

Primary Industry Investment in Longer Term Research and Innovation

**A Report to the
New Zealand
Nuffield Farming
Scholarship Trust**

John A Wright

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**NEW ZEALAND
NUFFIELD
FARMING
SCHOLARSHIP
TRUST**

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**John A Wright
Marrs Road, Methven
RD 12
Rakaia**

john@wrightfarms.co.nz

Executive Summary

New Zealand primary producers have been facing a gradual decline in real commodity prices for decades, costs of production are increasing and more recently land values have in many places exceeded the level where an acceptable return on capital is possible.

I hypothesised that our commodity producers could overcome these problems, on an industry wide basis, by investing in longer term research and innovation, with the aim of removing this emphasis on commodity production.

I used my Nuffield Scholarship opportunity to go in search of good models of industries where this approach was successful. My study tour included parts of North America, but primarily United Kingdom and Europe.

The first discovery was that many primary producers were in fact exploiting opportunities that enabled them to continue in business whilst facing the issues highlighted.

New Zealand agriculture has historically concentrated on exploiting its **comparative advantage** in the production of commodities, relying on favourable soil and climate conditions. Marketing has also been supply driven. This approach is not sustainable as other nations discover similar comparative advantages.

Successful commodity production appeared to be sustainable only where **competitive advantage** is gained, offering consumers greater value through lower prices or greater benefits that justify greater prices, i.e. lowest cost or differentiated product. Lowest cost can be gained through production techniques, superior processes and infrastructure, and unique skills.

The major shift is from a production driven supply chain to consumer driven value chain, and the aim is to gain a bigger share of existing value of a commodity.

However the focus of my study was enhancing the total available value of a commodity in a value chain, or value adding, as a mechanism of removing emphasis on commodity production.

I investigated various industry and value chain participants who were investing in **fundamental research**, research with less well defined return on investment than **applied research**, but with more commercial application than **blue skies research**. Investors came under the categories of Government, Cooperative, Levy Body, Private Company, and Individual.

Through this process I saw a number of interesting initiatives that provided a two way transfer of information and knowledge between primary producers and researchers, or provided new investors with support with the development of new products and processes. A number of these could provide benefits to New Zealand primary producers.

Following this extensive consultation I made the following conclusions and recommendations for the consideration of New Zealand primary industries.

- Investing in value adding and innovation is a useful mechanism of improving overall business return.
- Value adding and innovation can be achieved at many levels.
- At the very least, New Zealand's agricultural industries should invest in gaining competitive advantage, and I **recommended** that farmers continually analyse the long term potential of their industry and their personal position within it to assess whether a change of business strategy or focus is required.
- Not everyone wants to invest in value adding and innovation.
- Industry wide investment in value adding and innovation should be well targeted.
- Best individual results could be achieved by private investment model.
- The critical point for industry wide investors to consider their investment position is the presence of intellectual property. I **recommended** that holders of Levy Orders under the Commodity Levies Act 1990 ensure they have a clear mechanism for assessing the value of investing in intellectual property, and a clear process of controlling how far down that 'path' they do invest.
- Industry wide investment is important to underpin future applied research.
- Government investment is critical in the areas of research capability, 'blue skies' research and the majority of fundamental research. I made the **recommendation** that Government ensures that sufficient resources are invested in 'blue skies' research and scientific capability to allow for future national growth and works more closely with levy bodies to assist in achieving industry fundamental research goals.
- Farmers need to be made aware of potential value adding and innovation opportunities, and I **recommended** that Government and levy bodies encourage farmer investment in value adding and innovation by ensuring opportunities are highlighted and that engagement processes are transparent and competitive.
- Government should support farm based businesses in exploring value adding and innovation opportunities. I made **two recommendations**. Firstly, Government and levy bodies ensure that there is a clear pathway for sourcing information on the establishment and running of farmer controlled value adding businesses, and secondly that Crown Research Institutes and Universities consider how pilot processing plant could be made available to aspiring processors, with Government support.
- Industries collecting commodity levies should better cooperate in coordinating generic applied research activities. I **recommended** that holders of Levy Orders of the Commodity Levies Act 1990 ensure there is a forum where generic research cooperation is fully discussed.

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1. Introduction

Commodity producing industries in New Zealand are all facing a similar dilemma. A gradual decline in real commodity prices has been evident for decades, costs of production are increasing and more recently land values have in many places exceeded the level where acceptable return on capital is possible.

Productivity improvements have been our primary ammunition against these issues and investment in 'farm gate' research and 'kiwi ingenuity' have been the keys to at least maintaining our position in the food chain.

This in itself has caused issues of increasing size of economic unit and the obvious barriers to entry for young farmers.

I hypothesised that our commodity producers could overcome these problems by adding value to the commodities produced and that the key to doing this was to invest in longer term research and innovation.

My interest in this topic is not new, and the foundation for this study was set when I prepared a report entitled "The Effectiveness of the Commodity Levies Act for Long Term Research" in 2003 for the Primary Industry Council / Kellogg Rural Leadership Programme. This report concluded that the Commodity Levies Act 1990, our primary mechanism for collecting industry levies for 'farm gate' research, was a suitable funding method for longer term research provided that levy payers are convinced of the merits and that funds are not used to compete unfairly with any private business.

Therefore I could see the opportunity to propose to spend at least a portion of industry levies on longer term research, however I could see major issues with resultant returns from high value and niche products being diluted over the greater industry pool.

Hence I went in search of good models of industries where investment into longer term research and innovation was removing the emphasis of commodity production from industry participants. If only it was that easy.....

2. The Study Tour

The study tour involved six months of travel during 2005. The first six weeks was part of the Global Focus Tour organised by the Australian and United Kingdom Nuffield organisations.



Initial travel was through California, Alberta and Washington DC with eight Australian scholars observing a wide range of agricultural industries and the political framework present in North America.

The group then joined with twenty two UK scholars in London and observed mostly political and business activities in London, Paris and Brussels.

The remainder of my study tour was primarily based in UK, where I was involved in UK Nuffield Group tours observing the dairy industry in Shropshire, arable industry in Lincolnshire, and horticulture industry in the Murcia region of Spain.

I travelled extensively through England, Scotland, Wales and Ireland observing agriculture and meeting researchers & funders of research.

I also travelled through France, Switzerland, Germany, Denmark and the Netherlands with the same approach.

A week in Ukraine was also arranged observing agricultural and cultural practices.



3. The First Bombshell

Some time had passed in my study tour, probably more than should have, when it became evident that many primary producers were in fact exploiting opportunities that enabled them to continue in business whilst facing the issues I highlighted in the introduction.

New Zealand agriculture has historically concentrated on exploiting its **comparative advantage** in the production of commodities. A range of supply driven industries have relied on favourable soil and climate conditions, and efficient production systems to enable them to compete in global markets.

The industries relying on this advantage, and not moving their focus to customer demands, have been coming under severe pressure from other production regions in the world with similar advantages. New Zealand agriculture in this form is under real threat.

MW Dunbier (2001) wrote “in a dynamic world market, comparative advantages like low cost pastoral production systems, are no longer any protection...”

Given that New Zealand is so dependent on a vibrant agricultural industry compared to many of our trading competitors, it is important that the focus is moved from continued supply driven exploitation of diminishing comparative advantage.

If we accept that a change is necessary, there would appear to be two basic opportunities for overcoming this reliance, which are gaining a bigger share of existing value of a commodity or enhancing the totally available value, value adding.

3.1 Gaining a bigger share of existing value

Many industries rely purely on commodity production and marketing. The successful industries seem to exhibit a point of difference.

This industry wide **competitive advantage** should be one of the key drivers for investment in agriculture as it is in other areas of business.

Michael E Porter (1990) investigated why some nations were more successful than others. He described competitive advantage as effectively an advantage over competitors gained by offering consumers greater value, either by means of lower prices or by providing greater benefits and services that justifies higher prices.

This advantage is quite different to that of comparative advantage, and in “Upgrading New Zealand’s Competitive Advantage” (Crocombe et al , 1991) Porter described our competitiveness as too dependent on basic factor conditions like favourable soil and climate.

A **Customer focus** seems to be the key to commodity production with competitive advantage, which will come as no surprise. Primary industries that cooperate well with processors and end users generally perform better than those who do not. There are many examples of grower groups and individuals supplying processors and supermarkets in UK and gaining preferential treatment over other growers.

In some cases the arrangements are quite formal. British Sugar and UK beet growers have an “Interprofessional agreement” which is effectively a long term contract committing both parties to doing business. This example has been labelled as a “structured hate relationship”, but ensures producers are close to their customer.

Short value chains also seemed to be a key to retaining a customer focus. Not only did this provide for more available value in the chain, it also allowed relationships between producers and processors or end users to be stronger due to more direct contact.



