



Irrigation Training in Horticulture: How farmers adopt and adapt to new technologies

Peter Reynolds

2011 AgriFood Skills Australia Fellowship

An ISS Institute Fellowship sponsored by

AgriFood Skills Australia



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i. EXECUTIVE SUMMARY

The MIA (Murrumbidgee Irrigation Area) in South-western New South Wales covers around 660,000 hectares (Ha), of which around 120,000 Ha are able to grow irrigated crops and around 40,000 Ha of that area is used for horticulture. There are around 3,500 farms that are irrigated. These crops are irrigated with water taken from the Murrumbidgee River or ground water reserves and annually use around 450 Gigalitres (GL) per year, about one third of that water is used for horticultural crops¹.

There is considerable pressure on all irrigators to continually reduce water usage. Most irrigation farmers have installed or adopted new irrigation technologies on their farming enterprises in the past 10 years. There is however, a serious lack of farmers and farm workers with adequate skills to take the maximum advantage of the new technology.

There are some individual enterprise attempts to implement 'Best Practice for Irrigation Management' for specific horticultural crops in the MIA region but there are insufficient resources and trainers to provide this information to farmers, farm workers, farm managers and farm advisers.

By visiting training institutions in Netherlands, Spain and Portugal, the Fellow was given the opportunity to discuss and investigate how both private and government run organisations in those countries are attempting to address skills shortage in irrigation and horticulture in general.

There are many common difficulties faced by every organisation in these countries, such as, keeping courses relevant and new, attracting participants, attracting funding, attracting and retaining trainers and how to interact with governments, grower associations, corporate farms and private farmers. The travel program provided the Fellow with many ideas and suggestions exactly addressing some of the skills deficiencies and organisational difficulties, such as in successful training programs, unsuccessful training programs, attracting trainers, funding issues and the effect of globalisation on the workforce and training of the farm workers.

The organisations the Fellow visited in Portugal were probably the most relevant in terms of providing a dedicated irrigation training and research facility and where the needs of the growers are very similar to the needs of growers in the MIA region of Australia.

Skills in irrigation are linked very closely to overall agricultural skills and are very quickly affected by many external influences such as government policies, local, national and global economic circumstances, agricultural commodity prices, water-value and farmer attitudes. Skilling farmers to improve their irrigation knowledge can only be achieved by having a long-term strategy within an overall agricultural skills framework.

The MIA and Australian irrigated agriculture is in great need of professional, dedicated irrigation skills training. This can be achieved using existing private or government run facilities and utilising industry experts to carry out the training. The basis for training already exists in Australia; it needs planning, co-ordination and a budget to implement a suitable program.

By making representation to all industry stakeholders, the Fellow hopes that a co-ordinated plan from government and industry stakeholders could be initiated within a relatively short time frame of three to five years.

¹ Danzi, E. 1999, 'Irrigation Water Reforms', ABARE Current Issues, Canberra .

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ii. ABBREVIATIONS/ACRONYMS

AAAC	Australian Association of Agricultural Consultants
AIASST	Australian Institute of Agricultural Science and Technology
COTN	Centro Operativo e Tecnológico Hortofrutícola Nacional, Alcobaca, Portugal (Translates to Centre for Horticulture and Fruit Technology)
COTR	Centro Operativo e de Tecnologia de Regadio, Beja, Portugal (Translates to Regional Centre for Technology)
CPAg	Certified Practising Agriculturist from AAAC
E. Coli	Escherichia Coli bacteria
EU	European Union
fax	Facsimile
GFC	Global Financial Crisis
GL	Gigalitres (1,000 Megalitres)
Ha	Hectares
IVIA	Instituto Valenciano de Investigaciones Agrarias. Carretera Moncada-Naquera, Moncada (Valencia), Spain (Translates to Agricultural Research Institute, Valencia)
Km	Kilometers
MDBA	Murray Darling Basin Authority
MIA	Murrumbidgee Irrigation Area
ML	Megalitres (1,000,000 Litres)
Mm	Millimetres (of rain)
NSW	New South Wales
PTC +	Practical Training Centre - Netherlands
SMS	Short Message Service
TAFE	Technical and Further Education institution

1. ACKNOWLEDGEMENTS

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Awarding Body – International Specialised Skills Institute (ISS Institute)

The International Specialised Skills Institute (ISS Institute) is an independent, national organisation. In 2015 it is celebrating twenty-five (25) years working with Australian governments, industry education institutions and individuals to enable them to gain enhanced skills, knowledge and experience in traditional trades, professions and leading edge technologies.

At the heart of the ISS Institute are our individual Fellows. Under the Overseas Applied Research Fellowship Program the Fellows travel overseas. Upon their return, they are required to pass on what they have learnt by:

- Preparing a detailed report for distribution to government departments, industry and educational institutions
- Recommending improvements to accredited educational courses
- Delivering training activities including workshops, conferences and forums.

Over 300 Australians have received Fellowships, across many industry sectors. In addition, recognised experts from overseas conduct training activities and events. To date, 25 leaders in their field have shared their expertise in Australia.

According to Skills Australia's 'Australian Workforce Futures: A National Workforce Development Strategy 2010'.

Australia requires a highly skilled population to maintain and improve our economic position in the face of increasing global competition, and to have the skills to adapt to the introduction of new technology and rapid change. International and Australian research indicates we need a deeper level of skills than currently exists in the Australian labour market to lift productivity. We need a workforce in which more people have skills and knowledge, but also multiple and higher level skills and qualifications. Deepening skills and knowledge across all occupations is crucial to achieving long-term productivity growth. It also reflects the recent trend for jobs to become more complex and the consequent increased demand for higher-level skills. This trend is projected to continue regardless of whether we experience strong or weak economic growth in the future. Future environmental challenges will also create demand for more sustainability related skills and knowledge across a range of industries and occupations.

In this context, the ISS Institute works with our Fellows, industry and government to identify specific skills and knowledge in Australia that require enhancing, where accredited courses are not available through Australian higher education institutions or other Registered Training Organisations. The Fellows' overseas experience sees them broadening and deepening their own professional knowledge, which they then share with their peers, industry and government upon their return. This is the focus of the ISS Institute's work.

For further information on our Fellows and our work see <http://www.issinstitute.org.au>.

Peter Reynolds also thanks the CEO (Bella Irlight AO) and staff (Ken Greenhill and Paul Sumner) of ISS Institute for their assistance in planning and development of the Fellowship and completion of this report.

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Fellowship Sponsor – Agrifood Skills Australia

AgriFood Skills Australia develops and implements workforce development strategies and the industry's nationally endorsed qualifications to meet the current and emerging needs of agrifood enterprises, employees and students throughout regional and urban Australia. They have sponsored a number of Fellowships over many years, covering a very wide range of challenges faced by the Australian agrifood industry.

Fellowship Supporters

The Fellow thanks the following supporters for their assistance and support for this Agrifood Skills Australia International Fellowship application and planning:

- Mr. Arthur Blewitt, Chief Executive Officer, AgriFood Skills Australia
- Mr. Brian Halse, Manager, High Security Irrigators Council, Griffith, NSW
- Mr. Trevor Le Breton, Business Manager, Irrigation Council of Australia
- Ms. Iva Quarisa, Irrigation Officer, NSW Industry & Investment
- Ms. Anne Mooney, NSW Industry & Investment, Horticulturalist
- Mr. Brian Simpson, Chairman, Wine Grape Marketing Board, Griffith, NSW
- Mr. Dom Testoni, Riverina Citrus, Griffith NSW,
- Mr. Harley Delves, Chairman, Australian Prune Industry Association (APIA)
- Mr. Phil Chidzey, Manager, Australian Dried Fruits Association, Mildura, Vic
- Mr. Peter Calabria, General Manager, Yenda Producers Co-op Ltd, Yenda, NSW.

Organisations Impacted by the Fellowship:

- High Security Irrigators Council
- Wine Grape Marketing Board, Griffith, NSW
- Riverina Citrus, Griffith NSW
- Australian Prune Industry Association (APIA)
- Western Riverina Community College, Griffith, NSW
- Yenda Producers Co-op Ltd
- Horticultural clients of Yenda Producers Co-op Ltd
- Horticultural clients of Reynolds Horticulture Services.

2. ABOUT THE FELLOW

Name: Peter Reynolds

Employer: Owner / Director of Reynolds Horticultural Services Pty Ltd (an independent horticultural consultant based in Yenda, NSW)

Education:

- Diploma Applied Science (Agriculture), Riverina College of Advanced Education, 1981
- Certificate in Advanced Management Skills (Part 1) and (Part 2), Management Technology Education, Sydney, NSW, 1991
- Bachelor of Management (Horticulture), University of Sydney, 1997
- Certificate 4 in Workplace Assessment & Training, Riverina Community College, 2002

Professional Associations

- Member of Australian Association of Agricultural Consultants (AAAC)
- Certified Practising Agriculturist (CPAg) from AAAC
- Member of Australian Institute of Agricultural Science and Technology (IAST)

Brief Biography

Peter Reynolds has been involved in the horticulture industry for 27 years - employed in various production roles within the vegetable, vegetable seed, wine-grape and chemical reseller industries. His current occupation is as an independent horticultural consultant in the Murrumbidgee Irrigation Area (MIA) region of New South Wales (NSW). Reynolds also has a small farm, producing a range of small-scale specialist crops under open field and plastic tunnel-house systems.

Throughout his horticultural career, Reynolds has been involved with intensive irrigated cropping and assisting growers to produce those crops. He has been involved in all aspects of horticultural crop production including crop management, soil management, pests and disease control, irrigation, moisture monitoring, crop trials, and soil and leaf testing.

