
Teagasc Food Programme Peer Review 2011

Final Report

Date: 09/12/2011
Author: Peer Review Committee
Submitted to: Dr. Frank O'Mara, Director of Research

Status: Final

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1. Introduction

Teagasc is committed to carrying out a peer review of its Food Programme on a regular basis with the purpose to (i) assess if an effective and balanced scientific programme is being delivered which fulfils the mission of the programme and meets the needs of its stakeholders; (ii) identify how the research programme and operation of the centres could be improved to make the best use of resources; (iii) provide accountability for public funds expended.

This evaluation report presents the outcome of the peer review undertaken from 10 to 12 October 2011 under the auspices of the Director of Research and the Teagasc Business Planning and Performance Evaluation Unit by a Peer Review Committee (PRC), composed of the following experts:

Jan T.M. Wouters (NL, chairperson), James Lindsay (USA), Stefaan De Smet (BE), Ingolf Figved Nes (NO), Terry Smith (IE), Alan Reilly (IE), John O'Connell (IE), Declan McDonnell (IE), Lance O'Brien (IE), Jane Kavanagh (IE, secretariat) (Appendix 1).

The PRC addressed the review objectives based on the recommendations of the Director of Teagasc, Professor Gerry Boyle, and the Director of Research, Dr. Frank O'Mara:

- Improve the programme's research quality, including scientific and societal relevance of research, industry impact, research strategy, and research management.
- Provide accountability to the Teagasc Authority and towards funding agencies, government and society at large.

The members of the PRC reviewed the documentation and self-assessment provided in advance of the meeting. They were informed in detail about the Food Programme and the Food Technology Transfer Strategy by presentations from the Head of Food Programme and the Assistant Director of Research, respectively. Subsequently, the Heads of the departments of Food Biosciences, Food Chemistry and Technology, Food Hygiene and Food Industry Development presented the research programme and the performance of their Department. The PRC was offered the opportunity to ask them for further information and clarification of details of their presentation in order to facilitate the required assessment. In closed sessions, the PRC assessed the Departments and their individual research programme according to four criteria: quality, productivity, relevance and impact, vitality and feasibility. The results of the assessment of the Food Programme and its Departments are presented in this report. Comments, issues of consideration and recommendations are included as guide for future prospects.

2. Review of Teagasc Food Programme

Food and drink processing is Ireland's main indigenous industry in terms of direct economic activity and upstream and downstream impact on the economy. The sector has a gross annual turnover in the order of €25 billion, accounts for 8% of gross domestic product and over 18% of gross value added in manufacturing. However, in general there is an over-dependence on commodity processing, which leaves the industry vulnerable to global swings in commodity values and limits the opportunities for significant added value. A key strategic objective for the industry identified in the recently-published national strategy - **Food Harvest 2020** - is for it to invest in consumer-focused innovation and new product development to deliver a 40% growth in value added output. Public research and innovation is highlighted as being a critical component in the achievement of this growth.

Given its scale and its developmental mission, the Teagasc Food Programme is expected to play a key role in delivering the new knowledge and technologies that will underpin the attainment of the ambitious **Food Harvest 2020** targets. The Food Programme is one of four programmes that constitute the research and knowledge transfer capability of Teagasc, and is delivered from two different locations, namely, Ashtown in Dublin and Moorepark in County Cork.

The Programme spans a range of science and technology areas reflecting the primary technologies that underpin the main industry sectors, most notably meat, dairy and food ingredients, and encompasses research, development and innovation activities. Furthermore,

the Programme encompasses Moorepark Technology Limited (MTL), a state-of-the-art food pilot plant, which runs as a separate company, and a smaller pilot plant at Ashtown.

In accordance with the overall developmental role of Teagasc, the stated mission of the Food Programme is to provide leadership in science-based-innovation for the agri-food sector in a way that will lead to economic development and profitability. The key objective is to provide the science and technology platforms to support the development aspirations of the food industry. To achieve this mission and objective, the Food Programme is managed through four distinct but integrated sub-programmes as follows:

- ***Food Chemistry and Technology Sub-Programme:***
- ***Food Safety Sub-Programme:***
- ***Food Biosciences Sub-Programme:***
- ***Food Industry Development Sub-Programme.***

2.1 Reflections on Programme Quality

2.1.1 Quality and scientific relevance of the research

The overall Teagasc Food Programme is a tightly managed and quite well-focused programme built on a small number of key technologies, which are considered critical to the long-term development of the Irish food industry. The Programme is supported by a reasonably well-balanced programme of strategic and applied research, which aims to develop the necessary scientific leadership and maintain the pipeline needed for the long-term development of the industry. The Programme has developed a strong national scientific reputation and has been very successful in winning national competitive funding, whilst a number of Programme areas are highly regarded and successful internationally. A number of the research staff have significant international reputations and the Programme is supported by an extensive, modern and high-quality infrastructure which has benefited from continuous investment in recent years. The PRC would like to see management develop a coherent long-term strategy, embracing knowledge and technology transfer strategy, setting out how it is planned to maintain the Programme's high quality output and effectiveness in the face of growing financial and staffing challenges and increased demands from a growing industry base.

2.1.2 Leadership

The Programme benefits from strong scientific leadership at senior level, with a number of senior managers having established international reputations. Moreover, some of the Principal Investigators recruited in recent years are also displaying marked scientific leadership qualities. The challenge is to match this level of scientific leadership with strong strategic and operational leadership in order to benefit from the potential synergies arising from full integration between the two research locations, consolidating the alliance with UCC, implementing the planned knowledge and technology transfer strategy and developing more innovative strategies needed to maintain effectiveness in light of the many new challenges and opportunities.

2.1.3 Reputation

The national scientific standing of the overall Programme and its staff is high and elements of the Programme and some senior staff members are also held in high esteem internationally. There is now a growing emphasis on translating this scientific reputation into an equally strong reputation for producing value for the Irish food industry. The growing emphasis on meeting industry needs in recent years is reflected in the enhanced relationships and reputation with food companies. The PRC would like to encourage management to build on recent successes in this regard. We would also encourage Programme Management to consolidate the alliance with UCC and use the significant reputational resource of the two institutions in order to create a powerful knowledge broker role serving the needs of the Irish food industry.

2.1.4 Resources

The Programme is delivered by a dynamic, innovative and flexible staff complement, supported by modern laboratories and pilot plant facilities. The capacity to deliver in a wide range of relevant areas is further helped by the innovative Walsh Fellowship Postgraduate Scheme and by the excellent partnerships built with other institutions, particularly with UCC. The Programme has responded very well over the years to the challenge of generating significant amounts of competitive programme funding. However, it will face increasing challenges in future as further budgetary cutbacks take hold and public sector staffing policies continue to tighten. In this context, the lack of technical support staff and gaps in key areas, such as Bioinformatics, will impact. In particular, a continuing lack of core funding for programme purposes will act as a brake on future development of long-term programmes of innovation and the capacity to become a true partner/co-investor with industry and others. A strong case can be made for increased dairy levy funding for processing and the introduction of a meat levy to fund the strategic and applied research which will be needed if Ireland is to secure the maximum value from the greatly increased primary output projected under **Food Harvest 2020**. In addition, given the success of Moorepark Technology Ltd in serving the needs of the dairy industry, a strong case can be made for the development of a similar model, in association with industry and Enterprise Ireland, at Ashtown (Ashtown Technology Ltd) serving the needs of the meat industry.

