PRESIDENTIAL ADDRESS

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New Zealand society gives us an important privilege. That is to speak independently when delivering the presidential address for an organisation such as ours. As with all such privileges it is important it be used and this society's immediate previous Presidents have set an excellent example. It is equally important this privilege be used with discretion. I will endeavour to meet those twin requirements.

Matters on which comment is made had been decided before announcement of my appointment to a Wellington position.

Clover nitrogen and fertiliser nitrogen: The more the question is examined the more does it become apparent that philosophies of approach to source of nitrogen are central to how far we can develop our productivity. From being the shining jewel of our production system clover nitrogen is rapidly becoming the major retardant to large scale increase in the productivity of our land and hence efficient utilisation of our climate energy resource.

That climate energy resource is large. In round terms every 300 hectares of land receives an average power input equivalent to the output of a 300 megawatt electricity station in continuous operation.

Although the Nitrogen issue shows most apparently on the easy contour and level land its consequential effects go far beyond that.

In past decades we have established a predominant land use system based on symbiotic nitrogen fixation by white clover. With the help of cheap phosphate from Nauru, spoils of war from Germany, we established an efficient grazed pasture system. It allowed us to market ruminant animal products originally mainly to Britain and now throughout the world. It also provided largely the nitrogen requirements for a modest cropping programme.

However, there are substantial prices paid for that. The largest one is loss of production. Annual yields of usable plant product from grazed pasture i.e. feed into the animal's mouth, are 2-3 fold lower than are yields obtainable from alternatives. That is for crops grown with equivalent levels of skills.

In addition, the phosphate has to be used in luxury amounts relative to the feed produced; nitrogen application through the animal's rear-end is inefficient in its timing and the cycle is very leaky; and costs are substantial to plough up and subsequently re-establish a pasture so that a crop can use the nitrogen accumulated.

It follows that the old idea that the white clover plant provides New Zealand with free nitrogen has no substance. Such thinking is equivalent to comments that horses were cheap sources of power on a farm because a farmer grew his own oats and didn't have to buy fuel. They ignore the large losses in alternative production opportunities which such systems impose on us. The same goes for overall energy efficiencies.

Recent work by Hardy and Havelka with soybean shows how much ability to fix nitrogen is restricted by inability of the plant to supply enough energy to the symbiosis. Also it is increasingly realised that in a grazed pasture growth. Further lavish use of phosphate onto pasture, and equivalent spreading around of animal return of nitrogen and phosphate is leading to substantial problems in other peoples environments. That comes from wash off, runoff and leaching to rivers, lakes and ground water.

High production crop systems based predominantly on fertiliser nitrogen would not use appreciably more nutrients than are being cycled through pasture grazing, and would be able to keep them under much better control.

Now New Zealand has available from Maui gas field a feedstock for synthesis of nitrogen fertiliser. It is available in abundant quantities. Irrespective of the world's energy position New Zealand is almost embarrassed to find alternative ways to use it efficiently.

An economical, controlled source of phosphate was an essential basis for development of our grazed pasture system. The Maui gas field represents a base for a similar nitrogen fertiliser supply. Done on adequate scale that is a key to our ability to utilise fully the production potential our climate bestows on us. High yield cropping systems could be developed knowing their supply of this essential fertiliser is assured, economically priced, and free of large fluctuations in price which can occur in the world market.

Our world gives every indication that shortage of economically produced, high quality food will press on it far harder in the years ahead than will the present energy crisis. New Zealand's real energy crisis is not with oil. It is with our static feed supply for our livestock industry.

In those circumstances it is appropriate for New Zealand to lend every effort to developing the successors to our present limited output grazed pasture operations. These are the high output crop systems, and support industry, which are technologically practicable right now. To do otherwise is economically irresponsible and morally untenable.

These comments do not denigrate the role of the legume crop as a versatile and outstanding source of high quality plant protein. That will become increasingly important. It is a separate role from using legume as the

main source of nitrogen for our crop production system as a whole.

Returns from science: Overall, there are increasingly strong grounds for querying whether the main production technology on our land, the pasture - grazing animal system, has capability to effectively utilise our climate energy resource. That gives grounds for enquiring into the role which science itself has played in our development in recent decades.

This is against the background that a major role which New Zealand expects from its scientific investment is a lead in opening new frontiers for attainment of the country's economic and social objectives.

