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Inside

The New Zealand Institute of Agricultural & Horticultural Science Inc

When the dust settles…

"Dad, we couldn't see anything because of the dust". The comment came from my seven-year-old and was unprovoked. Those who were in Lyttelton on February 22 would understand.

Once I saw past the fact my boy will carry this day for the rest of his life, I realised his turn of phrase would be a good metaphor to describe what we are seeing with the RS&T funding from the primary sector. At times there is a lot of noise and a good smokescreen of apparent best intentions (to use a mixed metaphor), but the investment that individual parts of our primary sector are making in RS&T is quite variable. I won't identify those who I think are under-spending (if they are spending at all), but I will sing the praises of Fonterra/DairyNZ, Pipfruit New Zealand Inc. and Zespri International Limited. Their investment is sound and I think they will get a good return on it.

To the others, I would ask a simple question: "How much longer do you expect the taxpayer to pick up the bill?" True, they might be able to claim they still contribute a lot proportionally to our export economy, but will that last? Moreover will their competitors overseas, who are investing more money and more wisely, ultimately beat them in the marketplace?

I realise it is difficult to invest when things are bad economically, but with the price for commodities at a record high you would think something more – surely – could be put aside in some industries. True, this is once again a call from me to better fund RS&T, and while many of us consider the taxpayer investment to be inadequate, certain primary industries are just not in the race. At the same time, they often put up a bit of a smokescreen (or dust screen) that they are doing their fair share. Beware. Their industry disaster may appear when the dust settles!

Money gripes aside, this is about leadership as well. If an industry doesn't invest in RS&T then it doesn't look as appealing as the successful organisations mentioned above. These will recruit the most capable people into their ranks and the rest will be left with the pickings. With the numbers entering into RS&T careers in agriculture and horticulture still low, they will be lean pickings.

There are positives, however, at the moment. It is certainly splendid to see the pastoral sector bathing in the benefit of one of the best autumns climatically for many years. Grass was still growing in Southland at the end of May. It may have changed by the time you read this, but it lays the foundation for productivity in the spring (although I appreciate the costs that may come with wetter, milder weather). This, and a healthy trade surplus earned on the back of our primary industries, are good. We are paying our way in the world once again!

And yet I still pick up annoying hints that New Zealand undervalues our primary industries, the wealth they earn us and the vastly important and advanced RS&T that we members of NZIAHS undertake to lay a sound foundation for the sector's future. For example, I recently read a comment along the lines of the "primary industries versus high-tech or applied versus not-yet-applied research". The phrase was wrongly attributed to someone who actually does know better, but the underlying implication that our primary industries are "low-tech" is both naive and dangerous thinking. To those who think this way and hence are misinformed, my door is always open for me to prove otherwise.

This brings me to this edition of *AgScience*. It is refreshing to report the progress being made by some of our leading horticultural researchers. They are laying a solid foundation for industry growth. As part of an international consortium, scientists from New Zealand's Plant & Food Research sequenced the genome of Golden Delicious apples. Not only does this reveal the international mana of the scientists involved, but it underlines my claim above, that our primary industries are decidedly not "low-tech".

Professor Julian Heyes, one of our Fellows, summarises his work on "Future Vegetables". He should take heart from the words of one of our leading sheep breeders. When commenting on the imminent irrigation of the Canterbury plains (and we'll save that for a future *AgScience*), he claimed that "dairy farming was just a passing tenant on our prime land and one day I would drive through fields of export lettuce to get to his door".

In this issue we note the passing of one of our distinguished members, Dr Bill Kain. We also give notice of meetings for the Canterbury Section and plans are underway for our National Political Forum, where we will put the 2011 political aspirants to the test. Our thoughts are also with our Canterbury members in these trying times, although I might be a bit biased in this respect.

Jon Hickford
President

NZIAHS CANTERBURY SECTION FORUM 2011

BIOLOGICAL INNOVATIONS FOR AGRICULTURAL SUSTAINABILITY

WEDNESDAY 6TH JULY 9.00AM

VENUE: C1, COMMERCE BUILDING, LINCOLN UNIVERSITY

Programme and Registration details on website www.agscience.org.nz

Cover Photograph courtesy of Plant & Food Research: This red fleshed apple will be the parent of new cultivars

Check the fine print
for science spending

By Bob Edlin

Bill English … pursuing a growth programme

THE WORD "SCIENCE" WAS mentioned just once in Finance Minister Bill English's Budget speech on 19 May. "Research" was not mentioned. Nor was "R & D".