Since commencement of his horticultural consultancy in 2002, Reynolds has been actively involved in assisting farmers with their irrigation practices and operation of moisture monitoring equipment. By learning from other growers in the MIA and other horticultural regions, he is able to learn about, then demonstrate and offer alternative methods to his clients.

In an effort to improve his training skills Reynolds completed and achieved a Certificate 4 in Workplace Assessment and Training in 2002. As part of this Certificate 4, Reynolds regularly carries out specific industry training programs and provides training, supervision & assessments for agricultural trainees within the MIA region.

3. AIM OF THE FELLOWSHIP PROGRAM

The aims of this fellowship program and overseas research trip were to develop a thorough understanding of the best practices in training and employment in horticultural farming industry:

- Investigate how other countries with similar horticultural farming issues are addressing training and employment issues with regard to skilling and retaining workers.
- By interviewing key educators and training organisations, the Fellow will identify programs and incentives used to encourage people to become irrigation trainers and educators.
- To identify successful on-farm programs that have been implemented to train and retain skilled workers.
- To identify programs or training that the farm owners or managers undertake to improve their own skills.
- To discover existing Best Practice Irrigation Plans and understand how and why they were created and how successful they have been.
- By observing and learning about experiences and successes from international horticultural groups, there will be an opportunity to develop practical, formal and informal training plans that will be applicable to farmers and training organisations in the MIA.
- Gain an understanding of the global influences currently affecting people working in the horticulture industry and identify strategies that are being used to deal with those influences.
- Study first hand how the farmers have learnt the wide range of irrigation techniques being used in order to manage with less water and what is the effect on staff, staff training, crop health, crop profitability and environment.

To gain this global perspective, Reynolds visited a number of countries that have similar climatic, farming and economic conditions to Southern Australia and also have similar issues with irrigation water. It was identified that the Netherlands has some excellent formal training colleges and on-farm programs that will be investigated.

The Fellowship program concentrated primarily on intensive horticultural crops such as citrus, wine-grapes, stone fruit, nuts, olives and vegetables.

4. THE AUSTRALIAN CONTEXT

Whilst this Fellowship concentrated on the skill enhancement necessary for the Australian industry, it is relevant to discuss the overall irrigation industry as it gives some scope to the diverse nature of horticulture and the skills required to maintain those enterprises.

Murrumbidgee Irrigation Area (MIA) Horticultural Production

Established in 1912, the Murrumbidgee Irrigation Area, located in southwest NSW, has become one of the most productive horticultural areas in Australia, producing crops to the value of over \$1.5 Billion and directly employing over 3,000 people¹.

The crops produced are:

- Wine-grapes – around 30 different red and white varieties are produced, amounting to around 12 per cent of the national wine-grape crop
- Table-grapes are a small but increasing crop
- Citrus crops including summer and winter oranges, used fresh or for juicing, mandarins, lemons and grapefruit. Sold domestically and internationally
- Nut crops including almonds and walnuts
- Stone fruit – such as plums, prunes, peaches, apricots and nectarines, destined for fresh or dried fruit markets, both domestically and internationally
- Pome fruit – such as pears and apples for fresh or processing
- Olives for processing as whole fruit or for oil
- Vegetables – including onions, carrots, melons, chilli, capsicum, tomatoes, garlic, pumpkins, lettuce, cabbages, broccoli and other new and traditional types. They are produced in open field, greenhouses or hydroponically. Most are produced conventionally but some are under organic regimes
- Vegetable Seed crops – including lettuce, onion, carrot, brassica and cucurbit seed for national and international sales
- Nurseries, producing a range of trees and plants for commercial and retail sales within the region and also nationally
- Other minor crops, including pomegranate, jojoba, avocado, figs, blueberries, tea tree and specialist timber trees.

MIA Irrigation

The MIA covers around 660,000 Ha, of which around 120,000 Ha are able to grow irrigated crops and around 40,000 Ha of that area is used for horticulture. These crops are irrigated with water taken from the Murrumbidgee River and annually use around 450 Gigalitres (GL) per year; about 150 GL is used for horticultural crops. Most of this is supplied to the farms via concrete or earthen channels, totalling around 2,700 kilometres of supply channels. The water is gravity fed or pumped from the Murrumbidgee River. NSW State Water controls the flow of water into the Murrumbidgee River from Burrinjuck or Blowering Dams².

¹ Murrumbidgee Irrigation, 2010, Company Overview, Murrumbidgee Irrigation, Griffith.

² Murrumbidgee Irrigation, 2010, Company Overview, Murrumbidgee Irrigation, Griffith.

4. THE AUSTRALIAN CONTEXT

In recent years there has been some installation of pressurised systems where water is pumped from the channels and delivered to the farms via buried pipelines. There is some bore water used, particularly along the Murrumbidgee River and this is used for broad acre and horticultural crops.

Irrigation Industry Participants

While there are many 'stakeholders' within the irrigation industry, there is no overall irrigation industry strategy or single authority to oversee water management and on-farm use. It is useful to identify some of these stakeholders and their primary involvement in the industry:

- Farmers – using irrigation water for cropping and livestock
- Government (State and Federal) - regulating the industries and water
- Government (Local) – regulating local industries and supplying domestic water for towns and cities
- Water suppliers (Murrumbidgee Irrigation, State Water, etc.) – providing and selling water
- Water brokers – facilitate the sale of water allocations between water buyers and sellers
- Grower associations – representing growers to government
- Buyers (wineries, packing houses, agents, supermarkets) – buy the produce from the farmers and transfer or process the goods for final consumption
- Irrigation equipment suppliers – supply and install irrigation systems
- Agronomists – assisting farmers with chemical and fertiliser products and their use
- Industry specialists (NSW Industry and Investment, moisture monitoring installers, etc) – provide specific equipment and information
- Agriculture and horticultural training organisations such as universities, colleges, Tertiary and Further Education (TAFE) and Registered Training Organisations (RTO) – delivering general agriculture and horticulture training packages.

Many of the farmers have to deal with many or all of the other stakeholder groups, each who have a specific objective and often the farmers get differing or even conflicting information from those different groups. This makes it very difficult for the farmer to continue to produce a quality crop with profitable yields, with fewer resources whilst minimising on and off farm impact.

Water Shortages and Future Changes

Over the past 10 to 15 years there have been significant water shortages due to drought in the water catchment regions, resulting in lack of water for all irrigated crops and therefore restricting production. Many horticultural growers have converted to drip irrigation or changed crops in an effort to better utilise the water. Whilst this has been quite successful, there is a great deal of uncertainty about the future of irrigation, with projections of less water being available as governments attempt to restore river ecosystems.

Recently the Federal Government created the Murray Darling Basin Authority (MDBA) to oversee major changes to the management of water within the Murray Darling Basin. This authority has recently released a draft plan, outlining proposed changes to the use and catchment of water throughout the Murray Darling Basin with an aim of restoring river and catchment health. This has led to considerable confusion and uncertainty about the future of irrigation across the whole irrigation community in southern Australia.

New Technology and Skills Enhancement Required

In response to less water, increasing costs and appreciation of environmental concerns, many growers have installed new equipment and implemented new production methods. Traditionally crops were furrow or flood irrigated; now they are using pressurised drip or micro-sprinkler irrigation systems. While the installers do show the farmers how to use these systems, there is little training or information available as to how to optimise the irrigation, and most operate on a trial and error system and rely on other farmers for information.

After using these new systems for a few years, many growers are not achieving 'promised' water savings or are suffering with significant crop quantity or quality losses. There are a number of equipment or management issues that have contributed to this; however the Fellow has heard from many growers who feel that their costs have increased while income per hectare has decreased. Farmers have told the Fellow that operating costs (electricity, maintenance and repairs) are significantly higher than originally estimated when the installations were planned. By using less water and applying less inputs, many growers have stated the average winegrape yield per hectare has decreased in the past 10 years, resulting in lower income.

There are some individual enterprise attempts to implement 'Best Practice for Irrigation Management' for specific horticultural crops in the MIA region but there are insufficient resources and trainers to provide this information to farmers. There is considerable pressure on all irrigators to continue to reduce water usage but they do not have enough practical information to help them make the best decisions with regard to their own enterprise. There is a serious lack of farmers and farm workers with adequate skills to take the maximum advantage of the new technology.

There is one education program (Envirowise®) run by NSW and Murrumbidgee Irrigation that provides good information to growers about soils, irrigation, moisture monitoring and farm management but it is a one off program and not all growers attend.

There are some Horticultural Traineeship courses available (Certificate I, II, III, IV and Diploma) through some registered training organisations; however the uptake is very low and there are very few qualified trainers and assessors available to carry out the necessary skills training. These traineeships do have irrigation components but often they are not undertaken in favour of more practical on-farm skills such as machinery operation, pruning and so on.

There are few other formal training programs available and those are only offered as distance education with no local irrigation based courses offered.

SWOT Analysis of Horticultural Skills in the MIA

Strengths

- Extensive horticultural cropping area, therefore there are many existing farmers and workers with good skills.
- Combination of corporate, large and small farming units throughout the area.
- History of innovation and change – local farmers and engineers have designed new equipment to improve productivity and provide mechanisation of traditional hand labour tasks.
- Farmer resilience - two World Wars, depressions, recessions, drought and floods have affected and altered farming but have not defeated the MIA farmers.
- Wide variety and acceptance of different people and cultures in the area with new and differing skills, around 25 different nationalities can be found working and living in the area..

4. THE AUSTRALIAN CONTEXT

- Ability to upsize farms and gain production efficiencies.
- Ability to change crops and cropping methods if desired.
- Some training organisations already established.

