# Canterbury Commercial Organics Group

## Newsletter

Issue No 9 : October 1999


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# Field Day 10th October

CCOG has organised a two part field day at Morton Mushrooms and Joy and Peter McLeods on Sunday 10th October from 10.00am till 3.00pm. We will visit Morton mushrooms first, spending about an hour and a half there, then drive to Joy and Peters for a BYO picnic lunch, followed by a walk around. Please note that Joy and Peter have young chickens which are very sensitive to disturbance. We ask that you avoid bringing pets with you, and that children will not be able to run around. To get to Morton Mushrooms: From Hornby take Shands Road, after about 5km veer right into Selwyn Road, then after about 2.5km veer left into Waterholes Road, Morton Mushrooms is on the right-hand side. A map will be available at Morton Mushrooms for directions to Joy and Peters (via the back roads). If you can only come to Joy and Peters then direction are: Head west from Yaldhurst and take the Old West Coast Road. After 7.7km turn hard left into Langdales Road and it's the first gateway on the right.

Morton Mushroom is owned by James Morton with Peter Mony as his business consultant. James bought the farm about seventeen years ago as a going concern, which included a mushroom spawn producing unit. Unfortunately it had a large number of pest and disease problems. Mushroom growing is a very demanding business. Peter says it often feels like a cross between a production line in a factory and a regular farm. If not enough attention is not paid to details then problems will occur.

Over several years James got the pest and disease problems under control, and was producing a good line of mushrooms. However Meadow Mushrooms in Prebbleton were in the stage of rapidly expanding their production and prices were falling as a result. It was at this point that Peter become involved. He introduced new management and record keeping procedures that underpin the complex systems required in mushroom production. Peter also suggested organics to James as part of a market focused paradigm as compared to the production paradigm that James had been working with. Peter says it took three years before James came round - helped by the fact that pesticides were becoming unaffordable, yet were essential to prop the production system up. Peter and James originally approached Bio-Gro with the aim of becoming certified through them. As there were no mushroom standards at that time, Peter helped create draft standards. Unfortunately there were a number of problems that saw them abandon Bio-Gro and use the MAF auditing arm to certify them to Codex (the United Nations organic standard) and to CCOF (California Certified Organic Farmers) one of the USA's largest and an internationally recognised organic certifier. This certification has also been ratified by Australian certifiers and they are now selling to Coles Myers in Australia. Even though it is not required Peter insists that they take regular residue tests, and they use organic wheat straw in preference to conventional. Marketing during the transition phase between conventional and organic was a tightrope act. When they gained certification

and were building up the organic outlets they had to be very careful not to let their conventional outlets know, otherwise they could have sold James and Peters mushrooms as organic undercutting them in the organic market. They had an entirely separate brand for the organic markets named after Peters farm "Brigadoon". Morton Mushrooms is now a successful organic business gaining 40% premiums over conventional prices.

Joy and Peter McLeod farm 8ha near the Waimakariri river and the Longdale and Gatehouse vineyards. The farm has been fully Bio-Gro certified organic for ten of the fourteen years they have owned it. Over that time they have experimented with a wide range of crops. These include asparagus, nut trees, beef, pine trees, feijoas, coppice trees and olives. They are currently concentrating on producing nashi, tart cherries and free-range meat chickens. Part of their land is in permanent sabbatical fallow and has been transformed into a 'park-like' wilderness with the planting of over 10,000 trees. The inter-tree areas have been left to natures processes, don't expect to find neatly mown lawns or neatly trimmed trees here!

# Field Day: From Production to Plate

## Terrace Farm, Rakaia, Sunday 17 October,1999

Geoff and Ira Wilson farm 140ha; growing four varieties of wheat, rye, buckwheat, marrowfat peas, linseed and oats, and have 70 cattle and 700 sheep. They have been using Bio-Dynamic methods since they took over the farm from Geoff's parents 14 years ago. They have followed a traditional Canterbury mixed farming system which has over the years evolved to include extensive processing and direct marketing – the latest addition being the setting up of a bakery on the farm.

