

Concluding review

J.L. Davidson

CSIRO Division of Plant Industry, GPO Box 1600, Canberra ACT 2601

Introduction

It is now traditional for each biennial agronomy conference to be reviewed in its final session. Because concurrent sessions are held nobody can listen to all speakers and few would attempt to read all papers. I have therefore taken the role of the reviewer to be that of providing a brief cover of matters discussed in these pages, and of assessing whether the meeting reflects issues of general importance for either Australian agriculture or for our Society.

Although the review may have omissions due to late arrival of papers, my main impression is that the organisers of this conference and its referees have accepted a huge workload in order to stage the conference and to publish its proceedings. It is only through their efforts to sort, compile and publish the papers that we are offered a broad picture of current agronomic research in Australia.

Topics discussed

Sustainability and environment

For the first time at an Australian agronomy conference, this topic is large enough for group discussion; this development reflects a shift in agronomic emphasis towards issues that are of immediate public concern. In an invited paper, Anderson (World Bank) accepts that agricultural research has always been concerned with more efficient use of resources and that political and emotional forces have thrust us into this emphasis on sustainability. Reasons why it is of such concern to the public are outlined in the invited papers of Blessing (GRDC) and Campbell, while other invited papers outline more specific concerns for grazed pastures (Hutchinson, CSIRO), crops (Marcellos and Felton, NSW Dept) and soil (Freebairn, Qld Dept/CSIRO).

Contributed papers indicate the extent of agronomists' involvement with sustainability or environmental issues. Chaffey and Gardner (Vic: Dept) describe how the Victorian Department of Agriculture is using booklets and videos to educate the public on principles of sustainability, as they are now understood, and Mendham (University of Tasmania) describes steps that are now being taken to overcome land degradation in a Tasmanian valley with a long agricultural history. In order to effect improvements, Kent (Farm Advance) argues that we could well learn from old, traditional systems, including shifting agriculture. Crop/pasture rotations might be considered a modification of shifting agriculture, and the paper by Chen Wen *et al.* (China) describes the importance of a lucerne-based pasture phase in reducing erosion of very eroded, deep loess soils in China.

Other papers also deal with the role of legumes in sustaining agriculture, although Bushby and Lawn (CSIRO) point out that as long as nitrogen remains more valuable as seed protein than as soil nutrient, it is unrealistic to expect grain legumes to build fertility. This supports the conclusion of Gardner *et al.* (Vic. Dept) that the inclusion of grain legumes in rotations in Victoria is reducing soil nitrogen and that an economically competitive livestock industry is needed for sustainable agriculture. The value of pasture legumes is implicit in the establishment study of Belotti *et al.* (SA Dept).

Judgements of whether or not agricultural practices lead to land degradation depend on objective measurements. The approach of Bissett and O'Leary (Vic. Dept) in measuring infiltration rates of water appeals because of its relevance to productivity in Australia. Often, degradation is obvious, and Badawy *et al.* (Vic. Dept) are examining the value of halophytes such as *Atriplex* on salt-affected country. *Atriplex nummularia* is valuable as a fodder plant elsewhere, and Condon and Sippel (Narromine Transplants) recommend its establishment for intermittent grazing because of its high productivity.

There is unusual diversity in approach to considerations of agricultural sustainability. One paper by MacLeod and Taylor (CSIRO) describes a sociological survey of the way it is perceived. At the other extreme is the specialised study by King and Wilkinson (CSIRO) of vesicular-arbuscular mycorrhizal symbiosis which enhances the uptake of phosphorus from soil. Other papers in this group examine tillage and stubble management (Bissett and O'Leary, Vic. Dept), conservation cropping (Gunton, Qld Dept), fallow and non-fallow systems (O'Connell *et al.*, Vic. Dept), mineral and organic fertilisers (Grierson *et al.* and Nietzsche *et al.*, University of Adelaide), crop rotations (Ford, Vic. Dept; Derrick, Australian National University), and difficulties of assessing sustainability (Thompson and Penton, Qld Dept). These illustrate that across a broad spectrum of research, agronomists are examining sustainability. While many might agree with him, only Anderson (World Bank) argues here that sustainability is so ill-defined that it can scarcely continue to attract funding, and he suggests that research emphasis will return to increasing productivity through improved management.