I saw examples of this working for primary producers of blackcurrants for Ribena, and apple production for cider. In these examples the producers were aware that those skills or resources they possessed could eventually be duplicated or found elsewhere in Europe and the relationship, or customer focus, became the overriding factor.

The major effect being experienced through the focus on customer requirements is a shift from production driven “supply chains” to demand driven “value chains”.

Customer focus will improve an industry’s access to a market, but to successfully compete in that market an element of competitive advantage is required.

Competitive advantage can take a number of different forms, but essentially fall in the categories of targeting lowest cost of production or differentiation.

3.1.1 Lowest Cost of Production

Production techniques are a key contributor to enabling an industry to gain competitive advantage through low cost of production.

The Murcia region of Spain produces off season vegetable and fruit production for UK and Northern Europe. Searing summer temperatures allow horticulturalists to sterilise soils under plastic covers and



grow continuous vegetables without fear of major diseases. Even with major transport costs this region has competitive advantage over other areas.

Competitive advantage arises from the exploitation of a certain amount of knowledge around the production, processing or delivery of commodity products.

Unique skills and **superior processes**, at any stage in the value chain, support low cost of production and overall competitive advantage.

Historically many New Zealand agricultural industries put little value on this knowledge and allowed competing nations to access it freely.

Even if this knowledge is guarded jealously, innovative production techniques are however no guarantee of a reasonable return on investment for an extended period. Innovative farmers find new areas to produce commodities, new techniques to compete with low cost of production, and land values are often driven up by alternative land uses, eroding the ability of the competitive advantage to return sufficiently.

The key is therefore to be continuously investing in the development of new production techniques if the aim is to retain and grow your share of existing value in the value chain.

Infrastructure is another characteristic that allows some industries competitive advantage in commodity production.

Regardless of the product or industry, if you are one of the top traders you have certain advantage over smaller players. This effect is economies of scale in infrastructure leading to efficiencies, and market signals being more direct.

The United States domestic wheat industry is the major driver of international prices and thus gives US wheat growers an advantage of market signals that better reflect their domestic market than any other nation's industry. Both trading and physical delivery & export infrastructure give this industry an advantage.

The Danish herbage seed cooperative DLF is one of the major producers of herbage seed in the world. The large production base, substantial infrastructure, coupled with favourable growing conditions allows this group to compete well with most other international production areas.

Scale is a key characteristic. A processor or end user who only needs to deal with a small number of large producers has reduced cost and higher control than one who deals with a large number of small producers. Large producers have the ability to produce at lower cost.



This is becoming particularly evident in UK supermarket supply in produce like potatoes, strawberries and eggs. It is often somewhat of a double edged sword as margins for producers are not necessarily high and they rely on that scale to survive.

Although I met many producers and processors who felt a reasonable amount of value was being shared though the value chain, I met a large number who were despondent with their involvement or had exited value chains in recent years.

I guess you could say that this proves the points mentioned above but it also makes many producers nervous about their position in the value chain and where its future might lie. Many are critical of other participants in their value chain and believe they are unfairly treated.

I take a more realistic viewpoint that the processors or end users have likely invested a significant sum into research, product development, brand development, process development and are likely to constantly be reviewing their primary produce procurement to ensure that they are competitive in their market. After all, these people are running businesses with profit targets.

3.1.2 Differentiated Product

The second form of creating a competitive advantage is to produce a differentiated product.

It could be argued that if a product was truly unique it would exhibit characteristics of a proprietary product rather than a commodity, but most primary products have a limited life before a competing industry has duplicated its nature. Some proprietary products that have some form of intellectual property right control over them can still be classed as commodities because they compete directly with commodities in certain markets.

Kiwifruit and New Zealand apple varieties are an example of this. Some form of control over production can be achieved but they compete with both other varieties and other fruit in international markets.

Production and marketing of unique products, or control of the process that enables their uniqueness, does allow an industry to maximise market potential of those products while they remain unique.



Commodity production of Pima Cotton (extra long staple) in California was achieving a premium over standard cotton varieties. Growers were specialising in this variety to provide more long term stability.

There are many examples of niche products, branded products and proprietary products and processes where primary producers are important links in a value chain without owning any of the intellectual property in that chain. They are therefore capitalising on commodity production of a differentiated product.

As I have alluded to, unique products may only give short term advantage over other producers. Extra costs will be incurred to ensure continued access to differentiated products and this needs to be factored against standard commodity production.

3.1.3 Summary

Continuing commodity production is a real option for many producers. This is feasible where commodity production is supported by some form of competitive advantage, but there are many other regions in the world who are moving their agricultural industries from relying on comparative advantage also. These will provide ongoing pressure on our commodity producing industries.

3.2 Enhancing the total available value

The second opportunity for overcoming reliance on comparative advantage is effectively the crux of my study topic.

This is the option where farmers reach deep into their own pockets and invest into research and innovation that is not guaranteed to give them any short term return on the basis that it might in some form isolate them from the issues of pure commodity production. This could be as individuals, through cooperatives or through levy boards.

The remainder of this report will further explore this possibility, but we should not lose sight that this is only one option for farmers and that they may choose to rely on commodity production and attempt to gain competitive advantage or many may continue to rely on simple comparative advantage.

While this section might not appear, to many, to be a bombshell in nature, it provided me with useful clarification around the direction of my study topic. I had highlighted the reason that the majority of primary producers and levy based researchers I was interviewing had little interest in investing into the longer term. Rightly or wrongly they believed they could survive by extracting a bigger share of existing value in their value chain, or believed they still had an element of comparative advantage over other producers.

4. Definitions

As I travelled and interviewed various researchers and investors in research I found it difficult to reconcile the terminology used in various industries and countries. I have therefore provided simplistic definitions of the forms of research that allowed me to better understand the information I have collected.

Applied Research

Applied research is often called near market, or in agriculture's case, farm gate research. This is the research that has a more obvious and faster return on investment. It generally has effects on farm productivity and provides steady improvement in overall productivity.

The Commodity Levies Act 1990 mainly caters for applied type research. The nature of the returns allows for primary industries to better justify investment than some longer term research types.

This also means there is less Government investment in this area.

Blue Skies Research

At the opposite end of the scale sits the area of blue skies research. This term can mean different things to different people but I have defined it as the research with no direct commercial application.

Often this area of research is more about knowledge building and is seen as the responsibility of the government. The New Zealand Ministry of Research Science and Technology administers the Marsden Fund for this purpose.

Fundamental Research

Somewhere in between these two research categories lies fundamental research. This effectively encompasses a large range of research categories that have less well defined return on investment. In some cases return on investment would be better described as cloudy.

New Zealand's Foundation for Research Science and Technology would include 'basic targeted research' in this area.

Much of this research underpins applied research by providing the new science that can be developed into practical on farm solutions. For this reason alone there is some justification for primary industry investment in this area.

It is this last area of research that is of primary interest to this report. This is the area that will produce the innovative products and processes that we require to remove ourselves

from commodity production. This type of outcome is obviously different to that of one that simply underpins future applied research or provides knowledge that will give an industry competitive advantage.

However it is not always clear what outcomes might be achieved when an initial fundamental research investment is made. The best of investment intentions may provide surprising outcomes, good or bad.

At various stages in carrying out research it can become apparent that the research has some value in being restricted from general release. In industry speak, intellectual property can be attached to that research or the outcomes of it.

Intellectual property to me simply means that there is some **perceived** value in restricting that research from general release.

Added value products and innovation are increasingly the goal of fundamental research and the determining factor for further investment is the existence of intellectual property.

The intellectual property tag can be placed on knowledge generated in the endeavour to provide a commodity producing industry with competitive advantage, such as production techniques. For the purposes of this report I am intentionally separating this form of intellectual property from that associated with added value and innovation for the purpose of removal of an industry or individual from commodity production.

At the point where potential intellectual property is highlighted there becomes a conflict with industry wide investment. Questions like..... How does the whole industry share in the returns on this investment?..... Is this research better restricted to a few players?.....Is this big enough that the whole industry should participate?

The pathway to added value products and innovation is also often the more expensive development phase of a new product or process compared to the original 'seed' developed at the fundamental level.

5. Who is Investing

The body of this report will investigate industry and value chain participants who are investing in fundamental research. It will encompass the wide range of researchers and investors that I interviewed on my study tour of UK and Europe.

Remember that the ultimate goal of this exercise is to find ‘good models of industries where investment into longer term research and innovation was removing the emphasis of commodity production from industry participants’.

Also be aware that many of the parties interviewed do not invest in longer term research as described and the reasons for this abstinence have been valuable in my ability to make conclusions on this topic.

I have categorised parties as either Government, Cooperative, Levy Bodies, Private Companies or Individuals.