But when you turn to the fine print of the Estimates of Appropriations, one of the many documents accompanying the Budget speech, you find Vote Agriculture was spared the scythe when the Government cut back departmental spending. Vote Research and Innovation was given a bit more money, too.

In the Budget speech, English said the Budgets of 2009 and 2010 helped sustain economic activity and support jobs, and protect the most vulnerable New Zealanders.

"At the same time the Government has pursued a longer-term programme to lift growth," he said.

"It has made major infrastructure investments, improved regulation, continued to reform and invest in science and innovation, shifted resources to frontline services and reformed the tax system. That work continues…"

The Budget was intended to further strengthen the long-term performance of the economy.

In separate media statements, however, Ministers did serve up two morsels of good news for primary industry science.

On 10 May, Agriculture Minister David Carter announced a successful bid by a Manuka honey industry consortium for Primary Growth Partnership funding.

The PGP is to fund half of a $1.7 million research programme proposed by the consortium to increase the reliability of supply and volume of medical grade Manuka honey.

Approval of the proposal lifts the total government-industry commitment to PGP programmes to $477 million over 18 months. The Government has contributed more than $218 million.

Mr Carter says the nine programmes approved for PGP investment since 2009 represent the largest investment by Government in primary sector innovation in decades.

On 1 June, Environment Minister Nick Smith and Minister of Science and Innovation Wayne Mapp announced the Government is to invest $9.3 million over the next six years in fresh water research.

The $9.3 million in funding by the Ministry of Science and Innovation will go into two research projects. Smith outlined them and announced who had secured the money:

Smart aquifer characterisation: Subject to satisfactory science peer review, the Crown Research Institute GNS Science has been awarded $1.2 million a year for six years to develop a suite of innovative methods for characterising and mapping New Zealand's groundwater systems.

New Zealand's groundwater resource is valued at $25 billion and provides 50% of the nation's consumptive water use and 80% of our agricultural water use.

The research team will apply new methods to overcome the current problems of data acquisition that are time- and resource-consuming, and develop specialised skills in hydrogeology, geology, satellite remote sensing, geophysics, seismology, mathematics and spatial information technology.

The wheel of water: Aqualinc Research Ltd has been awarded $700,000 a year for three years to develop a framework that has the potential to transform land and water resource users into water managers, through a collaborative process.

The researchers will develop a visual tool (the water wheel) and process for water users to individually and collectively understand how their decisions impact on water quantity and quality.

Water users can use the water wheel framework to set agreed catchment limits for water allocation and quality, balancing cultural, economic and social values, and outcomes.

The two projects support the objectives of the Government's Fresh Start for Fresh Water package announced in May, thereby complementing the work of the Land and Water Forum and the new National Policy Statement on fresh water management.

"Along with climate change, improving the management of our country's fresh water is one of the Government's top environmental priorities," the Ministers said.

"Our abundant fresh water resources are a real competitive advantage for our primary and tourism industries but we need to ensure we balance the needs of a growing economy with the great Kiwi lifestyle of swimming, boating and fishing.

"Investment in scientific research is crucial to improving the management of our most precious resource."

More science money is to be found in The Estimates of Appropriations.

The establishment of the Science and Innovation portfolio has resulted in Vote Research, Science and Technology being renamed Vote Science and Innovation from 1 July. The Minister of Science and Innovation is responsible for appropriations within that Vote of a total of $773 million, a net increase of $5 million.

Priority investment within science research outcomes is $707.5 million (92% of the Vote) in 2011/12.

The main six science and innovation investment priorities are high-value manufacturing and services, biological industries, energy and minerals, hazards and infrastructure, environment, and health and society.

Under Vote Agriculture and Forestry, the 2010/11 appropriation of $249.1 million (actual spending was estimated at $230.7 million) has been lifted to $323,968 ,000.

This includes a total of just over $83 million (25% of the Vote) for the Primary Growth Partnership. This appropriation (up from $24 million in 2010/11) is limited to primary, food and forestry sector investment in education and skills development, research and development, product development, commercialisation, market development and technology transfer, in partnership with relevant industry groups, including research related to greenhouse gases via the Centre for Agricultural Greenhouse Gas Research.