Soil stress

Papers grouped here are closely related to those in the previous section and deal mainly with problems of water, acidity and salinity. Braunack-Mayer (SA Dept) identifies waterlogging as a cause of low wheat yields in South Australia, and Cowie *et al.* (UNE) identifies the post-flowering phase as the most sensitive to waterlogging in chickpea. Heinrich (WA Dept) is concerned with the rainfall requirements for early-sown wheat crops to establish, and Scott and Sudmeyer (WA Dept) are examining leaf growth and senescence as a basis for irrigation scheduling. Elliott *et al.* (Qld Dept) are investigating practical measures that can increase production on irrigated duplex soils; Dracup *et al.* (WA Dept) suggest that root growth in lupins is physically restricted and reduces yield on duplex soils, and Gardner *et al.* (Vic. Dept) deduce that the dispersion of subsoil clay by water is responsible for low wheat yields on red soils in the Wimmera.

Although Crocker (NSW Dept) reports that pasture improvement in northern NSW has not been associated with increasing soil acidity, the yield and quality of pastures on acid soils there has been increased by lime (Hochman *et al.*, NSW Dept).

In relation to salinity, there are reports from Kaehne *et al.* (SA Dept) that clovers are generally more tolerant than medics, and from Rogers *et al.* (Vic. Dept) that balansa clover is more tolerant than subterranean clover. According to Cornish (NSW Dept), there are prospects of re-using saline water to irrigate tomato crops because of their relatively high tolerance.

Tillage and soil structure

Alternative tillage practices are being compared at several centres. Pregno *et al.* (Qld Dept) are studying effects on yield and quality in tobacco. Turpin *et al.* (Qld Dept) are studying the flow of nutrients to depth under different tillage practices. Wylie and Clarke (Qld) advocate reduced tillage in combination with fertilisers and legumes in rotation as the path to increased profits. Thomas *et al.* (Qld Dept) report lower yields from reduced tillage in a wet season, but not in a dry one and suggest disease is an important consideration, and Rovira *et al.* (CSIRO) emphasise that root diseases will be important if plant residues are not broken up; they advise that reduced tillage should be associated with appropriate rotations. Wheatley *et al.* (UNE) have found that zero tillage improves ground cover in soybeans, and Schmidt *et al.* (WA Dept) describe a modification to direct drilling that increases soil disturbance below seeds and leads to increased yields. A different aspect is that Pratley (Uni. C. Sturt) report that herbicides are carried over by stubbles into following crops.

Grazing resources

By far the largest group of papers deals with pasture studies or grazing resources, and there is particular emphasis on legumes. In the tropical north, the rapid seed drop of Verano stylo concerns Norton *et al.* (NT Dept) who recommend suction harvesting, while the competitive dominance of tropical legumes which affects persistence of buffel grass concerns Kerridge *et al.* (CSIRO).

In the southern states it is a very different picture. Papers from all state departments of agriculture, CSIRO and universities, (e.g., Ward and Quigley, Vic. Dept) refer to the degraded state of many pastures which have low legume contents and which are often dominated by undesirable volunteer grasses. Some work is aimed at controlling the weeds by management, such as the joint study involving three university departments (Jones *et al.* UNE) which is investigating the possibility of controlling *Vulpia* by light autumn grazing, to inhibit early germination, and intensive spring grazing to reduce seed replacement. But the majority of work in southern Australia is directed towards understanding why legumes, with a substantial proportion of hard seeds, disappear from pastures.

One question addressed is why do hard seeds become soft, with Taylor (CSIRO) demonstrating the importance of fluctuating temperatures at the end of summer, and Revell (WA Dept) reporting the influence of aphid damage.

Summer rains often produce seedlings with little chance of survival, though joint WA work involving university, CSIRO and Department of Agriculture (Saoub *et al.*) demonstrates useful differences between species, and Fitzgerald's work (NSW Dept) indicates that survival depends largely on the amount of water available in the critical establishment phase. Work at the University of Adelaide (Muyekho *et al.*) shows that grazing pastures late after flowering, and grazing pods during summer (Valizadeh *et al.*) can drastically deplete the seed supplies of legumes. The paper by Ripper *et al.* (CSBP & Farmers Ltd) in the plant nutrition section indicates that low potassium levels may also lead to clover decline.