Weaknesses

- No overall irrigation industry strategy or authority, too many government department and levels are all significant stakeholders.
- Lack of formal training and education programs, government or privately funded.
- Lack of informal training programs – many farmers are self-taught and struggle to teach workers or next generation farmers.
- Lack of individual and overall industry strategy to skill and retain workers;
- Lack of qualified trainers.
- Existing training organisations dependent on government funding.

Opportunities

- Current MDBA plan may allow rethink of existing irrigation techniques.
- Federal and State governments may be prepared to invest in infrastructure and training to achieve water savings.
- Growers may change crops to more profitable species / crop types.
- With a decrease in farm values, younger growers may be better able to afford to purchase irrigation land and water.
- Opportunity for new investments by outside companies or farming groups due to relatively reliable farming conditions.
- Opportunities for training organisations to instigate and develop training programs for irrigation farmers in general and for specific industries and specific workers or ethnic cultures.

Threats

- MDBA plan and proposed significant water allocation reductions.
- Global competition – imports from cheaper or subsidised countries.
- Reduced number of buyers – supermarket buying power.
- Increasing average age of farmers.
- Increasing cost of water and other cropping inputs.
- Pressure to become larger farming units, encouraging corporate farming structures with less workers.
- Lack of young people wanting to go into horticulture.

5. IDENTIFYING THE SKILLS AND KNOWLEDGE ENHANCEMENTS REQUIRED

There are examples of areas in Australian industries where there are weaknesses in innovation, skills, knowledge, experience, policies and/or formal organisational structures to support the ongoing successful development and recognition of individuals and the particular sector.

The focus of all ISS Institute Fellowships is on applied research and investigation overseas by Australians. The main objective is to enable enhancement and improvement in skills and practice not currently available or implemented in Australia and the subsequent dissemination and sharing of those skills and recommendations throughout the relevant Australian industry, education, government bodies and the community.

The following skills enhancement areas were investigated during the Fellowship:

5.1 Investigate how other countries with similar horticultural farming issues are addressing issues with regard to skilling and retaining workers.

The Fellow will visit and observe training programs currently being offered by government and private training organisations. It will investigate:

- How these programs are funded: government or private
- How these programs are conducted, in classroom situations, on farm or by distance education.

Outcome - a greater understanding and documentation will be developed of what training methods are used successfully and unsuccessfully by horticultural training organisations

5.2 Identify programs that are in place to encourage people to become irrigation trainers and educators.

By discussing the issue with training providers, the Fellow will gain an insight into the skills and incentives needed to employ irrigation trainers.

Outcome - a list of practices and incentives used to employ and retain horticultural trainers will be developed and included in the final report.

5.3 All horticultural areas suffer from insufficient numbers of skilled and semi skilled irrigation workers.

The Fellow will investigate on-farm programs that are implemented to train and retain skilled workers. The Fellow will also investigate training programs that the farm owners or managers undertake to improve their own skills.

Outcome - detailed reports of various on-farm training programs that are currently undertaken by different countries and farming groups will be obtained for later review.

5.4 To establish good management and quality assurance plans, some horticultural companies or industries have developed their own Best Practice Plans or have combined with like industries to establish general cross industry plans.

The Fellow will investigate a range of Industry Best Practice plans used in horticulture to:

- Determine the initial aim of those plans
- How those plans were compiled and by whom
- Evaluate if the plans were successful and the reasons for their success.

Outcome - copies of appropriate plans (or descriptions of them) will be obtained and analysed for development of suitable plans in the MIA.

5. IDENTIFYING THE SKILLS AND KNOWLEDGE ENHANCEMENTS REQUIRED

5.5 Global competition and increased buying power by wholesale companies are placing more and different pressures on horticultural farmers.

By meeting horticultural farmers and industry stakeholders, there will be a better understanding of these global influences and able to identify strategies that are being used to deal with them. The visits will help to identify:

- The issues that are affecting all horticultural growers
- Any actions the growers are implementing to deal with these issues
- The role of industry associations with addressing these issues
- The role of governments in addressing these issues.

Outcome - the issues and pressures resulting from globalisation will be identified and evaluated with reference to Australian conditions.

5.6 Study first hand the wide range of irrigation application techniques used in different areas to manage with less water and the effect on crop health, crop profitability and environment and how the farmers learn and apply these techniques.

Observe and question farmers and irrigation specialists in order to identify techniques that would be applicable to MIA farmers. This will help to understand:

- What learning method is best for farm workers
- What is the value of formal qualifications for farm workers
- What inputs are required for successful training
- How to gauge the success of the training
- How training helps to retain workers.

Outcome - the result of this area of the Fellowship study will enable the Fellow to identify various application techniques and how they may be taught to Australian farmers.

6. THE INTERNATIONAL EXPERIENCE



Country - The Netherlands

Greenhouse Production

The Netherlands has about 10,000 ha of greenhouses. There are about 3,000 farmers and these farmers are decreasing in number but increasing in average age. The area under glass (greenhouses) has been stable for the last 10 years but the average farm size is increasing as growers look for economies of scale¹.

The current cost is about Euro €120 to €200 per square metre (Australian \$170 to \$280 per square metre) to build a greenhouse, depending on the size and set-up².

Future Dutch Government Objective

The Netherlands government has recommended that by 2027 there will be zero per cent emissions from all greenhouses. This includes water, nutrients, chemical gas and waste. The government is aiming for 2027 compliance but key dates are 2015, 2021 and 2027. The specific targets and associated research projects are therefore in six-year increments and are designed to look for alternatives to current practices.

The projects are looking at minimising fertiliser and chemical usage and reducing and recycling all waste.

¹ Erik Van Os, 2011, Wageningen University, personal communication.

² Erik Van Os, 2011, Wageningen University, personal communication.

6. THE INTERNATIONAL EXPERIENCE



At present greenhouse growers already have to collect all rainfall. This has a significant impact on irrigation as it means all irrigation water must be recycled and held on farm. It is estimated that most greenhouses are 90 to 97 per cent efficient at controlling emissions but very hard to get to 100 per cent.

To achieve these targets, the Dutch government is providing extra funds for increased research and grower training.

Despite the current Global Financial Crisis (GFC), that deeply affected Europe during 2011, there appears to be less effect in Netherlands, with not so much discussion within the groups and individuals the Fellow spoke with during his visit around the Netherlands. Whilst farming and horticulture in general is in an economic trough at present, this is mainly due to the recent E. Coli outbreak, mistakenly blamed on tomatoes but has affected the sales of all salad vegetables.

The Dutch horticulture is very advanced in terms of production technology and much of their produce is shipped all over the world. So they are insulated to some degree from the effects of the GFC.

Destination 1 - Enza Zaden Vegetable Seed Company, Enkuizen, Netherlands

Contact/s

- Kees Van de Jong, Senior Plant Breeder, Enza Zaden

Overview

Enza Zaden is a 60-year old family owned company with their Head Office based in Enkuizen in North Netherlands and has offices and research facilities all around the world. In the past 20 years they have increased staff levels from 45 people to 350 people at the Enkuizen head office and over 1,400 world-wide.

Enza Zaden is in the top six seed companies in the world, specialising in lettuce, capsicum, tomato, cucumber and spinach. They are probably the number one company in the world for lettuce varieties and breeding, having around 250 commercial varieties and around 5,000 breeding lines. They also produce most other vegetable species, targeting both the greenhouse and open-field markets around the world. They only sell to commercial growers, not to the packet market.

Enza Zaden have research and/ or production facilities in USA, Australia, Spain, Italy, France, Chile and Indonesia, and have a sales presence in most other vegetable producing countries and potential countries such as North Africa, South Africa, Thailand, India, South America and Eastern Europe.

Enza Zaden is situated in the northern Netherlands and has around 10 Ha of glass house, used for research, seed production, disease testing, and variety trials. The Enza Zaden company structure is fairly flat with the owners and company board providing the direction and funds for the business. The company commenced a major upgrade about 15 years ago with new offices and greenhouses. These have only recently been completed and the company is already are planning more expansion.

Company structure is divided into seven business units:

- Administration
- Systems (Information Technology)
- Research or development
- Seed Logistics (Seed Production)
- Seed Handling (Receivals, Seed Cleaning, Seed Grading, Packaging and Dispatch)
- Technology (Seed Testing and Seed Treatments)
- Sales (Seed sales and support).

Enza Zaden are one of the largest privately run vegetable seed companies in Europe and are regarded as world market leaders in many of the vegetable seeds that they breed, produce and sell. As well as having branches all around the world they have a very close relationship with their customers, that is, the farmers who buy their seeds and the market agents who sell the end produce. From this perspective Enza Zaden are a very “vertical” company in that they try to keep all aspects of the company business “in house”. They try to employ good staff then allow them to undertake internal or external training and are happy for staff to progress within the company.

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Objectives

The visit to Enza Zaden aimed to gain an understanding of the following:

- Training methods for their technical staff
- How Enza attract and retain technical staff
- How training is funded
- The reasons for keeping training in-house as much as possible
- The global influences affecting the company.

Outcomes

Being a large company, Enza Zaden has the ability to design and implement in-house training programs on a large scale. These can be summarised as follows:

Hiring

Each department is responsible for the hiring of new staff (permanent) and the positions are filled either from within Enza or from outside.

Over the past four or five years, some of the other large seed companies in Netherlands have undergone significant restructuring so a number of staff have left or been put off and so there has been a good workforce available to choose from. This has ceased in the last two years so experienced workers are now harder to find.