2.2 Reflection on Productivity

On the basis of national and international benchmarks, overall Programme productivity is high in terms of publications and other relevant outputs. The number and quality of research publications has grown significantly in recent years, although there are quite marked differences in performance between staff members. Enhanced output has been driven by internal promotion policies, the enhancement of the Walsh Fellowship Scheme and by the increased interaction with external partners in competitively funded projects. Industry interaction has also expanded considerably over the past couple of years and the nature of that interaction has changed, with some of the larger companies engaging in a collaborative and strategic manner. In line with national policy on future Research Technological Development (RTD) funding, the future well-being of the Programme depends in large measure on the further strengthening and deepening of the relationship with larger and the more innovative companies. The development and implementation of the Knowledge and Technology Strategy is critical in this sense. This strategy should focus on fostering a variety of technology transfer channels and not just the narrow focus on Intellectual Property (IP) licensing. This new emphasis on knowledge and technology transfer will place a heavy burden on management at a time of declining resources to maintain a good overall balance in programme activities and outputs and strengthens further our earlier call for the development of a well-thought out long term strategy for the Programme.

2.3 Reflection on Relevance and Impact

Public policy has identified the need to prioritise moves away from commodities by building greater capability in producing products in a sustainable manner to meet consumer demands for greater variety, more convenience, and healthier food choices, accompanied by assurances of quality and safety. Specific areas of opportunity identified are prepared consumer foods, functional foods and beverages, food ingredients and speciality foods. A key area identified in **Food Harvest 2020** is to produce research which underpins Ireland's sustainability claims and validates the environmental and nutritional benefits of grass-based rain fed production. **Food Harvest 2020** also asks for improvement of commercial orientation by better targeting of research on emerging market opportunities and developing consumer trends.

The key need for industry in helping it achieve these targets is access to applied research expertise, innovative scientific outputs, technical solutions and skills development. The industry also requires solutions which open up new markets on a global basis and a clear route to commercialisation of research outputs is required by the industry. As stated, the Programme is becoming more active in responding to these needs. The new focus on industry linkages is exemplified by significant contracts with the Irish Dairy Board (IDB), Pfizer

and Kerry. The PRC strongly supports the new emphasis on deeper interaction with larger and more innovative food companies. The ability to strike the necessary balance between responding to the needs of larger companies and those of the growing number of very small companies will have to be considered as part of the strategy process referred to earlier.

In the context of building on the Programme's industrial relevance, the PRC considers that management should enhance the existing project management process to include feasibility studies, cost-benefit analysis and a stronger commercial focus at the design stage of new research proposals planned to have industrially relevant outcomes. Relevance can be further enhanced through the creation of end-user advisory panels.

The Programme also plays a significant role in supporting the needs of Government/Regulatory/Development Agencies for access to independent scientific expertise, particularly in terms of food safety and quality, but also in developing strategies and policy in the area of industrial development.

2.4 Reflection on Vitality, Feasibility and Vision for the Future

2.4.1 Strategy

While the Programme is well positioned within the overall ambit of **Food Harvest 2020** and is well aligned with current policy priorities, as already stated there is need for a future oriented strategy which addresses the issue of investment in the innovation pipeline to ensure research priorities continue to reflect the sector's future needs. The strategy must also address the issues arising from staffing and possible future declines in funding and how it will respond to the new demands from industry while maintaining its scientific reputation.

2.4.2 SWOT Analysis

The SWOT analysis provided in the self-assessment report identifies the many opportunities and challenges facing the Programme and the Irish food industry. The PRC recommends that this analysis be built on by developing a clear strategy for the long-term development of the Programme.

2.4.3 Robustness and stability

As stated already, the research and other infrastructure and facilities are excellent, having benefited from a well-thought out programme of investment over the past decade. These facilities provide the environment in which a young, high quality and committed staff has been assembled and all of this provides a good basis for the longer term stability and development of the Programme. As against this, however, the operation of public sector staffing policies, tighter budgets and the lack of core funding serve as threats to the future stability of the Programme. Replacing and upgrading the extensive infrastructure will also pose a challenge. There is a clear need to make the most effective use of all Programme resources across the two centres, build on the opportunities for greater cohesion with the Production Research Programme and the unique opportunity which the UCC Alliance presents to develop a robust and stable programme of research and innovation for the long term.

2.5 Conclusion

Agricultural output and food processing remain the largest indigenous industry, while expanding global population, increased living standards in Asia and more sophisticated consumer demands in terms of quality, safety, variety and health offer major opportunities for the industry in Ireland and the Irish economy. Expanding agricultural output, in particular dairy, will demand technical solutions for manufacture of new food products and ingredients: this will lead to increased demand from industry for services from the Food Programme. On the other hand, the national economic situation will most likely limit the resources available to the Food Programme to enable it to respond and, in particular, will impact the availability of essential core funding. The recruitment moratorium will result in fewer staff being available overall, key priority posts not being filled and limited opportunities to recruit staff to emerging areas of priority. Dealing with this expanded need in such tight budget and staffing situations could prove to be very difficult.

Overall, the current programme is in excellent shape with high quality staff and resources and excellent capacity built with funds available in the past. This capacity must now be directed to adding value in the industry and the current evidence suggests that this is happening. Programme management face considerable challenges over the short-to-medium term in maintaining the current high level of productivity and scientific quality in light of ongoing staffing and funding policies and the need for change and innovation in the industry. The PRC would like to see management develop a clear statement of long-term strategy which would address these issues, including the identification of key priorities, how the Programme will respond to the growing expectations of creating enhanced added value for the sector through the implementation of new knowledge and technology transfer strategies. It also needs to address the need for tighter integration between the two research locations and a more coherent relationship with the production research programme.