In addition to those hazards, another list is presented by Carter *et al.* (Uni. Adel.) of factors responsible for declining legume contents of pastures in the wheat belt. Tillage itself, by burying seed to a greater depth was found in the joint WA project (Saoub *et al.*) to reduce seed softening, but Latta (Vic. Dept) found that wheatgrowing reduced medic seed reserves substantially. Cropping does reduce the weeds of pastures so Campbell and Bowman (NSW Dept) are investigating aerial sowing of pasture grasses into wheat stubble.

Some other papers in this section are also related to the legume decline problem. Kemp *et al.* (NSW Dept) report that autumn-winter rests of annual pastures can increase their legume content, while Young *et al.* (Vic. Dept) suggest that, where possible, lucerne should be grown instead of annual medics because of the much higher carrying capacities of lucerne-based pastures in the Wimmera and Mallee.

In this very large section, other papers report on work aimed at improving the performance of legumes, particularly white clover through its national improvement program centred at Glen Innes, and serradella and lucerne through improved rhizobial relationships (WA and SA Depts). There are also reports of improving the establishment of legumes through bandseeding (Cook *et al.*, CSIRO) and reports of genetic improvements to perennial grasses, viz. perennial ryegrass (Cunningham *et al.*, Vic. Dept) and phalaris (Culvenor and Oram, CSIRO). State department of agriculture are active in studies of the management of native pastures (Garden and Dowling, NSW Dept) and perennial pastures (Beattie *et al.*, Tas. Dept); Harris *et al.* and Kemp *et al.*, NSW Dept; Kelly and Lawson and Stockdale and Kelly, Vic Dept).

Plant nutrition

While King and Hutchinson (CSIRO) deal with biological activity in nutrient cycling, other authors are concerned with individual nutrients, two-thirds of them with nitrogen, and most of these with production responses to applied fertiliser. With barley, Fathi *et al.* (Uni. Adel.) and Bishop and Bluett (Vic. Dept) report protein as well as yield responses. With wheat, research varies from examining applications of fertiliser nitrogen (Kearsley *et al.*, Uni. Adel.; Cantero-Martinez *et al.*, Uni. Melb.) in different circumstances to assessing the contribution from legume pastures in rotations (Revell, WA Dept; Heenan and Chan, NSW Dept) and how requirements for nitrogen might change when atmospheric CO₂ levels rise appreciably (Hocking and Meyer, CSIRO). Nitrogen effects are also considered in cotton in relation to aeration (Kraokaw *et al.* Uni Qld), in rice in relation to interactions with environment (Reinke and Williams, NSW Dept), and in sunflower in relation to light usage (Kamona and Steer, Uni. WA) and petiole levels for predicting requirements (Kerage and Steer, Uni. WA). One paper deals with modelling nitrogen availability to plants (Dimes and McCown, CSIRO).

Although only two papers report on responses to superphosphate (by Crocker and by Freebaim, NSW Dept), both identify major deficiencies of phosphorus or sulfur over a very large region. Of the papers dealing specifically with sulfur, one is about developing analytical guidelines for field requirements (Duncan *et al.*, CSBP & Farmers Ltd) and the other reports the value of determining S^{6i} by X-ray fluorescence spectrometry as a quick, simple index of sulfur status (Pinkerton *et al.*, CSIRO).

Problems of acid soils are addressed by Mullen (NSW Dept) who confirms the wide range of responses to lime between species which varied from 1200% with lucerne to 20% with triticale, by De Marco *et al.* (CSIRO) who report on sensitivities of pasture legumes to manganese and aluminium levels, and by Mitchell *et al.* (Vic. Dept) who comment on the usefulness of native grasses.

Cropping systems

Christen from Germany describes the European trend towards rotating one crop with winter wheat, or growing winter wheat continuously; it may be fertilised with 200 kg/ha of nitrogen and sprayed five times with fungicides. The low yields and low prices for wheat in Australia produce a different agriculture, and the local papers in this section resemble a grab-bag of cropping initiatives in the search for profitable options. At a low level of production, Walsh (Vic. Dept) recorded wheat yields of 0.1 to 0.7 t/ha in the Mallee that cannot support external inputs; in his rotations, lucerne reduced wheat yields through depleting water resources, while grain legumes benefited them by reducing cereal cyst nematodes. In a more productive region, Holford (NSW Dept) found that several years of lucerne benefited at least nine subsequent years of wheat.