Each year Enza will hire (if required) a number of university or college graduates who are given a position within the company and then transferred to different position every three months for a total of 18 months. After this training period the person and the company decide where the person is best suited and they will then take up a permanent position. The number of graduates will depend on the vacancies and needs of each department.

Training

This is an aspect that causes Enza management many problems, as the industry has very specific technical requirements for each department, requiring the overall company training plan to be very flexible. They have differing levels of training, however their overall aim is to improve the skills of existing workers rather than trying to hire people with those specific skills.

So, many of the senior staff at Enza have come from the “bottom up” and are provided the opportunity to progress within the company very quickly. Many managers are young to middle-aged.

Training Methods:

- In-house: Enza use their own technical people to carry out in-house training. For example the seed technology people are working on an X-ray type machine that can determine the health of a seed embryo without damaging the seed. This is being developed by Enza staff so all training has to be in-house. Most of this training is on-the-job-training, on an ongoing basis, but also with some formal training sessions where people from the same departments but from different countries will all meet one, two or four times per year and undertake training. There are no formal qualifications resulting from this internal training.
- In-house with External Trainers: Some training is done in-house using external trainers (specialists such as plant physiologists or generic trainers such as Work Health and Safety trainers). These courses are usually formal with defined outcomes. They can be tailored specifically for certain

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workers (seed cleaning for example) or generic training across different departments (Work Health and Safety for example).

- In-house, with Other Seed Companies and Using External Trainers: For some specialist (but standard) skills, Enza will co-operate with other seed companies and engage an external trainer to train a sufficiently large group. Such skills are industry standards such as climate control, greenhouse production, irrigation and fertiliser management, seed cleaning, seed germination testing and so on. The students will receive a certificate upon successful completion. (Note - they often use companies such as the Practical Training Centre - Netherlands (PTC +) for this training.)
- External Training Courses: Enza Zaden send some of their staff to attend external training programs. This can be basic training (forklift operation) or more specialised skills enhancement (Integrated Pest Management training, for example). External training is often used when a range of specialised equipment is required for teaching purposes but may not be available at the Enza Zaden workplace.
- External Tertiary Training: If a position requires specific or tertiary qualifications, then Enza Zaden will support the worker to undertake tertiary training, normally on an external student basis. They will allow the worker adequate time to attend University as needed or time off to study or attend examinations. Depending on the qualification, it is normally paid for by the worker and compensated by a higher salary after completion of the course.
- Future Training: Enza are committed to expansion and have infrastructure in order to cater for this. They believe their current training program is flexible enough to be able to cope with new staff and replacement of staff as they leave or retire.

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Destination 2 - PTC+, Ede, Netherlands

Contact

- Ben Van Den Brink, International Program Manger, PTC+

Overview

PTC+ is a private training company, specialising in the training of owners / managers / supervisors, working in the horticulture or agricultural sectors. Originally setup as a result of a private foundation, the company now is self-sufficient and has no government assistance. Training costs are for paid by attendees.

Although originally only dealing with training within Netherlands, now about 50 per cent of income is derived from dealing with international customers, providing training, training local trainers and designing programs for countries or organisations overseas.

PTC+ are currently carrying out training programs in Indonesia, Tanzania and Mexico. The training programs are aimed mostly at farm managers and owner/ managers, not so much at basic field workers. Courses range from one day (not common) to three to five day (most common), to seven weeks (two days per week for seven weeks). Most common is the three-day course, either as three days together or one day per week for three weeks.

Typical courses cover the following topics:

- Animal husbandry - pigs, cattle, poultry
- Protected cropping - greenhouses
- Open field cropping - horticulture and broad acre cropping.

The training centre at Ede is for protected cropping, there is a separate facility about 150 kilometres away for broad acre crop training.

PTC+ can do onsite (customer) training if there are sufficient numbers within the organisation doing the course. PTC+ have done training with Enza Zaden and Syngenta seed companies and also carry out some training for multiple seed companies (greenhouse operations, for example).

PTC+ survive by offering very good courses and charge a reasonable price for the service. As the Netherlands horticultural sector is quite static, it is more difficult for PTC+ to offer new and interesting courses to the same farmers, so they are now doing significant business in other countries, especially developing nations who wish to export to Europe.

Objectives

The visit to PTC+ was aimed at researching and understanding the following:

- Their training programs for growers relating to irrigation
- The innovations and restrictions in growing technology being passed on to growers
- Their training methods for their technical staff
- How PTC+ attract and retain technical staff
- Gain an understanding of the global influences affecting the company.

Outcomes

Trainers

PTC+ has over 150 trainers: some full time (maybe 20-30) but mostly part time (120+). It is not essential for all trainers to have formal qualifications but they must be industry experienced. Some trainers must be qualified, such as legal experts, plant physiologists. All trainers must commit to a full year of training. All trainers must also commit to having some training each year. This can be in-house (PTC+) or external training. Each trainer is peer-reviewed annually and actively involved in their professional development. PTC+ has their own 'Train the Trainer' programs and design their own training packages.

Flexibility is the key - employ the right trainers to teach the right subject. Many of the part-time trainers are also farmers or industry people and commit to training for the industry good and get paid well to teach.

Industry Auditing

PTC+ also provides a service to "audit" agricultural businesses to determine the current skill levels of their workers and compare it to industry standards. PTC+ will then propose a suitable training program. The key to this auditing is to identify specific business aims for the training, such as, a two per cent increase in production or a five per cent decrease in costs.

Training Courses

PTC+ has a fully equipped facility at Ede in eastern Netherlands where they carry out most of their training courses. Training groups are normally restricted to a maximum group size of 15 people – the ideal is 10 to 12. PTC+ can do onsite (customer) training if sufficient numbers within that organisation. Training has been done with the individual seed companies or a combined training with multiple seed company attendees.

Each training course will cover one or more of the five key areas:

- Nursery production: The stages of plant production from sowing seed until plants are ready for transplanting.
- Plant Physiology: The basic life cycle of plants and their growth stages. Includes the plant's use of nutrients, water and air. Is the most "theoretical" subject and often requires a "special-trainer" as it is difficult to teach.
- Integrated Pest Management (IPM): This covers pests, diseases, disorders and how to control or minimise the impact. Europe is cutting back the number of allowable chemicals that can be used in greenhouses and all the "soft options" have to be used in greater quantities.
- Climate Control / Environment: These subjects are combined as the relationship between the two is very close. Climate control involves regulating the conditions within the greenhouse - water quality, water catchment and recycling, air quality, oxygen and carbon dioxide levels, light, heating, cooling and the costs associated with controlling all these. Environment is the conditions outside the greenhouse that affect the conditions within the greenhouse. Also the conditions outside that can affect the inside conditions, this includes light, temperature and wind and also any emissions that come from within. (Note: the Netherlands government has decided that by 2025 there are to be zero emissions from greenhouses, this includes chemicals, water, nutrients and any other waste. It is estimated that it currently is about 90 to 95 per cent emission-free but the final five to 10 per cent is very hard to achieve³).

³ Erik Van Os, 2011, Wageningen University, personal communication.

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- Irrigation and Fertigation: As almost all greenhouse production is by hydroponic growing method, they combine fertiliser and irrigation as both happen together in most cases. This is a critical component as it is the only nutrient source for the crops and the implications of an error are both immediate and possibly devastating.
- Other Training: Specific courses or in-house training may cover some of these, all of these or other specific subjects, depends on the customer needs and existing skill level of participants. One common course is Pre or Post Harvest Phyto-sanitary Inspection and Quality Control. Many farms need certified Quality Control systems to sell to supermarkets or export. Some of these include certification such as EUROGAP or ISO 9001. PTC+ also conduct compulsory courses such as Farm Chemical Users course (similar to the Australian Chemcert Course). It is noted that all participants receive certificates either from PTC+ or may receive government licences or certificates if applicable.

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Destination 3 - Wageningen University, Greenhouse Horticulture, Wageningen, Netherlands

Contact/s

- Erik Van Os, Senior Research Officer, Wageningen University

Overview

Wageningen University now has about 6,000 students all science and agricultural based. Before 2006, student numbers were decreasing. However, since 2006 student numbers are increasing yearly⁴. This increase is credited to the restructure of university and introduction of new courses. New courses are more bio-sciences and applied agricultural subjects such as agricultural engineering, climate sciences, and bio-diversity courses. There is a distinct change of focus from theoretical courses to industry-based courses. The University had major interaction with industries and grower associations, so courses have a much greater practical experience component and are focused on real careers.

During the visit to the Wageningen University, the Fellow found out about the resurgence of the University as a training institution and the system of Applied Research that is carried out in the Netherlands. The research and eventual dissemination of results is more aimed at technicians, consultants and highly skilled farmers and owners. The interesting fact is that farmer groups are actively involved in the planning, the conduct of the research and the dissemination of results of each research project.

Objectives

The visit to Wageningen University was aimed at researching and understanding the following:

- Their training programs for growers relating to irrigation
- The impact of government policy on the courses and training the University offers
- The innovations and restrictions in growing technology being passed on to growers
- How the university is adapting to changing demand for their courses
- Identify programs or incentives designed to attract participants
- Gain an understanding of the global influences affecting the University.

Outcomes

Research Process

Growers and/ or industry propose a project that is submitted to the Netherlands Horticultural Research Council. If the project is accepted, then it then needs to be approved by Netherlands government (equivalent to the Department of Agriculture). If it is approved, the government will allocate appropriate funding. The project is overseen by the Industry Focus Group (IFG) made up of growers, industry and researchers. The IFG will meet at regular intervals, from six weeks to three months to review the project and address any problems.