Peer Review Committee Score for the Overall Food Programme (1-5)	4.25
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2.6 Recommendations

- Produce a statement of strategy identifying key priorities for the future and setting out how the Programme will respond in the longer term to the needs of the industry whilst maintaining its competitive science base.
- Retain a solid base in the existing core sciences in order to remain relevant to the broad spectrum of food companies and in order to address food safety aspects of public good while developing the science and technology platforms necessary to assist the industry in developing new areas including the current priority in food for health.
- Maintain the key research platforms that are already established and develop those which are necessary to address the requirements of an evolving food industry.
- Achieve full integration of the Food Programme across the Moorepark and Ashtown sites.
- Implement the planned knowledge and technology transfer strategy.
- Management of Teagasc should consider the development of a workload model for all permanent staff to ensure that all staff contribute to its overall mission in research, knowledge transfer and industry support.
- Develop the UCC/Teagasc Food Research Alliance to a level where it is recognised as the lead national research provider in food science and consider using the Alliance in the role of a knowledge broker for the Irish food industry.
- Develop closer and more open relationships with industry to ensure that the key driver of the Food Programme is applied research with potential for commercial uptake.
- Consider making a special case to the Department of Agriculture, Food and the Marine seeking sanction for limited recruitment in the Food Programme in view of its role in the development of the growing Irish food industry.
- Seek to secure additional Dairy Levy funding for food processing research and pursue the possibility of securing a levy from the meat industry for similar type research.
- Consider establishing an MTL equivalent for meat in Ashtown (Ashtown Technology Ltd) in association with industry partners and Enterprise Ireland.
- Address publication underperformance in a number of areas and aim to fill gaps in key areas of expertise (eg bioinformatics) either through exceptional external recruitment or through internal retraining and redeployment.
- Develop Project Management process to better reflect commercial realities in those project proposals intended to have industrially relevant outcomes.
- Consider restructuring the Food Market Research Unit back into the Food Programme given its new linkage with Bord Bia and its potential to contribute to the industry.

3. Review of Food Biosciences Department

The Food Biosciences Department is one of four research and knowledge transfer sub-programmes within the overall Teagasc Food Programme. It is the largest of the four sub-programmes, with a total of 14 permanent research staff, 19 contract researchers and 32 graduate students (2011). The Department's activities are spread across two sites, Ashtown, Dublin and Moorepark, Fermoy, though the majority of the Department's staff and activities are Moorepark-based. The core objective of the Department is to engage in advanced research and technology development in support of the Irish agri-food industry sector, and to this end its activities are organised into three research areas: Food for Health; Cheese Microbiology and Biochemistry; and Milk and Product Quality. The Department is well-equipped with modern and sophisticated instrumentation.

3.1 Reflection on Quality

Research within the Department is of a high quality overall, with some specific areas of a particularly high calibre and international reputation. The probiotics research programme at Moorepark is particularly high quality. The joint UCC/Teagasc probiotics research programme, which is at the core of the UCC-led SFI funded Alimentary Pharmabiotic Centre CSET, is world-leading, having been ranked at No. 2 in the world by Thomson Reuters Science Watch. The identification and development of antimicrobials, in particular Thuricin CD, is another indicator of internationally leading research within the Department, and ongoing commercial evaluation and planned exploitation of Thuricin CD is an indication of the industry relevance of the Department's research. Overall, the Department's publication outputs are impressive in terms of quality, with an average of 6.6 citations per peer-reviewed paper published over the five years from 2006-2010.

3.2 Reflection on Productivity

The quality of the research outputs from the Department is high. The total number of publications over the five years from 2006-2010 is 289, with an average of 5.96 publications per permanent staff FTE per annum. The productivity of the Department in terms of publications has increased significantly year on year, from 50 in 2006 to 89 in 2010, from 6.67 per permanent staff FTE in 2006 to 7.12 in 2010. In addition, the average impact factor has increased from 2.52 in 2006 to 3.00 in 2010, reflecting an increase in publication quality as well as quantity over the five year period. Productivity as measured by publications, within the Department's permanent staff is somewhat varied, with some staff members contributing more to the research outputs than others.

The Department's productivity as measured by the number of grants awarded is high with 30-35 research projects funded annually, while 35 PhD and 17 MSc students have graduated from the Department since 2006. The total research budget for 2011 amounts to slightly more than €3 million, with SFI and Enterprise Ireland being the main funding agencies. The Department has created several national and international collaborations with other well recognised scientists and research institutes to broaden the scope of its research activities and to strengthen its productivity.

In relation to interactions with and the provision of technology development and other support to the agri-food industry, the Department is very productive. In particular, through the Teagasc company MTL and its pilot plant at Moorepark, substantial interactions and engagement with industry occur. Very positive messages from industry representatives validate the quality of these interactions.

3.3 Reflection on Relevance

The research and technology outputs from the Department are highly relevant to the food industry and to society in general. Research grants are sought and obtained in areas of food biosciences both at the national and international level. In general, research within the Department is more long-term in terms of commercial application than that of other departments within the Food Programme. The Department appears irreplaceable in cross programme activities with the Food Safety and Food Chemistry & Technology Departments.

In particular, its expertise in the application of molecular techniques is broadly employable. Another important cross programme activity relates to the research on bioactives with potential health benefits from dairy, marine and meat sources.

3.4 Reflection on Vitality, Feasibility and Vision for the Future

Some scientists within the Department are nationally and internationally recognised which is strongly exemplified by the awards, appointments, speaking invitations, editorships, and memberships on national and international advisory committees and/working groups. The Department is vital and recognises its important role in adding value to future products from the Irish food industry chain.

3.5 Conclusion

The Peer Review Committee was impressed with the quality, productivity and relevance of the Food Biosciences programmes and considers the performance of the Department to be very good to excellent, which is expressed in the score below.

Peer Review Committee Score for the Food Biosciences Department (1-5)	4.5
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3.6 Recommendations

- Seek further support and funding to guarantee the maintenance of the high quality and productivity level of the Department's research.
- Continue and extend the many examples of the transfer of knowledge to industry, and ensure close alignment of the Department's research to the agro-food industry and **Food Harvest 2020**.
- Interaction with international stakeholders should be encouraged and collaborations extended.
- It is anticipated that over time high level research in bioactives produced by the Food Bioscience Department along with its collaborators and partners will underpin some health claims. Continued support for this research is strongly encouraged, while the PRC encourages further expansion in collaborations in this area in future.
- The research on meat waste should be widened and not just focused on bioactive discovery, which presumably requires long term research. Opportunities for near term applications of meat waste materials in food should be investigated in close cooperation with the Department of Food Chemistry and Technology.

4. Review of Food Chemistry and Technology Department

This Department was formed in 2010 through an amalgamation of several previous departments, which explains the broad diversity in research areas and food items that are dealt with. TheD is spread across two campuses, with dairy research being carried out primarily in Moorepark and meat and cereals research in Ashtown. This makes this Department somewhat less coherent than the other departments.

The Department's overall research objectives are to improve the scientific understanding of fundamental physico-chemical and micro-structural factors controlling nutrient and food quality characteristics. The research can be divided into three main areas, with each having more specific research objectives:

1. Based on milk: Cheese and other dairy fermentation products
2. Fresh and processed meat
3. Cereals and provenancing

The three areas of research are linked together through a common denominator in food chemistry, structure and rheology.

Ireland is heavily reliant on exports of dairy products and meat. Quality and innovation are important issues in order to ensure that these products remain competitive on the high value international markets. The Department provides the science for new product development and for enhancing the quality of foods, thereby assisting the food industries that are their major stakeholders.