An appropriation of $9.2 million is earmarked for obtaining science, research, technology, capacity and capability in climate change related to the primary land-based sectors (up from $8.6 milion last year).

The future for vegetables

Professor Julian Heyes
The New Zealand Institute for Plant & Food Research Limited

One of the first negotiated programmes supported by the former Foundation for Research, Science and Technology (FRST) was Future Vegetables. This eight-year programme, launched in 2007, arose from a long history of related Crown-funded vegetable research. The marked difference between the previous science programmes and the negotiated contract was that the new programme was a strategic collaboration between Horticulture New Zealand (HortNZ) and The New Zealand Institute for Plant & Food Research Limited.

Those involved recognised that, to effect real growth in higher-value exports of vegetable products and technologies, we needed a closer working relationship with the sector. When we secured eight-year funding (initial funding levels for long-term programmes are not adjusted for inflation) we somewhat wryly observed that the science system would probably change before the contract expired. It has. The Ministry for Science and Innovation was formed early this year and the contract may migrate into PFR's Core Purposes Funding from July.

During the protracted negotiations a significant number of FRST, HortNZ and PFR staff examined the HortNZ strategic plan and worked out what our Crown Research Institute could contribute to the (somewhat eye-watering) goal of growing vegetable-related exports to $2 billion a year by 2019. FRST recognised that the programme was not starting flat-footed; indeed, they assumed there would be programme outputs from the first year, such as an ongoing series of new cultivar releases from our potato, pea and sweet potato breeding programmes. FRST also recognised the need to help preserve capability in cutting-edge skills related to vegetable pests and diseases, and the opportunity to apply detailed knowledge of post-harvest deterioration to deliver high-quality products to distant markets. All in all, we were able to estimate a huge potential for our research to lift New Zealand's exports of vegetable products and technologies.

So as we approach the end of the fourth year, how has that promise turned out? The research programme has certainly made a difference but, as we were well aware from the negotiation phase, science advances do not always directly translate into commercial growth in the short term. Here are some examples.

Statistics New Zealand figures show that the vegetable sector is struggling. The dollar value of our vegetable exports has remained almost unchanged since the inception of our programme: $566.3 million total vegetable exports in the year to June 2007 compared with $564.2 million in the year to June 2009. Within those figures, processed vegetable exports have risen from 54% of the total in 2007 to 60% in 2009. Higher-value fresh exports have correspondingly fallen. Hence a higher volume of relatively low-value exported products is leaving the country while fresh vegetable exports are being squeezed downwards for a range of reasons.

A major reason is the need to have a comparative or competitive advantage for a particular product: we are far from our markets and do not have the low-cost production environment found in some competing countries. The horticultural model we look to is kiwifruit, exports of which increased by $305 million between 2007 and 2009. Most of that growth came from the steady expansion in global sales of ZESPRI® GOLD Kiwifruit. There is a keen appetite to develop something distinctively "New Zealand-owned" in our suite of vegetable offerings but innovation of this kind takes many years of patient effort (and a huge marketing budget). We do have some small signs of opportunity around potato and sweet potato lines differentiated by colour. These crops are not unique to New Zealand but the germplasm we have performs far better in terms of yield and disease resistance than similar offerings from overseas. Greater novelty can arise by chance. For example we have identified an attractive 'candy stripe' onion in our research programme (Fig. 1). In another case, we are deliberately seeking to improve the agronomic and flavour qualities of a little-known crop, ulluco, currently marketed as "Earth Gems" in New Zealand (Fig. 2).

A second reason for the struggle to increase fresh product exports is the risk of incursions of new and serious pests and diseases. The incursion of the tomato and potato psyllid in 2006 and its associated diseases led to a temporary restriction on exports of fresh tomatoes and capsicums in 2008, immediately reducing the value of an export trade worth $40 million a year. The problem is still a huge management issue for growers, but staff in our programme were among those who were able to provide the data that allowed the restriction to be removed from most countries (except for Australia) within a few months. Exports returned to $40 million in 2009. Without this research, the consequences for exports could have been far more serious. Vigorous ongoing efforts both inside and outside our programme are investigating more effective control mechanisms (including ways to monitor the spread of resistance in TPP populations) and ways to improve detection with diagnostic tests.