5.1 Government Investment

5.1.1 UK - Biotechnology and Biological Sciences Research Council (BBSRC)

The British Department of Trade and Industry funds seven research councils through their science budget. BBSRC is the main research council relating to agricultural research although there is some crossover with other research councils.

BBSRC provides core funding and competitive grants to eight research institutes in various areas of plant and animal research. Below is an overview of the research institutes I visited that have core funding from BBSRC.

5.1.2 Institute of Grassland and Environmental Research (IGER)

This institute based in Aberwythswyth, Wales, is well known to most in New Zealand as a source of herbage seed varieties under the banner of the old Welsh Plant Breeding Station.

The institute now has three main departments of Plant Genetics and Breeding, Animal Nutrition, and Soils, Environmental and Ecological Sciences.

In the area of Plant Genetics and Breeding IGER performs a reasonable amount of molecular and applied genetics as underpinning work for its plant breeding activities.



IGER has a long term agreement with private consortium Germinal Holdings, where it licences them new herbage seed varieties exclusively. Germinal Holdings, along with other private sector groups make up around ten percent of the Institutes funding. IGER in general retains intellectual property rights, particularly Plant Variety Right (PVR) registrations.

With impending plant breeder retirements Germinal Holdings is also funding a trainee plant breeder suggesting that maintenance of capability is seen as an issue for industry.

Department for Environment, Food and Rural Affairs (Defra) also support breeding in certain species because the market has failed to support its own research. In the past Defra has taken the attitude that breeding should be able to support itself but now believes public money may be required to support early breeding stages on the basis of significant downstream value in its outcomes.

BBSRC core funding has traditionally been based on ‘quality of science’ rather than any practical outcomes. IGER sensed that BBSRC are developing more interest in ‘strategic relevance’ of science while still demanding high quality.

Scientific publications have traditionally been a scientist’s pathway to promotion but minimal issues have arisen with more emphasis on protection of intellectual property and therefore delays in publication.

BBSRC also have significant influence over research direction. Recent years have seen environmental research have more emphasis.

With plant breeders working on the same site as soil scientists and animal nutritionists, the group believes a better understanding of the total farm system has been developed.

Levy boards show reasonable interest in meat and milk quality issues surrounding forage breeding but provide minimal financial support. IGER is however involved in formal LINK projects (described below) with the arable and intensive livestock industries.

5.1.3 Rothamsted Research



Rothamsted’s broadbalk experiment in Hertfordshire was placed 162 years ago and has grown continuous wheat under various treatments to this day. This site has been a pilgrimage for New Zealand arable farmers for many years.

Rothamsted is a multi disciplined research centre specialising in arable crops and environmental sustainability. Chemists, pathologists and plant scientists

are involved in plant improvement, nutrient cycling, biodiversity and pesticide development.

Again BBSRC provides core funding to the Institute. Rothamsted appeared to put more emphasis on the issue of academic performance as a key requisite of Research Council funding. This may have been due to a four year review of research being carried out at the same time as my visit. A group of independent scientists examine the quality of the Institutes research at the request of the BBSRC.

Commercialisation of research was of less importance to BBSRC core funding, and publication of good science was seen to conflict with potential intellectual property development. In the past Rothamsted developed synthetic pyrethroid insecticides but chose to take no commercial advantage.

It is likely that this approach would be slightly different today when LINK projects (described below) would be used to ensure the Institute received an appropriate return.

Defra funding is also significant for Rothamsted with research projects targeting policy related aims such as Common Agricultural Policy changes, the environment and climate change.

Levy bodies provide some funding although this has diminished in recent years as investment priorities have changed.

The Rothamsted Research Association was recently formed to channel information directly to farmers and consultants, as well as giving the industry some input into research direction and this appears to be a useful mechanism.

Rothamsted does undertake collaborative research with agrochemical companies.

5.1.4 Institute of Food Research (IFR) / John Innes Centre (JIC)

IFR and JIC are located at the Norwich Research Park in Norfolk. Both are independent Institutes core funded by the BBSRC.

IFR is involved in investigating food safety, diet and health, food materials and ingredients.

Food safety projects have included bacteria research such as ecoli, and Genetic Modification safety for the Food Safety Authority. Nutrition projects include a large project on developing broccoli with anti cancer properties.

Although commercialisation is seen as discouraging



publishing and therefore personal advancement in IFR, the Institute works very close to the market and uses an on site company to patent and develop new products.

IFR has many industrial relationships and also has some Defra funding and involvement in LINK projects (described below).

JIC is involved in research and training in plant and microbial science. This institute works further from the market.

JIC has carried out gene sequencing of Arabidopsis as a guide to sequences in other crops.

The same culture of publishing research outcomes being a prerequisite to career advancement exists in this institute.

5.1.5 Roslin Institute

The Roslin Institute near Edinburgh is most famous for the cloning of Dolly the sheep. Roslin is primarily involved in animal bioscience and receives core funding from BBSRC.

Roslin's remit is to be seen as a leading 'blue skies' researcher and not be too applied in its outcomes.



Roslin does employ other grant funding and is involved in commercial partnerships and generates commercial income to meet its break-even requirement that BBSRC imposes. The institute reports the need to balance commercial partners requirement for outcomes and its scientific remit, but did not see it as a major issue.

Most outcomes are licensed to private companies and staff commented that intellectual property is valuable but scientists don't want to be businessmen.

Roslin receives no levy funds but commercial income from chicken companies and biotech companies is significant. A drop off in biotech company funding was reported due to difficulties in funding those companies in the face of high perceived risk. Chicken breeding companies were seen to be in better financial state and good commercial partners.

Roslin collaborates with many universities involved in similar research, and is concerned about the sustainability of the current funding system.

5.1.6 Central Science Laboratory (CSL)

CSL is an Executive Agency of Defra providing it with scientific support, research and advice on policy objectives. The state of the art facilities are located in Yorkshire.

It also provides these services to the Food Safety Authority and commercial organisations. Activities include risk assessment of pesticides and genetically modified crops, animal welfare, food allergens and authenticity, wildlife management and land management.

I visited with a small sector of the agency known as the Alternative Crops and Biotechnology group. This group receives no core funding and relied on commercial contracts for its survival.

It's services include environmental and social economic services, for example how does a region replace tobacco production while keeping full employment?

One project is evaluating upland communities and what might be done to add value to forest trees and wool fleeces.

It also investigates, with commercial partners, the development of new innovative crops, and alternative uses for existing crops. Partners in these projects range from Government agencies to private companies.



Work has included organics, fermentation, bio-refining and pharmaceuticals. Non-food crops are a big emphasis with the aim of producing unique products for non-traditional markets.

The group works on a relatively small budget but provides valuable services and scientific backup, particularly to the private companies that engage its services. Minimal funding is received from levy bodies.

This organisation certainly has similar goals to that of the hypothesis in this study. The organisation seems to be mostly in the research phase and provided limited examples of where research has actually provided significant results to industries and communities.

However I saw this group as a good model for contract provision of science to assist industries or individuals in their endeavour to add value to their primary production, and I suspect the commercialisation of the research was left to the commercial parties involved.

One such party is the Springdale Group, which will be reported later in this document.

5.1.7 National Non-Food Crops Centre (NNFCC)

This relatively young organisation is based in York and was formed to coordinate and facilitate the development and uptake of non-food crops. Funding is obtained from Defra and The Department for Trade and Industry.

The centre's role is to promote and disseminate information on alternative crops and end uses for those crops. To date work has concentrated on bio-polymers, lubricants, phyto-pharmaceuticals, and bio-refining. Research projects are managed on behalf of government and private funders.

A team of 'technology translators' is the key to converting the science or engineering into practical solutions or products that farmers and industry can understand.

This group work closely with other science providers such as CSL.

5.1.8 NIAB

The National Institute of Agricultural Botany has been based in Cambridge since 1919. More recently the organisation has re-branded as NIAB. NIAB is not a true Government agency and is in fact a non-profit charitable organisation. It does however perform research for Defra as well as levy boards, farmers and corporate customers.

NIAB's primary statutory roles have been in the PVR registration and National Listing areas. Research includes molecular, environmental and laboratory services.

The NIAB research emphasis is very much in the area of plant breeding and it is currently proposing a new role for itself as a centre for public-good crop breeding.

The background for this move is a review of BBSRC funded research (2004) where it is proposed that public-good plant breeding should be re-established to provide improved germplasm and technology for the development of new varieties.

This is relevant to this study as the proposal is designed to support rather than compete with private breeding programmes and suggests that returns from current crop breeding programmes do not justify sufficient reinvestment in order to provide the genetic improvement we require. This type of investment would be a good example of fundamental research that underpins future products but is unlikely to be privately funded due to lack of payback because it is at a pre-commercial level.

