



FOODFRENZ



Report on

Workshop 1: Successful Institutional Collaboration

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1. FOREWORD: Martin Hall

The EU's competitive advantage in food production lies in adding value to raw materials derived from plants, animals and fish. By utilising the cultural diversity, regional specialisation and longstanding traditions of the EU member states, there are opportunities to develop innovative, novel and improved food products for consumers. This will lead to development of new industries, markets, exports and economic growth particularly for the new member states.

However, in order to be successful in this aim it is essential that collaboration between the food industry and research groups is well directed and effective particularly in respect of SMEs. SMEs make up a major proportion of the industry but due to time and financial constraints are notoriously difficult to engage in collaborative research. Several schemes exist within the EU to encourage SME involvement, however, New Zealand is a country that has been more successful than most in gaining SME participation. Around three quarters of New Zealand Government research attracts SME contributions of between 20% and 50% of the funding.

The Food-Frenz project brings together researchers and industry in New Zealand and Europe to enable effective scientific collaboration and to facilitate joint learning in respect of productive cross-sectoral collaborative research. This report details the findings of a workshop to explore exactly these issues.



2. INTRODUCTION TO THE WORKSHOP: Professor Ray Winger

The workshop brought together a wide range of actors involved in the industry:research association:tertiary institution nexus related to food research. The key intention was to brainstorm features of successful collaborative research projects and identify best practices. The work package aims were:

- To enable collaboration between research groups in Europe and New Zealand
 - To facilitate sharing of research capabilities to benefit the science base and contribute to exploitation of research outputs and objectives:
1. To develop world best practice used in collaboration among universities, research organisations and industry in EU and NZ for food innovation.
 2. To provide funding agencies with a set of operating principles to facilitate successful collaboration among universities, research organisations and the food industry in Europe.
 3. To provide research and business managers with a set of key principles and models for effective and meaningful working relationships and partnerships for conducting innovative research for the food industry.
 4. To bring together actors involved in facilitating cross-sectoral collaboration and to use success stories to illustrate best practice, and also gain an understanding of the EU cultural context in order to identify barriers to implementation of best practice.

The workshop structure involved a series of brief presentations to benchmark potential examples of good practice and to set the scene for break-out group discussions. These discussions focussed on three questions:

- How do we define and measure success (including innovation) from the point of view of each of the 4 types of stakeholder?
- What are the characteristics of winning collaborative teams and optimal team management?
- How can we enhance industrial engagement, particularly SMEs?

Following these discussions, the teams combined their views and overall conclusions were made by all workshop participants.



PRESENTATION PAPERS

3.1 *The New Zealand and European Wine Industries* (Professor Brian Jordan)

Introduction

The New Zealand wine industry is relatively young in comparison to the long tradition of European wine production. Although there are many differences between the European and New Zealand wine industries, the value of investment in research and development is universally recognised to ensure sustained performance into the future. Critical to successful research and development is the effective interaction between the wine industry, research providers and government. The New Zealand wine industry over the last few years has provided a case study of successful interactions between stakeholders. This experience is one that should provide helpful insights for European countries. Furthermore, efficient research programmes will lead to international collaboration and in the longer term benefits to all.

Common Issues for New Zealand and Europe

A number of common issues arise frequently in discussing the best model to develop successful research provider/industry collaboration. The list of these issues include: the role of government, scientific philosophy, industry imperatives, globalisation and the ability to gain acceptance of new technologies. Government as major investors play a key role. Should they have a “laissez faire” approach or be very prescriptive in their directives to research organisations. Government thinking is frequently subject to political pressure and can be short-term or inconsistent. The need for justification of the budget spending can also lead to “over indulgent” compliance requirements. Over compliance is certainly a major concern of scientists. In addition, government policy can lead to a competitive environment between research providers or possibly worse, an approach that does not create a climate of new innovations and scientific entrepreneurialism.

Some scientists also do not fit into a comfortable relationship with industry partners. They see long-term fundamental research as the pure research and want to discover, not be directed. These scientists do not relate to the outputs and outcomes of industry. They are not looking for benefits to industry, but to the “purity” of their scientific discipline. This scientific ethos conflicts with bottom line industry values and the need to know and resolve problems immediately. For some companies research is not appreciated and “old traditional approaches work just fine”. How then do advanced biotechnology approaches fit into such an environment? If global companies are introduced into the national situation another layer of complexity can also be envisaged. These examples are merely the ‘tip of the iceberg’, but contribute substantially to “slow progress”! Given some of the ingredients of the above scenario, how has the New Zealand wine industry fashioned a successful pathway through this potential minefield. Two important factors have helped New Zealand science in respect to industry relations. First, there has been a long and successful applied science approach, both by the Crown Research organisations, but significantly by some Universities. This approach is frequently reflected in research funding that needs clear industry support to be successful (direct finance and in-kind). Indeed the research proposals have to be developed with industry partners input from inception. Secondly, a competitive system



between research providers is being superseded by a more constructive “best team” approach. This has positioned several of the research providers to smoothly support a developing need by the wine industry. This support provision stems from a clear need for multidisciplinary approaches that can best be met by a number of different research providers.

The Marlborough Wine Research Centre: a new paradigm of research industry and government collaboration.