A third issue limiting fresh exports is the ability to guarantee pest-

Fig. 1 Candy stripe onion

free status to satisfy quarantine requirements in importing countries. The programme is making good progress with delivering new, safer or non-chemical control measures (such as 'water blasting' of capsicums, Fig. 3), which have proved to be surprisingly effective in both removing pests and improving quality after storage. At a more strategic level, we have established a Produce Market Access Committee with a small group of leaders from the vegetable export industry who meet to discuss important quarantine issues as they arise and reprioritise research where required.

The programme has delivered a series of more conventional potato and process pea cultivars to the market with excellent qualities for production and processing. These are increasing in popularity both in New Zealand and overseas. One particular trait, resistance to cold-induced sweetening, is the subject of serious underpinning research in our programme because of its importance for the French fry and potato chip industries. Newly released PFR potato germplasm is among the most resistant to this physiological deterioration in the world. Royalty returns to the programme are reinvested in the programme to offset the real annual decline in funding derived from the Crown. Specific New Zealand-derived technologies have also arisen from the programme, such as the semiochemical-based thrips monitoring device that has won an international innovation award and is now marketed by Koppert under the trade name LUREM-TR. Plant & Food Research has been a keen participant in the global Potato Genome Sequencing Consortium, which has recently sequenced the potato genome. Having access to the full genome sequence during the life of this project has allowed a marked acceleration in our ability to hunt for disease resistance genes (for example) and develop molecular markers for use in our future breeding effort.

Fig. 2 Ulluco (Ullucus tuberosus)

Another successful outcome of the programme has been the ongoing development of systems supporting the sustainability of vegetable production and the necessary science-based validation of those systems. One of the outputs of our past research is a decision support system (see www.croplogic.com) for growers to manage their nitrogen and water inputs for process potato production and deliver the desired yield and quality at a particular date. This tool not only saves money for growers but can be used as evidence of a commitment to the efficient use of agricultural inputs.

All of these science achievements are necessary but not sufficient for a step-change in New Zealand's vegetable exports. From a programme management point of view, we were delighted to see New Zealand Trade and Enterprise early in the life of the programme recognise that vegetables offered a real potential for export growth, given the strength of the partnership between research and industry. Realising that potential requires a key ingredient that we cannot deliver: gutsy, deep-pocketed entrepreneurs who are willing to recognise market opportunities, particularly in Asia, and aggressively promote New Zealand products for their novelty, high quality, health value and sustainability. The activity of such export-focused entrepreneurs, along with a favourable economic environment and world-leading R&D, will ultimately determine the trajectory of our vegetable exports and lead to real outcomes for New Zealand..

Fig. 3 High-quality capsicum four weeks after harvest

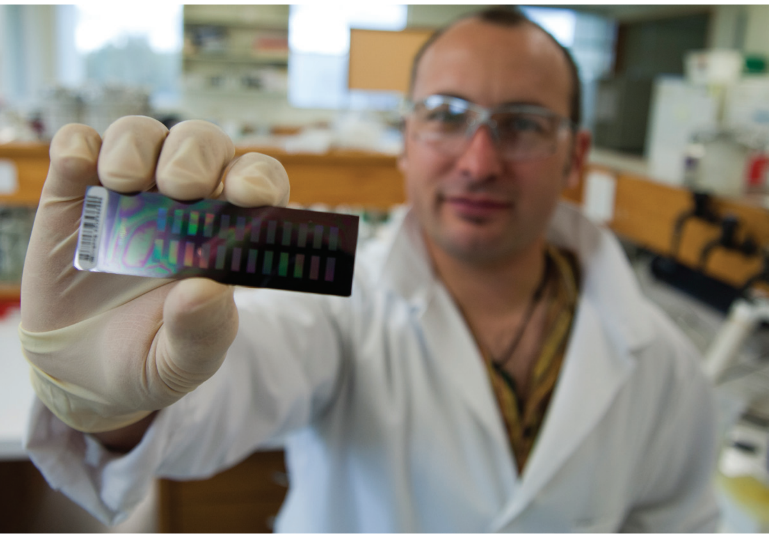
Apple genomics and new cultivars

By Dr Susan Gardiner, Dr David Chagné, Dr Satish Kumar, Dr Andrew Allan, Dr Vincent Bus
The New Zealand Institute for Plant & Food Research Limited

Genomics, the study of the nucleotide sequence of an organism, has developed hugely as a research area over the last 10-15 years as the techniques to sequence DNA have become automated and more refined. After the sequence for the human genome was published with some fanfare in 2003, attention turned to a range of other species, including a few horticultural crops. In 2010 the first draft of the apple genome was published. How did this happen? And how is the information being used?

