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**An *ex post* economic analysis of research
and extension for the cover comb.**

**A thesis presented in partial fulfilment of the
requirements for the degree of Master of Applied Science
in Agricultural Systems and Management
at Massey University.**

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ABSTRACT

Agricultural research funding organisations, such as Wools of New Zealand (WONZ), are seeking ways to maximise benefits from their research portfolio. It has been suggested that this can be achieved by reducing investment in on-farm research and increasing investment in post-farm gate research on processing technology, product development and market research. However, little information exists to substantiate this point-of-view, and this gave rise to the research reported in this thesis. The hypotheses tested were first, that the return on the investment made by Wools of New Zealand in research on cover comb technology was positive and comparable to the return on other investment options, and second, that a model for the *ex ante* economic analysis of on-farm research could be developed using an *ex post* economic analysis of cover comb shearing technology research.

The cover comb is an example of a discrete, relatively simple technology, whose development, research evaluation and extension have been reasonably well documented. Six experiments, funded jointly by Massey University and WONZ, were conducted with the cover comb at Massey University between 1989 and 1995. Most extension costs were incurred by WONZ. The cover comb generates financial advantages to farmers by reducing sheep losses and possibly by conserving pasture when the feed supply is low. Uptake of the cover comb was estimated by surveying shearing contractors and Wool Production Officers, and from the pattern of cover comb sales.

A spreadsheet model was developed to provide an *ex post* cost-benefit analysis of cover comb shearing technology research and extension for the period 1989 to 2020. This model included a sub-model of regional populations by class to estimate the number of sheep shorn by different methods, and a cost-benefit sub-model that described the temporal relationship between costs and benefits and calculated the returns.

The model estimated a 1330% internal rate of return (IRR), a \$49.22 million net present value (NPV) and a 115:1 benefit-cost ratio (BCR) for the cover comb research and extension investment at a 5% discount rate. The model outputs were sensitive to the post-shearing reduction in sheep losses associated with cover comb use (and therefore benefits per sheep) and the cover comb adoption rate. A sensitivity analysis indicated a 485% IRR, a \$12.30 million NPV and a 25.3:1 BCR at a lower adoption rate (an increase in sheep shorn with a cover comb between 1989 and 2000 due to the research and extension, of 9.5% of all adult sheep in New Zealand, versus an increase of 12.9%), a lower net benefit per sheep (\$0.23 per ewe shorn versus \$0.47 per ewe shorn) and a 10% discount rate. Thus, even where conservative values for the cover comb technology were applied, a very favourable return on the investment made by WONZ was shown. The rapid uptake of the cover comb (over 30% of ewes shorn were shorn in 1995 with a cover comb, compared to 15% of ewes in 1989), and the size of the industry (33.7 million ewes in 1995) the technology is applied to contributed to these returns.

The *ex post* cost-benefit analysis model could be adapted for *ex ante* evaluations of proposed on-farm wool industry research. This model would be useful for deciding which sheep production research should be funded.

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