The New Zealand wine industry is small in terms of its contribution to world wine production (<1%) with a vineyard area of approximately 20,000 hectares. It is however, focused on premium quality export wine, primarily Sauvignon blanc, with a high value. Export growth has been greater than 25% p.a. recently and the industry is thriving. Wine is produced at locations throughout New Zealand (which has a mid-point latitude of 43°; approximately equivalent to Portugal in the Northern hemisphere) and overall considered to be from a cool climate environment. Marlborough in the north of the South Island is the largest growing region with greater than 60% of the grape production. It also produces >70% of New Zealand's Sauvignon blanc including iconic brands such as Cloudy Bay. A characteristic of the industry that supports the success is a modern high technology approach and a well educated management.

In 2001 the representatives of Marlborough District Council approached Lincoln University to provide a tertiary qualification in Marlborough. Local wine companies had also committed to contributing to operational funding for research. From this initial starting point, research providers, local government authorities and wine companies developed a proposal to central government to build a wine research centre in Marlborough. The proposal was successful and in 2004 the Marlborough Wine Research Centre was officially opened. The formal partnership involved research and tertiary education providers; Lincoln University, Nelson Marlborough Institute of Technology and HortResearch, New Zealand Winegrowers, and Marlborough Wine Grower Representatives. Governance was established through a Board who also directed the scientific strategy. The next step to underpin the developing opportunities for the Marlborough Wine Research Centre was to get long-term research funding. The coordinated partnership with the addition of Auckland University was able to gain in 2004, NZ\$9.6 million over six years for a programme of research on Sauvignon blanc. This programme focuses on the need to understand what contributes to the fundamental characteristics (flavour and aroma) of the wine, including terroir, vine physiology, gene activity, the role of yeast and sensory characteristics. Through the knowledge gained in this programme new management practices will be introduced to improve the efficiency of the industry. The consortium of partners has now developed further research programmes and substantive International linkages are being established. This successful regional partnership has now become a “National vision” for research collaboration.



What Works and What Doesn't Work

A number of key factors have led to this successful partnership. A clear unambiguous target that has benefits to all, eg., understanding the production of the premium quality product; Sauvignon blanc. This was precompetitive and therefore assuming dissemination is effective it is a “win win situation”. Operationally clear objectives need to be set by all parties with an appropriate budget. Communication and transparency are vital for success.

A number of factors clearly are seen to hinder progress. These include over compliance, competition between providers, and policies that create bureaucracy. Difficulties that constantly need to be overcome include traditional approaches and resistance to change. Even in the most advanced wine industry, traditionalists do not see the threat of not staying ahead of the competition. This is most clearly demonstrated by the problems of introducing new technologies. Molecular biosciences provide the most advanced tools to understand systems biology. The technology complements (not replaces) traditional approaches such as; developmental biology, physiology, biochemistry and chemistry. The resistance to use this technology in Europe and New Zealand will see International competition out compete these countries. The Sauvignon blanc programme in New Zealand is thankfully starting to overcome this resistance, which is extremely timely as new genomic platforms become available.

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3.2 Assessment of the *IMPACT* of the EU FAIR Agri-Food Research Programme (Professor Peter Richmond)

Background

During 2000, the author together with Professor Jim Leslie, both of whom have substantial experience within both public and corporate R&D were awarded an Accompanying Measure by the Agri-food Directorate of DG Research to form an assessment of the *IMPACT* of a series of projects in FAIR. The outcome was a project titled “*IMPACT*”. A key characteristic of our proposed approach was that this assessment would be made by direct contact with the research and industrial community rather than simply use a questionnaire as has been done in the past. In addition to seeking to identify the outcome of a selected subset of FAIR projects, the authors were encouraged to seek embryonic groups that might also be the basis of new projects within the new research program or European Research Area.

The premise for the work was that whilst there were many examples of successful research projects emerging from EU sponsored research, much of the output could at that time be seen as building technical capability with limited attention being paid to address the real social and economic challenges facing Europe. More recent research programmes have made greater demands scientists seeking EU sponsorship by requiring proposals to include strategies focusing on these social and economic challenges. Without doubt, this has

- 1) required an increased professionalism and wider awareness of how *IMPACT* may be made
- 2) required the use of larger and more robust networks
- 3) required the use of larger and more robust networks
- 4) placed new demands on the overall coordination

Anticipating that these points were not fully appreciated by the research community, we developed a short *IMPACT* workshop at which attendees were taken through these aspects whilst at the same time assessing how their previous experience aligned with these new requirements. This workshop was run a number of times in Denmark, Ireland, the UK, Germany, Italy (where scientists from all across Europe were present), Spain and Brussels. The latter workshop was aimed specifically at Scientific Officers from the Commission. Representatives from industry were encouraged to attend and were present at most workshops.

During the final stages of this part of our program of *IMPACT* research, we developed in conjunction with a professional marketing expert, a questionnaire that was tested and further developed within the Workshops. This assessed the impact and level of success achieved by EU FAIR R&D projects across five *IMPACT* domains:

1. Commercial issues. What innovation has emerged from the research? What stock of new technologies has been developed and exploited either directly through development initiatives or licensed to either existing or new businesses? What new businesses have been created from the research?