Worldwide, apples (*Malus x domestica*) are the fourth most important fruit after citrus, grapes and bananas. The high health tag associated with the apple comes from its simple serving of fibre, vitamins and antioxidant content. Wild apples were first gathered in the Neolithic and Bronze Age, with first reports of domestication in Israel over 5,000 years ago. Apple horticulture was initiated in Assyria (modern-day Iraq) 3,100 years ago, introducing techniques such as grafting, pruning, fruit storage and development of cultivars, which were then passed to the Romans and into Europe.

In 2010, an international consortium, including scientists from New Zealand's Plant & Food Research, published the first sequence and analysis of the 600 million nucleotides that make up the apple genome, using DNA from the popular apple variety 'Golden Delicious'. The apple genome sequence provides insight into the evolution of this fruit crop, as well as a foundation from which advanced experiments can be designed to understand apple biology further. Some amazing insights into the evolution of apple can be seen, including its massive number of genes (around 57,000, twice as many as the human genome), and its relationship with near relatives such as pear and strawberry. More importantly for the New Zealand pipfruit industry, the apple genome sequence is a fantastic tool to speed up the development of new cultivars using a DNA-informed breeding strategy called genomic selection.



David Chagné, one of the scientists involved in developing genetic markers for Plant & Food Research's apple breeding programme with a new apple SNP chip, holding thousands of genetic markers (SNPs) used to screen the DNA of a single apple seedling for key traits.

Apple belongs to the Rosaceae family, which includes such exciting fruits as pear, plum, peach, cherry, raspberry, strawberry, as well as rose. While most of these plants have seven, eight or nine chromosomes, apples and pears have 17. Sequencing the apple genome has revealed that apples and pears evolved from an ancient herb-like bush (related to modern Gillenia) which had nine chromosomes. Following relatively recent whole genome duplication 50 million years ago, the distinctive pome fruit evolved.

DEVELOPING THE GENOMIC SEQUENCE

While most of the international community of researchers working on the rosaceous fruit crops were debating which of the three genomes to sequence first, their Italian colleagues were quietly getting on with the job. Lobbying the Trentino apple industry led to the team at the Instituto Agrario di San Michele all'Adige (FEM-IASMA), headed by Riccardo Velasco, receiving funding from the Trentino provincial council to begin analysing the apple genome.

Some essential elements required to sequence the genome were not available in Italy, and in 2007 Plant & Food Research was approached to join the research project. Plant & Food Research's breeding population of 600 apple trees descended from 'Golden Delicious' assisted construction of the genetic map needed to order large lengths of DNA sequence, or metacontigs, on the 17 apple chromosomes. Additional capabilities were also added to the consortium from France and the USA. Researchers from the French National Institute for Agricultural Research (INRA) contributed a special variant of 'Golden Delicious' with a simplified genome, which was then partially sequenced by scientists at Washington State University. This made validation possible for the more complex sequence of heterozygous 'Golden Delicious'.

The international effort resulted in the 2010 Nature Genetics publication of a high-quality draft version of the sequence of 600 of the 740 million base pairs of the apple genome.

To add to this reference genome of 'Golden Delicious', an international research group comprising Plant & Food Research, the USDA-funded RosBREED and European FP7-funded FruitBreedomics projects have recently generated genome sequencing information for a further 27 apple cultivars that are founders in global breeding programmes. This experiment has produced a huge reservoir of DNA markers found at high density in the genome of apple breeding parents – one marker or single nucleotide polymorphism (SNP) every 250 nucleotides. Some of these DNA markers are within genes that code for important horticultural characters, such as pest and disease resistance, fruit quality, fruit colour and crop production.

DOUBLE NUMBERS MEAN INCREASED ADAPTABILITY

One startling observation from the apple genome is that the number of genes (57,000) is the highest yet observed for a plant species. Analysis of the apple whole genome sequence indicates that around 50 to 65 million years ago, the apple ancestor separated from its Rosaceae cousins on the evolutionary pathway. By duplicating almost all its genome, apple now has double the number of chromosomes and very different fruit characteristics from related plants, such as peach, raspberry and strawberry.