The field day will be an opportunity to see Bio-Dynamic farming in practice, and to hear Geoff and Ira talk about their experiences on their mixed crop/stock farm and their reasons for further processing of their produce on the farm.

Programme:

- 10:00 – 12:30 Farm tour, looking at crops, pasture and stock under Bio-Dynamic farming methods
- 12:30 – 1:30 Lunch. Bring food for a shared lunch. Hot water will be provided.
- 1:30 – 3:30 Processing of grains - milling and baking

How to get there: Head south to Rakaia (from Chch). At Rakaia turn off to Methven and follow up the Rakaia River for 20 kms. After the first significant corner turn off to the right into Rakaia River/Gorge Road. After the first intersection Terrace Farm is the first place on the right. Further inquiries: Chris McLennan 03 352 1295

# The Mid Winter Feast

An informative and social evening was the feeling of the Mid Winter Feast held at Springston South Hall on the 24th July. Despite an initial hiccup, when power was lost in half the hall and the seminar room was plunged in to darkness, we were thoroughly illuminated by Tony Mallard's and Holger Kahl's informative presentations.

**Tony Mallard: Pesticides, Organics and Retailing**

Tony started by taking us back to the days of the first herbicides and pesticides. A time when he was working on the family farm. One of the first was sulphuric acid for weed control in onions which worked by burning the weeds but not the crop. It was applied with a knapsack sprayer which meant the acid got onto Tony's and his brother's clothes and ate them away. They had to work in 20 minute shifts applying the acid, discarding their disintegrating clothes each time before jumping in to shower! Next came linuron for weeds in carrots. It had a residual effect and was comparatively friendly to work with compared to acid. On the pest front DDT powder dusted on windowsills would keep flies at bay for a whole year! At the time it seemed like all the growers problems were over - no pests and no weeds. With the introduction of more and more chemicals, MAFF, other government bodies and the agrichemical industry made it sound like it was impossible to grow crops without chemicals. Tony, along with other growers at the time, though it was true. He now believes that we were sold a lie, and that it is completely possible to grow without chemicals and imperative that we do so for the sake of our health and the environment.

Tony left the family farm and worked as a surveyor for 19 years. However, he and his wife Lynnette, were drawn back to the land and purchased their current Marshlands block in 1971. It was passed over at auction and the owners struck a deal with Tony as he was leaving. It soon became clear why, as there was very bad flooding over the whole block that winter, due to an impervious clay layer underneath the topsoil. In '72 drainage was installed with shingle backfill. While this improved the situation it was not the complete answer, so a program of manuring was started. Initially this was chicken

manure, moving onto sawdust in '74 and then to compost made with sawdust and chicken and horse manure by '76. Tony noted that the compost he made then is quite different to what he uses now. It was composted for only six months to a year, with the result that it was still relatively raw, and with the large proportion of sawdust meant that it tied up nitrogen in the soil. Today Tony composts his material for two years before use, and uses sawdust, horse manure and chemically untreated waste material from a local seed cleaners, which includes seeds with a low germination rate.

In the early days Tony and Lynnette sold their produce into the Christchurch auction. At its worst they would get only ten cents for a carton of twelve lettuces, deducted from this was a container fee, and 10% commission. They got about half a cent a lettuce. They decided they could not do any worse with gate sales. So in 1972 they put up a sign at their Dallington property and started selling the lettuces for eight cents each, a vast improvement! Customers asked them if they were growing other produce so they started to plant a wider variety of crops. From then on marketing was a trial and error affair, with more and more crops being grown and sold from the farm.

In '82 Bob Crowder visited Tony and Lynnette, and pointed out that they were practically organic already, and why did they not go the whole way. Over the years they had been progressively reducing the number and amount of agrochemicals used and found that as they did beneficial insects and pathogens arrived and started to control most of their pests and diseases. When Bob visited they were only using linuron when they were getting behind on hand weeding of carrots. Tony firmly believes that if a pest gets too common then nature will do a better job of controlling it than pesticides which will only cause more problems in the long run. Quality has also improved over the years and the numbers of rejects has considerably decreased. When they first started they harvested perhaps 60% of the lettuce while now a good 95% is of harvestable quality.