2. Scientific and Academic Issues. What published material has emerged? How much has been recognized via prizes, awards and other 'recognition' factors? What impact has EU funding had on the standing of university departments and Institutes that have or are participating in the program? Have Framework funds led to contractions and consolidations (emergence of particularly strong National groups, for example) within the academic sector? What is the current standing of the EU research reputation, vis-à-vis competitor regions, for example, USA, Japan, Australasia? Is the training element within FAIR being exploited? For example, are the postgraduate students and postdoctoral fellows finding appropriate employment at the conclusion of the project?

3. Training and resources. Are participants adequately resourced for the project in hand? Are capital and significant recurrent items requested in the proposal being appropriately utilized? How effective is the experience in providing a basis for future employment for young researchers?

4. Policy Issues. What contributions to EU policy objectives are being made? For example, how are food safety studies contributing to the demands of the commercial and public domains? What are the prospects for take-up of new technological and biotechnological innovations currently under investigation?

5. Consumer Relevance. What links with consumer groups have been made? How effective are these links and to what extent are consumers informed and involved with the research programme and its evolution.

All of these factors impacted directly on the effectiveness and impact of the FAIR Program, which was a key concern of the Commission. However we also recognized that the overall effectiveness and useful impact, actually achieved reflected other facets – so-called 'process' factors such as intrinsic scientific quality of the partnership, appropriate targeting of the research, effective management, good dissemination activities, etc.

About 400 partners and coordinators responded to our questionnaire from 116 of the 118 FAIR projects. This was an average of 3 replies per project considered to be a high return. From the data and comment we were able to identify high scoring and potentially high impact projects. In addition, direct contact was made with over 100 participants, independent beneficiaries, the wider peer group and Marie Curie Fellows. Following analysis of the questionnaire returns, about 30 projects were chosen for more detailed study. This allowed verification and validation of our methodology.

The final results pointed to a number of exciting success stories that had already arisen from EU sponsored research. IMPACT is clearly judged differently by different stakeholder groups and we confirmed a high degree of relevance of the five different domains already noted against which IMPACT might be measured.



More importantly for the purpose of those seeking to prepare project proposals, the study pointed to a number of characteristics that seem to be a feature of successful projects having a strong impact. The key characteristics termed 'process factors' were:

- Clarity of project goals
- High quality of contact between partners
- Strong industry commitment throughout life of project
- The availability of dissemination opportunities
- Style of coordinator
- Strong team spirit
- Availability of well trained staff
- Close contact with scientific officer

The report was well received and presented not only to senior high level officials within the Commission but also external advisory groups. In addition we were invited to present the report at a special session of the Institute of Food Technology annual meeting in Anaheim in 2002 where much interest in the outcomes and methodology was expressed. The methodology is clearly of wide application. More importantly for FoodFreNZ, the conclusions point to key issues or critical points that should be closely followed when preparing successful research proposals for submission to Framework 7.

Full details are given in EU DG Research publication EUR 20496



3.3 New Zealand Crown Research Institutes: An overview (Dr Prue H Williams)

Research in New Zealand is mainly carried out by Crown Research Institutes (CRIs), universities and private companies. The CRIs are independent science research businesses owned by the New Zealand government. They were formed in 1992 from government research organisations, including the Department of Scientific and Industrial Research and then the Ministry of Agriculture and Fisheries. Today the CRIs are the largest providers of science research. They carry out fundamental and applied research for private sector, local and central government in New Zealand and internationally.

What are Crown Research Institutes?

There are 9 CRIs. Four focus on agricultural production research: Crop & Food Research (arable, vegetable, seafood and ornamental); HortResearch (horticulture); AgResearch (pasture); and Scion (forestry). Three have an environmental focus: NIWA (water and atmosphere), Manaaki Whenua Landcare Research (natural landscapes), and GNS (geology). ESR's research underpins the health and justice systems while Industrial Research Limited specialises in industrial research. The CRIs vary in size. The largest is AgResearch with 900 staff and annual revenue of €60m while the smallest is Scion with about 350 staff and annual revenue of €18m. More information can be found on www.acri.cri.nz.

The CRIs are all required to carry out excellent research. Collaborations with other science organisations help to ensure that research is of a high standard while extending the reach of research capability and creating a highly effective and efficient national research community. The CRIs are also expected to engage with relevant industries and to ensure their research delivers benefits to these industries and therefore New Zealand. There is a strong emphasis on commercialisation of science to ensure the maximum benefits are obtained from the research carried out by CRIs.

Collaboration with private companies

CRIs work closely with private companies. The companies provide complementary skills in research and development as well as access to materials and equipment that the research institutes do not have. In addition, involvement of industry throughout the different phases of research, from planning through to implementation of the new technology or knowledge, ensures the research is used by industry and results in economic and strategic benefit to the industry and ultimately to New Zealand's economy. Companies also provide funding that is often used to leverage funding from the New Zealand government. Indeed, cofunds from industry is often a requirement for obtaining government funds.

Collaboration with universities

Universities are also important collaborators with CRIs. Universities provide complementary research skills and resources. There is a growing number of joint university-CRI research facilities and centres on specialised subjects, e.g. National Centre for Advanced Bio-Protection and Hopkirk Research Institute.



An important feature of these collaborations is that they create the opportunity for graduate students to further their research experience while working within professional research teams on very real science challenges.