The timeframe for this evolutionary change coincided with similar

Scientists are using DNA sequence data to identify genetic markers for important traits found in apples, including texture, juiciness and colour. These will be used to select the best breeding parents and to screen seedlings in the Plant & Food Research apple breeding of new apple cultivars with the characteristics desired by consumers.

events in other plants and mass extinctions of some species, including the dinosaurs. This suggests that a major environmental event affected the survival of certain species, including apple. Researchers hypothesise that the autopolyploidisation event that doubled the chromosome number of its ancestor enabled apples to adapt duplicated genes for specialised roles more readily.

A striking example of this specialisation is the pair of genes that controls the expression of red flesh colour in apple fruit. One gene is responsible for the area around the core, the other the flesh in the fruit's cortex. When the genome doubled, the genes remained in the same relative location near their respective chromosomes of 9 and 17, while their precise function changed during evolution.

More general evidence for this specialisation in the apple genome sequence can be seen in the form of a greatly expanded number of genes coding for enzymes and other proteins involved in the metabolism of sorbitol, the most important sugar transported in apple fruit.

USING GENOMICS KNOWLEDGE IN BREEDING NEW CULTIVARS

In the last 10 years, DNA markers located close to targeted single loci controlling disease resistance have been used for selection by Plant & Food Research apple breeders. For more complex traits that are controlled by several loci, such as fruit quality, apple breeders have used 'classical' breeding values of individuals, based on their phenotype only. Estimated Breeding Values enable breeders to make selections of next-generation parents or potential cultivars for further testing in commercial conditions.

A huge reservoir of SNPs (Single Nucleotide Polymorphisms) – single changes in the DNA sequence that are inherited and so can be used as genetic markers associated with a particular phenotypic trait – is detected by sequencing apple cultivars. This has enabled the development of a DNA fingerprinting technique now used to screen thousands of DNA markers in seedlings from the apple breeding programme. This genomic selection technique is now being validated by apple breeders as an alternative to phenotypic selection. This strategy involves estimation of the effects of all the DNA markers across the apple genome (hence the term genomic selection) in a 'training' population for which there are both genotypic and phenotypic data. Then this training exercise is followed by prediction of genomic breeding values for individuals in the 'selection' population that only have DNA marker data.

Access to the apple genome sequence and the development of DNA markers enables breeders to identify efficiently candidates with the characteristics that consumers want in new cultivars, including aroma and flavour. Genomic selection will also speed up the introgression of novel production traits into commercial cultivars, such as durable disease resistance. DNA screening and fingerprinting at the seedling stage means that only those seedlings with desired traits enter the orchard selection phase of the breeding programme. Through early elimination of undesirable plants and reducing the population entering orchard trials, research orchard costs are now focused on growing genetically elite plants only.

Kiwifruit

A dry argument for initiating research and expanding the market

A meeting of the NZIAHS Auckland Section late last year was addressed by Mike Chapman, chief executive of The Kiwifruit Growers Incorporated. Asked if there was a good potential market for dried kiwifruit, his reply was negative: he commented that only the best fruit was suitable for drying.

But to the layman it seems obvious that drying enables use to be made of the quantities of fruit which, because of inconvenient size or deformities, are unsuitable for packing in conventional trays.

Dried kiwifruit are tasty, healthy, easy to eat with the fingers and, if stored in suitable containers, have a long shelf life. They are much cheaper to transport than fresh fruit because they can be packed in bulk without the need for trays or for refrigeration. But processing involves the cost of cutting fruit into slices and the energy needed to dry them. Perhaps the opposing costs may be nearly equivalent.

Dried fruit in many ways is more convenient than fresh but each has its own appeal, advantages and usefulness.

An additional market for dried fruit could be created by grinding the dried slices into powder. One outlet would be for stirring into water to make a refreshing, healthy and inexpensive drink. The powder could also be sprinkled on to various confections to add flavour or decoration.

Thus kiwifruit could be marketed in two different forms: fresh fruit for those who want and can afford it and dried fruit for convenient eating or to cater for diverse culinary requirements for which fresh fruit are not suitable or appropriate.

Dried fruit arriving in bulk at an outlet could be bought by entrepreneurs for packing in containers, which would be convenient and/or attractive to particular customers ranging from restaurants and air passenger meals, to supermarkets and shops.

Thus there is a potential market for dried fruit made from all shapes and sizes of kiwifruit. This could expand the total kiwifruit market and because of its long shelf life, dried kiwifruit could provide an important reserve if needed.

Research into the value potential and processing methods for large quantities of dried kiwifruit therefore is justified.