From his experiences Tony 'questions everything' about what he is doing, and believes that more farmers need to fully think through the long term effects of their decisions. Even with irrigation, for example, watering too early can reduce the rooting depth of a crop, meaning it does not reach water and nutrients lower down in the soil.

Tony's cultivation techniques have changed considerably over the years and Tony now shudders at what they used to do! They originally ploughed using a crawler tractor, and finished with many surface cultivations. Tony now minimises cultivations with one pass with a lighter tractor and rotary hoe producing a fine seed bed. He believes that inversion of the soil causes a number of problems and no longer ploughs. Subsoiling has produced some great results, which, with the improved soil porosity from the compost, means that even after the heavy rains of mid July there were no puddles on the cultivated land at all - when many properties had water standing on their fields for days on end.

Many people getting into organics are worried about pests and disease. Tony has found that most of them are prevented and controlled by the farms ecosystem and his humus and microbe rich soils. Birds are potentially his biggest problem, especially in early crops. They use Mikroclima frost cloth to keep them off. Carrot fly is the next most important pest. Tony has noted that there are considerable variations in the number of damaged carrots between plantings. This can be as much as 45% between plantings one week apart (5% vs. 50% damage). He thought it may be due to the adult flies hiding in the sweetcorn crop but this turned out to not be the case. Tony now thinks that the flies attack the carrots at specific growth stages, which, coupled with the specific dates the successive generations of adults emerge, is responsible for the huge differences in damage. Glasshouses are often pest heaven and Tony introduces the *Encarsia formosa* parasite to control white fly which can be a problem. Those are virtually his only pest problems.

With nearly 20 years at their Marshlands property Tony and Lynnette are starting to think about retirement and consolidating the business. They have found themselves, in what most people would think of as a very envious position, of having more customers than produce! They have thus started to restrict who they sell to. While this may seem amazing from a kiwi perspective, there are numerous box and community supported agriculture schemes in the USA and Europe with long waiting lists of people wanting to join. This illustrates the huge potential demand in Christchurch and New Zealand as a whole for quality organic vegetables. Tony's presentation and his farm are a real inspiration to organic farmers, and proof that organic systems are not only possible but are highly effective and profitable.

Tony and Lynnette Mallard are organic growers from Marshlands, Christchurch.

**Holger Kahl: Genetic Engineering**

Genetic engineering is becoming an incredibly complex debate, and it is increasingly difficult to separate fact from fiction. This was highlighted by the questions Holger posed at the start of his talk: "Is it safe, or is it not?", "Is it the same, or is it not?",

"What do the experts/scientists say"? Some would say it is now impossible to answer such questions at all. Holger therefore took the bold step of looking at the assumptions behind the debate. He suggested there are two paradigms in the science of genetics at present, 'genetic determinism' and 'the fluid genome'. The word paradigm was coined by Thomas Kuhn in his famous book "The structure of scientific revolutions" in which he describes how one set of beliefs, assumptions and philosophy in a scientific discipline are overthrown by a new set, when the old ones disagree beyond tolerance with the results of experiments. A classic example is Einsteiniam physics overthrowing Newtonian physics. It is often forgotten that this took many years to achieve as the proponents of the new battled with the defenders of the old. Holger outlined the belief structures and central tenets of the two paradigms.

Genetic Determinism

- DNA or RNA is the genetic material
- Genetic information flows one way from DNA to RNA to protein via a triplet genetic code,
- The sequence of bases in the genes corresponds exactly to the sequence of amino acids in the polypeptide it encodes.
- The genetic code is universal.
- The sequence of base triplets in a gene is read in one direction, without overlap, and only in one correct reading frame.
- The DNA of most cells remains constant during development, only the genes expressed differ between different types of cells.
- Environmentally induced modifications in the characters of somatic cells do not affect the DNA and cannot be inherited.