All projects need to have an achievable outcome (either cost savings, improved production or other production advantage for the growers). At the end of the project the results are presented to growers or industry. These are presented via a field day, field demonstrations, print media, posters, technical publication or article in an industry magazine.

⁴ Erik Van Os, 2011, Wageningen University, personal communication.

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The University also try to carry out trials on growers' farms as well as at the University glasshouses at Bleiswijk (100km away, North of Rotterdam). After the project ends, the grower will be interviewed by media and the information then published in papers or industry magazines.

All results are presented in terms of the achievable outcome, whether or not the outcome was actually achieved and to what degree (percentage increase in production or percentage reduction in costs).

Research Presentations

The biggest problem researchers such as Van Os have is getting growers to attend research presentations. Van Os will try to keep field days to three to four hours in duration and held during the mid to late afternoon time. Often drinks and a meal will be provided. The University will occasionally subsidise the grower travel costs.

It is normal to have "knowledge days", from 14.00 to 19.00 pm; sometimes there will be a whole day session. If the project covers a crop production cycle, the University will offer a three to four hour session, one day per week for four to six weeks. It is difficult to get private industry consultants to attend, as they don't get paid (or generate income) for learning.

Agricultural Extension Services

There are no government extension services now in the Netherlands; they were all privatised about six years ago and most government staff became private consultancies. Wageningen University will do joint venture projects with some of these consultants (PTC+ and DLV Agri-consultants mostly) however PTC+ train mainly growers on new and existing production techniques, not involved so much with research or releasing research results.

Dutch Growers and Skill Level

The education level of most growers is quite good; many have degrees or diplomas. Not many glasshouse growers can survive without formal qualifications. Research is targeted at growers with medium to high skill levels. These growers are more likely to adopt research results. As in Australia, the growers who need to learn new skills and methods are the ones who don't regularly attend field days or training courses.

Some growers can accrue "points" by attending certain events or field days and these are recognised as "prior learning" in order to achieve some compulsory licences, such as, spray licences which are regulated by the Dutch government. Research projects will try to target specific growers or industry groups, for example, a fertiliser trial may target tomato and pepper growers only. The aim is to focus on similar crops or industries. Growers will not attend seminars and field days if it does not address the needs of those individual growers.

International Research Projects

Wageningen University are also doing international research to generate extra income, usually joint ventures with governments or private industries. They are carrying out research projects in India, Africa and Asia.

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Country - Spain

General Information

The organisations the Fellow visited in Spain had many similar features in that they were government funded and aimed a great deal of their efforts towards the average farmer. The services offered were quite basic (deliberately so) and aimed at gradually improving the skill level of the majority of farmers.

The horticultural research carried by those organisations is also very closely tied to farming with the focus on Applied Research, or projects that will have significance to the farming groups.

Due to the ongoing effects of the Global Financial Crisis throughout Spain, there is a very obvious lack of funds for research with many projects being cancelled or postponed due to lack of funds.

The average Spanish farmer is earning a very poor return with current market prices as low as they have been for 10 years. Much of the produce is consumed domestically or exported to other southern European countries where the quality required is not so high.

The average farm size is quite small and the government, both Spanish and EU, have chosen to continue to pay subsidies to growers. This is as much to keep them on the farms, rather than relocate to cities where they would be an even greater drain on the government. Most of the horticulture (permanent plantings) is now on drip irrigation and the water boards are actively assisting growers to save water.

Apart from the subsidies there are many similarities with the two regions the Fellow visited with hot, dry climates, recent drought and pressure to save water so it can be on-sold for electricity or the environment. They are also similar to the MIA region in Australia and it was discovered many of the issues facing both farmers and trainers are almost exactly the same in both countries. Reluctance to change, suspicions about the value of training, slow uptake of new methods and so on, are common in Spain and MIA region. Many of the trainers and researchers mentioned that the Spanish government will probably continue to support “grass-roots” training and support programs but the higher research projects are under threat. Private industry is being asked to support research more and more.

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Destination 4 - Escola de Capacitacio Agraria, Generalitat de Catalunya, Tarrega, Spain, (Department of Agriculture)

Contact/s

- Senora Maite Sisquella, Manager, Escola de Capacitacio Agraria
- Mr Josep Porta Isanda, Trainer, Escola de Capacitacio Agraria
- Mr Pere Boixadera Abella, Trainer, Escola de Capacitacio Agraria

Overview

Escola de Capacitacio Agraria, is based in Tarrega, a town about 50km from Lleida. Lleida is about 200km west of Barcelona and is one of the most intensive horticultural areas in the Catalunya Region of northern Spain.

- In this region there around 3,000 farmers in the region, producing pears, apples, stone fruit (peaches and nectarines), olives, almonds, vegetables (tomatoes, melons, onions), maize, cereals and pastures (for hay making)⁵. This department specialises in the training of farmers in current irrigation and the adoption of new irrigation methods.

Objectives

The visit to Escola de Capacitacio Agraria was aimed at researching and understanding the following:

- Their training programs for growers relating to irrigation
- The impact of government policy on the courses and training the department offers
- The innovations and restrictions in growing technology being passed on to growers
- How the department is adapting to changing demand for their courses
- Identifying programs or incentives designed to attract participants.

Outcomes

Irrigation Workshops

Hands-on workshops are conducted at the department station or on-farm. They conduct about ten workshops per season (drip) and three per season (centre pivot sprinklers). Workshops are three to four hours in duration, held in the afternoons, with refreshments afterwards.

The workshops are designed to be very practical with growers completing basic worksheets and measuring the effect of different irrigation using the stations testing and demonstration equipment. The workshops cover the major aspects of irrigation:

- Water and water quality
- Soils and effect of irrigation
- Types of irrigation and components
- Moisture monitoring
- Irrigation scheduling.

⁵ Sisquella. M, Escola de Capacitacio Agraria, 2011, personal communication.

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Growers are contacted via direct mail and through the numerous grower co-ops (fruit packing and marketing co-ops) and through the water communities. The aim is to target water users within a single local community (so all growers know each other) or target growers within a single crop enterprise, for example, pear growers within a valley. Each workshop has specific fact sheets and worksheets that the growers keep for future reference. (Note: The government controlled Water Board is actively involved in promoting water savings and involved in courses provided. They will help fund the course or provide other resources such as irrigation equipment or computer software.)

Other Services

The station also provides the following services for growers:

- SMS Alerts: Send automated SMS to about 700 growers each week, informing the growers how many hours they need to irrigate
- Internet: Growers can log onto their website and enter location and crop details from drop-down menus and will be shown local weather and an estimate of required irrigation time
- Media: Publish weather data in local papers and on TV and will have suggested irrigation requirements. (Note: for SMS service, growers register their details, locality, farm size, crop, irrigation capacity, crop requirements at the start of each season or when they attend a workshop and then the computer software automatically calculates irrigation requirements based on weather and evaporation and crop coefficients.)

There are a number of automatic weather stations throughout the region (25+) and some linked moisture monitors in different crops, so the data from each station will be matched to each grower's location and evaporation and crop stage is used to predict water usage for the next week.

Conclusion

This Department of Agriculture station is designed purely to target the many low skilled farmers and basically by making the growers attend by compulsory means, teach the growers the basics of irrigation. In addition the department provide a basic irrigation advisory service via SMS, Internet or print media to assist growers decide how much to irrigate. There is a very low uptake of moisture monitoring equipment (due to cost) so this is the most effective way of informing the growers about crop water use.

Destination 5 - Escola Technica Superior d'Enginyers Agronomes, University of Lleida, Lleida, Spain (Department of Irrigation Engineering, University of Lleida)

Contact/s

- Dr. Josep MaVillar, Professor Soils & Water, University of Lleida
- Dr. Pere Villar Mir, Professor Agronomic Engineering, University of Lleida

Overview

The University of Lleida is located in the Catalan region of northern Spain, concentrating on natural resource and engineering courses. It has around 2,500 to 3,000 students⁶.

The Irrigation Engineering faculty is involved with the development and design of courses to teach to students, carries out research on irrigation, carries out "auditing" of irrigation systems and evaluation of new irrigation schemes. The Irrigation Engineering faculty work primarily within Spain but do some international work to generate funds.

Objectives

The visit to the Irrigation Engineering faculty at Lleida University was aimed at researching:

- Their training programs for growers relating to irrigation
- The impact of government policy on the courses and training the university offers
- The innovations and restrictions in growing technology being passed on to growers
- How the university is adapting to changing demand for their courses
- Identification of the programs or incentives designed to attract participants
- Gaining an understanding of the global influences affecting the university.

Outcomes

Research - There are two main types of research carried out by the Irrigation Engineering faculty:

- Pure research - mostly done within the university and often involves high technical or microscopic work
- Applied research - research with outcomes designed for growers or industry.

⁶ Dr. Josep MaVillar, University of Lleida, 2011, personal communication.

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Training of Farmers - The Irrigation Engineering faculty is involved in the training of farmers in two ways:

1. Presenting research findings - Seminars and technical presentations are used to present new information for the higher skilled agricultural workers, for example, farm or crop technicians and co-operative field officers. These can take the form of:
 - » Field days (maximum of a half day in length)
 - » Articles in industry publications
 - » Articles in local papers
 - » Published papers (scientific)
 - » Conference presentations
 - » Books.

Field days and technical presentations are more commonly used to target the technicians and skilled farmers. Articles in journals and conferences are more commonly used to present information to other scientists and researchers. The Faculty occasionally offers separate presentations for farmers (basic) and technicians (more technical).

2. Workshops - The Irrigation Engineering faculty conduct an annual three-day workshop (two days inside and one day out in the field). They will have international speakers and industry experienced consultants, not reliant on pure research. These workshops are aimed at Spanish and international consultants, skilled technicians and highly skilled farmers.