4.1 Reflection on Quality

The quality of the Department's research is very good, and is well appreciated by the international science community and by the related food industries. The research staff are highly regarded as shown by the participation in EU projects (predominantly in the meat research group) and the close collaboration with industry partners. The quality of the work is also illustrated by the innovative character as exemplified by new processes launched and patented. Furthermore, low fat cheese (3%) has been patented and work on low salt cheese is under way.

Meat research has focused much on meat quality improvements and supporting the meat industry to ensure that quality is enhanced along the production chain. This is done to an international scientific standard. Novel meat products have not received the same level of investment. Despite this, increasing attention is now being paid to healthier processed products and not just low fat and low salt products as in the past. The cereals group has not really supported novel product development except in the case of gluten-free products, but plays a significant role in assisting the bakery industry.

4.2 Reflection on Productivity

The Department's publication record is very good and has steadily increased from an average of 2.35 publications/FTE to 5.54/FTE in 2010. In addition, papers are published in journals that have good impact factors, and the average impact factor is similar or above the reference impact factor. The Department receives a considerable number of grants, and has international collaborations with other well-recognised scientists and research institutes. There is good contact with the industry, and as far as we can judge, there is also good support from the industry.

4.3 Reflection on Relevance

Scientific and technical outputs are highly relevant. The R&D programmes of the Department address the main agricultural food production issues, namely, milk/dairy products, meat production and quality, and cereal production and cereal based food. In all three areas research activity is highly relevant, and the results are in many cases directly applicable to industry. There are several examples of collaboration with the industry, e.g. the Department has become one of the main research providers for the (multinational) infant formula sector. Research on cheese focuses on developing non-cheddar table cheeses and cheeses/cheese ingredient products for food service. This has also led to the development of a New Cheese Technology Platform.

Meat research focuses on quality management throughout the whole chain and on functional and healthier processed meats. While it engages fully with the meat industry it should develop more formal collaborations in this regard. Similarly, the cereals group aims to develop science and technology to support the bakery industry's needs for product quality and innovation. To support direct quality measurement, the Department has built up expertise in spectroscopic and microscopic techniques. It is felt that the Department is very well oriented to the needs of these food industries.

4.4 Reflection on Vitality, Feasibility and Vision for the Future

The leadership, motivation of the staff members and vision for the future all seem very good. The Department has formulated areas for future research that are in line with **Food Harvest 2020**. The policy of food production in Ireland towards 2020 is aimed at a 50% increase in meat production and 30% in milk production. Such growth in production requires a significant increase in exports of food to an international competitive market. The future will likely also bring more diversification of food products directed towards the various needs and demands of consumers, such as health products, nutritional enriched foods, 'green' products, artisan products, etc. It will be a great challenge also for Teagasc to develop R&D activities to support such a growth in the coming 10 years. It is perceived that Teagasc is well prepared to assist the food industry in this development with the research topics that are now elaborated and that are in the pipeline.

4.5 Conclusion

The PRC appreciates the quality, productivity and relevance of the department's activities. The PRC had no major criticisms of the Food Chemistry and Technology Department, but some recommendations for further consideration.

Peer Review Committee Score for the Food Chemistry and Technology Department (1-5)	4.0
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4.6 Recommendations

- Continue doing excellent research as is going on now and keep or strengthen the links with industry and other research partners, e.g. by developing new strategic alliances. In this context, it is advised to strengthen the integration with the Animal and Grassland Research and Innovation Programme (AGRIP), with industry input, to integrate farm and production research through to retail. This should include dairy as well as beef.
- The 'omics' approach in meat research is considered innovative research with a large potential for the future. Regarding the genomics work that is planned, consideration should be given to examining the genetics of the Irish cattle breeds on a broader scale than only testing the applicability of genetic markers that have been established elsewhere. Given the many factors that affect meat quality, this research should be done in standardised slaughter conditions that are representative for the Irish situation. The farm to fork approach in meat quality research should be maintained even if the focus is shifting to 'omics'-based work.
- The group has excellent competence and infrastructure (advanced physico-chemistry analytical tools) to investigate the structure of foods. Structural studies are very relevant when traditional foods with new ingredients are developed as well as the development of new foods. This technology is internationally quite unique in food research and Teagasc has a pre-competitive position that should be taken advantage of. On the other hand the Department is not well equipped to do sensory analyses. The PRC considers such instrumentation to be a very valuable tool when one is working close to product development and to consumers. We strongly recommend that a greater sensory instrumentation focus be established.
- The work on healthier food products (cereals, dairy and meat) is directed towards the future since there seems to be an increasing demand for these products such as gluten-free, low carbohydrate, fiber rich, low-fat, low-salt etc. It is recommended that the development of these foods is followed up by human studies in order to substantiate the health claims. Such studies will need collaboration with nutritionists. The PRC were advised that such collaborations are planned in the design of the research projects.

- The newly planned project on upgrading the value of meat and slaughter offal to high priced bioactive peptides is very challenging and interesting, because there is a great need for high grade proteins and protein hydrolysates for various applications. However, it is also considered a risky project. It is recommended that an economic and technical feasibility analysis be carried out before this project is launched, e.g. are all sanitary risks well considered?
- There seems to be some imbalance between the research on dairy and meat products compared to the economic importance of both sectors in Ireland. It is suggested that a more balanced approach be taken into account in future strategic plans of the Department by increasing the level of meat research.
- The cheese diversity R&D programme is aimed at developing new technologies to produce traditional and new cheeses not only for Ireland but also for export. Inclusion of new technologies which might save time and money. Additionally, traditional sensory assessment might also be a valuable tool in finalizing new products.
- Processed meat products have not developed the same way as dairy products. Thus further collaboration with industry on new meat products should be considered. One possibility is to develop cured and fermented meat products both for national consumption and possibly also for export. The predicted future growth in meat consumption will lead to a demand for greater diversity of meat-based products.
- An important niche in the Irish cheese industry is the on-farm production of high quality artisan cheeses. Teagasc should actively support this growth industry with advice and scientific support, and should also be proactive and foresee both problems and possibilities.
- The Department is advised to continue searching for internal scientific commonality given the variety of research topics that are undertaken. The recent investment in new infrastructure and analytical tools (e.g. microscopy, spectroscopy) may offer opportunities to fully exploit cross-fertilisation within the Department.

5. Review of Food Safety Department

While the Food Safety is the smallest Department within the Teagasc Food Programme, it is the most directed, productive and cohesive in terms of direct accomplishments and impact both nationally and internationally. The Department's research programme is directed towards providing the science to underpin a risk-based approach towards food safety, focussing on microbial and chemical contamination throughout the farm-to-fork cycle. The programme sees food safety as a continuum, which is correct and appropriate, and research directed towards this end is also correct. The programme is focused to address stakeholder needs in particular those of the regulatory and policy bodies such as the Food Safety Authority of Ireland (FSAI), and priority food safety challenges faced by different sectors of the food production and manufacturing chain. Indeed the Department is an excellent example of working with industry, policy makers and regulatory agencies and of setting a high standard of applied research that is well regarded at home and abroad.