The Fluid Genome

- DNA cannot specify anything at all by itself. Gene expression is an extremely complex process
- Interrupted genes exist where the gene spans multiple sections of DNA, with junk DNA or other genes in-between.
- There are versatile genes where one gene can code for one or more polypeptides or several genes can encode one polypeptides.
- Overlapping genes exist were one gene starts and or ends part way through a neighbouring gene
- The triplet base code of DNA is not universal
- Some genes occur in multiple copies (multigene families) and function simultaneously to make large amounts of a single protein
- Complex multigene families can contain slightly different sequences in each gene
- Genes can be silenced as a defence against invading DNA/RNA from viruses and human inserted transgenes
- The information in the DNA can be edited during transcription so the protein produced is different from that encoded in the gene
- Genes can jump; transpositioning of genes e.g. duplications, deletions, chromosomal rearrangement are regulated by cellular functions
- Genes can be amplified by copying whole segments of a chromosome and adding them back into the chromosome. This process is a physiological response under biochemical control and is not due to mutation of the gene.
- Genes can be changed by the environment
- There are wandering genes called transposons that travel between species that cannot interbreed (horizontal gene transfer)

Holger explained that these two paradigms were mutually exclusive. The first originated in the 1950's, it is based on a reductionist philosophy and man's domination and control of nature. The second acknowledges the phenomenal complexity of the genome, and biology of cells and organisms, and is aligned with more holistic philosophies that acknowledge the complexity of natural systems and humanity's inter-dependence with other organisms. The current wave of genetic engineering, particularly that driven by corporate interests, is based on the 'genetic determinism' paradigm, while those urging caution, restraint and the precautionary principle are coming from the 'fluid genome' paradigm. The debate therefore cannot be settled by scientific experiments, as it is a clash of two scientific paradigms and can only be addressed at a political / philosophical level within science.

However, with the involvement of profit driven trans-national corporations (TNC) the debate is taken beyond science and into the realm of citizens, consumers, agriculture, governments and world politics. Holger asked who stands to benefit from GE and who bears the risk, pointing out that most of the benefit goes to TNC and scientists while citizens, consumers, farmers and the environment bear most of the risk. He noted the importance of using the 'precautionary principle' in place of 'risk assessment', and noted the ethical dimension of GE has hardly been touched upon in the public debate.

He concluded with a quote by Dr Morgan Williams, The Commissioner for the Environment, speaking at the inaugural 'State of the Environment' address held at Lincoln University only a few days before. "Improving the ecological sustainability of our society ultimately requires major changes in hearts,

minds and behaviours… but the paradigm shift has not yet happened"

Holger Kahl is a Senior Tutor in Organics at the Christchurch Polytechnic

**Charles Merfield**

# OGCT AGM

The second annual general meeting of the Organic Garden City Trust was held in September. The audience was given an overview of the achievements of the many facets of the Trust. After the business of the evening, nine presentations outlining special organic projects showed the organic movement is in good heart in Christchurch. The Chairman of the Trust, Joep Nederpelt nominated the Kid's Edible Gardens project as the flagship for the year. The evening courses at the W.E.A. and the updated newsletter jointly produced with Soil and Health have been very successful. Much groundwork has been done towards a closer relationship with the Council. The treasurer reported a dramatic increase in the annual turnover -from $10,000 to about $93,000. Most of this increase has gone to wages for office staff and employees for Kids Edible Gardens. WINZ is a major contributor to wages with another grant coming from the Community Trust. Christchurch City Council and Soil and Health are among a number of other contributors. The Secretary Matt Morris reported on the running of the office at the Environment Centre. Kid's Edible Gardens have been established in 23 schools now with over 500 children involved. Composting and worm bins are started along with the gardens. Video footage of television coverage was shown and the two awards -Green Ribbon from the Minister of the Environment and the Early Initiatives Certificate from the Canterbury Public Health -were duly admired. The Tertiary Education Group driven by Holger Kahl has started the courses in organic growing at the W.E.A. There has been a successful move to involve the Hospitality students at the Polytechnic in the organic unit to learn about certified organic food. The Community and Home Gardens Group has run a barn dance, and provided ideas for an organic helpline (to be funded with money from the green employment agency), and community gardens. The Canterbury Commercial Organic Group aims to provide information, networking opportunities, encouragement and mutual support for people interested in commercial organics. There are now about 80 members. A teacher from the Mckenzie Residential School spoke of the benefits of the Kids Edible Garden for those children with behaviour problems. Envy Composting is on the move to organic certification, better marketing and new composting plants. Last year 18,000 cubic metres of compost were made. Problems with heavy metals are being tackled. Holger showed slides of the Environment Experience Centre in Europe which involved new experiences for all the senses in a unique organic garden atmosphere. The Christchurch City Gardens could do so much! Willie Kong outlined the work done in the Community Gardens. Often the benefits are as important for the many individuals involved as it is for the produce grown. Last speaker for the night was "yours truly" impressing all with the achievements and plans for the CCOG group. Most volunteered to help with the stand at the Show and there will be droves of people at our next farm walk for sure!