— Dr Colin Little

Dr Colin Little is a Foundation Member and Fellow of NZIAHS

Dr Bill Kain

DR BILL KAIN WAS involved in agricultural and horticultural research throughout his working career, continuing this involvement with vim and vigour beyond what used to be regarded as the natural age of retirement.

He was an increasingly influential figure in science from 1975 when he was made a science leader in the Ministry of Agriculture. He became the Director of Levin Horticultural Research Centre, then Regional Director of the Southern North Island, embracing agriculture and horticulture, then moved to become National Board Director and Regional Manager.

During the science reforms, Dr Kain co-ordinated the establishment unit for Horticulture and Food, and was appointed as the first CEO of the newly-formed Pastoral Agriculture CRI, now known as AgResearch.

Recognising his varied and high-level experience, in 1997 he was invited to be a visiting scientist to the Irish Agricultural and Food to assist in developing a Strategic Plan for the Irish Agriculture and Food Sectors with industry.

Beyond the conventional, but ever upwards appointments, Dr Kain was involved in a considerable number of industry groups, some of which also involved education. He was on the Tertiary Education Advisory Commission as a member of the industry and research working group, for instance. He was also Director of the Postgraduate and Research School at Lincoln University for a five-year term, during which a considerable number of industry links were formed. This position overlapped with his appointment to the Board of Directors for Dexcel, where the education of farmers is an important focus.

Dr Kain was instrumental in establishing SIDE (South Island Dairy Event) which has run successfully with full attendances of farmers for over a decade. He also worked with Ravensdown, Crop and Food Research and Dexcel, LIC and South Island Farmer representatives from SIDE to establish SIDDC (South Island Dairy Development Centre), which has been operating the Lincoln Dairy Farm and associated extension and research activities.

As a director, Dr Kain's energy and enthusiasm were legendary. His involvement as chair of AGMARDT meant that his passionate interest in sustainable land-based biological production systems was focussed on making a difference through investment in education (at all levels), research, and developing market opportunities. He also worked tirelessly to encourage not only industry, but also AGMARDT, to develop strategies for the future.

Dr Kain's legacy will be in the initiatives he supported in leadership and development, in the people he encouraged, and the all-encompassing work model he presented to others. He died just after he had been introduced to almost 400 delegates at the International Farm Managers' Association Conference as an icon of New Zealand agriculture. The applause was his due.

On the Web

These articles have been posted in full on the Institute's website.

The spreading of science

Geoffrey Moss (Foundation Member and Honorary Fellow of NZIAHS) traces the history of the New Zealand Institute of Agricultural Science (the horticultural component came later) back to ideas raised by Margot Cowen, an Australian Institute of Agricultural Science member in about 1950.

But he goes back much further in a discussion of technology transfer, recalling how Sir Arthur Ward first introduced discussion groups for farmers into New Zealand after seeing similar groups operating successfully in Britain in the town milk industry.

The Department of Agriculture was operating an advisory service for farmers in the early 1920s.

Student data sought

IHC 2014 Brisbane

An Australian initiative is under way to identify post-graduate students engaged in horticultural research in the build-up to the International Horticultural Congress in Brisbane in 2014, jointly hosted by New Zealand and Australia (http://www.ihc2014.org/content/welcome).

Julian Heyes, Professor of Postharvest Technology at the Institute of Food, Nutrition and Human Health, in Palmerston North, is academic liaison on the congress organising committee.

He aims to set up a similar database on this side of the Tasman and would welcome a flood of names from students or their supervisors who are keen to be included.

His proposal, and the nature of the information he seeks, can be found on the Institute's website.

New members
We welcome

Judith Bowen (Auckland)
Felix Zulhendri (Auckland)
Shane Olsson (Auckland)
Jessica Robertson (Hawkes Bay)
Danitsja van der Linden (Manawatu)
Nina Wards (Manawatu)
Steffan Browning (Nelson)
Victoria Raw (Nelson)
Andy Dumbleton (Canterbury)
Tom Ward (Canterbury)

Corporate members

- AGMARDT
- AgResearch
- Ballance Agri-Nutrients
- Catalyst R&D
- Plant & Food Research
- DairyNZ
- Federated Farmers of New Zealand
- Horticulture New Zealand
- Lincoln University
- Massey University
- PGG Wrightson Seeds
- Ravensdown Fertiliser Co-op

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