5.1 Reflection on Quality

The quality of contributions from the Department is excellent and directed, and the impact is outstanding. Indeed, the accomplishments in great-part form the cornerstone of standard setting by the FSAI and food safety policy development. Results and accomplishments are also directly available to industry. Accomplishments are seen as the first stage of a relay race, where technologies are developed and validated and the uptake and implementation by stakeholders is independent of the Department. Staff within the Food Safety Programme are highly regarded as shown by the leadership and participation in EU Framework Research Programmes on food safety and risk assessment.

5.2 Reflection on Productivity

The Department's publication record (a direct and quantitative measure of productivity) is excellent and has increased from a 2006/07 average of 3.32/FTE to 7.27/FTE in 2009/10. More importantly, papers are published in journals that have good impact factors (>2), and that are actually read by peers in academia and industry. Productivity can also be measured by the Department's increased number of (large) grants, and national and international collaborations with other well recognised scientists and research institutes.

5.3 Reflection on Relevance

Scientific and technical outputs and accomplishments are highly relevant. The Department recognises that some outputs/accomplishments have a direct impact, while others require decisions by external bodies as to their implementation. For example, the Department has provided the scientific rationale for interventions to reduce the incidence of campylobacter in poultry and is working with the industry and regulators in the implementation of these interventions. Research grants are sought and obtained in areas of food safety concern both at the national and international level. The Department recognises the global nature of food safety issues and responds accordingly with a focused and relevant research agenda. The Department also provides specialist services in analysis of foods for chemical residues and microbiological quality. These services support the requirement of the industry to self monitor for residues and support the international marketing of dairy products. It also provides a revenue stream; for instance, residue testing brings in an annual income of €600,000. There are other examples of where research outputs have been taken up by stakeholders. For instance quality control assay techniques developed by the Department are currently routinely used in different sectors of the Irish industry, such as the PCR method for detection of spoilage in vacuum packed beef and swabs used in meat processing. Research on the role of the hide in transmission of VTEC to carcasses led to changes in managing animals in processing plants in Ireland. Real time PCR methods developed and validated by the Department for rapid detection of Salmonella transferred to the Irish National Reference Laboratory where they are currently used in testing of industry samples.

5.4 Reflection on Vitality, Feasibility and Vision for the Future

Leadership in the Department is excellent and there appears to be an excitement related to the work being undertaken. Scientists within the Department are nationally and internationally recognised, which is strongly exemplified by the numerous awards, appointments, speaking invitations, editorships, and memberships on national and international advisory committees and/working groups. The Department provided a detailed plan of future opportunities and strategies. The Department recognised that food safety is both an agriculture and public health issue. This is a critically important recognition and is in line with other international food safety research organisations. The Department recognises that strong collaborations are critical in addressing food safety issues, and that “going alone” is not an option. The Department has a plan to continue proactive targeting of EU FP 7 and 8 funding opportunities. The Department recognises that the growing complexity of the agri-food sector introduces new risks of food contamination and challenges to ensure a safe food supply which needs to be addressed in tandem with new process and product developments. Their vision for the future which is supported by the Review Panel is of a risk-based total chain approach to food safety management in order to reduce level of food borne illness and to sustain and expand both domestic and export markets.

5.5 Conclusion

The PRC had no criticisms of the Food Safety Department. Indeed, the PRC considered the Department as exemplary, and could be used as a model within Teagasc. The PRC gave the Food Safety Department a very high score.

Peer Review Committee Score for the Food Safety Department (1-5)	4.75
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5.6 Recommendations

- Continue doing the excellent job they are doing now.
- Continue collaborations with other European/international researchers.
- It is anticipated that the Department will have to increase in size in the near future due to new regulations and increased focus on food safety internationally. The PRC strongly suggests that representation by Teagasc Administrators be made for hiring exemptions for this Department.
- As noted above the Department has delivered technologies and should continue to strive towards a better uptake of research findings by industry.
- The PRC noted that there was no research on fresh fruit and vegetables which is a high priority globally. The *E. coli* O104 STEC outbreak in Europe in 2011 suggests that Teagasc consider focusing on food safety issues with these commodities in the future.

6. Review of Food Industry Development Department

Assessing the Food Industry Development Department requires considerations different from those of the other research departments within the Teagasc Food programme. This arises for a number of reasons as follows:

1. The research undertaken and assistance provided is very applied technology development support for food companies rather than academic in nature and as such is not published in peer reviewed ranked research journals.
2. The majority of the research undertaken and assistance provided is for SME's whose research and development resources and management systems may be very variable and often not very well developed.
3. The research undertaken and assistance provided may be done in the form of many small projects for a large number of clients.
4. A lot of the work undertaken with industry and assistance provided may be done on an *ad hoc* basis and in the form of "fire fighting"

Because the research undertaken, and assistance provided, is different from that of the other research departments, this department requires an appropriate reporting process to capture the quantity and quality of the work done.

6.1 Reflection on Quality

The actual quality of the research undertaken and assistance provided is excellent and appears to be making a real difference as assessed by the products on display during the pilot plant tour. The Food Industry Development Department appears to provide assistance and expertise in all areas pertaining to product development ranging from packaging to shelf-life analysis to manufacturing/food technology.

It is very clear that great work is being done. Less clear is how the workload is generated and how the Department is organised into a focused research programme. It appears that the majority of work is based on responding to individual customer demands and better use could be made of utilising the expertise of the Food Marketing Research Unit in assessing sub sector technology development requirements.

6.2 Reflection on Productivity

The productivity of the Department appears to be very good. They have provided technical assistance to a range of high quality brands owned and operated by SME's. This work is of absolutely key importance. Recording the level of productivity again appears to be a challenge. The display of food products, assisted in their development by this department, clearly showed the level of engagement with industry and emphasises the need to develop and appropriate system for recording and monitoring this productivity data.

6.3 Reflection on Relevance

The relevance of the work within the Food Industry Development Department is very high. The department aids in product development and "fire fighting" of real living products that have been launched. All this research and development work is "real time". The staff in the department does not have the luxury of addressing "real time" issues at their ease.

6.4 Reflection on Vitality, Feasibility and Vision for the Future

As outlined above, this department operates to serve real time issues for the industry. It would appear that a lot of the tasks undertaken are customer-driven. There would appear to be little focus on a long-term vision for the development needs of SMEs. Vitality for addressing industry-driven real issues appears to be good.

6.5 Conclusion

The quality of the work being done by the Food Industry Development Department appears to be of a high standard, is relevant to the industry and to a high level of productivity. Reporting systems which capture the value or impact of the work should be put in place. There should be more focus on anticipating the longer term market place demands of companies and the Food Marketing Research Unit could be utilised in this regard.