Havilah *et al.* (NSW Dept) present a case for maize to be bred specifically for silage production; Garside *et al.* (Qld Dept) argue for double cropping rice, sorghum and maize in northern Australia; and Stewart and Mendham (Uni. Tas.) aim at defining how best to grow navy beans and dual-purpose barley which are both suited to Tasmanian conditions. Methods of sowing and irrigating sunflower and maize are compared (Pritchard and Small, Vic. Dept), crop rotations are evaluated (Tow, Uni. Adel.; Holford, NSW Dept; Robinson and Holford NSW Dept), and time of sowing effects are investigated (Heinrich, ADAC, WA; Heenan and Murray, NSW Dept). Other research papers report on problems of duplex soils (Dracup *et al.*, WA Dept), genotype x environment interactions (Brinsmead, Qld Dept), and competition between wheat and medic (Graham *et al.*, Qld Dept).

Models of varying complexity are used to predict crop distribution (Walcott and Kirschbaum, BRR) and the value of resowing stands of sunflower that are variable (Wade *et al.*, Qld Dept). There is even an outline of a cash flow method of evaluating research proposals in terms of expected benefits (Page and Hunter, Qld Dept).

Alternative practices

Here we are given a picture of the various ways in which agricultural chemicals are used, a glimpse of concern over their use, an indication that naturally occurring allelochemicals may become useful commercially, and examples of conventional breeding countering insects.

Herbicides remove grasses from pastures in order to reduce take-all in subsequent wheat crops, but Kidd *et al.* (NSW Dept) and Inwood *et al.* (CSIRO) demonstrate the need for early spraying. They can also be used to control difficult weeds in pastures, and Leys *et al.* (NSW Dept) illustrate the need to support their effects with management that encourages vigorous competitors. They can also be used to preserve high digestibility of annual pastures over summer, though Gafford *et al.* (Uni. Melb.) found the effect held for only two months, and yields were substantially reduced. They can also be used to reduce grass seed problems and so increase lamb production (Little *et al.*, SA Dept). Glyphosate is regarded as one of the safer chemicals, yet Cornish (NSW Dept) reports that its residues can persist at phytotoxic levels for two weeks in sandy soils.

The invited paper from Evans and Finney (UK, ICI) presents a reassuring picture of chemical companies responding to both public concern about the safety of their products and the continuing dependence of agriculture on them. Work on plant products that stimulate the germination and growth of other species (Jones, UNE) and that inhibit other plants (Lovett and Hoult, UNE; McFarlane *et al.*, Vic. Dept) offer hope that specifically targeted agricultural chemicals that are otherwise benign will be developed. Breeding and selection are countering insects and diseases in lucerne (Kaehne *et al.*, SA Dept) and disease in chickpea (Brinsmead and Knights, Qld Dept)

New plants

In an invited paper, Marshall presents clear arguments that our best prospects for new plants lie with the development of new genotypes of existing, productive crops, and suggests some exciting possibilities for lupins, linseed and cereals.

From current research, Oram and Schroeder (CSIRO) have Holdfast phalaris available for producers; it has better seed retention and lower levels of toxins than genotypes now grown. Two lines of linola (linseed for edible oil) have been developed by Green (CSIRO) and are about ready

for release. Oram and Kirk (CSIRO) are well on the way towards producing Indian mustard varieties which promise to out yield canola and have greater resistance to blackleg; work on the same crop by Wright *et al.* (UNE) suggests that it will also be more tolerant of water stress than is canola. A younger breeding program is under way to develop narbon beans as a crop for Australia (Mock *et al.*, Vic. Dept).

There are reports of national programs aimed at improving pasture legumes. The subterranean clover one has produced a new cultivar, Goulburn, with good disease resistance and hard seed levels which should replace Woogenellup: this was achieved by selection (Dear *et al.*, NSW Dept). The national program centred in WA is integrated with breeding and selection work by state departments in SA and NSW to provide cultivars of the sub-species brachycalycinum that will be suited to large areas of the two states (de Koning *et al.*, SA Dept).