**Robyn**

# Canterbury A&P Show

We have had a successful meeting of three -Holger from the Polytech, Pete from Soil and Health and Robyn from CCOG. We have access to stands and desks and a tentative plan of the stall. We would like photos of sound organic growing for our brochure and of product/produce for the display. If any of you out there in the growing world have anything you want us to give away - great advertising! - or to use in the display please contact me. So far we have local bread, pickle, possibly cherries, oranges and kiwifruit from North, veggies if it's a good season, hopefully some meats or smallgoods. We are thinking we will offer a platter of whatever we have on hand as often as we can allowing for supply! It will be a good opportunity for spreading the word. We have a number of Show tickets to give away to helpers so line up. The Polytech can supply a good number of student helpers - about half the requirement we hope, but we need growers especially for the first two days - two people at a time and three changes a day. Thanks to those people who have already offered support - great.

**Robyn**

# Organic Weed Control Part 7

## Weeding Machinery

There are a large number of post crop emergence weeding machines on the market, many are only available from Europe or the USA unfortunately. There are two broad classes of equipment for annual crops, broad acre and inter-row machines.

Broadacre machines work by having a weeding action which the crop is immune to but kills the weeds. Inter-row machines, only work in the areas between the crops, and kill all plants. There are also a small number of weeding machines for perennial crops such as fruit, nuts and vines.

Most of the weeding machines, with few exceptions are most effective at killing weeds up to the time the weeds have one to three true leaves. Once weeds get bigger than this the percentage of weeds killed decreases. This is because larger weeds are physically tougher, they have more food reserves and can thus develop new roots again. Some farmers believe that the best time to weed is before the weeds have emerged. While this may appear sensible, the few pieces of research have indicated that this post-germination but pre-emergence weeding kills a lower percentage of weeds than weeding when the weeds have emerged. The highest percentage kill is at the cotyledon stage. Machines vary in how fast the percentage kill decreases as the weeds mature. For broadacre machines the percentage kill decreases very rapidly, while for the inter-row machines, with their more aggressive action, the kill rate decreases more slowly. Some of the very aggressive machines, such as the horizontal axis brush hoe, or rotary hoes can kill adult plants, but at decreased work rates. Even with the ability of these machines to kill large weeds it is not sound practice to leave weeding till weeds are bigger. In all cases best overall results will be achieved when weeds have up to three true leaves.

Most machines work best in hot dry conditions. This is because they do not actually destroy the weed, (e.g. by cutting in half or ripping roots and leaves off) but just leave the whole seedings on the soil surface. If the soil is moist or wet and or the weather is overcast then the seeds can re-establish. Even those machines that are more aggressive, kill rates will be higher with dry soil and hot windy conditions. There is thus a tricky balance to strike between waiting for good weeding weather and the weeds getting to big. There are no hard and fast rules for deciding and each case has to be judged, using past experience, on the likely weather patterns, the number, type and size of weeds, the type and state of the crops.

Both machines need a moderately fine seedbed to work effectively, however the spoon weeder will work better in coarser tilths and where there are soil caps, which it breaks up most effectively.