Peer Review Committee Score for the Food Industry Development Department (1-5)	4.0
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6.6 Recommendations

- Continue to provide assistance and advice to customers in their product development.
- Create a well focused research programme to meet future market demands.
- The Food Market Research Unit should assess current and future market requirements.
- Systems to quantify the impact of the research activities for the industrial partners should be envisaged.

7. Overall Conclusions and Recommendations

The main conclusion of the PRC is that the overall Teagasc Food Programme is currently at a very good to excellent level. Each of the departments scored at least 4.0 on the five point scale. The research is internationally competitive and, in some areas, world leading. The staff are high quality and until now the funds available for research are adequate to maintain a high level of productivity and scientific quality.

The foreseen expansion of Irish agricultural output will demand continued, and also new, services from the Food Programme in the near future. The role of this Programme in fulfilling the objectives of **Food Harvest 2020** is of paramount importance. Due to the national economic situation, however, the resources available for the Programme will become limited. Therefore, management of the Food Programme must seek ways to circumvent this problem, such as by striving for exceptional provision in the recruitment moratorium and securing additional and new levies from industrial partners. To be successful in these attempts, a clear strategy should be identified to set key priorities for the Programme in order to respond adequately to the future needs of the food industry, whilst simultaneously, securing its high scientific level.

The review of the Food Programme in Chapter 1 includes a number of very relevant further conclusions and recommendations that offer important challenges for the future development of the Food Programme. The Department reviews in Chapters 2-5 contain recommendations specifically for the four departments.

The Peer Review Committee hopes that this report offers the management and staff of the Food Programme sufficient encouragement to continue their challenging research activities to the benefit of the Irish food industry and consumers worldwide.

APPENDIX 1: Food Programme Peer Review Panel Members

Name & Email	Company
Prof. Jan TM Wouters (Chairperson) jtm.wouters@planet.nl	Former Director of Research, NIZO.
Dr. James Lindsay James.Lindsay@ARS.USDA.GOV	Senior National Program Leader, Food Safety, USDA
Prof. Stefan De Smet University of Ghent Stefaan.DeSmet@UGent.be	Department of Animal Production, Ghent University
Prof. Ingolf Figved Nes Ingolf.Nes@umb.no	Department of Chemistry and Biotechnology, Norwegian University of Life Sciences
Prof. Terry Smith terry.smith@nuigalway.ie	National Centre for Biomedical Engineering Science, National University of Ireland Galway
Prof. Alan Reilly fbyrne@fsai.ie	Chief Executive Officer, Food Safety Authority of Ireland
Dr. John O'Connell johne.oconnell@kerry.com	Kerry Group PLC
Declan McDonnell dmcdonnell@ifp.ie	R&D Manager, AIBP, Irish Food Processors
Dr. Lance O'Brien lance.obrien@teagasc.ie	Head of Foresight and Strategy Development, Teagasc
Ms. Jane Kavanagh (Secretariat) Jane.kavanagh@teagasc.ie	Head of Business Planning and Performance Evaluation Unit, Teagasc
Mr. James Maher James.maher@teagasc.ie	Business Planning Officer, Teagasc

Peer Review of the Teagasc Food Programme 2011

Action Plan for Implementation of Recommendations

Date: 3 January 2012

Submit to: Dr. Frank O'Mara, Director of Research

This action plan outlines the recommendations from the report on the *Peer Review of the Food Programme 2011*. To complete this action plan please specify the actions to be taken, if any, to implement the recommendations outlined, allocate responsibility for these actions and set a target date by which the recommendation is to be implemented.

1. Recommendations for the Food Programme

No.	Recommendations	Actions to be taken	Person responsible	Date for completion
1	Produce a statement of strategy identifying key priorities for the future and setting out how the Programme will respond in the longer term to the needs of the industry whilst maintaining its competitive science base.	- Produce Statement of Strategy	P. Ross	April 2012
2	Retain a solid base in the existing core sciences in order to remain relevant to the broad spectrum of food companies and in order to address food safety aspects of public good while developing the science and technology platforms necessary to assist the industry in developing new areas including the current priority in food for health.	- 6 monthly review with Senior Management - Yearly review with Stakeholder Group	P. Ross	Ongoing
3	Maintain the key research platforms that are already established and develop those which are necessary to address the requirements of an evolving food industry.	- 6 monthly review with Senior Management - Identify key skills and resources necessary to meet the requirements of the food industry. - Develop a systematic process which allows for the constant collection of data with regard to our technologies and engagement with industry. - As part of the Strategy for Knowledge and Technology Transfer in Food, proactively engage with external stakeholders to align our technologies and capabilities to solution focused programmes and projects. - -	P. Ross P. Ross D. Troy/M. Walsh, P.Daly P. Ross/D. Troy	Ongoing
4	Achieve full integration of the Food Programme across the Moorepark and Ashtown sites.	- Have regular cross site research meetings - Have increased number of cross site collaborations - Have increased number of cross site funded projects	P. Ross, G. Duffy, T. Beresford, M. Fenelon,	Ongoing

		-	P. Daly	
5	Implement the planned knowledge and technology transfer strategy.	<ul style="list-style-type: none"> - Developing best practice in technology transfer through collaborations with other Public Research Organisations. - Mapping of Teagasc key personnel, technologies and systems. - Develop a systematic process which allows for the constant collection of data with regard to our technologies and engagement with industry. - Development and launch of a Technology Marketing Portfolio. - Ensuring that our technologies, capabilities and expertise are widely accessible. - Fostering key collaborations and strategic partnerships with industry and state agencies. - Proactively engage with external stakeholders to align our technologies and capabilities to solution focused programmes and projects. - Establish a high profile and effective TTO. - Measure and evaluate key Performance Indicators of technology transfer in Teagasc. - Identify key skills and resources necessary for an effective technology transfer strategy. 	<p>D. Troy</p> <p>D. Troy, M. Walsh, P. Daly</p> <p>D. Troy, M. Walsh, P. Daly</p> <p>D. Troy</p> <p>D. Troy, P. Ross</p> <p>D. Troy, P. Ross</p> <p>D. Troy</p> <p>D. Troy, M. Walsh</p> <p>D. Troy, M. Walsh</p> <p>D. Troy, M. Walsh</p>	<p>Dec 2012</p> <p>June 2012</p> <p>June 2012</p> <p>April 2012</p> <p>April 2012</p> <p>May 2012</p> <p>Ongoing</p> <p>June 2012</p> <p>Oct 2012</p> <p>June 2012</p>
6	Management of Teagasc should consider the development of a workload model for all permanent staff to ensure that all staff contribute to its overall mission in research, knowledge transfer and industry support.	<ul style="list-style-type: none"> - Staff spreadsheet with staff allocated time to be reviewed at HOD meeting on 6 monthly basis. <p>Teagasc Research Directors to develop norms for staff outputs and activities</p>	<p>P. Ross, G. Duffy, T. Beresford, M. Fenelon, P. Daly</p> <p>Director of Research</p>	<p>6 monthly</p> <p>June 2012</p>