5.1.9 LINK projects

The LINK project funding has been mentioned previously. Funding is up to 50% of a collaborative project when the balance comes from industry participants. Funding comes primarily from Defra but other government departments and Research Councils will also contribute funds.

These are effectively what we would call consortia in New Zealand. Industry groupings apply for Government funds and carry out research projects at a fundamental level. In the UK the projects are required to be 'pre-competitive' or fundamental, with an element of risk, and might well lead to intellectual property opportunities for some contributors.

This is an effective system of Levy bodies or farmer groups contributing to larger projects with the potential of gaining some added value or at least some underpinning of applied research.

Intellectual property that may develop is the property of the consortium, and the consortium can decide how to share it.

There are three LINK programmes available, Horticulture LINK, Sustainable Arable LINK, and Sustainable Livestock Production LINK.

5.1.10 Scottish Crop Research Institute (SCRI)

SCRI is a non-profit company, registered as a charity, based at Dundee, Scotland. Core funding is obtained from The Scottish Executive Environment and Rural Affairs Department (SEERAD)



SCRI are involved in a full range of research, from applied to blue skies, around various crops such as potatoes, barley and soft fruit.

Core funding targets longer term research and industry is expected to fund anything within a five to six year payback period.

Contract research is a major component of the Institute's activities, such as potato and strawberry breeding activities. SCRI has a commercial arm, Mylnfield Research Services (MRS), which handles the commercial contracts, subcontracts research to SCRI and returns profits as gifts.

Under these arrangements intellectual property is generally retained and managed by MRS. Issues do arise regarding confidentiality of research information so the Institute is careful to 'ring fence' contracts and agree on information flow. Contracts exist with companies like McCains and Glaxo Smith Klein.

Much effort is also put into educating scientists in the awareness of intellectual property and see the conflict of publishing and commercialisation as a delay in timing only.

SCRI also have involvement in LINK programmes with industry, and various other industry funding arrangements. Levy boards also fund short term projects, mostly applied in nature and this funding is often incorporated in LINK programmes.

There is a limited availability Venture Capital fund for ‘blue skies’ activities such as biotech and genome identification. Levy boards are encouraged to contribute to these activities to ‘future proof’ their own research but most are reluctant.

5.1.11 Scottish Agricultural College (SAC)

The SAC has been divided into education, research and consultancy segments. Research activities include some commercial research for Levy Boards and SEERAD funded work.

Research is tending to be more applied and more driven by Government policy. These activities in recent years have concentrated on environmental issues.

SAC had been involved in genetics and golf course development but has ‘spun off’ companies with that involvement.

This organisation appears to be coming under pressure from the Scottish Executive.

5.1.12 Netherlands – Applied Plant Research, Wageningen UR

The Plant Research Centre is based at Lelystad and is the centre for research into herbage seed, field and vegetable crops for the Wageningen University.

Wageningen University is a collective of a number of research and educational centres around the Netherlands and is the primary science provider for agriculture in the country. Wageningen UR has activities in the fields of food, animal, plant, environmental and social sciences.

The merging of a number of research centres occurred in the last five years, many of which were part of the Ministry of Agriculture, and has caused significant upheaval. Wageningen UR is effectively a Government agency.



The Plant Research Centre undertakes primarily applied research with one to five year outcomes and is funded by levy boards, Government, chemical companies and industry. Government funding concentrates on environmental and sustainability issues.

More recent activities have concentrated on whole farm systems and production chains and the group is directly involved with information transfer.

Minimal fundamental research is being carried out although scientific capability is seen as an important investment by Government. Government also works closely with levy boards on research direction.

A lack of competition for scientific services has led to new players in the market in recent years although Wageningen UR still undertake the majority of the work.

5.1.13 Denmark – Danish Institute of Agricultural Science

The Flakkebjerg Research Centre near Slagelse undertakes fundamental and applied research in the area of herbage and vegetable seed production. The research centre is part of the Danish Institute of Agricultural Science which is a Government agency and receives around 50% funding from a Government fund.

Universities are the main practitioners of ‘blue skies’ research and most applied research is undertaken by the Danish Agricultural Advisory Service.

The herbage seed industry appears well organised and levies fund longer term projects at this research centre. The cereal industry collects no levy.

Farmers seem to have a reasonable amount of control over research direction although environmental issues surrounding the use of pesticides and nitrogen have forced a large investment in this area. Research direction using levy funds is determined by a committee of the Danish Seed Council.



To date there has been limited research output with any commercial value or intellectual property potential. Most work has been underpinning applied research.

Government funding appears reasonably flexible and commercial projects can be funded provided they are refunded if significant commercialisation occurs. The Institute retains intellectual property and royalty streams and does see some conflict

with the importance of staff publishing scientific papers. Publishing articles in farmer magazines is seen as suitable means of proving ones worth as a scientist.

5.1.14 Ireland – TEAGASC, The Agriculture and Food Development Authority

Oak Park Research Centre, Carlow, is the national centre for arable crops research and part of Teagasc. The centre is involved in crop science, plant pathology and entomology, plant breeding and plant biotechnology.



Oak Park receives 60% of its funding from government, slightly lower than the Teagasc average of 70%. The remainder of the funding is from commercial contracts, levies and royalty streams.

Oak Park receives all arable levy funds from the 400,000ha of crops grown in Ireland. Farmers fear that contributing too significantly will allow Government to reduce their support and require higher levy payments.

Plant Breeding is concentrated on herbage seed and potatoes and the recent addition of the biotech centre is primarily to support these activities. Funding for this development was sourced from a separate government fund. Commercial biotechnology research will also be undertaken.

Levy funds are targeted at the more applied type research and Government support appears to support the more fundamental and 'blue skies' research.



5.1.15 Summary of Government Investment

Fundamental and 'blue skies' research investment is generally seen as the domain of Governments. Governments however favour joint funding mechanisms with industry to gain industry buy-in.

With their investments the Governments expect a certain amount of control over research direction and frequently push research in the direction of current policy issues.

Governments have no interest in accumulating intellectual property and generally vest research outcomes with research partners and providers.

Maintenance of research capability is considered important and rarely falls outside the area of Government funding.

5.2 Cooperative Investment

5.2.1 Ireland – Glanbia

The Glanbia Innovation Centre is based at new facilities in Kilkenny, and is part of the Glanbia dairy cooperative. Glanbia is a food and ingredient company with significant international interests.

Glanbia see innovation as the key driver for the company's future. They sell products on a 'solutions system' where ingredients are sold with both before and after service, gaining a quicker return on investment than if they were selling their own branded products. This 'business to business' approach sees them selling ingredients to companies producing health bars, probiotic drinks and anti microbial products.



Glanbia 'innovation managers' spend their time taking 'blue sky' ideas and attempting to create products for the company. At least one new product is developed each year.

Although the innovation centre was involved in some very exciting activities the outcomes of these activities only make up a relatively small part of the overall company business. With a large milk volume processed this tends to have a 'watering

down' effect on the individual dairy farmers ability to see the added value.

European Dairy Farmers data (www.milkprices.nl) shows Glanbia milk prices to farmers at about the European average which would suggest the added value component of that pricing is minimal at this stage. Current investment is significant and farmers will be hoping that this is reflected in milk prices in the future.

5.2.2 France – Limagrain

The Limagrain Group is a farmer owned cooperative that was set up around the time of the Second World War. Around five hundred farmers are the shareholders in this company which was formed with the aim of capturing value.

Early focus was on maize and in the 1970's one of the developed maize varieties was very successful. Since then the group has expanded its breeding business into vegetable seed and invested in downstream processing such as flour mills. A recent investment in a bakery business has seen the group introduce sliced white bread to France.

Limagrain is now the fourth largest seed company in the world with ownership of companies such as Nickerson. It invests significantly in research and innovation, a total of about 12% of its group sales.

I visited the groups ULICE development site in Riom, near Clermont Ferrand. This is effectively the innovation centre for the overall group and pilot plant for product development. Genetic markers are produced for genes identified at the group's biotech company Biogemma and forwarded to various breeding companies. Food processes and equipment are developed for new product streams. New uses for grains are developed, such as bio-degradable plastic film for crop protection.



Cooperative members of Limagrain receive dividends based on holding and throughput basis. Members are still primarily in the business of producing commodities but are capturing significant value from their investment in down stream business, brands and innovation.

5.2.3 UK – Biogemma

Biogemma is the biotech company under majority ownership of the cooperative Limagrain. The company has sites in both Paris and Cambridge.

Biogemma conducts experimental work for breeding companies in the Limagrain group and is funded through the cooperative.

Less emphasis is being placed on genetic modification in recent years and more effort is being placed on molecular markers and germplasm screening. Limagrain does see a future in genetic modification for its company however public objection is currently quite strong, particularly in France.