Issues that occur during collaboration

There are a number of issues in bringing together staff from CRIs, universities and private companies to work on research projects. Commercial staff tend to be driven by expectations around price and profit while academic staff are driven by working to understand the answers to the research questions. This can lead to tensions if the science is too slow to react to commercial opportunities. Ownership of intellectual property (IP) can also be an issue, particularly who owns what and who will benefit from new IP. Both issues can be overcome by setting clear expectations at the start of the project and by engaging people at different levels within the organisation. An example of a successful collaboration is the “Lifestyle Foods” programme, which involves 12 industry partners and Crop & Food Research. The project aims to develop next-generation snack foods with specific glycaemic impact designed to match the lifestyle of consumers. The project uses a combination of novel raw materials and an understanding of food physical properties to develop products with the required health benefits as well as good taste and long lasting “fresh-baked” shelf life characteristics. The project is jointly funded by the New Zealand government (€10m over 6 years) and the industry partners. The key factors in the success of this project are that the chief executives of the company are involved in the project. They meet once a year and agree on the strategic directions of the project. An industry person is employed in the project to ensure research meets industry needs and to facilitate communication between research and company staff. How IP will be handled was agreed to early on in the project and a food industry “club” has been established to agree on how IP will be commercialised. The New Zealand CRIs derive a lot of benefit from working with universities and private companies. Research innovation requires bringing together the complementary skills from across these organisations. While there are some challenges, the collaboration is important for ensuring research is adopted by end users and delivers economic benefits.



3.4 Collaborative projects from an SME perspective: A call for the development of fresh functional foods with an integrated approach (Dr J.E. van Doorn)

Vegetables, potatoes and fruit (VPF) form a significant part of the human diet as providers of nutritional value and essential functional phytochemicals with an impact on health and well-being of the consumers.

Consumer demands and behaviour with respect to health and well-being related issues are more and more becoming the cornerstones for the modern food industry and providers in the food chain. According to the European Committee and associated agencies research needs to focus on expanding our understanding around balanced diets and beneficial and harmful dietary factors. As cited in a specific call from the EC FP7 program will "this will involve the investigation of new dietary strategies, the development and application of nutrigenomics and systems biology, and the study of the interactions between nutrition, physiological and psychological functions. It could lead to reformulation of processed foods, and development of novel foods and ingredients, dietetic foods and foods with nutritional and health claims. The investigation of traditional, local, and seasonal foods and diets will also be important to highlight the impact of certain foods and diets on health, and to develop integrated food guidance".

VPF has an important role in this respect as a carrier with a high content of specific health promoting components (natural nutraceuticals). VFP has the potential to be brought to the market and presented to consumers as functional foods with proven preventive effects towards the main 'welfare' diseases like diabetes type II, obesity and diet-related cancers and ageing. Currently, fresh produce is considered to be healthy in a general sense and promoted by campaigns like '5 a day'. There exists, however, a broad variation in the content and distribution of specific healthy components in vegetables, fruits and potatoes influenced by genetics, cultivation and storage practices. In other words, the choice of variety or cultivar from specific crops and associated production and post harvest storage time and conditions, have a large impact on the content of specific health promoting components in fresh produce. Some varieties are much healthier than others because of their (natural) genetic composition and presence of effective doses of functional ingredients. The awareness that specific components in VPF have a preventive potential towards the development of diseases and disorders is steadily growing and often based on scientific findings by Canadian and US R&D health & food departments.

The EC has sponsored a large number of projects (e.g. HealthGrain, www.healthgrain.com) with a focus on the themes Healthy food, Health claims, identification of healthy components and corresponding content in VPF. Despite these efforts, it is still safe to state that hardly any VPF is offered to consumers which contains scientifically based health claims.

The definition and development of health claims for VPF should be an integrated approach with members from the whole fresh produce chain to convert - with the support of the scientific community - accumulated facts and findings from the past combined with new, cutting-edge technologies into healthy produce for consumers in



the near future. The approach might be based on different parallel lines of activities that in principle can be embedded in various work packages that should be executed by multidisciplinary teams. Protocol development and screening of phytochemicals is the basis for the inventarization of functional phytochemicals in VPF. The development and optimization of protocols for the determination and screening of candidate preventive phytochemicals is needed for components such as specific glucosinolates, anthocyanins, flavonoids, polyphenols, vitamins, carotenoids, terpenes, and microelements such as Se, sulphur-containing allicins etc. in a broad range of VPF. Developed protocols can be applied for the screening of broad germplasms of specific species and crops for the identification of varieties with the highest levels of the relevant components as carriers of healthy produce to the consumer, and deliver the best fresh functional food candidates.

Underlying mechanisms and actions of health promoting components in VPF, as part of the daily diet, have to be studied from a human perspective with attention to relationships between consumption of these components and the development and epidemiology of diseases. Technologies such as human genomics, metabolomics and proteomics can be used as tools for the development of health and risk associated biomarkers.

The development of health claims for specific health promoting compounds with human intervention studies using varieties and ¹³C labelled produce identified during the screenings in the former paragraphs has to be conducted according to the new, recently published, EC guidelines. Protection of intellectual property or investigating patenting possibilities should be part of the process to reward the efforts of these innovators in functional fresh food development.

Commercialisation of functional foods with awarded health claims should be done against ISO guide 62 and 65 standards, with special attention to consumers by an active promotion campaign.