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7	Develop the UCC/Teagasc Food Research Alliance to a level where it is recognised as the lead national research provider in food science and consider using the Alliance in the role of a knowledge broker for the Irish food industry.	<ul style="list-style-type: none"> - Assistant Director of Research and HOP to Meet with President of UCC re setting up a Food Science Masters Programme in conjunction with Teagasc Food sites - Appoint Director of UCC/Teagasc Food Alliance - Appoint Technical Support person 	D. Troy, P. Ross, T. Beresford	June 2012
8	Develop closer and more open relationships with industry to ensure that the key driver of the Food Programme is applied research with potential for commercial uptake.	<ul style="list-style-type: none"> - Develop a systematic process which allows for the constant collection of data with regard to our technologies and engagement with industry. - As part of the Strategy for Knowledge and Technology Transfer in Food, proactively engage with external stakeholders to align our technologies and capabilities to solution focused programmes and projects. - - 	P. Ross, D. Troy, M. Walsh, P. Daly	Ongoing
9	Consider making a special case to the Department of Agriculture, Food and the Marine seeking sanction for limited recruitment in the Food Programme in view of its role in the development of the growing Irish food industry.	<ul style="list-style-type: none"> - - SMG to consider in the context of organisational staffing needs 	Director of Research/P. Ross	March 2012
10	Seek to secure additional Dairy Levy funding for food processing research and pursue the possibility of securing a levy from the meat industry for similar type research.	<ul style="list-style-type: none"> - Additional Funding secured from Dairy Levy - Meet with CEOs of four major meat companies to discuss potential levy funding and also contributing to Ashtown Technology Centre 	P. Ross/ Declan Troy	June 2012
11	Consider establishing an MTL equivalent for meat in Ashtown (Ashtown Technology Ltd) in association with industry partners and Enterprise Ireland.	<ul style="list-style-type: none"> - Set up steering committee - Draw up 1 page outline including mission statement, deliverables and structure - Arrange to meet with CEO's of the meat industry 	Director, Director of Research, Assistant Director of Research, HOP	December 2012
12	Address publication underperformance in a number of areas and aim to fill gaps in key areas of expertise (eg bioinformatics) either through exceptional external recruitment or through internal retraining and redeployment.	<ul style="list-style-type: none"> - HOD's to identify underperformance staff/areas and report to the next HOD meeting 	P. Ross, G. Duffy, T. Beresford, M. Fenelon,	April 2012

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			P. Daly	
13	Develop Project Management process to better reflect commercial realities in those project proposals intended to have industrially relevant outcomes.	- Commercial justification to be included in each project proposal	All staff	Ongoing
14	Consider restructuring the Food Market Research Unit back into the Food Programme given its new linkage with Bord Bia and its potential to contribute to the industry.	- Decision to move food marketing researchers to Rural Economy and Development Programme was taken after much consideration and with regard to commonality of research methods. Senior management will ensure food marketing researchers continue to work actively on food topics	Director of Research	On-going

2. Food Biosciences Department Recommendations

No.	Recommendations	Actions to be taken	Person responsible	Date for completion
1	Seek further support and funding to guarantee the maintenance of the high quality and productivity level of the Department's research.	<ul style="list-style-type: none"> - Continue to seek funding from public calls. - Review quality of research staff scientific output with a view to identifying researchers with potential to secure international funding or high level national funding such as SFI 	<p>Researchers</p> <p>T. Beresford</p>	<p>Ongoing</p> <p>June 2012</p>
2	Continue and extend the many examples of the transfer of knowledge to industry, and ensure close alignment of the Department's research to the agro-food industry and <i>Food Harvest 2020</i> .	<ul style="list-style-type: none"> - Ensure departmental research programme aligns with Strategy for Knowledge and Technology Transfer in Food - As part of Business Planning and proposal preparation, ensure that programme links to industry needs and Harvest 2020 targets. 	T. Beresford	<p>Ongoing</p> <p>Ongoing</p>
3	Interaction with international stakeholders should be encouraged and collaborations extended.	<ul style="list-style-type: none"> - Continue to seek collaborations with international companies by attending conferences and getting involved in collaborative EU funding bids - Set up a workshop with Enterprise Ireland to assist in identification of suitable international companies. 	<p>Researchers</p> <p>T. Beresford</p>	<p>Ongoing</p> <p>Sept 2012</p>
4	It is anticipated that over time high level research in bioactives produced by the Food Bioscience Department along with its collaborators and partners will underpin some health claims. Continued support for this research is strongly encouraged, while the PRC encourages further expansion in collaborations in this area in future.	<ul style="list-style-type: none"> - Build Food BioTest Facility. - Seek new collaborators nationally and internationally. 	<p>T. Beresford</p> <p>Researchers</p>	<p>Dec 2012</p> <p>Ongoing</p>
5	The research on meat waste should be widened and not just focused on bioactive discovery, which presumably requires long term research. Opportunities for near term applications of meat waste materials in food should be investigated in close cooperation with the Department of Food Chemistry and Technology.	<ul style="list-style-type: none"> - Establish a working group with industry involvement to identify key opportunities for added value to meat waste. - Seek funding to support significant project for long term research in bio-active discovery in this area. 	<p>M. Fenelon</p> <p>Researchers</p>	<p>June 2012</p> <p>June 2012</p>

3. Food Chemistry and Technology Department Recommendations

No.	Recommendations	Actions to be taken	Person responsible	Date for completion
1	Continue doing excellent research as is going on now and keep or strengthen the links with industry and other research partners, e.g. by developing new strategic alliances. In this context, it is advised to strengthen the integration with the Animal and Grassland Research and Innovation Programme (AGRIP), with industry input, to integrate farm and production research through to retail. This should include dairy as well as beef.	- Initiatives have been taken in this area with significant collaborations with the AGRI programme underway through, Stimulus, RIMS and SFI funding, Both dairy and beef have been integrated into these projects.	M. Fenelon Researchers	Ongoing
2	The 'omics' approach in meat research is considered innovative research with a large potential for the future. Regarding the genomics work that is planned, consideration should be given to examining the genetics of the Irish cattle breeds on a broader scale than only testing the applicability of genetic markers that have been established elsewhere. Given the many factors that affect meat quality, this research should be done in standardised slaughter conditions that are representative for the Irish situation. The farm to fork approach in meat quality research should be maintained even if the focus is shifting to 'omics'-based work.	- The 'omics' approach to meat research has been incorporated into the collaborative projects mentioned above which involved animal geneticists. This approach is being applied in the context of beef and pork. We are expanding research in this area through pursuit of external funding from national and EU sources.	Researchers (Meat)	Ongoing
3	The group has excellent competence and infrastructure (advanced physico-chemistry analytical tools) to investigate the structure of foods. Structural studies are very relevant when traditional foods with new ingredients are developed as well as the development of new foods. This technology is internationally quite unique in food research and Teagasc has a pre-competitive position that should be taken advantage of. On the other hand the Department is not well equipped to do sensory analyses. The PRC considers such instrumentation to be a very valuable tool when one is working close to product development and to consumers. We strongly recommend that a greater sensory instrumentation focus be established.	- The expertise for sensory science is based with the Food Bioscience and Food Industry Development departments. Significant developments have been made in the area of chemical characterisation of flavour components within the Food Biosciences department. A working group has been established to review the status of sensory analysis within Teagasc and to propose an adoption plan. The Food Chemistry & Technology department will participate when required.	T. Beresford P. Daly	Ongoing
4	The work on healthier food products (cereals, dairy and meat) is directed towards the future since there seems to be an increasing demand for these products such as gluten-free, low carbohydrate, fiber rich, low-fat, low-salt etc. It is recommended	- In accordance with the recommendation, the department will collaborate with the Food Bioscience Department to engage	T. Beresford M. Fenelon	Ongoing