Current undertakings are identifying agronomic and agronomic quality traits in various crop plants. It is likely in about five to eight years that this emphasis may change to consumer quality traits.

Traits have been identified that are unlikely to be commercialised due to lack of potential return.

High value extract products are also in the same category, with very high cost of development and doubtful return on investment.

This company is one of the few involved in ‘blue skies’ type research that is funded privately and is quite open about the issues of gaining a return for that investment.

5.2.4 France – Sugar and Maize Cooperatives

Based in Amiens in Northern France is a sugar beet cooperative that is joining forces with another sugar beet cooperative and a Southern French maize cooperative to invest funds into researching and developing production facilities for Ethanol, alcohol and pharmaceutical alcohol.

Given the upheaval in European sugar industries due to imminent subsidy reform, this is more likely to only ensure survival rather than add any value to sugar beet producers. There tends to be a European culture of cooperation in processing even though the French in particular claim they find it hard to work together.

If my French was somewhat better than it is I would have been able to glean some more useful information from this interview.

5.2.5 Denmark – DLF Trifolium

DLF Trifolium produces around 45% of European herbage seed production, and is the largest cooperative seed company in Denmark with 85% of production. The company has multiple breeding and processing sites around Denmark and has 4500 active seed grower members.

DLF Trifolium invest significantly in their core business of producing new technology in the form of plant varieties, and are active in many other countries in the world.

When asked of the key to the company’s success it was noted that farmer investors were very patient, or had a low expectation of return on investment. This is not always the case in private companies.



DLF Trifolium supplies many commodity markets with herbage seed and I get the impression that there are limited controls on the volume of production. This is in stark contrast to proprietary seed production in New Zealand where significant premiums over commodity varieties are gained by restricting production.

On this basis it would appear to me that a large cooperative business like this can tend to commoditise any added value created

from the original investment in research and development, although all members do have growing opportunities.

5.2.6 Denmark – Dansk Landbrugs Grovvarerelskab (DLG)

DLG is a farmer owned cooperative involved in grain marketing, animal feed manufacture, agrochemical and fertiliser supply, food production and telecommunication and domestic services.

Of the three million tonne of grain purchased from Danish farmers, around 50% is used in feed compounds. Profits are invested in new machinery or returned to farmer shareholders.

DLG does invest some funds into fundamental research in the form of plant breeding and this is seen as a profitable exercise with good royalty returns. However an individual farmer shareholder will not have any less reliance on commodity pricing due to the ‘watering down’ effect of the large cooperative.



5.2.7 Summary of Cooperative Investment

Cooperative investment in fundamental research can be significant. Unless the added value segment of the business is significantly large, these businesses can tend to commoditise the value add by allowing all members to share in the production.

Some cooperatives can also tend to water down value add to individuals under these circumstances.

If the value added segment of the business does become significant, it tends to be looked at as a dividend return on investment to boost commodity production activities.

Cooperatives are generally more patient investors than their private sector equivalents, allowing longer term investments to be made.

5.3 Levy Bodies

5.3.1 UK – Home Grown Cereal Authority (HGCA)

HGCA collects a statutory levy on cereal and oilseed crops in UK at a rate of about 0.6% of current farm gate value. Funds are invested in a combination of market promotion and development and applied areas of crop management.

HGCA is a Non-departmental Public Body (NDPB) within Defra, meaning that authority governance is appointed by the Ministry although they are not under any direct political control.

Promotion and market information has been an increasing portion of levy spend in recent years, with an emphasis on studying commodity markets.

A wide range of applied research is carried out in the areas of variety testing, crop management, crop drying and storage and food safety. HGCA uses science providers to perform the majority of the research. Information transfer is a critical component of the levy spend.

HGCA also invests funds into more fundamental type research that generally underpins future applied research and creates knowledge. Research investment is also made through LINK projects that generally have a more long term nature.

HGCA does not invest in research with the aim of adding value to farm businesses in the sense that this report is investigating. There was some feeling that the principal of investing further up the value chain was a flawed method of getting better returns on farm. “Farmers are good farmers, and not good flour millers” was one comment.

5.3.2 UK – Milk Development Council (MDC)

The MDC collects around 0.3% of milk value as a statutory per litre levy on all UK milk production. The council is a NDPB within Defra, and has 16000 levy payers.



The three main areas of investment are farm management, datum economics (independent market pricing information) and market development.

Research focus has changed in recent years from predominantly research to around 50% market development. Declining milk consumption over recent years has seen the need for generic promotion with the aim of boosting overall consumption.

Value added production and brand development is also encouraged through matched funding to certain levels. MDC takes the attitude that by helping a few farmers move away from commodity production is in fact good for the whole industry. They ensure that they are quite open about this individual support and acknowledge that they can't help everyone although not everyone wants to be helped.

On farm research is mostly of an applied nature to ensure productivity improvements, sound business management and environmental sustainability.

5.3.3 UK – Horticultural Development Council (HDC)

The HDC is another NDPB within Defra and collects a statutory levy of around 0.3% of gross sales of horticultural crops. The Council collects levy on field vegetables, protected crops, hard nursery stock, soft & stone fruit, mushrooms and bulbs & outdoor flowers.

The HDC invests primarily in applied research and communication of research outcomes. Fundamental research is considered to be the domain of government although government focus has moved to policy objectives such as environment and sustainability. This has caused a slight drift to more underpinning fundamental research investment.

The HDC does invest in LINK projects with industry and Government with longer term outcomes. Investments in plant and rootstock breeding return royalties that are reinvested in similar programmes. Varieties are made freely available and there is less emphasis on the exploitation of intellectual property.

There is concern around the future of Government funding and its effect on scientific capability in the horticultural industry.

5.3.4 UK – British Potato Council (BPC)

Another of the five NDPB's, the BPC is based at Oxford and collects per hectare levies from some 3000 potato growers. This would average at about 1.25% gross revenue.

The BPC is involved in research and development, knowledge transfer, statistics and market information and generic promotion. It also undertakes some advocacy work on behalf of the industry.

Marketing spend is equivalent to that of research. Knowledge transfer has moved from single project information to encouraging the supply chain to keep growers informed on a system basis.

Large emphasis is placed on literature review of research, including that coming through the pipeline. However, much of the research funded is in fact some form of fundamental

research including quality research, pre breeding and disease screening research and underpinning research.

The BPC avoids investing in any area that would normally find commercial investment and relies on those other parties for product and process development.

LINK programmes are used to get industry solutions and any commercialisation is usually handled by commercial partners.

The BPC is currently debating whether they should contribute core funding to research centres to ensure applied research is adequately funded. The belief is that fundamental research is being adequately funded.

5.3.5 UK – English Beef and Lamb Executive (EBLEX)

The last of the NDPB levy bodies is the Meat and Livestock Commission (MLC). Levies collected are distributed to a number of industry specific organisations including EBLEX, Hybu Cig Cymru/Meat Promotion Wales (HCC), British Pig Executive and Quality Meat Scotland (QMS). Levies are a range of per head values collected on sale.

EBLEX targets primarily applied research to gain a quick return to levy payers. Minimal fundamental research is funded although some quality and underpinning work is occurring. Activities like vaccine development and genetic markers are seen to be the domain of government or commercial organisations.

Any longer term investment, particularly if product development could be an outcome, is avoided unless there is generic benefit. In general, supermarkets expect product development to be undertaken by processing companies and this attitude is shared by EBLEX.

LINK programmes are considered but value to producers is a key prerequisite. There is some concern that these programmes are merely a mechanism to keep scientists employed. Needless to say EBLEX has little concern over maintenance of research capability.

5.3.6 Scotland – Quality Meat Scotland (QMS)

As mentioned above, QMS receives the Scottish share of the MLC levies on beef cattle and sheep. They perform a similar role to EBLEX although a significant part of their activity is the running of an on-farm quality assurance scheme.

Some investment is made into more fundamental type research in the area of eating quality of meat although this is seen as a generic activity. Any commercialisation of this type of research investment is expected to be undertaken by industry.

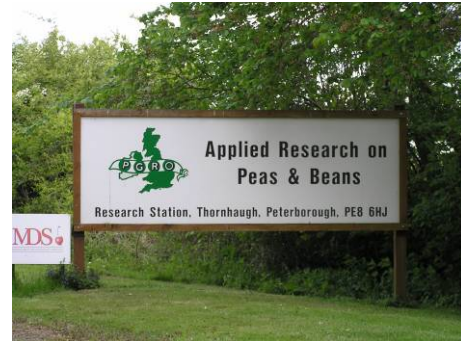
Marketing is also a significant investment for QMS.

5.3.7 UK – Pulse Growers Research Organisation (PGRO)

PGRO collects a non-statutory levy on pea and bean crops. The levy is automatically deducted from sales proceeds at a rate of around 0.5%. In theory growers could claim the levy back if they did not agree with the deduction but many believe it is statutory.