The development of a consumer information system for the obtained functional foods is an essential step to get a communication and supporting system for the food chain that will inform consumers, medium and small companies in agribusiness, hospitals, assurance companies and sports & health organisations. For this purpose, experience in the field of Marketing and Consumer Behaviour should be included in the process. Interactions between consumer organisations and insurance companies as stakeholders for this theme might further promote the use and consumption of functional VPF by consumers.

The development of functional VPF should therefore be a task for all relevant members of the food chain from breeder to consumer involving (bio)chemists, plant breeders, plant physiologists, nutritionists, marketers, food technologists and consumer advisors etc. to meet the targets of a successful chain approach.

The current FP7 program from the EC might serve as initiator and driver of projects according to this proposed design to demonstrate that the current challenges in the field of health and well-being of consumers all over the world can be adequately tackled by the multidisciplinary development and, once available, consumption of functional fresh food (as part of a balanced diet).



3.5 How to successfully engage industry in advanced food research (Dr Øyvind Fylling-Jensen)

The European and Norwegian food industry is one of the most important industry sectors, and the food and drink industry had a turnover of 810 billion Euros in 2004. It transforms over 70 percent of the agricultural raw materials and employs four million people. The industry is fragmented and consists to a large extent of SMEs.

In Norway the food industry is the second largest industry sector. The average Norwegian food company employs less than thirty persons. Thus it is evident that this industry, with its fragmented structure, extreme variation in product offerings and spread geographical locations, has limited ability and capability to perform or engage in research.

The food industry is meeting new challenges due to change in demography and health cost related to food. The consumers demands more healthy food and the government is confronted with increased healthcare spending related to food related diseases, such as obesity, Type II diabetes and cardiovascular diseases. These challenges needs to be solved by increased research and development in the food sector, a sector historically known to spend less than one percent of its revenues on R&D. In contrast the pharmaceutical industry spends 10-15 % of revenues on R&D.

The Norwegian government and the food industry, both the agricultural and marine sector has recognized that the R&D spending in the food sector is too low. There is an urgent need to meet the future challenges related to food and health, need for innovation and increased competitiveness. Thus long term, strategic research is important.

On all products produced there is a research levy, which is used to fund research. The research activities and research programmes are then developed in close collaboration with the industry – both companies and trade organizations, representing the whole value chain from fjord and farm to fork. The process is very interactive and the outcome is a number of 4-5 year research programmes built around the challenges identified by the industry.

In addition, the Norwegian Research Council and Innovation Norway have several programmes directed towards the sector. Important features of these programmes are that the industry is the project owner, whereas the research institutes and universities are the executers. The successes of the projects are strongly linked with the industries and the research entities ability to design and formulate relevant, realistic and achievable goals and work structures.

Matforsk has developed a model, internally called the “Integration model”, which has been designed to increase the ability of SMEs to engage and use R&D. This model has now successfully been applied to more than 800 SMEs throughout Norway, and several of the industry partners are now participating in advanced research projects. The model is a stepwise procedure where the lowest step is on-site visits to solve company specific challenges and to start knowledge transfer from the research institutions to the industry.



By engagement and broad knowledge of the industry, Matforsk develops industry or company specific development projects. These projects usually have duration from three months to one year. A number of the companies we interact with see that their need for longer term solutions means that they become an industrial partner in research projects, either as sole partner or as part of a research consortium. The idea is to combine the levy financed, long term research projects with a number of projects ranging from R&D to implementation, creating value and increased competitiveness for the participating party.



3.6 Industry:Research Association:University Collaboration (Dr Jeremy Hill)

Introduction

Fonterra processes over twenty billion litres of milk in 180 dairy plants into over 1000 different products and export those products to 120 countries. Of the fourteen billion litres of milk that Fonterra processes in New Zealand only 5.0% is consumed domestically with the remainder exported. Fonterra has significant internal R&D capabilities with facilities in Australia, Singapore, China, Malaysia, Germany, Mexico and New Zealand, including the Fonterra Research Centre with 350 staff, four thousand square metres of pilot plant and four thousand square metres of laboratories. However like many other companies small and large Fonterra is looking to open innovation to meet its' innovation needs.

No company today has internally all the capabilities it needs to innovate, particularly for more radical innovation and must partner with external organisations often universities and research associations as a source of complementary capabilities. But with such a dependence on collaborations between industry, research association and universities how do we maximise the chances of making these successful?

It all starts with a need

In order to have a successful research collaboration the purpose of the collaboration must be clear. However, often this is not the case, or at least not for all partners. Far too often collaborations are entered into without a clear definition of what the collaboration is going to produce for the various partners in the collaboration. Collaborations involving universities, research associations and the commercial sector can encounter difficulties due to the different objectives they look to the collaboration to meet, including revenue and intellectual property creation, capability creation, staff and student development/training, attracting commercial and/or government grants, scientific excellence including publications, etc.

How the “product” of the collaboration is to be used by **all** partners in the collaboration needs to be clear at the outset. From an industry perspective problem or opportunity definition is critical and particularly from the perspective of the end user. In the food sector the end user could be a primary producer, a manufacturer, a fast moving consumer goods company (FMCG), a food service outlet, a food retailer or consumers. With the final product clear to all and thus ultimate success, the individual components of success for each partner must also be explicit be they publications, profile, funding etc.