Support for the grazed pasture system has been the dominant objective of our agricultural research effort. Yet there is increasing evidence that the output from our pastoral industries has been static or near so of recent times. In some sectors it has slipped back appreciably. Put simply, if the considerable scientific input to support the grazed pasture system had been giving good return that should not have occured.

The economic excuses don't hold. It is said the farmer has been too hard up, yet in the 1930's depression record increases in productivity occured. It was said that the farmers were too well off. Yet in the 1950's and early 60's, when they were relatively well placed, there were major and sustained increases in output.

The real situation is that the grazed pasture technology has come close to its limits — for farms as they operate in the real world of New Zealand farming. Given a satisfactory technology farmers have, and always will respond magnificently with enhanced productivity and returns to the country.

On this basis it could be concluded there has been over a considerable period a near nil return from the scientific investment.

It can be fairly said our industry would be a lot worse off without help from present scientific organisations. This is an intangible. More importantly it puts science in the role of a polisher and guardian of the status quo.

This preventative maintenance role is one science has undoubtedly to accept as part of its responsibility. However it is not the whole or the major one the community can resonably expect of it.

Alternatively the situation can be justified if it can be said there have been no major alternatives. However there have been. Consider the cropping potential in the Waikato to which Elliott drew attention in the 50's. Consider the potential of irrigation in its many forms and in many areas to allow the development of new cropping systems. In Canterbury and North Otago alone this can transform those areas to a radically higher level of economic turnover and integration to industrial processing. Consider the potential of high yield forage crops as the dominant feed for ruminant animals, not only for increasing on farm productivity but also for enhancing all of its off-farm processing and marketing.

There has not been a shortage of big alternatives. There has been an outlook that scientific resources have to be husbanded to tending the existing system. This is now the boldness of foresight the community expects when it makes its investment in science and gives scientists the relatively privileged position they hold. It's an outlook of timidity which benefits neither the community nor science itself.

In cost terms the above alternatives, once effectively developed, could add an additional $1000 million above our pastoral export income which is now about $1500 million. If that is the case, and we spend each year approximately $20 million on agricultural research, it follows that every 8 days delay in getting such developments going sends down the drain a year's annual investment in research.

Inertia in properly testing such selected large alternatives is supremely expensive. That is not only to scientists and the industry they serve. It can cost a country its ability to achieve its overall economic and social objectives. Consider the difference an additional $1000 million of export income right now would make to the lives of each and every one of us. We have had the science and the technology to achieve that available for years.

It can properly be said the real situation which decision makers have to deal with is much more complex. It pays at times to look at the simplicities as a means of keeping the so-called complexities in perspective.

Outlooks in Science: The past cannot be recovered. How to the future. Here perspectives from recent history can help.

New Zealand had a proud record with its pastoral industry in adopting science into its own very fine production technology. This was one of the world's success stories. That was done essentially in the 1920's and 1930's, although its impetus carried well after that.

Then after the last war attitudes changed. The old leaders who had a keen sense of association with the New Zealand environment and its well-being were progressively discarded. They were replaced by a new breed of scientists. The watershed of the change was the abrupt retirement of Levy in the early 1950's and the down grading of the standing of that Division's staff. Emphasis was transferred to elegant science, as distinct from accomplishment science.

The new men had their roots much more in international science than the New Zealand environment. They sought to maintain their links and their standing in the international field. They felt much less sure in how best to link their science to the New Zealand environment. From that it was a short step for them to put their main effort into supporting and polishing, and making glitter and glisten, an existing, dominant, established system. That is as distinct from probing whether there weren't potentialities for major new alternatives which could become fine successors to that established system in the years ahead.

The fragility of the approach is well illustrated by the short time it took for its two main proponents to depart from the New Zealand scene for broader science pastures. They were away by the mid 50's and made a major imprint on science in their new country. Now word is that country's Prime Minister has asked for evidence as to whether their expenditure on agricultural research is worthwhile. One can be reasonably certain the case in justification of research will be based less on results from those centres of science with a big S such men sponsored and more on results from men who chose to move elsewhere and worked with and for their country's environment.

In simple terms there had been the classical failure to distinguish between the baby and the bath water. The real baby was the dominant dedication to New Zealand's environment and its development, and willingness to take radical new approaches to achievement of these. Time had dulled realisation that the older style men

being phased out in the late 40's and the 50's had commenced as radical innovators. The real need had not been to replace that baby as largely occurred, but to give it a good wash and dress it with new science styles.

In these matters issues are always shades of grey rather than the black or white suggested by description in brief terms. However in the two decades subsequent to the changes New Zealand has slipped from near the top, to around 14th in world living standard indices; and we have frequently portrayed ourselves as a country needing development help rather than one able to give it generously and well.

Utilisation of Science for Nation Development: If that problem does exist, what thoughts are there on handling it? Outlook is that this is best achieved by changes in emphasis and with evolutionary development, rather than by abrupt large shifts which can have their own high costs.

The overall premise offered is that we have moved beyond the stage where science and its practitioners need to be cossetted separately to ensure survival.

This is emphasised by the regeneration of our Univerisites and tertiary educational institutions. Now they can fill the role of custodians of basic and new science skills. In doing so they rapidly pass them out into the community through the students they train.

This University development then allows more emphasis on integration of sciences, in its research and its applied technology, directly into operational organisations. Increasingly the day-to-day interaction of the scientists with the planners and operations men becomes a dominating requirement and a source of material stimulus for effective work by all.

Again our recent past gives perspective. In the mid 1930's the greater part of this country's agricultural research was transferred from Department of Agriculture into D.S.I.R. This was in the belief that an operational Department could not effectively nurture such work. Agriculture Department then promptly proceeded to demonstrate that was not so. They now mount the largest agricultural research effort in the country and have at least as good a record of effectiveness over the years as does D.S.I.R.

Another example is Forestry. In the late 1940's it was agreed a research operation was needed. Forestry Department held this should be handled by them and not by D.S.I.R. This was accepted. The subsequent development of their research and of their production as a whole, has been one of New Zealand's outstanding success stories.

A key here is that Forestry had able, professionally trained, operational leaders. An organisation with such men at all levels is able to assess the nature and implications of scientific work, and hence guide it and use it effectively.

From their responsibilities, and from their size, such developments will occur first in Government Ministries and Departments. However as commercial firms develop in size and sophistication many will certainly find it is to their trading advantage to create this amalgum of technologically trained operations men and a science R - and - D investment. Some producer boards are already doing so and weathering the international winds of trading opportunity much the better.

Such evolution makes practicable effective partnerships to shared objectives between Government, Producer Boards and Commercial Industry.

Multi-disciplinary Development Teams: However integrations of scientists into operational organisations has dangers which have to be consciously organised against. If the immediate problems of the present are allowed to dominate the calls on, and the thoughts of, the scientific and development staff the whole situation can very subtly become a strong force for conservatism.

The counter to this is well proven where organisations and countries have decided they have major new objectives to achieve. That is the formation of multidisciplinary development teams.

There is extensive international experience that to get prompt acceptance of a significantly new production system the package as a whole needs to be worked up and implemented.

The compact team containing the appropriate range of skills, formed for the job, and briefed to show best how to make the system go with optimum combinations of New Zealand and overseas expertise is the unit for the job. It can turn outward to draw on an extensive range of other people's experience; inwards to cross check implications; then merge disciplines to get an integrated result. The lesson of the Climate Laboratory development, and equivalents in many other fields is that the strength of such groupings is far greater than that of individuals operating separate from each other and part-time on such matters.

Research groupings with their outlooks and resources hitched to the merits of an existing system are not those to implement the radically innovative thinking new systems call for to see them to their full potential. Similarly the widely spread and loosely integrated disciplinary groups into which much of the agricultural industry's research effort is organised are an arrangement suited to continued servicing of an existing system, as distinct from getting new ones into action fast.

In summary there are three requirements for the success of such teams. They need to be led by able, relatively young, vigorous men. They need defined objectives for whose attainment little if any new basic science understanding is needed. They need a finite term of existence with appropriate prior planning of attainability of the objectives defined.

The bane of such approaches has been approval in principle accompanied by allocation of inadequate, widely diffused and-or part-time resources. The other bane has been unwillingness to stick with time limits for completion and subsequent re-deployment of personnel to other objectives.

O.E.C.D. Conclusion: It may be thought these views are those of an individual without generalisation. Could attention be drawn to a quotation from the O.E.C.D. report "Science and Growth of Society". It states "Co-existence of old functions and new problems almost inevitably favours the former over the latter, which have to develop in a context in which the bulk of the resources is already earmarked under budget mechanisms which respect the past more than they protect the future". The authors were a group of well established scientists and scientific administrators from Europe and North America.

Agronomy's future role: Agronomy's role in these matters is as creators of the future, not curators of the past.

With the knowledge that acceptance of Agronomy's major role in our national economy does lie ahead, let us enjoy understanding of the outlooks and sincerities of others.