Because of the voluntary nature of the levy PGRO must prove value for money in their research investment. For this reason primarily applied research is undertaken and much emphasis is put into transfer of information to levy payers.

Fundamental and ‘blue skies’ research is seen to be the domain of Government.



5.3.8 UK – British Beet Research Organisation (BBRO)

BBRO levy funding is derived equally from sugar beet growers and British Sugar, the privately owned sugar processing company in UK. Levy rates are around 0.4% of farm gate value for each party.



Levy funds are primarily used to 70% core fund the Broom's Barn Research Centre in Suffolk, which is a division of BBSRC sponsored Rothamsted Research. BBRO grants funds for projects up to four years in term with the majority at the applied level.

Around 15% of the funding is also used for longer term research such as biotechnology with the aim of knowledge building and genetic characteristic identification. BBSRC and Defra funds boost these activities.

BBRO undertakes sugar beet research to the ‘factory gate’ only, after which British Sugar undertakes research in its own right. All research on product development, by-product utilisation and other forms of innovation are undertaken by the private company.

BBRO does use other service providers such as The Arable Group.

5.3.9 UK – The Arable Group (TAG)

TAG was formed with the recent merger of Morley Research Centre based in Norfolk and Arable Research Centre based in Gloucestershire. TAG is a subscription based organisation with some 2600 members from around England, encompassing around 35% of the arable area.

TAG performs consultancy services to subscribing members and commercial research for other industry members such as chemical companies and levy bodies such as HGCA and BBRO. Research undertaken is of applied nature, although some longer term work is investigated.



5.3.10 Denmark – Danish Seed Council

Denmark is one of the major herbage seed producing areas in Europe and has a well organised seed industry. The Danish Seed Council is involved in advocacy work and administer a research fund derived from a 0.2% farm gate value levy on seed crops. The Council also administers royalty payments on herbage seed varieties.

The levy fund is effectively matched by a Government contribution and funds are invested in a combination of applied and fundamental research.

Applied research is primarily undertaken by the Danish Advisory Service, looking at short term issues such as nitrogen use and fungicide effectiveness.

The investment into fundamental research is made through five year projects at the Flakkebjerg Research Station of the Danish Institute of Agricultural Science. These projects are targeting knowledge building and underpinning of future applied research.

Plant Breeding activities and innovation are vested with commercial seed companies, the majority of which are farmer owned cooperatives.

5.3.11 Netherlands – Hoofdproductschap Akkerbouw (HPA)

The HPA is one of The Hague based commodity boards with a statutory right to collect levies on primary produce. A range of general arable and specific vegetable levies are collected and investment is coordinated through this organisation.

Regional committees highlight research needs and proposals are received from service providers, primarily Wageningen UR.



Research undertaken is mostly applied in nature although some longer term fundamental work is funded, such as underpinning work. Some levy is spent on promotion and advocacy work such as developing codes of practice.

Fundamental research is generally funded by government who are investigating new uses for primary produce and environmental & economic sustainability issues.

Product development and innovation is assumed to be invested into by industry.

5.3.12 France – ARVALIS – Institut du vegetal

ARVALIS was recently formed by the merger of the ITCF and AGPM-Technique. Their main research centre is based at Boigneville, south of Paris. Although I did not visit this organisation I was able to glean this information by email communication. This was a lesson in investigating common holiday timings for different countries. It appears that all of France goes on holiday in the first week of August.

ARVALIS collects a levy as a combination of a per farm contribution and around a 0.4% levy on farm gate value of output. This income is the primary source of investment into purely applied research around the management of cereals, maize, pulses, potatoes and forage crops.

Some promotion is also undertaken by this organisation.

Fundamental research in the French Arable industry is undertaken by private companies and Government. Government research is mostly undertaken by The National Institute of Agronomical Research (INRA), a large organisation with around eight thousand staff.

5.3.13 Summary of Levy Bodies Investment

Levy bodies generally make minimal investment in fundamental research. Investment in research that might have some added value or innovation outcome is virtually non-existent and left in the domain of individuals or industry.

Where levy bodies are investing in fundamental research, it is generally at a level that underpins future applied research or is aimed at some generic quality characteristics. This is knowledge building with the aim of providing an industry with competitive advantage.

Many levy bodies actually struggle to convince their levy payers of the merits of investing in applied research.

Few organisations promote the concept of diminishing reliance on commodity production and some take the attitude that farmers should remain farmers.

5.4 Private Companies

5.4.1 UK – CPB Twyford

CPB Twyford is a privately owned plant breeding company based in Cambridgeshire. The company concentrates on cereal breeding and has a market share of around 25% of the UK market.

Plant breeding businesses are purely fundamental research investment companies. They invest in a breeding process that will over time produce a range of varietal technology. That technology is then commercialised and returns an income in the form of a royalty stream. Control over the intellectual property is given by Plant Variety Right registration.

CPB Twyford are involved in a very competitive business that has seen a lot of rationalisation in recent years. A multitude of plant breeding companies have merged to now three main companies.

Government funding of ‘blue skies’ research and public good pre-breeding is seen as valuable, as companies are not seen to have the ability to capture the benefits of this work exclusively.

Plant breeding companies have a long term approach to business and have a clear ability to measure the returns on their research investment.

5.4.2 UK – Yeo Valley

Yeo Valley is a family owned dairy food business based in Somerset, and is the second largest manufacturer of yoghurt in the UK.

Although not an investor in research as we would traditionally classify it, innovation and brand development has been the key to their success.

This company is very profit driven and invests heavily in new innovative food products and the brands to take them to the market. Key successes have been in organic products and luxury ice-cream.

The return on this type of investment is very measurable and relatively short term in this type of business.

5.4.3 Scotland – Cygnet PB

Cygnet PB is a potato breeding company based near Perth, Scotland that was part of Plant Breeding International prior to being purchased by Unilever and then Monsanto. The company was taken on by a family owned cereal seed company, Alexander Harley Seeds.

The company is making long term investments in potato breeding. They estimate that a new variety could take ten years to get to critical seed sales levels.

Royalties are the key mechanism for return on investment although Cygnet PB also take a margin on seed sales. The company is extensively involved in mini tuber seed production and has a sister company GenTech Propagation Ltd which produces reduced generation seed.

The company uses the pre-breeding services of SCRI as it can not justify investment into the very long term.



The UK potato industry is currently facing immense pricing pressure from retailers and EU supply which is reflecting in the ability to buy higher value seed.

5.4.4 Canada – Permolex

Permolex is a privately owned ethanol, gluten and flour producer in Red Deer, Alberta. The company runs a value added fractionation plant with a throughput of 100,000 tonne of wheat per year.



Although the company has invested significantly in plant upgrades they are the third owners of the facility and hope to be the first to be successful.

The company has discovered that the added value in such a business comes from the various waste streams and by-products as the mainstream products are very competitively priced in the market. Capturing carbon-dioxide, generating electricity and selling mill products as animal feed keeps the plant viable.

The key to this business also appears to be the ability to purchase relatively low cost grain due to limited export opportunities available to Alberta grain growers. Alberta has named itself the 'value added' capital of Canada, by processing grain through beef feedlots, driven mainly by necessity.

5.4.5 Germany – KWS

KWS is a privately owned breeding company involved in sugar beet seed, cereal and maize breeding. The company's facilities and head office are based in Einbeck.

Around 50% of the company's turnover is reinvested in some form of research, primarily in their breeding activities.

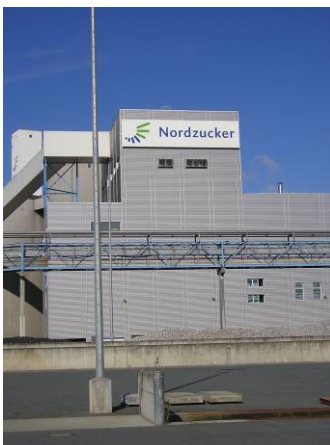
KWS also has an investment in a biotech branch that is used to identify, transfer and implant genes in support of traditional breeding. Emphasis has been taken of genetic modification currently due to European public concern over the scientific tool.

This company is required to continue to invest in longer term research to remain at the forefront of its various markets. The return on this investment is very measurable.



5.4.6 Germany – Nordzucker

'Northsugar' is a private sugar processing company with facilities in Northern Germany, and Eastern Europe. I visited the Uelzen processing plant which is claimed to be the largest plant in Europe, and produces around 300,000 tonne of white sugar per year.



Long term investments in this business are mainly in the form of plant and machinery to ensure that the company is as, if not more, efficient than its competitors. The company packs sugar in supermarket branded packaging rather than selling their own brand.