## Broadacre Machines

Tine weeders consist of a large number of spring steel rods (tines) between 0.5-1cm thick bent at 90° about 10cm from the end, see Figure 1. They work by vibrating rapidly backwards and forwards 'chiselling' through the soil. This action flicks out small weed seedlings. It was designed for use in cereals where the large deep drilled seed is out of the reach of the tines, and the flexible vertical shoot 'moves out the way' as the tines pass. There are a number of different manufacturers, some with a range of models. These machines are widely used and can be highly effective, however the different brands vary quite a bit in their effectiveness. They work best on larger, deeper seeded crops that are have flexible stems, e.g. peas and cereals. They are less effective against grass weeds, and has little effect on established weeds. The tine angle / spring pressure can be altered on most machines to allow for different crops and soil conditions. On some machines individual tines can be changed to deal with non-flat field profiles, e.g. raised beds. On others all the tines are adjusted at once, and a few have both options. Widths vary, some very wide ones are available exceeding 15m in width. Forward speed needs to be quite fast - up to 8km hour to get the most effective weed kill. Some crops, especially at later growth stages will need to be done more slowly to avoid crop damage. Soils need to have a dryish surface

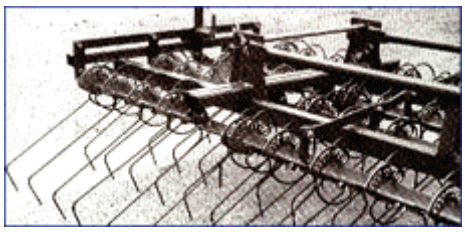

**Figure 1.**

Spoon weeders, also know as rotary weeders or rotary hoes, consist of a number of flat, thin, steel spokes emanating from a hub forming a wheel (see Figure 2). The end of each spoke is curved and has a thin 'spoon' like tip. It works by the wheels being driven round by contact with the ground. As the spoke hits the ground the curve in the end of the spoke makes the spoon enter vertically. As the wheel continues to turn the curve means the spoon is much more horizontal. As it exits the soil it thus lifts a cone of soil and weed seeds directly above itself and throws it into the air. The seeds being lighter come down last and desiccate on the surface. The spoon weeder has a more aggressive action than the tine weeder, and it also works best in large seeded, deeply drilled crops. Spoon weeders are used extensively in the USA, including in

no-till systems, and there are various models designed to cope with high trash levels. There are a range of working widths going up to about 10m. The spoon weeder is considerably heavier than a tine weeder of the same width.

**Figure 2**

## Inter-row Machines

While there are a wide variety of approaches to inter-row hoeing, the issue of where and how to mount them and ensuring accuracy is common to them all. With narrow tolerances, described in the last issue, it is often difficult to achieve the necessary steering accuracy when a weeder is mounted on the back of, and steered by, the tractor. The ideal mounting position is between the front and back wheels of the tractor. However for standard tractors this is impossible. There are a number of specifically designed tractors and tool carriers which can mid mount tools, such as Fendts. Mid mounting has the advantage that movements of the steering wheel produce the smallest changes in the position of the hoes compared to front or rear mounted machines. It is also the closest to the driver so they have the best field of view of the crop rows. Some machines have an off centred driving position so the driver has an unobstructed view of the crop without having to lean sideways which can be very uncomfortable after a few hours and can lead to health problems. If more than a few ha of crops are being grown the value and flexibility of a small tool carrier can outweigh its cost several fold. Front mounted hoes have the advantage that the crop can be viewed by the driver and while more sensitive to steering wheel movements than mid mounted they are less than rear mounted. The disadvantages are that either front three point linkages or special mounting attachments are required, which are often expensive. Rear (three point linkage) mounted equipment has the advantage of being able to fit on standard tractors. However on close tolerances found on most row crop they need to have someone steering them. This doubles labour costs. Exceptions to this are where the crops are in ridges, where the tolerances are less and the equipment tends to steer itself or on more robust crops that such as sugarbeet or cereals (some farmers hoe cereals sown in 30cm rows) where the tractor often has centre articulated steering (e.g. Holders) which means that equipment will accurately follow the tractors steering path, and hence the crop rows, rather than its own steering path, which is what happens on front wheel (and rear wheel) steering tractors.