The national white clover improvement program centred at Glen Innes with the NSW Department appears at this stage to be based on selections from a wide range of genotypes from different countries. Growth, seed production and cyanogenic properties of white clover are being assessed in Victoria (Clark *et al.*, Vic. Dept), and the relationship of root activity to production is being examined (Blaikie and Mason, Vic. Dept). The selection of improved pasture legumes also appears to be the aim of Rowe and Craig (SA Dept) with balansa clover, and of Saunders *et al.* (SA Dept) with *Medicago orbicularis*. Kelman and Blumenthal, (CSIRO) and Duarsa *et al.* (UNE) have been examining *LOW* species, and in particular their tannin contents, with a view to improvement. Williams (Qld Dept) has investigated flowering control in kenaf and deduced that flowering is induced by daylengths less than 13.6 h or greater than 14.2 h, which he contends would allow areas for seed and for fibre production to be separated usefully.

An important development for dryland agriculture is the domestication of two *Danthonia* species reported by Lodge (NSW Dept); these will be the first native grasses registered for pastoral use in Australia. Bowman (NSW Dept) also reports progress towards domestication of *A. strebla lappacea*.

New technology

In this area, authors seem to be divided between those with feet firmly on the ground, and those with their eyes on the skies. Schultz (Vic. Dept) describes how, with conventional equipment, desiccants can be sprayed onto soybeans to make their harvesting easier. Taylor *et al.* also use conventional equipment, but to sow pastures in rows alternating with cereals, and they describe advantages over undersowing. Mock and Makin (Vic. Dept) outline advantages from banding fertiliser below lupin seeds, and Ferraris (CSIRO) is investigating the value of injecting water into the furrows as summer crops are sown.

Cawood (Vic. Dept) uses data from infra-red sensors mounted on a satellite to record nocturnal surface temperatures and attributes surprising differences more to thermal properties of the landscape than to elevation. Associated with this study, he is investigating the value of low velocity wind turbulence to reduce hazards of frost. Vickery and Fumival (CSIRO) are also using satellite data, but to identify individual paddocks that will respond to fertilisers, while Roth (Uni. Canb.) focuses on variation in crop vigour within individual paddocks through video images collected by light aircraft.

Brown *et al.* (Vic. State Chem. Lab.) have stored on computer the results of analysing soil samples sent to them, and have sorted the data in relation to post codes. This has revealed that deficiencies of phosphorus, potassium and sulfur are widespread in the state, and it has identified localised areas of aluminium and manganese toxicities.

Modelling and decision support

The largest group of papers in this section is from the QDPI/CSIRO Agricultural Production Systems Research Unit at Toowoomba, which is producing models aimed at providing rainfall probability values for producers (Stone and Hammer), predicting rate of floral development in crops (Holzworth and Hammer), assessing production risks for several crops (Meinke *et al.*; Jamieson *et al.*), and predicting yields of maize grown with undersown legumes (Carberry *et al.*).

Scott *et al.* (UNE) are using a model to value changes in farm resources, while Abadi Ghadim and Morrison (WA Dept) use a farm model to identify research priorities. Through indicating respectively that legume pastures are of real value within cropping systems and that research leading to increased production in spring is of little value, these models largely support experience. Lawrence *et al.* are condensing experiences of graziers in order to devise improved management recommendations, while Gillard *et al.* (Tas. Dept) describe how computer-based advisory systems are used to help farmers.

Managing information

Lincoln (DDB Needham) emphasises that if farmers are to use any information, they must be aware of it, recognise its relevance, and appreciate its benefits. Hartley and Lincoln (NSW Dept) point out that there is a large investment in extension literature and argue that in future there will be less dependence on it. Nevertheless literature remains important and Thwaites *et al.* (Qld Dept) describe a manual aimed at helping producers in one shire: it characterises a wide range of soil types, and recommends for each, management practices that are preferred for pastures, crops, stock and soil. Hayman (NSW Dept) describes the development of a service that allows farmers to compare alternative rotations, and Stephens (Vic. Dept) also describes how a non-computerised management package evolved in his state.