In a competitive market like this, which is also facing serious pressure on farm subsidies from the World Trade Organisation, any value added is simply in the form of further processing. Large companies like this, based in a productive beet growing area, are likely to make sugar production difficult for less productive regions if any form of deregulation is ever imposed.

5.4.7 Summary of Private Investment

Larger companies naturally invest more in research and innovation. Not surprisingly these investments are always profit motivated rather than any effort to build knowledge.

Investments are made in longer term research in an effort to gain efficiency, discover innovative processes, develop branded products and capture intellectual property.

Private companies have a better ability to both capture and measure the return on that investment than Governments or industry investors.

Plant breeding companies are quite unique in their reliance on investment into fundamental research and are at the mercy of a suitable system to control the intellectual property developed.

5.5 Individuals

5.5.1 UK – Thatchers Cider

This family owned cider business is based in Somerset and has been producing apple cider for 100 years and four generations.

The family still grows apples on its farm base and produces niche ciders that ride on the ‘coat tails’ of the larger cider brands. The facilities also process blackcurrants for the Glaxo Smith Klein Ribena brand, which provides extra income and a significant spread of risk.

The family has continued to invest in plant and innovation which has enabled them to continue to produce a high quality product and gain contracts such as Ribena. Investment in their own brand has also been the key to their success.

Investment is not in fundamental research as such, but this is a good example where investment in innovation with the aim of adding value has eventually led to the value added part of the business superseding the commodity production.



5.5.2 UK - Springdale Crop Synergies Ltd

Ten years ago Clifford Spencer changed his emphasis from arable farming in Yorkshire to investigating industrial uses for arable crops. He established Springdale Crop Synergies with the aim of profiting from field production, added value processing and retail marketing of non-food crops.

Springdale invested heavily in developing strategic alliances with funding organisations that would allow for significant future investment in innovative processing facilities and marketing. This reduced the need for the use of private funds and reduced risk.



The direction of non-food crops was quite intentional, to remove the pressure exerted by supermarket chains in the marketing process. Supply chains were built with control being retained close to home.

Projects have ranged from hemp production for natural products, turbine modification for electricity generation from whole rape seed, and other novel seed crops grown around the world.

This is a very interesting business that is a good model for gaining control of newly formed value chains. As the business grows it will be interesting to gauge the attitude of seed growers as to the amount of value that is shared.

5.5.3 UK – Lynher Dairies

Lynher Dairies is a niche cheese maker based in Cornwall. Ten years ago, Ben and Catherine Mead established a joint venture with an existing cheese maker to add value to the milk produced on their dairy farm.

With the confidence of an existing brand in place the couple invested in a new processing facility to expand the business.

The company produces a niche Cornish Yarg with distinctive stinging nettle or garlic wrap. The couples marketing backgrounds have helped in the process of developing a successful niche brand.



The market is deliberately kept short of the product range so as not to commoditise any of the products. New products are constantly under development.

Again this is an example of innovation rather than direct investment in research. It has had the effect of removing the business from commodity production but does not allow for major scale enlargement.

5.5.4 UK – Tagmoor Beef

Based in the Cotswold town of Bourton-on-the-Water, the Maccuragh family run an arable and beef farming business. As a mechanism of adding value to their business one of the family has developed a further business marketing branded beef products to local restaurants and pubs.



Although only on a small scale at this stage, the progeny of the beef herd is completely marketed through this mechanism, providing improved returns.

The family invested in branding and marketing of the product, and also in developing a relationship with a local butcher that provides extra long curing time to allow the beef to be differentiated.

Another family member also runs a business storing caravans and exclusive cars in old dairy facilities.

5.5.5 Summary of Individual Investment

This is only a small sample of the individual innovation I saw in European farming families. Although not strictly investment in fundamental research there has been a certain investment in **differentiation** and innovation. The key to their success is a shift of focus from supply, to **customer demand**, gaining competitive advantage.

Most investment is of a **smaller scale** but also has a larger impact on the overall business because businesses are also smaller. Generally **niche products** provide individuals with the added value they require.

Motivation is generally **profit** rather than value adding for the sake of it.

Many of these businesses can outgrow the original core business and become significant enterprises in their own right. This allows the individual to have more control over their commodity producing destiny but I am sure presents them with a complete new set of business challenges.

6. Interesting Initiatives

As I was travelling and investigating the above parties I was confronted with a number of interesting initiatives that I thought might have some relevance to the overall concept of investing in value adding technologies. Some of these initiatives are briefly outlined below.

6.1 UK – Applied Research Forum

The “Curry report” (2002) recommended that a forum be established, where various primary industry research investors could meet and discuss research projects covering common issues.

The UK levy bodies investigated above plus BBSRC, Defra and the National Farmers Union meet on a regular basis to ensure that there is little duplication of cross-industry research and discuss joint investment opportunities.

New Zealand has the Primary Industry Council as a forum for cross industry discussion. Although our industries do communicate through this and other forum, I believe this would be a useful model for those primary industries in New Zealand who collect levies under Orders to the Commodity Levies Act 1990. There are undoubtedly some generic research issues that could be better coordinated under this process.

This could also be a useful forum for progressing generic research more focussed on the value chain with the aim of providing our primary industries with competitive advantage.

6.2 UK - Rothamsted Research Association

The BBSRC funded institute, Rothamsted Research, was charged with communicating research activities and outcomes to the wider industry. They set up a subscription based association where consultants and farmers received regular research updates and opportunities to attend field-days.

Not only does this provide a direct communication link for farmers and consultants to the scientific community, it also provides valuable feedback to scientists to fine tune research direction.

Although the transfer of information in the New Zealand situation is generally the responsibility of the levy body concerned, a more direct relationship with scientists involved in our Crown Research Institutes could provide the same valuable two way flow of ideas. This would particularly be the case for more fundamental and ‘blue skies’ research providing awareness of future opportunities and future needs.

6.3 UK – The National Rural Knowledge Exchange

This recent initiative connects the rural community with 14 colleges and universities in England. The universities collectively fund a team of people across the country who identify the contact points for rural businesses wishing to access research, consultancy and expert opinion.

This seems to be a good method of streamlining public access to universities and relevant staff.

6.4 UK – Knowledge Transfer Partnerships

Government funds a programme where graduates at universities are part funded to move to the industry with newly developed technologies to assist with knowledge transfer.

Hosting businesses and universities both receive support for the process of implementing new technologies. The programme aims to increase business relevance in universities, assist companies in developing new technology, and enhance the career of graduates involved.

6.5 UK – The Alpha Group

The Arable Group is a small group of progressive farmers, with an interest in the future of research.

This group meets occasionally to provide a forum for discussion and contemplation of future research needs for the arable industry.

Although this is not a particularly democratic process, I believe it is actually a very valuable mechanism of gauging the attitude of leading agriculturalists who will be at the forefront of any new technology adoption. Providing a forum to interact with researchers would be beneficial to the whole industry.

6.6 UK – English Farming and Food Partnerships (EFFP)

EFFP was established to help develop cooperation and collaboration between farmers and between farmers and the food chain. The focus is on developing farmer controlled businesses that will capture extra value beyond the farm gate for their farmer members.

EFFP believe that UK has less farmer controlled businesses than some of their international competitors, and there would be advantages in promoting further development in this direction.

The organisation works closely with interested parties helping develop businesses of this nature and provides some useful literature outlining existing examples of successful farmer controlled businesses.

This type of business support is quite relevant to this study. Not only do farmers need to be aware of the value adding opportunities that might exist, they need to have support in setting up the business and financial structures that might allow developments to be undertaken.

Although this type of support is probably available in New Zealand through various channels, it is likely that most farmers considering such developments would not know where to start looking.

6.7 France – Centre de Valorisation des Glucides et Produits Naturels (CVG)

Based in Amiens, this organisation was established by the French Government to evaluate new markets for plant based materials.

CVG has pilot and small production equipment and scientific capability that allows them to both develop novel products and further develop product concepts that private companies might bring to them. Companies therefore do not need to invest in plant and equipment development or modification until products are confirmed worthy.

Around 25% of the organisation's funding now comes from Government and the remainder from industrial contracts.

CVG specialises in fractionation of plant materials from the basic arable crops. Projects have included cosmetics, food ingredients and food products.

There are a number of these types of organisations in France and I see it as a general acceptance by Government that they need to provide both capital and ongoing support for research into innovation so that added value business can thrive.



6.8 Canada – Food Development Centre

Similar to the above example, the Alberta Government has developed a product and process development site at Leduc. Again the purpose of the investment was to progress value adding to primary produce on the basis that small companies could not afford their own research and development.



The site is a registered meat processing facility, has milk, grain and vegetable processing facilities, and a fully specified bakery.

The facility has a set of six 'business incubators' where independent companies can use facilities with confidentiality on a fee for service basis.

Again the facility is part funded by Government as breakeven is seen as unrealistic.