Field surfaces are quite uneven over fairly small distances (ten's of centimetres) due to the way cultivation machinery functions. Many inter-row weeders have very precise depth requirements if they are to work efficiently. If they go too deep or shallow the percentage of weeds killed can decrease very rapidly. Quite a number of weeders consist of simple horizontal toolbar(s) to which individual weeder 'units' such as hoes or discs are attached. On such machines it is important that each weeding unit (e.g. a hoe blade), or small groups of units are able to independently adjust their depth. This is normally achieved by a parallelogram between the toolbar and weeding unit, with a small depth wheel. While this is complex it allows the height to vary without changing the pitch. Changing the pitch of a weeding unit such as a sweep changes their effectiveness. Alternatives to parallelograms include simple hinges where the vertical leg of each weeding unit is on the end of a 10-40cm horizontal bar with a simple hinge at the end. The horizontal bar reduces the amount of change in pitch when the unit pivots on its hinge. Systems where each weeder unit cannot individually adjust its depth should be avoided.

Some weeders rely on a single clamp to change more than one type of adjustment such as depth, horizontal position, and yaw. This makes it difficult, slow and frustrating when changing one adjustment as another adjustment setting gets accidentally changed as well. Ideally each adjustment should be changeable without affecting any other adjustment setting. The maximum recommended number of adjustment settings that can be changed with one clamp is two. More than this and adjustment becomes very difficult indeed.

The traditional machine for inter-row hoeing was the steerage hoe. At their simplest these consist of a horizontal tool bar to which vertical legs are clamped with hoe 'L' shaped hoe blades at the bottom, to machines with independently floating legs and quick width adjustments. The depth of hoe blades is critical for them to achieve a good kill - too deep and they go under the weeds, too shallow and they pass over them. It is therefore recommended to use independently floating hoes. Hoes do not work well in trashy conditions. Clumps of dead grass can quickly block hoes. The design of hoe blades is critical to achieve a good result with the minimum crop damage with the least clogging. Figure 3 shows a well designed hoe blade for

use in small seeded crops. The side wall has a shallow downward sloping cutting edge which enables it to deal with trash effectively. The side wall is also long and deep, with a curve away from the crop at the back end which ensures that soil is kept off crop seedings. The horizontal blade is flat on the ground so it has an ability to regulate its own depth. This also means that soil flows over it rather than along it. The blade is also angled backwards quite sharply which gives it more a slicing action on the weeds, but tends to encourage soil to flow along it and build up at the end of the blade in a ridge. In comparison the left-hand hoe in Figure 4 is badly designed. It has an upward sloping front edge on the side wall which means it tends to collect trash which then wraps around the vertical shaft damaging the crop. The side wall is very short and shallow with a distinct cutaway at its end which funnels a stream of soil into the crop row. If the crop is small this can bury them. The right-hand hoe in Figure 4 has a short downward pointing front edge which is better at dealing with trash than the left-hand one but not as effective as the hoe in Figure 3. Its blade is angled sharply up from the horizontal making it more difficult for the soil to flow over it, so it tends to flow along. However the backwards angle is much reduced which means soil tends to want to flow over it rather than along. It is also more strongly constructed than the left hand one. The right-hand hoe in Figure 4 is better suited to large robust crops such as maize or sweetcorn where depositing 1-2cm of soil in the row will not damage such tough crops but will bury small weed seedlings thus killing them. Different hoes are required for different crops. The left-hand hoe in Figure 4 is badly designed as it cannot handle trash well and is neither suited to small or larger crops.

**Figure 3**

**Figure 4**

Weeding machinery will continue in the next issue.

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Advertising rates are one New Zealand dollar a line (eight words a line) up to a quarter page, and then twenty five New Zealand dollars per quarter page. All enquires to Merf.

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**Canterbury Commercial Organics Group - Newsletter**

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