Culture is critical

Universities, research associations and industry often have very different cultures and as such communication is an area needing particular attention. But this can be difficult as increasingly collaborations cross borders, languages and time zones.

Partners must want to collaborate, obvious you might say, but an agreement at senior management level that is not reflected by those responsible for doing the work spells disaster.



There must be a clear understanding of roles and responsibilities and the WIIFM or 'wants in it for me'. Adopting the RASCI model can be a help, where for each project the following are identified:

- **Responsible:** those who do the work to achieve the task, there can be multiple resources responsible
- **Accountable:** those who are ultimately accountable for the completion of the task and make the final decision, there must be exactly one A specified for each task
- **Supports:** those who support the R for recommending a decision or taking the action
- **Consulted:** those whose opinions are sought, two way communication
- **Informed:** those that are kept up-to-date on the progress, one way communication

Structure is important

Having the right structure within a company is important to capture the benefits of open innovation. Fonterra promotes this through a dedicated External Relationships Management (ERM) team within its Group Technology function. ERM provides centralised corporate-wide management and coordination of all external research partnerships, contract management, external funding and technology scouting. Externally sourced solutions through open innovation does not need less management attention, it need more management attention! Far too often companies have outsourced some of their innovation needs, but neglected to pay enough attention to these outsourced projects and the changing needs of the various partners leading to misalignments and failures. In Fonterra the ERM team is responsible for making sure this is happening across the companies' external projects by ensuring there is a close liaison between the staff that will be responsible for commercialising externally sourced solutions and Fonterra's external partners.

IP

IP in and of itself is often of little value – a fact often lost in contract negotiations. Companies, universities and research associations are spending far too much time in protracted discussions relating to who will get what share of the IP pie before the pie has even been baked. IP discussions should start with clarity about how the various partners will use the product of the collaboration and all partners need to be realistic about the value of the capabilities and insights they bring to the collaboration. The negotiation of IP rights is an area that needs attention if we are to create and exploit collaborations at a speed that is needed for our fast moving world where opportunities will be captured not only by the creative but also the fast and nimble.

Roles and Responsibilities of Partners

All partners can and indeed should bring ideas and insights as today collaborations need to be based on access to heads and not hands. In addition to intellectual capital here is a perspective of what the primary contributions universities, research associations and industry bring to commercial food R&D:



Universities:

- R&D talent development and basic long term research.
- Provision of independent expert advice to companies, but also governments and regulators etc.

Research Associations:

- Contract research for specialised services in their areas of expertise and acting as a hub for the companies to engage in collective R&D projects.
- Also provision of independent expert advice to companies, but also governments and regulators etc.

Industry R&D:

- Commercialising R&D. Incremental innovation, line-extensions and renovations done using in-house resources.
- More break-through or radical innovations from a combination of external and internal resources.
- Internal capabilities to focus on problem definition and adoption/adaptation of external solutions to those problems.



3.7 Establishing health benefits of novel foods – University of Auckland & Uniservices

(Professor Lynn Ferguson)

Introduction

The University of Auckland is New Zealand's largest university and is centrally located in Auckland city, providing a teaching environment for over 40,000 students. Established in 1883, it's stated mission is to be an internationally recognised, research-led university, known for the excellence of its teaching, research, and service to its local, national and international communities. Teaching and research is conducted in eight faculties, of which 4 conduct research or possess skills that are relevant to the food industry: [Business and Economics](#), [Engineering](#), [Medical and Health Sciences](#) and [Science](#).

Research for developing health claims

It is recognized that double-blind placebo-controlled randomised clinical trials represent a gold standard in making sustainable health claims. These can be done through the Clinical Trials Unit or the Cancer Society clinical trials centre. However, taking a trial of nutritional product to a disease endpoint may be very difficult to achieve in practical terms, and it may also be unethical. Thus, animal studies and short term human trials with biomarker endpoints may be far more appropriate and flexible. Among the key technologies represented in the Faculty of Medical & Health Sciences, there is a particular focus on new animal models for chronic disease, and on ways of bridging the gap between animals and human studies with biomarkers.

Research for personalised nutrition

Nutrigenomics New Zealand is a FRST-funded collaboration, aimed at developing the skillbase necessary for personalising nutrition through nutrigenomics, as a New Zealand resource. It is an excellent example of a collaboration between University and Crown Research Institutes, representing some 50 named individuals across New Zealand. If we consider what makes any one individual different from the person sitting next to them, then several points emerge:

- Diet/environment
- Genetic factors
- Variation in physical traits
- Metabolic differences
- Disease susceptibility
- Mood and stress responses
- Effects of exercising
- Response to medications

The technologies appropriate to characterising these and developing foods to match them are represented by the nutrigenomics collaboration. At the base of human studies must be analysis of single nucleotide polymorphisms (SNPs) in DNA. Genotyping may involve several cutting edge technologies –the Taqman assay is ideal for a small number of SNPs (1--20) in a moderate number of samples (100s-1000s). However, it is becoming increasingly common to do SNP genotyping using the highly accurate Sequenom MassARRAY technology.