7. Conclusions

Recall that the basis of this study surrounded the dilemma that commodity producing industries in New Zealand are all facing. A gradual decline in real commodity prices has been evident for decades, costs of production are increasing and more recently land values have in many places exceeded the level where acceptable return on capital is possible.

I hypothesised that our commodity producers could overcome these problems by adding value to the commodities produced and that the key to doing this was to invest in longer term research and innovation.

Following are the conclusions and recommendations developed from this study.

7.1 Investing in value adding and innovation is a useful mechanism of improving overall business return.

On my travels I saw numerous examples of businesses which have reduced their dependence on commodity production by investing in some form of value adding or innovation.

Return on overall business investment was always the main driver for successful endeavours, rather than value adding because it was an obvious progression.

Often a new set of skills and attitudes were required to be developed or imported into the overall business and successful endeavours accounted for this.

7.2 Value adding and innovation can be achieved at many levels.

Similar results for individuals can be achieved by a large range of investment strategies.

Small investments in further processing or branding can have a similar effect on an individual's business as large cooperative investments in new products or processes.

The most important outcome is the reduction of individual reliance on commodity production.

7.3 At the very least, New Zealand’s agricultural industries should invest in gaining competitive advantages.

I have made a distinction between value adding to remove a business from commodity production and investing with the aim of gaining competitive advantage while remaining in commodity production.

Traditional reliance on comparative advantages such as climatic and soil conditions are no longer an option for primary production in New Zealand due to increasing competition from similarly resourced regions. However successful commodity production can be achieved with a shift in focus from production to the customer with the aim of gaining a bigger share of existing value.

The first of the options to achieve this is to target low cost of production using innovative production techniques, unique skills, superior processes and infrastructure. The second is to differentiate commodities produced.

Recommendation 1: That farmers continually analyse the long term potential of their industry and their personal position within it to assess whether a change of business strategy or focus is required.

7.4 Not everyone wants to invest in value adding and innovation.

Investors of research funds on behalf of primary industries need to consider that many producers have personal circumstances that provide that they have little interest in adding value to their primary produce.

Even in seriously ‘under threat’ industries there are participants who are comfortable for reasons of alternative incomes, minimal debt loading or closeness to retirement.

7.5 Industry wide investment in value adding and innovation should be well targeted.

The analysis of cooperative and levy body investors in the body of this report highlighted the issues of returning significant benefit to individuals from collective research investment.

Cooperative investment can tend to be commoditised if the industry is focused on production.

Cooperative investment can tend to be ‘watered down’ if the production base is relatively larger than the value added component.

Industry wide investment must be well targeted to achieve industry goals. In some cases removal from commodity production may not be feasible and targeting competitive advantage in commodity production could be more achievable.

7.6 Best individual results could be achieved by private investment model.

In many cases it would appear that the best approach for adding value to individual commodity businesses is to make investment into added value research and innovation privately.

The key is to spread the investment sufficiently that each individual business receives suitable or required level of relief from commodity production issues, while not exposing themselves to major investment.

Primary producers are a wide and varied ‘bunch of characters’ and have different thresholds for these types of investments. Some may choose to invest significantly in large value added product research projects and others may be more comfortable in small cooperative structures that require smaller financial and personal contributions.

Regardless of the approach, it is apparent that private company investment is more focussed and results are more measurable than any industry wide investment.

7.7 The critical point for industry wide investors to consider their investment position is the presence of intellectual property.

Conclusion five above outlined the difficulties of investing in adding value and innovation. There is a critical point where research investment can be assessed as having potential conflict with research intention and that is where the presence of intellectual property evolves.

At this point the intellectual property needs to be developed into products or processes and significant further investment is required. At this point an industry must decide if it may be more suitable for a smaller group of producers or a private industry participant to take on the investment role, or if it is an appropriate industry initiative.

The potential of intellectual property at some point in the future should not necessarily be a deterrent to continued investment as this in itself does not provide major conflict.

Levy body and industry investors need to be aware of this issue and have a clear mechanism for assessing how far down the value added path they might invest.

Some may choose to go further than others but it is important that there is a full assessment of realistic value to the industry before significant funds are invested.

Recommendation 2: Holders of Levy Orders under the Commodity Levies Act 1990 ensure they have a clear mechanism for assessing the value of investing in intellectual property, and a clear process of controlling how far down that ‘path’ they do invest.

7.8 Industry wide investment is important to underpin future applied research.

It would be easy for a levy body to concentrate purely on investment into applied research and rely on Government for any longer term investments. However this approach is unlikely to provide for consistent long term productivity gains and therefore industry sustainability.

Fundamental research is by nature more difficult to justify to levy payers but is critical to ensure that the basic information needed to progress future applied research is available. This underpinning approach is widely used elsewhere, although few levy organisations internationally are as accountable to levy payers as our organisations subject to Commodity Levies Act 1990 Orders.

Investment into underpinning fundamental research also provides an industry with much needed influence over research direction for the future, and provides valuable “leverage” that encourages both government and industry participation in projects.

This type of investment should not be seen as a ‘cop out’ or to let Government ‘off the hook’, but rather as an investment in the future of an industry.

7.9 Government investment is critical in the areas of research capability, ‘blue skies’ research and the majority of fundamental research.

On the same basis that primary industry has certain responsibilities in research investment, Government has its role to play.

The areas of ‘blue skies’ investment and retention of research capability are most definitely the domain of Government. No participants in a value chain can justify research investment in these areas because potential return on investment is unclear.

Both areas are critical for future ‘national growth’ and must be supported by Government.

Fundamental research is also a critical investment for Government. The ‘market failure’ principle will prevent industry investment in the majority of fundamental research areas required. Levy organisations and industry must however invest alongside Government to ensure common research goals and provide leveraged encouragement.

Recommendation 3: That Government ensures that sufficient resources are invested in ‘blue skies’ research and scientific capability to allow for future national growth and works more closely with levy bodies to assist in achieving industry fundamental research goals.

7.10 Farmers need to be made aware of potential value adding and innovation opportunities.

One of the critical issues highlighted was the lack of awareness of potential value added and innovation opportunities. Larger private companies had sound processes with research organisations to highlight prospective investments but individual primary producers and groups were generally unaware of what was in the ‘pipeline’.

If we are to encourage individual and small groups of farmers to take the value adding approach we also need a mechanism to highlight the opportunities to them. Although there is a certain need for individuals to seek out opportunities, levy bodies may also need to put more emphasis on this activity.

Ideally, farmers could periodically view potential investments and make assessments as to their suitability for their own circumstances or that of a group of producers.

When opportunities were to be offered for ‘sale’, it would be important that the process is transparent and competitive so as not to discourage farmer involvement.

One of the more difficult issues is that of industry investment at a level prior to this stage, a more fundamental level. Often this gives investors more ‘rights’ over all outcomes, which is a major disincentive to farmer investment.

It is important that Government funding is used as much as possible to invest in the early stages of value adding and innovation development. Alternatively the industry consortium approach would be suitable providing primary producers were given access to future opportunities.

Recommendation 4: That Government and levy bodies encourage farmer investment in value adding and innovation by ensuring opportunities are highlighted and that engagement processes are transparent and competitive.

7.11 Government should support farm based businesses in exploring value adding and innovation opportunities.

If farmers decide that value adding and innovation investment could be beneficial to their business it is important that they have access to good sound advice on establishing a varied business structure. The New Zealand Cooperative Association provides useful information to members but the EFPF model from UK would be useful in this process.

Many farmers would already have access to professional advice but others would need some direction in obtaining the skill support they need.

Once a business has preliminary outcomes to this investment path they will often need to invest in plant and machinery to further develop and test new products. The pilot processing facilities highlighted above would be extremely useful in this process.

Purpose built facilities might be unrealistic for most New Zealand industries but equipment is available for the dairy, meat and wool industries. The arable and horticultural industries could benefit from identification of equipment available in research institutes and universities for this purpose, and Government support may be required.

Recommendation 5: Government and levy bodies ensure that there is a clear pathway for sourcing information on the establishment and running of farmer controlled value adding businesses.

Recommendation 6: Crown Research Institutes and Universities consider how pilot processing plant could be made available to aspiring processors, with Government support.

7.12 Industries collecting commodity levies should better cooperate in coordinating generic applied research activities.

The UK model of an ‘applied research forum’ would be a valuable forum for New Zealand levy bodies. It could provide for spreading of costs of generic research activities and improve awareness of issues of other industries.

Existing forum in New Zealand may serve this purpose, however the focus must be on collaboration in research areas.

Also there are potential areas of collaboration in research more focussed on the value chain and providing competitive advantage to our primary industries.

Recommendation 7: That holders of Levy Orders of the Commodity Levies Act 1990 ensure there is a forum where generic research cooperation is fully discussed.

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