Workshops are usually subsidised by the government with the balance covered by commercial sponsorship and attendance fees of 150 Euro per head after the government subsidy.

Conclusion

The Irrigation Engineering faculty is more akin to the “traditional” university research model and is interested in publishing scientific papers and not focussed so much on getting information to the farmers. They prefer to target the technicians and consultants to attend their courses who will then disseminate the information.

Destination 6 - Instituto Valencano de Investigaciones Agrarias (IVIA), Carretera Moncada-Naquera, Moncada (Valencia), Spain (Agricultural Research Institute, Valencia)

Contact/s

- Mr. Diego Intrigliolo, Senior Irrigation Research Officer, IVIA
- Professor Rafael Domingo, Professor Irrigation Engineering, IVIA.
- Mr. Carlos Ballester, Citrus Irrigation Research Officer, IVIA
- Mr. Luis Bonet Perez de Leon, Extension and Training Officer, IVIA

Overview

IVIA is a government funded research organisation, carrying out research on a range of agricultural subjects. Also carries out training and dissemination of research findings to technicians and farmers. It is based in Moncada a town about 50 kilometres west of Valencia in the southern region of Spain.

IVIA was previously made up of permanent staff but now it is run on a project-to-project basis with many researchers and technicians only employed on a project basis. These changes are primarily due to funding cuts and as a result, some researchers are going overseas or changing industry.

There about 20 or 30 permanent staff and up to 100 project workers present during this visit.

IVIA service covers a large area of central and eastern Spain. This service area encompasses around 6,000 farms with about 3,000 farmers whose average age is probably 50 to 60 years old.

In this region, an average “parcel” of land is two ha and ranges from one ha to 50 ha. Most farmers own or manage two or more parcels of land⁷.

All farmers in the region belong to local water communities that consist of all irrigation farmers within a certain local area. There may be as few as three or four larger growers in a “community”, or up to 200 small farmers.

Each water community may have only one or multiple pumps supplying their water so the “community” is defined by a channel, pipe or valley or “suburb”, depending on how the Water Board defines each community.

Most of the horticultural crops are irrigated by drip irrigation. There have been incentives given to farmers to convert from flood irrigation to drip irrigation. The EU and Spanish governments pay for most major infrastructure, such as pipes, pumps and power supplies. Reduced government funding of new irrigation programs due to the ongoing economic crisis and as a result much of IVIA funding has been reduced.

Objectives

The visit to Instituto Valencano de Investigaciones Agrarias (IVIA) was aimed at learning about:

- Their training programs for growers relating to irrigation
- The impact of government policy on the courses and training the department offers
- The innovations and restrictions in growing technology being passed on to growers

⁷ Perez de Leon L., IVIA, 2011, personal communication.

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- How the department is adapting to changing demand for their courses
- Identifying programs or incentives designed to attract participants
- Gaining an understanding of the global influences affecting the department.

Outcomes

Perez de Leon co-ordinates and carries out training courses for farmers and technicians at the IVIA site which is a fully equipped research and training facility. Farmer training courses normally take four hours, usually during the afternoons. Some training sessions may be carried out entirely in the field, especially if it is to look at new varieties or new technology. IVIA will occasionally conduct whole day courses with a range of speakers.

IVIA have tried a range of different times of day, different lengths of the course and different incentives to entice growers to attend, but overall find it very difficult. Most growers only attend to get government incentive payments.

The ideal class size is 12 to 15 people per course, but a maximum of 20 maintained.

The courses are targeted to specific industry groups, for example, irrigation scheduling in citrus.

Perez de Leon demonstrated a PowerPoint presentation he currently uses for a Moisture Monitoring course. Very few farmers have moisture-monitoring systems due to the expense but IVIA teaches the farmers about them as it is a key component of irrigation scheduling.

IVIA courses are designed to keep the information basic and interesting, using pictures and flow charts, not graphs and big tables.

IVIA conducts courses on:

- Crop production (various fruit and vegetable)
- Irrigation
- Chemical application
- Protected cropping
- Quality control schemes
- Environmental management.

Trainers

IVIA use both permanent and casual trainers, mostly casual. Some are tertiary trained with many of the researchers at IVIA also conducting the courses. IVIA also engages other trainers who are industry experienced with no formal qualifications. IVIA will bring in experts to conduct specific training if need be, such as the equivalent to Australian Work Health and Safety courses.

IVIA find it very difficult to find good trainers, researchers do not necessarily make good trainers. Also there is a need to offer good pay, due to the associated administration before and after conducting a training course.

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Other Services for Farmers

IVIA have established a network of automatic weather stations (about 50) and Enviroscan® moisture Monitors (26) across the whole Valencia region. The information gathered from these recording sites is used in three ways:

- IVIA has developed a comprehensive website where growers can log into and can get weather data and evaporation data. A simple program will give them their own required irrigation times for the next week after they enter their details (less than 20 per cent of growers have access to the internet)
- Comprehensive website for researchers and technicians with complete weather history and moisture monitoring data at each of the sites. This has been developed at IVIA and is used in other areas in Spain
- Weather data is published on TV Teletext (most farmers have this), in local print media and on radio. It also shows regional evaporation data. Teletext is automated and an email is sent to radio and newspapers so the process has minimal input by IVIA staff.

Conclusion

IVIA is a comprehensive research and extension service and manages to combine research and grower training and staff are often involved in both. It also provides weather and evaporation data to farmers and they are looking at introducing an SMS service but at this stage there are too many farmers and the cost is substantial. The biggest risk is from government cutbacks and IVIA is not prepared for a user pays service and they doubt most farmers would pay unless forced to do so from government.

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Country - Portugal

General Information

As one of the three or four main countries affected by the GFC, there is much evidence of a poor economy with basic food items quite cheap and poor sales of luxury goods. Many businesses have closed and many people have had to move out of “nice” homes into poorer standard places due to repayments being greater than their wages. There is very little government investment in agriculture and a scaling back of most government services. The small farmers have no excess money to spend on capital improvements.

Portugal joined the European Union in 1986 but the European Free trade came in to force in 1994 and the adoption of the Euro was in 1999. During this time Portugal received significant money from the EU and this was used to fund substantial irrigation projects (as well as numerous other projects) but now this money has “run-out” and most of the investment in agriculture is from international investors who can purchase reasonable irrigated farmland for a low price.

Horticulture in Portugal is very diverse - there are the traditional small farms run by the owners who are struggling to earn a sufficient income, and the larger corporate style farms, often owned by international investors or corporate farming groups. This international ownership position is seen to not really help the Portuguese economy as either the produce or the profits (or both) from the large farms goes back to the owners' home country.

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Destination 7 - Oliveira Consultancy, Beja, Portugal

Contact

- Mr. Isaurindo Oliveira, Private Irrigation Consultant, Beja

Overview

About 20 years ago, the Beja region, located about 200km south-east of Lisbon, was predominantly a dry area farming area with a few irrigated crops (from underground bores). In the 1970s and 1980s a very large dam was built to the east of Beja, containing the Targa River, creating the largest dam in Europe.

The region now has around 100,000 hectares of irrigation and constitutes about 30 per cent of irrigated horticulture in Portugal and is the largest area in southern Portugal for irrigation. The climate is hot, dry summers and cool wet winters, average rain is about 450 mm per year⁸.

Crops grown are maize, sunflowers (for oil), cereals, grapes (for wine), olives (for oil), nuts and vegetables (mostly for processing). Large farms tend to be owned by Spanish investors or Portuguese investment companies (non-agricultural).

Oliveira was a lecturer at University in Lisbon but then moved to Beja University and then left to start COTR (Centro Operativo e de Technologica de Regadio). He retired in 2010 but still works as a private consultant to the irrigation industry and is currently writing his second book on irrigation and is also active in assisting with courses and workshops on irrigation in Portugal.

Objectives

The visit to Mr Isaurindo Oliveira was aimed at researching:

- The history behind COTR
- The impact of Portuguese government policy relating to irrigation training
- The innovations and restrictions in growing technology being passed on to growers
- Identify programs or incentives designed to attract participants
- Gain an understanding of the global influences affecting the irrigation industry.

Outcomes

Mr Oliveira helped set up and establish COTR, translated loosely to Regional Centre for Technology. It was established in 1998, with three people and was funded by the EU and Portuguese governments.

With the downturn in the Portuguese economy, the government withdrew funding for many training programs, including COTR, so it restructured to become a private self-funded organisation. It has taken a few years to get growers accustomed to paying for training. As a result of the restructure, COTR had to expand its business and now undertakes its own research and then passes on the results to growers.

Whilst Mr Oliveira has retired from active work, he is still very much involved in the irrigation industry and is passionate about continuing to educate and inform growers. Mr. Oliveira gave the Fellow some very specific suggestions and recommendations about what programs and incentives work well and what does not work.

⁸ Oliveira, I., 2011, personal communication.

Destination 8 - Centro Operativo e de Tecnologia de Regadio (COTR), Beja, Portugal (Regional Centre for Technology)

Contact/s

- Mr. Jorge Maia, Manager, COTR
- Mrs. Cristina Lourenco, Program Manager, COTR
- Mrs. Cristina Guerreiro, Field Technician, COTR

Overview

COTR was established in 1998. It was government funded for five years, and then became a self-funded private organisation. It commenced operation with three staff, it now has 14 permanent staff and employs up to 20 casual staff.

COTR is only involved with projects focussing on irrigation, such as:

- Training provider for irrigation courses
- Education in irrigation (books and publications)
- Providing an irrigation scheduling service
- Providing an irrigation system assessment and audit service
- Dispute resolution regarding irrigation system suppliers and farmers.

COTR started with two or three key individual farmers in each crop, and worked with them for two years before expanding the client base. It provided a free service for the first five years and then began charging for the services.

COTR started doing trials on their own site (an old government Department of Agriculture farm) but this was not successful as growers were not interested in seeing the trials, they just wanted the results. COTR have also installed around 20 weather stations around the Beja region and a few moisture monitors in permanent crops, so all the data is relayed back to head office.

Objectives

The visit to Centro Operativo e de Tecnologia de Regadio (COTR) was aimed at researching and understanding:

- Their training programs for growers relating to irrigation
- The impact of government policy on the courses and training the organisation offers
- The innovations and restrictions in growing technology being passed on to growers
- How the department is adapting to changing demand for their courses
- Identify programs or incentives designed to attract participants.

6. THE INTERNATIONAL EXPERIENCE

Outcomes

COTR provide the following services.

Training

- They conduct in-house (COTR), in-field or remote location training courses in any aspect of irrigation from planning, installation, operation, repair and maintenance, crop specific irrigation, moisture monitoring, scheduling and economics.
- Provide training courses, workshops and seminars and field days for farmers, technicians or other clients as required. Courses are tailored to the clients' requirements.
- Some of COTR staff will conduct the courses but often they will bring in experts (industry and researchers) to do presentations.
- Some courses are compulsory, such as, chemical spray application, but most are requested and paid for by grower associations, the water board or private companies. Courses are held on-site, off-site or in remote locations.
- They will conduct courses in other irrigation areas at the request of other industry advisory groups.

Education

COTR publish books and pamphlets on irrigation, and organise and run irrigation seminars and workshops.

Scheduling Service

COTR provide an on-farm service for various crops by monitoring crop water use and then making weekly recommendations. For this they use various moisture monitors and leaf stress meters, will do weekly farm visits during the main growing season.

They also provide the on-farm advisory service, measuring plant water use and providing recommendations on number of hours to irrigate. This advice is provided by email or SMS or both, or fax. Mostly email. The email contains information such as:

- Crop farm details
- Crop stage
- Weather and evaporation data, past week
- Previous weeks' water recommendation
- Previous weeks' water applied
- Recommended number of irrigation hours for next week
- Any comments such as how many days the water is to be applied on.

The evaporation and recommended application are also plotted on a graph to show how stressed the plants are. Recommendations are sent out each Wednesday so most field inspections are done on Mondays and Tuesdays.

Irrigation System assessments

For a fee, COTR will analyse an irrigation system and test all components and produce a report comparing the system actual output with the original manufacturer's specifications. They will calculate system efficiencies. (Notes - this has led to arguments and disputes with suppliers and installers that have led to the creation of another service.)

6. THE INTERNATIONAL EXPERIENCE

Dispute resolution

As a result of testing systems that did not perform according to specifications, COTR set up a workshop where various components can be brought to COTR for testing or their mobile workshop team visit on-site, they will test the component and report on its performance. This service is now used by farmers and irrigation suppliers to settle disputes regarding component performance.

Provide weather data

COTR provide weather and irrigation scheduling data on the internet from their weather stations and are looking to provide data via SMS. (Note - less than 20 per cent of the farmers have access to internet in Portugal. The larger farms (mainly the clients of COTR) do have email.)

Soil Testing Laboratory

Due to poor service from other commercial laboratories, COTR have set up their own on-site soil testing laboratory. Mainly process samples from their own clients but also provide a commercial service. Only do a limited number of tests but can do the most common tests.

Irrigation Testing Laboratory

In conjunction with their irrigation system testing, COTR have a dedicated workshop and laboratory where they test irrigation components and compare them with stated or advertised performance. This lab is often used to resolve disputes between suppliers and customers.

Olive Fertigation Trials

On behalf of a number of large-scale olive producers, COTR are conducting some long-term trials using different fertilisers and different rates of those fertilisers. They are measuring both fruit production and vegetative growth. (Note - tis not really their core business but it generates some extra income.)

Other Trials and Research

COTR are involved in the trialling of new or different crops in the region such as stone fruit and poppies. Not really a separate department as they are using existing COTR staff and existing COTR clients.

6. THE INTERNATIONAL EXPERIENCE

Destination 9 - Centro Operativo e Tecnologico Hortofruiticola Nacional, Alcobaca, Portugal, Centre for Horticulture and Fruit Technology (COTN)

Contact/s

- Mrs. Maria Cormo Martin, Manager, COTN
- Mr. Pedro Nunes, Spray Co-ordinator, COTN

Overview

COTN are based in Alcobaca, a town located about 150km north of Lisbon and about 15km from west coast of Portugal. Alcobaca is located in a major horticultural area producing pears, apples, peaches, nectarines, grapes (table), vegetables and olives. It is one of the older horticultural areas in Portugal with production going back some hundreds of years. The major feature of the town is the monastery that dates about 1,000 AD. Many of the surrounding farms were run by monks to provide food for the monastery.

The land is undulating to very hilly, with most of the horticulture based in the valleys and lower areas. Irrigation is from the numerous streams and rivers that flow from the steeper hills to the east and from local bores. The horticulture ranges from very basic open field vegetable production through to tunnel houses and complex trellised tree crops. Most farms are small scale from four to 15 hectares in size. Some of the newer larger farms are owned by corporates, either Portuguese or international investors. Most farmers supply their produce to one of the many co-operatives who pack and market the produce on their behalf.

COTN

COTN is 10 years old and has six permanent staff and employ up to 20 people as trainers or project coordinators on a casual or as-needs basis. COTN is a co-operative formed as a joint venture by the marketing co-ops and some of the regional grower associations. The primary aim of COTN is to provide training and professional services to farmers and co-operative technicians. They aim to be the conduit between research and the farmers.

Funding

COTN is self-funded with no direct government funding. When a project is funded by the government there is a proportion of each research project for COTN activities. COTN also receive funds from the co-ops and grower associations.

Most courses and workshops are free for the growers and technicians. Some courses are fee based if external experts are brought in. Grower associations and marketing co-operatives will engage COTN to run any specific irrigation subjects or courses.

COTN are currently compiling a 'Best Management Practise' manual for horticultural spraying. The growers are supposed to comply with EU guidelines but the spray practices are many and varied and COTN are trying to implement some standard but basic sprays compliance standards.

6. THE INTERNATIONAL EXPERIENCE

Objectives

The visit to Centro Operativo e Tecnológico Hortofrutícola Nacional enabled research into and an understanding of the following:

- Their training programs for growers relating to irrigation
- The impact of government policy on the courses and training the organisation offers
- The innovations and restrictions in growing technology being passed on to growers
- How the department is adapting to changing demand for their courses
- Identifying programs or incentives designed to attract participants.

Outcomes

COTN carry out the following activities:

- Training - Provide practical training to farmers by conducting formal courses, field days, field demonstrations and practical workshops either on-site or at the customers' business.
- Research Planning - COTN is involved in all stages of research that is directed to crops or growers in this region. As in other areas, the aim is to have Applied Research, which is research proposed by grower associations or co-operatives and funded (wholly or partially) by government. COTN are involved in the design of the research project and ensure that there is a significant component allocated to extension and dissemination of results. They are also present at all research update meetings between researchers and Industry. COTN will often present the final research results to the farmers and technicians. Sometimes the researcher is present, sometimes not.
- Spraying Workshops - COTN carry out sprayer workshops to demonstrate correct spraying methods, demonstrate new equipment and evaluate farmer's sprayers. At some workshops, farmers will bring in their own sprayers and have them tested and compared with industry standards. Sometimes they will visit individual farms to evaluate spraying equipment.
- Weather Data - COTN has obtained the data from 10 weather stations located around the region and are in the process of developing a website where all this data will be available to farmers and technicians. These weather stations are owned by the co-ops or private farmers; not government owned.
- Publications - COTN produces articles and pamphlets to be available to growers and technicians.

COTN Summary

COTN is a small but dedicated organisation whose primary focus it to provide education and training to farmers and field technicians. The company is different to other training providers in that it is a private co-operative formed by grower associations and marketing co-operatives. It is therefore able to provide training sessions at no charge to the farmer although they are still paying indirectly through levies and charges on their produce.

While courses are free, they still have trouble getting farmers to attend. Usually courses and field days are promoted through the co-ops and grower associations and in some cases they will make the courses compulsory, especially quality control or spray application courses. Normally only new courses take half a day (afternoon) or a maximum one-day for farmers.

For technicians they may design courses for two or three days depending on topics. Disadvantage of this system or structure of COTN is that some of the co-operative members would like courses run just for their farmer suppliers and would like to restrict the information going to other co-operatives or growers. It is a means of ensuring research results are disseminated in a good manner to farmers who generally have low skill levels.

6. THE INTERNATIONAL EXPERIENCE

Overseas Research Summary

Netherlands

The Fellow chose to visit Netherlands because of their intensive horticultural industries and reputation for the high skill level of farmers and specific and relevant training programs. There is no connection with horticulture in the Netherlands and the MIA region of Australia, but the Fellow sought to gain some understanding of the research and training programs that are being used successfully in the Netherlands.

The three organisations the Fellow visited were quite different: Enza Zaden is a very large commercial seed company with offices and research facilities throughout the world, the PTC+ group is a private company specialising in the training of farm owners and technicians and third the Wageningen University is a government funded university with research, training and extension services.

There is considerable co-ordination and co-operation between the government run facilities such as the university and private training groups such as PTC+ and private corporations such as Enza Zaden.

Spain

The organisations the Fellow visited in Spain were similar in that they were government funded and aimed a great deal of their efforts towards the average farmer. The services offered were quite basic (deliberately so) and aimed at gradually improving the skill level of the majority of farmers.

The horticultural research is also very closely tied to farming with the focus on Applied Research, or projects that will have significance to the farming groups.

Apart from the subsidies there are many similarities with the two regions the Fellow visited with hot, dry climates, recent drought and pressure to save water so it can be on-sold for electricity or the environment. They are also similar to the MIA region and it was realised that many of the issues facing both farmers and trainers are almost exactly the same in both countries. Reluctance to change, suspicions about the value of training, slow uptake of new methods and so on, are common in Spain and MIA region of Australia.

Portugal

The two training groups the Fellow visited were quite similar in that they are began as government funded organisations but have become private, self-funded organisations. They both offered some very good ideas that could be adopted in Australia.

COTR, based in Beja an area similar to Griffith in the MIA, is now an established training provider for irrigation services. Initially government funded it is now privately funded through the training courses and services it provides. COTN based in Alcobaca is not so similar to the MIA with a cooler, wetter climate and water is not such a scarce commodity. COTR is funded by grower associations and marketing co-operatives.

6. THE INTERNATIONAL EXPERIENCE

Concluding Remarks

Overall the overseas travel has provided the Fellow with many opportunities to discuss and investigate how both private and government run organisations are attempting to address skills shortage in irrigation and horticulture in general.

There are many common difficulties faced by every organisation, such as, keeping courses relevant and new, attracting participants, attracting funding, attracting and keeping trainers and how to interact with governments, grower associations, corporate farms and private farmers.

The organisations the Fellow visited in Portugal were probably the most relevant in terms of providing dedicated irrigation training and research facility and the needs of the growers are similar to the needs of growers in the MIA region of Australia.

The travel program provided the Fellow with many ideas and suggestions exactly addressing some of the skills deficiencies mentioned earlier in this report, such as, successful training programs, unsuccessful training programs, how to attract trainers, funding issues and the effect of globalisation on the workforce and training of those workers.

One aspect that the travel uncovered, that was not anticipated by the Fellow, was that training in irrigation couldn't be a stand-alone course. All the organisations visited incorporated irrigation training with other related activities such as research, other agricultural training, other irrigation services or diagnostic services. The same teaching methods and techniques used for training in irrigation are common to all other agricultural training.

Skills in irrigation is linked very closely to overall agricultural skills and is very quickly affected by many external influences such as government policies, local, national and global economic circumstances, agricultural commodity prices, water value and farmer attitudes. Skilling farmers to improve their irrigation knowledge are seen as a long-term strategy within an overall agricultural skills framework.

7. KNOWLEDGE TRANSFER: APPLYING THE OUTCOMES

The International experience has given the Fellow a greater understanding of training in irrigation and how it can be implemented in Australia. Irrigation training in Australia and the MIA in particular is both achievable and necessary. The skills deficiencies experienced in the MIA are exactly the same as those seen in Spain and Portugal. In both these countries the governments, in conjunction with industry and training providers, have established a very good range of training facilities to address these deficiencies.

A review of the actual industry situation in each of the countries visited is included here to put the recommendations in Section 8 (following) into perspective:

Water for Irrigation

In the Netherlands water is not really an issue, except how to get rid of excess water and they do this very well by regulating their drainage and co-ordinating the pumping with low ocean tides.

All greenhouses in Netherlands are not allowed to let any rainwater escape from their farms so they have installed sophisticated catchment systems, alongside or underneath their greenhouses, the water is then used on-farm or sold to towns or industries that do have a high water requirement.

In Spain and Portugal farming areas there is significant pressure from government, townspeople and environmentalists to reduce or divert water from farming into other areas such as cities, river regeneration and electricity production, very similar to the Australian situation. The governments have invested significant amounts of money in improving irrigation infrastructure and the water authorities are active in promoting water savings. There is little emphasis on farmer training as a means of saving water. It is seen as too difficult, too slow and not “media friendly”.

Globalisation

Even the smallest farmer in Spain and Portugal is aware of the effects of globalisation; the small and large towns are seeing an influx of cheap variety stores at the expense of local shops, fruit, vegetables and meat may be local or imported:

- Casual and farm labourers may come from any number of foreign countries
- Reduced number of suppliers of machinery and equipment
- Reduced price for farm products blamed on either “overseas imports” or the effect of the currency exchange rate
- Even with government subsidies, many of the farms in Spain and Portugal are not sustainable or not economically viable in their current form
- The older farmers are gradually retiring or abandoning their crops and the younger farmers are trying to expand or grow different crops. As in Australia, every farmer is looking for the “magic” crop that has high demand and therefore high price and has some ingredient or attribute that inspires consumer purchase.

The problem is that as soon as a new crop is identified, the corporate farms plant large areas, install processing equipment and flood the market within just a few years. The smaller farmer cannot compete.

In Spain and Portugal most of the smaller farmers have formed or joined co-operatives to pack and market the fruit for them; this has many advantages and gives the growers the independence to farm by themselves but getting the marketing power of a large organisation.

7. KNOWLEDGE TRANSFER: APPLYING THE OUTCOMES

Irrigation and Farm Workers

Foreign-born workers carry out the low skilled work in most countries in Europe. These may be from Eastern Europe, Africa, West Indies or South America. This is tied closely to immigration and there is an influx of displaced people or asylum seekers. All EU countries are having massive problems with illegal and legal immigrants. Some of these people will be prepared to go to regional areas for work but most prefer to live in the cities. The farm workers are generally poorly skilled, are itinerant in nature, have language difficulties and as a result are lowly paid.

Even though there is legislation to prevent illegal use of non-registered workers, there is a significant amount of work done for cash. Many jobs that are mechanised in Netherlands or Australia are still done by hand in Spain or Portugal.

Training Structure

- Every training facility that the Fellow visited stressed the importance of good training for irrigation practices and the Dutch, Spanish and Portuguese governments all recognised the benefits of having a better skilled farm workforce.
- To encourage this, the governments provided incentives through subsidies or through compulsory attendance requirements.
- Training is provided by private or government funded organisations; in all cases the training providers also provide other training or other professional irrigation services.
- The Fellow is unaware of any specific irrigation training in the MIA region of Australia and believes there is a definite need for such training.

Trainers

- All of the training facilities visited in Europe use a combination of casual and professional trainers. They would engage industry experts on a “as needs” basis. The professional trainers may be industry experienced as well or professional teachers.
- These industry trainers are then trained on how to present the information, this is known as “Train the Trainer”. For specific subjects, chemical usage, for example, professional trainers are used. This is when participants are expected to be licenced or the course is regulated by specific government legislation. Agsafe and Chemcert trainers in Australia are a similar example of these qualified trainers.

Courses

From the European experience, it appears that irrigation training courses ideally:

- Short courses in length, maximum half a day
- Restricted to small groups of six to 10 people only
- Information is kept simple, using pictures and use demonstrations to show the results
- Technicians and skilled people would attend different courses with more scientific information
- Use good trainers (industry trained rather than formal teachers)
- Use trainers rather than researchers to present research results, unless the researchers are good presenters
- Need good technology to back up presentations, weather stations for example
- Target the “progressive” and “probably progressive” farmers. Let these leaders teach the rest. It is not realistic to try to teach those farmers who see training as a “waste of good working time”.

7. KNOWLEDGE TRANSFER: APPLYING THE OUTCOMES

Cautionary Comments

While there are many suggestions for a good training course, it is also relevant to point out actions or structures that do not work and usually result in the failure of the overall training. Some of these include:

- Classes too large (>20)
- Courses too long (maximum of one day)
- Trying to target multiple industries;
- Being over technical
- Having unsuitable presenter
- Trying to cover too many topics
- Not having a clear objective or desired outcomes
- Too much government influence
- Trying to sell a product or service.

8. RECOMMENDATIONS

Government

- Government support is essential in establishing Irrigation Training programs in the MIA or Australia.
- Farmers will not pay until they are confident of the value of the service. Can be linked to current or future water saving schemes where growers are compensated for using less water.
- The training scheme will provide more skilled farm workers, will assist in optimising water usage and will reduce environmental effects of incorrect irrigation.
- The aim of the training service is to be self-sufficient within five years.
- Call the organisation an 'Industry Advisory Service' (IAS).
- As both NSW and Federal governments are involved in the supply and regulation of irrigation water, the Fellow will make representation to both government representatives in the MIA region. Also representation will be made to local government who are also closely linked to irrigation in the region.

Industry

It is essential to involve industry on a number of levels:

- Water companies – encourage growers to attend, provide financial and material support and provide experts to assist with training
- Irrigation Suppliers – to provide material support, such as irrigation parts and equipment. Also to provide experts to assist with training
- Associations – such as the Irrigation Australia organisation who represents irrigation industry and water users
- Grower Associations – such as Grape Growers Association, Citrus Australia and Ausveg. These associations would provide grower encouragement, publicity and financial support.

Education

- Irrigation Training could occur at a government-operated facility such as TAFE, university, such as Charles Sturt University or local Department of Agriculture facility.
- Irrigation Training could also occur at a privately operated facility, such as, Community College, private trainer or private irrigation organisation.
- The Fellow will make representation to both government and private training organisation representatives in the MIA region.

Community

- Community involvement can be achieved by releasing this report (or parts of) to the MIA community and by involving the irrigation community. The majority of people who live and work in the MIA are directly or indirectly involved in irrigation and agriculture, so this report can be provided to key stakeholders throughout the irrigation industry.
- The Fellow will make representation to both irrigation representatives and local media in the MIA region.

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