This proves to be the case for a moderate number of SNPs (10-1000) in a moderate number of samples (100s-1000s). However we are also able to access SNP genotyping that considers more than 1 million SNPs at a time, using SNP chips. There is also a considerable amount of interest internationally in studying variation in gene or chromosome copy number variants (CNVs). Similarly, the emerging field of epigenetics is being increasingly recognized as important to understanding human variation. These very new technologies are also available across the collaboration. Having identified SNPs, CNVs or epigenetic events associated with disease or health endpoint, how can this be used to discover new foods? Dietary questionnaire methods are fundamental in relating diet to genetic or epigenetic variation. It is also important to study environmental factors, since these also interact with both genetic factors and diet. One of the most essential skills then becomes database management, to keep control of a large and multidimensional dataset, and bioinformatics, to intelligently interrogate the data.

Need for national and international collaborations

This brief set of examples defines some of the technologies necessary for pursuing personalised nutrition. It also illustrates some of the language – and some of the minefields associated with this field. How does one communicate some of these advanced ideas and technologies to the food industry? It is essential that the field is not confused with genetic engineering, since public opinion would argue that this could kill the science in it's infancy. This illustration demonstrates the need for national cooperation among Universities, Crown research institutes and the food industry – and the need to solidly ground our efforts alongside others proceeding internationally.



4. WHO ARE THE STAKEHOLDERS?

Four stakeholder types were identified as key players in the innovation framework:

- industry
- universities and academic staff
- research associations and research staff
- government agencies (including all EU and individual country public agencies)

Each type has their own culture and reason to be involved in food innovation. A template of the various stages of innovation and the interest of each stakeholder type across the activities is outlined in Figure 1.

It is clear that each stakeholder has a different culture and the drivers for each are significantly different, even within the various layers of a single organisation (from corporate to individual scientist). The key success factors for each stakeholder were identified as:

- Universities now want to exploit their inventions, so universities hold IP
 - Academics – success is getting grants, publications and winning prizes
- Industry wants sales and profit and bottom line results – competitive advantage/market place; problems solved
- Research Associations want development of scientific capability (revenue generation)
- Government
 - Includes all public sector, EU, govt and all their bodies
 - Able to justify spending to see EC growth
 - Development of softer skills – young people – strong education base to improve level of thinking of citizens
 - Tendency for govt bodies to get lobbied, with individual lobbyists focused on their own problems
 - Suggestion to get a balanced approach to the investment – not just covering one lobby group
 - Industry to balance own investment -leverage investment from industry
 - Development of networks
- Most individuals just want to get the job done

These different cultures and expectations result in the ultimate measures of success for different stakeholders having different timing. The research side needs to listen and frame questions of the SME technology side of the consortium.



Figure 1. Components and outcomes of food innovation and the interests of each stakeholder

Corporate group		Proof / disproof of concept of idea that could be commercialised	Understanding of the principle behind the method/process	Commercialisable outcome / product	Revenue generation due to new product sales or increased efficiencies	Continuity or development of scientific capability by acquiring revenue (grants etc.)	Direct/ indirect social benefits	Effective (productive) research network	Publications
Industry	Corporate								
	Individual								
Universities	Corporate								
	Individual								
Research Org.	Corporate								
	Individual								
Government	Corporate								
	Individual								



5. KEY PRINCIPLES AND MODEL

Successful collaboration requires the right conditions for end user engagement in programme planning, execution and decision-making. The right instrument and/or model for engagement must be identified. This may take a number of angles, such as a “club” situation where up to 60 SMEs would have access to the output or research knowledge. It may involve government incentives, tax incentives and access to special facilities (such as a spray drier, or extruder). The benefits of these different models should be communicated via case studies and examples.

It is important to really get industry to clarify their strategy and expectations. It's relatively easy to deal with large companies who have a clear idea, but it's more difficult to deal with small companies. Encourage SMEs to engage with larger industry associations to access trans-institutional research concepts and ideas where applicable. This can readily lead to big club models with universities. One option is to offer free, or reduced cost access to research infrastructure, tax breaks and/or other mechanisms to encourage SME involvement and make sure the project is financially supported.

Academia has a “thought” leadership role and this should influence industry strategy. University administrators and funding bodies should consider providing incentives to engage meaningfully with SMEs, either directly or indirectly, with contract research organisations rather than fundamental scientists.

It is critical to use the right people, with the right thinking, aligned to the time frame and needs of all parties. Differentiate the needs and time frames for incremental development (short-term immediacy) versus breakthrough knowledge building (10 to 20 year time frame).

The key principles and operating model for successful collaboration at a project level are:

- Establish common goals and success factors at the outset
- Identify measures of success for each partner
- Establish appropriate divorce criteria and the process
- Review regularly -- communicate

The project documentation is critical to a successful collaboration. It is vital to consider every stakeholder at the outset, including the various layers of each organisation. Each partner will have different criteria for judging success and this will vary within an organisation as well. Ensure all participants are aware of the needs of the others when projects are discussed and defined. There must be no surprises or hidden agendas – there must be transparency and trust. All partners need to get benefit and this has implications for the way the consortium is managed. Identify funding streams to facilitate interactions between commerce, universities and contract research organisations. Work out IP at the beginning and avoid deal breakers, as this will often be a problem as a project progresses and research begins to uncover new opportunities.



Finally, the regular review should evaluate the positive and negative aspects of the research work throughout the project:

- communicate and disseminate success
- Learn from mistakes, provide a platform for future projects
- retrospective evaluations



6. ENHANCING INDUSTRIAL ENGAGEMENT

To make collaborations work, a range of issues need to be considered. These are an expansion of the model and principles outlined in Section 5 above.

SMEs and industry

SMEs and industry tend to consider only the issues of most immediacy. This must be recognised and thus research organisations and universities need to respond to their needs. However, micro SMEs might not even know the questions that need to be answered. In this instance, case studies could be used to show best practice and help others. Another option is to consider the club approach. SMEs who can't afford R&D or breadth of R&D get benefits if they participate and the cumulated revenue from many small companies provides sufficient funding for quality and relevant research. The key is to be able to mobilise knowledge from the club to be useful to SMEs. Unfortunately, universities and RAs are centralised and regional, while SMEs are spread geographically. They need another mechanism to engage and this requires a change to the value chain to help SMEs.

There is a need to build trust through continuous communication, personal relationships (CCFRA do this well) with a long term focus and commitment. CCFRA membership (≈1700 of which 400-500 are SME). However, the majority are based in UK and membership doesn't cross international boundaries easily. It is hard to convince SMEs of research in Club projects as their timescale is too short. End users should be embedded into the programme planning process -- not just letters of recommendation but with real cash. SMEs are more dependent on external funding for R&D than larger companies. Thus research organisations and universities need to lower the hurdles! Reduce the initial costs of participation in research projects by SMEs (free/reduced cost access to research infrastructure, tax breaks etc.). This is something government agencies can facilitate. Another option is to use students to assist SMEs with small projects. This builds trust and goodwill. SMEs perceive Universities and RAs are involved for their own ends, not for the SMEs. IN NZ, Technet – a mechanism operated through a government agency – assists small companies through funding to tackle small applied technical problems. Consultants and research scientists who are registered on Technet can be approached by companies who need specific skills to solve problems.

Adoption and adaptation of research requires vehicles:

- Multinational has internal development capability
- SME needs access to development capability – mobilisers, converters eg PhD placement

SMEs require direct support in trans-institutional project management. In NZ, a European size SME would be a large company, but the NZ SMEs do allow research organisations to manage their interaction and assist in making a project work. SMEs usually lack a marketing / business plan, so failure of SMEs is usually a business one, not a research one.



Timing for funding is a serious problem for SMEs. Government funding takes a long time to obtain and many SMEs are out of business before this happens. There needs to be a special instrument to deal with the immediacy of SME needs for funding.

Industry starts with a strategy to grow revenue and impact and then decides how to achieve that. They set their own strategy and relevant programmes. This needs to be acknowledged by RAs and universities.

Universities and Research Associations:

The biggest issues for these research providers is getting the culture right for the R&D partner. There is a different approach required for short-term projects versus long-term science. There needs to be about 60% of institutional time spent on the science.

It is crucial to align expectations of industry with outputs of the R&D programmes, or align R&D programmes to the needs of SMEs. The challenge is to decide when to engage. Define approach to SMEs from inside – out. Invite companies to understand a subject (workshops, etc) then define project from that. RA needs to define group benefits for SMEs. RAs tend to approach SMEs from the wrong way. Need to build in the SME culture into the RA, then start description of project, then look at finance, then write application. In NZ, there are Research Associations (like-sized companies) who levy members for funding and then pool resources (often with government matching funds).

CCFRA / MATFORSK have massive tri-annual consultation with industry, but little input from SMEs. Is there a need for a special session for SMEs? Food Federations provide help with legal issues and discussions with government. Then having gained trust, can offer solutions to problems. An example is the integrated project “True Food 11 Federations”.

It is advisable to consider incentives for academics to engage SMEs – directly or indirectly. There is potential for academics and scientists to work in industry for a period of time – researchers often only want to work on their own interests, not interested in industry problems. There is a need to have “appropriate” staff for the different engagement with industry versus fundamental science. Adopt or adapt strategy – RAs / Universities need to employ individuals who can do that. Allows SMEs to then get together around these people and fund a common programme. There also needs to be a range of schemes able to deal with scale of food companies. Advice → problem solving → relationships.

Food is not a knowledge-based industry (cf pharmaceuticals). RAs must communicate the benefits of R&D to industry, or it will always be an uphill battle. However, if you try to drive food down the research line when it is not the nature of the industry, you risk alienating all of industry and the research will fail.



7. OPERATING PRINCIPLES FOR FUNDERS

- Given the significance of food in health the level of funding is small compared to pharmaceutical and medicine. Greater emphasis needs to be given to food research in line with the Strategic Research Agenda (SRA) of the European Technology Platform on Food for Life.
- There needs to be clear integration and interconnection between short-term and long-term research. This requires tactical consideration and continued funding of both strategic far-market and more applied collaborative research.
- In particular for SMEs risk needs to be removed from the research process. This could exploit processes such as the EU Risk Sharing Finance Facility although this delays risk rather than mitigates against it.
- Clear processes to promote transfer and exploitation need to be built into projects as an essential funded element.
- Collaborative research is important to different stakeholders for different reasons. Project definition and evaluation needs to take account of all of these benefits.
- Evaluation needs to consider evidence of effective teams with trust and consultation built in and ideally prior evidence of successful collaboration.



8. MORE INFORMATION, CONTACTS

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