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	that the development of these foods is followed up by human studies in order to substantiate the health claims. Such studies will need collaboration with nutritionists. The PRC were advised that such collaborations are planned in the design of the research projects.	in human studies if required. A human studies component will be included in future projects if appropriate; strategic alliances will be created both in-house and externally to facilitate this incorporation of this research. A number of collaborations involving human studies have already taken place within the department with Universities such as University College Cork, University of Surry (UK) and Cork University Hospital.		
5	The newly planned project on upgrading the value of meat and slaughter offal to high priced bioactive peptides is very challenging and interesting, because there is a great need for high grade proteins and protein hydrolysates for various applications. However, it is also considered a risky project. It is recommended that an economic and technical feasibility analysis be carried out before this project is launched, e.g. are all sanitary risks well considered?	- In accordance with the recommendation, review of the economic and technical feasibility will be carried out on projects in this area.	T. Beresford M. Fenelon	June 2012
6	There seems to be some imbalance between the research on dairy and meat products compared to the economic importance of both sectors in Ireland. It is suggested that a more balanced approach be taken into account in future strategic plans of the Department by increasing the level of meat research.	- The imbalance will be raised at Senior Management level for discussion. At present no mechanism exists whereby the imbalance, at resource level, can be addressed due to the moratorium on recruitment.	P. Ross	March 2012
7	The cheese diversity R&D programme is aimed at developing new technologies to produce traditional and new cheeses not only for Ireland but also for export. Inclusion of new technologies which might save time and money. Additionally, traditional sensory assessment might also be a valuable tool in finalizing new products.	- A working group has been established to review the status of sensory analysis within Teagasc and to propose an adoption plan for a tasting facility. - Sensory analysis facilities are presently located within the Food Industry Development department who will carry out the chemical analysis in collaboration with the Food Bioscience department.	T. Beresford P. Daly	Ongoing

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8	<p>Processed meat products have not developed the same way as dairy products. Thus further collaboration with industry on new meat products should be considered. One possibility is to develop cure and fermented meat products both for national consumption and possibly also for export. The predicted future growth in meat consumption will lead to a demand for greater diversity of meat-based products.</p>	<p>- New projects will be submitted for funding at a national level to support the demand for greater diversity of meat products.</p>	<p>M. Fenelon Researchers (Meat)</p>	<p>Ongoing</p>
9	<p>An important niche in the Irish cheese industry is the on-farm production of high quality artisan cheeses. Teagasc should actively support this growth industry with advice and scientific support, and should also be proactive and foresee both problems and possibilities.</p>	<p>- Support for the artisan cheese industry is largely driven by the Food Industry and Development department. The Food Chemistry and Technology department supports the sector through dissemination of scientific findings both by direct engagement with clients the and through the Food Industry Development department.</p>	<p>P. Daly</p>	<p>Ongoing</p>
10	<p>The Department is advised to continue searching for internal scientific commonality given the variety of research topics that are undertaken. The recent investment in new infrastructure and analytical tools (e.g. microscopy, spectroscopy) may offer opportunities to fully exploit cross-fertilisation within the Department.</p>	<p>- It is part of the strategic direction of the department to use food structure and chemistry to promote interdepartmental studies across different food systems. Scientific commonalties already exist in this area and further projects are planned.</p>	<p>M. Fenelon Researchers</p>	<p>Ongoing</p>

4. Food Safety Department Recommendations

No.	Recommendations	Actions to be taken	Person responsible	Date for completion
1	Continue doing the excellent job they are doing now.	- Staff to continue to deliver and develop the programme to provide the science to underpin a total chain risk based approach to food safety focusing on microbial and chemical contaminants in the “farm to fork” food chain.	G. Duffy	On going
2	Continue collaborations with other European/international researchers.	- Retain the level of applications to and involvement in FP Programme including campaigning for areas of potential interest to Food Safety to be included in calls.	G. Duffy	On going
3	It is anticipated that the Department will have to increase in size in the near future due to new regulations and increased focus on food safety internationally. The PRC strongly suggests that representation by Teagasc Administrators be made for hiring exemptions for this Department.	- Agree, there is need to expand programme with additional staff resources to meet growing demand from stakeholders at national and international level. SMG to consider in the context of organisational staffing needs	F. O'Mara/SMG See point 9 of Food Programme recommendations	On going
4	As noted above the Department has delivered technologies and should continue to strive towards a better uptake of research findings by industry.	- We will look for new ways to engage with stakeholders as part of the Strategy for Knowledge and technology Transfer in Food will be important.	G. Duffy	July 2012
5	The PRC noted that there was no research on fresh fruit and vegetables which is a high priority globally. The <i>E. coli</i> O104 STEC outbreak in Europe in 2011 suggests that Teagasc consider focusing on food safety issues with these commodities in the future.	- Agree, there is a big knowledge gap here that needs to be addressed and it would be an opportune time to explore collaborations between food and horticulture in this area with core funding support in 2012.	G. Duffy	December 2012

5. Food Industry Development Department Recommendations

No.	Recommendations	Actions to be taken	Person responsible	Date for completion
1	Continue to provide assistance and advice to customers in their product development.	<ul style="list-style-type: none"> - A programme of technology development supports will be provided for food SME businesses. The range of supports will include product development, training/skills development and individual in company assistance. 	P. Daly	On going
2	Create a well focused research programme to meet future market demands.	<ul style="list-style-type: none"> - The department research programme will be constructed utilizing the Teagasc business planning process and will be based on national and Teagasc strategies for the development of the food sector. - Develop a systematic process which allows for the constant collection of data with regard to our technologies and engagement with industry. - Proactively engage with external stakeholders to align our technologies and capabilities to solution focused programmes and projects. - 	P. Daly	Annual Business plan
3	The Food Market Research Unit should assess current and future market requirements.	<ul style="list-style-type: none"> - Food Market Research will be consulted and engaged in assessing food sector technology development requirements. 	P. