping the roading authorities' capacity to fund roading improvements rapidly enough to cope with the demands made upon roads.

In this situation the National Roads Board understandably placed considerable emphasis upon the maintenance of existing roading

assets, particularly sealed surfaces, and to protect bridges, the overweight permit system was introduced, together with the normal bridge loading restriction systems. With the removal of the Class 3 category of roading in 1974, the remaining classifications of 1 and 2 remained in force to different degrees in different areas. It may be assumed, particularly in the rural areas, that those Local Authorities which retained Class 2 classification did so for very good reasons. There is no doubt that the removal of the Class 2 restrictions would free up the movement of heavy traffic in these areas and overall from the point of view of the transport industry, this would be a very good thing. I would have some reservations, as has sometimes been suggested that the savings that might result from such a move would be passed on to the consumer, which in most rural areas would be the farmer.

The situation must also be looked at from the roading authorities' point of view. Consideration must by given to the value in real terms of any rate input into a roading system as compared to the value that might accrue to the area as a whole from the removal of any road classification restrictions that might apply. This is obviously a very complex question, but there are some more obvious effects that the removal of road classification restrictions might have in a rural area. Submission No. 6926 to the National Roads Board went to considerable lengths to discuss the financial advantages of lifting the classification from Class 2 to Class 1, and developed a theme based on a comparison between Class 1 and Class 2 roading design that "Class 1 and Class 2 designs are identical for all practical purposes". The fallacy in this argument is that it assumed that the roads were physically Class 2 roads to start with, and this is far from the case in many County roads. In my view the re-classification of this type of County road to Class 1 would invite an accelerated rate in failures, not only of the pavements, but also of the bridges that are protected where a general Class 2 classification is in force.

There is no doubt that a Class 1 roading system throughout the country is very desirable and the one way to achieve this is to build

Class 1 roads and to replace sub-standard bridges with full highway design loading structures. If Local Authorities, particularly Counties, are to be encouraged to provide an unrestricted roading system in their areas, then the works necessary to do this should attract a premium subsidy rate through the National Roads Board.

Such a system of premium subsidy rates would be designed to encourage those Local Authorities concerned to re-classify selected existing pavements to Class 1 on the understanding that when the remaining useful life in these pavements was used up under the heavier loadings that would then be applied to them, that adequate National Roads Board funding will be available to reconstruct the roads to Class 1 requirements.

At the same time, again provided a premium National Roads Board rate was available, the roading authorities concerned could immediately proceed with the reconstruction of selected roads and so eventually form an arterial Class 1 roading network within their areas.

I would anticipate that a system of this kind would enable the maximum utilisation to be extracted from existing pavements, at the same time as a reasonable amount of reconstruction was proceeding. It would be very necessary that the Local Authority be assured that when its existing pavements failed, its actions in re-classifying them to Class 1 would be recognised by adequate finance being available to rehabilitate them. To give maximum utilisation of both pavements and funds, it would be necessary for each authority to do a considerable amount of investigation to determine the strength of its existing pavements, the likely needs of heavy traffic in its area, together with preferred routes. The structural integrity of any bridges that might be involved on these routes would likewise need checking. A long range plan would then need to be prepared to meet these needs, on the basis of a continuing programme of road upgrading sustained by commensurate finance.

To sum up, I believe a realistic approach to this problem would be for Counties concerned to evaluate their own roading systems by actual pavement testing to determine their actual situations,

and then for the National Roads Board to adopt a premium subsidy system to be allocated to meet the needs as outlined above of those Counties prepared to assist road transport in this way.

3. Public Awareness of Roading

The New Zealand public is in my view quite knowledgeable about roads. There is a considerable ground swell of public opinion about what constitutes an acceptable level of roading, and I believe the support of the general public could be enlisted in emphasising the part roading plays in our national economy. Roading touches upon everybody and everything, and it follows that the developments that could arise from research along these lines would be very wide ranging indeed. The savings that good roads would make to the average motorist, the economic advantages of good roads to our transport industry generally, the advantage good dust free surfaces that provide quick and safe access could be in attracting people back to our rural areas to live and to work, are but a few. In urban areas, a great majority of New Zealanders have had good sealed roads for so long that this has come to be looked upon as an integral part of the urban way of life. It is time that something of the same viewpoint was adopted insofar as the rural areas are concerned.

4. Statistics

Attached to this document are some statistics which I think speak for themselves. These compare the relative situation of the rural sector, both in length of road, finance available and so on with other road controlling sectors. Some facts on the impact upon roading of forestry developments are also included, as it is rural roads that carry the bulk of forestry generated traffic.

5. Conclusion

Good rural roads in New Zealand are vital if rural road transport is to operate efficiently and economically. I have outlined some of the needs and advanced the thought that insufficient finance is now being made available to enable rural roading authorities to meet those needs adequately. I believe as a first step to overcoming that situation, roading interests must convince Government that a greater percentage of roading taxation must be returned to the actual roads. To do this, a case backed by properly researched evidence will be essential, and avenues to that end have been suggested.

The quotation following summarises the situation:

"We were not a wealthy nation when we began improving our highways, but the roads themselves helped us to create a new wealth in business, industry and land values.

So that it was not our wealth that made our highways possible. Rather it was our highways that made our wealth possible."

Commission of the United States
Bureau of Public Roads

APPENDIX 1

Land Use In New Zealand

Total area of N.Z.	26.9 m ha.	
Of the Rural Area:	26.5 m ha.	(100%)
- Agriculture is currently using	20.09 m ha.	(76%)
- National Parks account for	2.69 m ha.	(10%)
- Forestry is currently using	1.10 m ha.	(4%)
- Other land including waste land mountains	2.62 m ha.	(10%)

APPENDIX II

Major N.Z. Export Sales Value
(for the year ending 30.6.81)

Commodity	Million $	Percentage
Agriculture	3,763	67
Forestry	534	9
Manufacturing	1,169	21
Fishing	132	3
	5,598	100

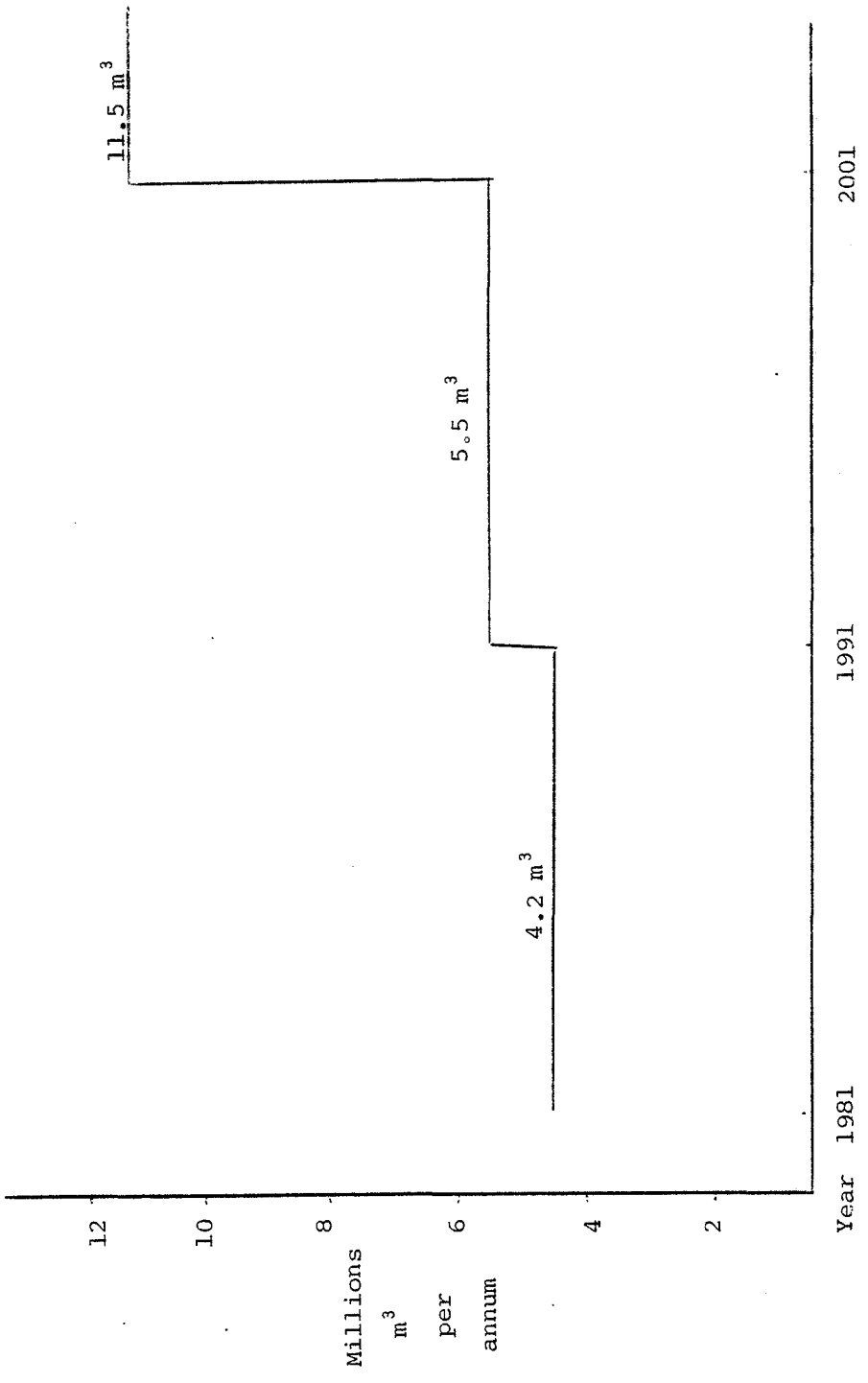
Included in the Agricultural figures are the dairy exports to 30th June 1981. They were:

Milk and cream	$315.2 million
Butter	$398.0 "
Cheese	$137.2 "
Casein	$117.2 "
	$968.1 "

This information was given by the Department of Statistics, Wellington p.m. 31st March 1982.

APPENDIX III

Graph Showing N.Z. Total Exotic Forest Production



APPENDIX IV

Road Statistics - N.R.B. Stats. 31 March 1981

Roading Authority	Length of Road Controlled (Km)						% National Total		NRB Funds Expended On Roads ($)		% of Total NRB Expenditure
	Total	%	Sealed	%	Unsealed	%	Controlled	Sealed	000 $	% of Total	
State	11,566		10,900	94	666	6	13	12	108,565	57	52
Urban Local Auth.	13,153		12,415	94	739	6	14	13	44,745	23	21
Rural Local Auth.	68,131		24,871	37	43,260	63	73	27	38,666.60	20	19
	92,850								191,976		
Special Purpose									1,425		
Total NRB Expenditure:									208,888		

APPENDIX V

Average Yearly Movement of Wood Products by Mode

For Five Yearly Periods 1981 - 2005 (000 Tonnes)

Mode	Commodity		81-85	86-90	91-95	96-00	01-05
Road							
	Logs	Ex Forest	6469	6661	9198	13935	19269
	Logs	To Port	38	38	90	307	525
	Logs	Other	393	287	390	1285	1655
	Newsprint	To Port	-	-	175	350	350
	Pulp	To Port	220	320	320	520	620
	Pulp	Other	300	305	305	409	509
	Timber	To Port	64	32	103	404	920
	Timber	Other	1531	1754	2219	3338	4861
	Chips	To Port	477	247	280	1001	1073
	Chips	Other	484	535	738	683	1742
	Panel	To Port	20	20	20	20	20
	Panel	Other	65	65	65	65	65
Rail							
	Logs	To Port	268	31	74	405	584
	Logs	Other	56	59	58	-	-
	Newsprint	To Port	328	503	503	1028	1378
	Newsprint	Other	352	352	352	352	352
	Pulp	To Port	530	535	735	920	1390
	Pulp	Other	43	43	43	43	43
	Timber	To Port	257	262	388	999	2191
	Timber	Other	459	673	775	599	333
	Chips	To Port	250	204	211	442	792
	Chips	Other	212	201	273	541	484
	Panel	To Port	20	20	140	445	685
	Panel	Other	50	50	50	50	50
Barge							
	Logs	Other	165	197	325	880	1071
	Timber	Other	2	2	40	133	182
Port							
	Newsprint	*	-	175	175	350	350

* Processing at Port

APPENDIX VI

Capital Improvement Requirements for Roads and Highways Servicing the Forestry Industry

Table 1: Summary of Assessed Costs by Regions

($ millions in 1981 values)