Other papers illustrate the growing importance of electronic equipment, including computers, as instruments of extension. Some uses are very specific, for example, a program that evaluates alternative methods of controlling wiregrass in pastures (Doss, NSW Dept). Equally specific are the discussion by Cull and Finch (Neutron Probe Services) of the value of using a neutron probe and other sensors for irrigation scheduling, and the computer program outlined by McCormick *et al.* (NSW Dept) to improve irrigation efficiency of lucerne. McIntyre and Jones (Qld Dept) outline a broader use for interactive computer programs in providing information to grain growers.

Extension officers are also concerned about whom to influence. Blacket and Lawrence (Qld Dept) discuss the importance of working with rural women, colleges and a range of businesses in addition to farmers. Cahill and Douglas (Qld Dept) describe the coordination of 'most efficient yield' groups by a project officer servicing Queensland's wheatgrowing districts, and other group enterprises are outlined by Delaney and Van Beek (Qld Dept) and Kent (Farm Advance). Finally, Troedson (Qld Parliamentary Library) argues that Australian agriculture can be advanced by the extension of clear, concise factual information to politicians.

agricultural implications

Australian agronomy conferences probably provide the most comprehensive accounts available of research that is aimed at helping Australian primary producers. The archetypal review of our agronomy conferences was that of Onko Kingma 10 years ago. He concluded that agronomists were too concerned with issues of the past, that there was a lack of cohesion across agronomic research in Australia, and that too frequently our measurements failed to consider transport, processing and sale of products outside of farms.

Ten years on, our research is still concentrated on problems within farms, but it is concerned with current issues of vital importance, such as those of soil salinity, soil acidity and legume decline in pastures. And agronomists are looking to the future through offering new crops, using satellites to diagnose problems, and devising improved ways of communicating results to farmers. There are also encouraging signs of improved cohesion in pasture research through the development of the national improvement programs for subterranean and white clovers, and a concentration of research on major problems. Elsewhere there is still a lack of cohesion in agronomic research which reflects difficulties of developing cohesive research among state departments which have a dominant role in agronomic research.

It is disturbing that there are no reports of basic studies that we expect from universities. Perhaps basic research is reported to conferences of specialists. But there is no evidence here of work aimed at providing basic information about the way in which different plants respond to temperature, or the separate and combined responses of different legumes and *Rhizobium* strains to pH or nutrients, or of studies of apomixis and hybrid vigour that Professor Marshall has offered as exciting prospects. Our development of new approaches, new ideas and new techniques depends on strong basic research.

Because all research organisations compete for industry funds, the contribution of funding bodies towards the lack of balance and cohesion must be questioned, since they have become so important in affecting the direction of work within research organisations. Cohesion and balance can only be achieved through interaction which does not exist between applicants and funding committees. The capability, responsibility and willingness of research organisations to develop cohesive programs should not be jeopardised by funding committees controlling research at the project level.

The authorship and contents of papers indicate that the differences once ascribed to the roles of universities, CSIRO and state departments seem to have disappeared. It is disturbing to sense that universities have moved away from basic research, and state departments from applied research, with all organisations now concentrating on strategic research as they dip into the same barrel of limited funds. The question now is whether there is a role for the commonwealth in agronomic research, or whether some effort should be devoted to inducing the universities to devote more of their efforts to basic research, and the state departments to applied research.

The paper from ICI should persuade us that private industry should be more involved in agricultural research here: it is stimulating and challenging to learn of a commercial enterprise integrating research from fundamental studies of molecular properties to environmental concerns and farm use. Where commercial prospects are real, government and industry funds could be used more effectively to encourage participation by private enterprise.

A specific criticism from Onko Kingma 10 years ago was that there was too much emphasis on plant nutrition in Australian agronomy. It then accounted for 21% of contributed papers; a further criticism was that half of those were concerned with measuring effects of phosphorus. He would not make the same comment today: here only 10% of papers deal with plant nutrition, and only a tenth of these are concerned with phosphorus. He may have caused an over-reaction, given the low fertility status of many of our soils, and the findings that phosphorus deficiency is now very widespread and costing Australian producers hundreds of millions of dollars annually.

Ten years on, I think that our conference indicates different major problems: these concern the organisation of research. Specifically, if our research is to become more efficient, we need to define the most appropriate roles for the universities; commonwealth and state departments, we also need to

establish a more useful way of allocating rural industry funds, and we need greater participation by private industry.