	1980/85	1985/90	1990/95	1995/2000	2000/05	Total
Northland	2.3	3.1	3.9	3.1	3.9	16.3
Auckland	0.8	0.8	0.8	0.8	0.8	4.0
Coromandel	1.0	1.2	1.4	1.6	1.5	6.7
King Country	-	0.4	1.1	1.4	1.4	4.3
Rotorua/Taupo	5.3	5.3	5.3	6.1	6.8	28.8
Gisborne	1.5	2.0	2.0	2.5	.0	11.0
Hawkes Bay	1.0	2.8	1.8	0.8	1.8	8.2
Taranaki	0.4	0.4	0.4	0.4	0.4	2.0
Manawatu/Wanganui	-	1.0	1.8	1.6	1.7	6.1
Wairarapa/Wellington	0.8	0.8	0.4	0.4	0.4	2.8
Nelson	1.7	2.1	2.3	2.4	2.6	11.1
Marlborough	-	0.8	0.8	0.8	0.8	3.2
West Coast	0.4	0.4	0.4	0.4	0.4	2.0
Canterbury	0.25	0.25	0.25	0.25	0.25	0.25
Otago	1.4	1.4	1.4	2.5	2.5	9.2
Southland	0.5	0.5	0.6	1.0	1.2	3.8
Sub-Total	17.3	23.25	24.6	26.0	29.6	120.7
Additional 10% For Miscellaneous Plantings	1.7	2.3	2.5	2.5	3.0	12.0
Additional 15% For Upgrading Bridges	2.85	3.9	4.0	4.4	4.8	19.9
Private Roads and Ancillary Routes	4.8	4.8	5.5	5.8	5.6	26.5
Total:	26.6	34.2	36.6	38.7	43.00	179.10

SOURCE: Ministry of Works and Development; Ministry of Transport.

(Appendix VI Cont...)

Appendix VI (Continued)

Table 2: Summary of Assessed Costs and Lengths of Local Authority, Private Roads, and State Highways

Table shows lengths (km) and costs ($M in 1981 values) for the period 1982 to 2005.

	Local Authority		State Highways		Private Roads and Ancillary Routes	
	Lengths	Costs	Lengths	Costs	Lengths	Costs
Northland	140	11.2	70	5.3	60	4.0
Auckland	80	4.0	-	-	12.5	0.5
Coromandel	5	0.2	95	6.5	-	-
King Country	25	1.5	35	2.8	-	-
Rotorua/Raupo	60	4.8	425	24.0	120	9.5
Gisborne	60	6.5	70	4.5	15	0.7
Hawkes Bay	60	5.0	40	3.25	15	0.8
Taranaki	25	2.0	-	-	5	0.40
Manawatu/Wanganui	80	6.1	-	-	-	-
Wairarapa/Wellington	35	2.8	-	-	-	-
Nelson	95	7.6	70	3.5	50	2.5
Marlborough	40	3.2	-	-	-	-
West Coast	25	2.0	-	-	-	-
Canterbury	25	1.25	-	-	35	2.0
Otago	70	5.6	50	3.6	70	5.6
Southland	30	1.8	40	1.75	12.5	0.5
Miscellaneous and Bridges	-	17.3	-	14.6	-	-
Total: $M	855	82.85	730*	69.75	395	26.50

* This is the length affected. Costs are the assessed incremental share due to forestry oriented traffic.

SOURCE: Ministry of Works and Development; Ministry of Transport.

IX. ASSESSMENT AND RECOMMENDATIONS EMANATING FROM WORKING SESSIONS

D.R. Lovatt, National Roads Board.

1. Traffic Generation from Land Uses

In the rural traffic generation studies undertaken for RRU Bulletin 59 only a limited number of rural land use types was investigated. Other land use types considered to be of significance were:

(a) Horticulture

Berry, stone and pip fruits and kiwi fruit industry in particular were noted and were considered urgent. The road surface condition may become an important factor in areas devoted to this type of horticultural use.

(b) Forestry

An extension to forestry was considered fairly urgent. The considerable emphasis on forestry as an overseas funds earner, the very substantial nature of milling operations, the heavy vehicle concentrations, the all year round harvesting system and the social impacts of forestry were emphasised as matters requiring study and the publication of information helpful to local authorities.

(c) Small Farms

Many small farms are operated as a recreational or second job enterprise. The owner has an off-site daily job which results in work trips comparable in number to the urban dweller in addition to the farm activity related trips. Consideration of this type of operation leads to a concept of farm house and farm as separate identities. Under this concept full time farmers can be envisaged as having an on-site work trip. Total trip making for the farm household may be very similar to the suburban household.

(d) Rural Crafts

There was a feeling that increasing numbers of craftspeople (potters, woodworkers, painters, etc) were establishing themselves in rural areas thereby creating a demand for more servicing and increasing the amount of travel on rural roads. Gate sales may add to the amount of traffic as well as providing a reason for passing traffic to break its journey.

(e) Alternate Life Styles

Communes, ohus, self-sufficiency groups and other single or groupings of households were also named as rural land uses producing travel patterns that warranted some special consideration. In some areas there were concentrations of these types of land occupation which result in identifiable increases in traffic flow and in demands for improved roads.

(f) Recreation

Recreational use of rural roads can place strains on local body resources and some exchanges of information between local authorities would be helpful.

(g) Rural Heavy Industry

Major heavy industrial enterprises are being established in rural areas (viz Marsden Oil Refinery, Glenbrook Steel, Kapuni etc). Some help for local authorities was considered desirable to ensure that all likely consequences were adequately assessed at an early stage.

General Comment

It was agreed that there are many types of non-farm activities in rural areas which can be of interest and importance. In all the cases outlined here, such information as trip generation by type of vehicle, vehicle gross weight, and trip purpose was considered necessary. In addition to information on land use type, the intensity of that use was also seen to be important for forecasting traffic.

2. Model Validation

The information presented in RRU Bulletin 59 is intended for use in predicting traffic generation for various common rural land uses. Additional studies could be undertaken of existing land use patterns and then estimate traffic volumes to verify that the Bulletin 59 figures are appropriate.

Preparation of models relating trip cost, distance, and purpose would aid in forecasting travel patterns for existing situations and for projected changes. A guide showing how to use this information is considered to be very necessary.

3. Seasonal Variations

A road pavement's load carrying capability varies seasonally due to the moisture content of the subgrade and pavement layers. Some local authorities impose loading limits during these periods of weakness. More information about the seasonality of road traffic - particularly forestry - would be of assistance. Some indications were given that forestry milling plans can be adjusted to keep heavy loadings off seasonally weak pavements.

4. Other Rural Transport

Rural transport as envisaged in the Bulletin 59 studies consisted almost entirely of private cars and heavy motor vehicles. Rural delivery services, buses and rail services also contribute to rural travel service, and increases or decreases in these services could affect the types of rural activity and the amount of road travel.

5. Rural Traffic Management Methods

During the seminar a number of methods were referred to by which local road controlling authorities could control traffic use of their roads, and also methods for obtaining financial contributions from particular land uses. Differential rating was suggested and the possibilities of obtaining contributions through Town and Country Planning Act Conditional Use Procedures were mentioned. It was suggested that these various methods and procedures and the initiating and authorised authorities should be itemised and described in a readily available publication. This information could be assembled by a committee of local government officials.

6. Effect of Road Improvements

Deficiencies in the rural roading network (e.g. adverse grades, tight corners, bridge restrictions, dust from unsealed roads) inhibit at least to some extent the types of farming activities which occur on the land served by these deficient roads. Case studies of the benefits accruing from removal of these deficiencies were considered desirable. Some instances of improved land use were named. Studies which compared land value, use and productivity with the state of road access would provide a basis for further decisions regarding investment or maintenance expenditure on rural roads.

Dust from unsealed roads was considered to be a problem worthy of attention. Dust affects productivity on adjoining land, safety of road users, comfort and convenience of road user and adjacent dwellers, and has some additional adverse social effects. Research into the extent of these effects was considered an urgent matter.

7. Market Research for Roads

Roads meet market needs of various kinds. There is the basic need for vehicle and other traffic movement, either for travel or for property access. These two kinds of needs can be provided by roads at various levels of satisfaction. Some roads provide just the bare necessity of access; on some roads quite high standards are economically justifiable and beyond these two levels of service there

are the aspirations of the individual and the public at large for comfort, environmental quality, etc. It is conceded that little is known about the public aspirations for roads as a useful and desirable public good.

Roads perform a social role. They permit social interchange and access to social services and occasions. Poor roads inhibit the amount of optional travel which would take place to satisfy the desire for social interchange. Rural dwellers in some areas are suspected to suffer some social deprivation which may be attributable to poor roads. (Similarly there are urban dwellers who, not owning a private car, may suffer social deprivation due to lack of public transport).

A social science study of the social effects of roads and accessibility in rural areas was thought to be desirable.

8. Road Administration

New Zealand has had a number of different administrative systems for managing its roads. The last major change occurred when the National Roads Board was established through the passing of the 1953 National Roads Act. Subsequent changes in the nature of the roading and transport problems in New Zealand, the establishment of the regional level of government, and the introduction of the Urban Transport Council and authorities, all point to the possibility that the National Roads Act may require reappraisal. Concern was expressed that the level of funding, and methods of funding the Board, had been altered, leaving the Board in a difficult position for funding works previously considered necessary and desirable. Local roading authorities now find themselves funding, solely from rates, works which previously would have received subsidy and grant assistance. This lack of funds has resulted in some rural roads which have experienced increased traffic volume, not being improved to the standards previously considered appropriate for those volumes.

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