Implications for the society

Scope of activities

The Australian Society of Agronomy was formed to strengthen the profession. If the new office bearers wish to continue the strengthening process, they can seek weaknesses exposed by this conference and act to remedy them. One that was clear to Onko Kingma and remains obvious now is a lack of cohesion apparent in some fields. Our society could expand its workshop activity to bring agronomists together in order to encourage cohesion and collaboration where it is most needed. In the past, workshops have been generated by enthused agronomists in areas of strength; it is the weaker areas that need more support. Similarly, if the office bearers are sympathetic to the problems of research organisation just raised, they can consider ways by which the society can help to rectify them.

The biennial conference

The main purpose of a conference is to generate discussions among participants. This conference will do that and provoke thoughtful evaluation of the work of agronomists as it is presented in the proceedings. It must be judged a success and the organisers deserve unqualified thanks from us all. As always the organisers of the next conference will need to consider conference details.

Proceedings. Organisers of this conference have followed the precedent set at the Melbourne conference of publishing the proceedings before the conference is held, and there may be good reasons for doing this. But proceedings are meant to record the event, not to forecast it. Reviewers can scarcely avoid thinking that there is something wrong with a society that wants its conference reviewed before it is held. But the main concern about the emphasis on early publication of the proceedings is that it forces organisers into premature decisions before contributed papers are read.

At Melbourne, a workshop on modelling was organised, and the contributed papers then revealed that modelling was very unimportant to agronomists. At Perth, the proceedings stated that the conference was held in one year, when, through no fault of the organisers, it was not held until the next. And at Armidale, had organisers appreciated the magnitude of the rural crisis that would envelop Australia, they would surely have chosen a theme that reflected urgency rather than contemplation. Early publication has drawbacks.

Speakers. Through having to invite speakers for the plenary sessions before contributed papers were refereed (in order to publish the proceedings before the conference), organisers of the last three conferences have had to ignore the society's by-law that states that the majority of plenary papers be invited from authors of contributed papers selected by referees. That stipulation was intended to ensure that the most important and interesting of work in Australian agronomy would be presented as subject reviews, and that the authors would be selected without reference to their location, organisation, status or acquaintance with organisers; it still left scope for organisers' personal selections.

Some authors here should still be encouraged to discuss their work in broad reviews. For example, agronomists have voted with papers that poor persistence of legumes in pastures concerns them most. It is a field pioneered and led by E.D. Carter, and his massive contributions to this subject plus his concerns for gaps in knowledge and his vision of pastures for the future would be invaluable. Badawy *et al.* from Victoria maintain that dryland salinity is the most serious environmental threat to agriculture in their state, and they could well expand this to explain the origins of the problem and how these might be reversed, and describe the basis and progress of their own localised attack. As an example of imminent hope for farmers, a new crop plant, linola, has been developed by A.G. Green in Canberra, and the unravelling of the story behind its appearance would mesh well with the general approach to new crops outlined by D.R. Marshall. And in a fine example of applied research, R.D. Freebairn from Coonabarabran has compiled

the results from 36 experiments by nine district agronomists, to reveal marked, economic responses to phosphorus and sulfur over wide areas of New South Wales; this is complemented by the work of G.J. Crocker from Tamworth and that by Brown *et al.* from Victoria. Together they could well review recent evidence of soil nutrient status in Australia and discuss whose responsibility it should be to monitor the state of our agricultural base.

Length of papers. Agronomy is an integrating discipline in which pasture agronomists, for instance, must be as concerned with soil physical and chemical conditions, and with crops that are rotated with their pastures, as they are with the effects of stock that eat them. Consequently agronomists are usually interested in all topics that are discussed at each conference, so the challenge for organisers is to feed participants the messages of all papers as palatably as possible. A short paper is harder to write than a long one, but it is easier to read. In addition, the allocation of different lengths for contributed papers is always going to appear arbitrary.

These are points of detail of minor importance. I realise that my attitudes to them are controlled by the reluctance, with age, to accept change, and by the historical experience of Edward Everett. I raise them only to emphasise that there never will be unity of opinion in organisation, that changes with time will be needed and must be tried, and that younger agronomists need to express their views. Our profession belongs to them.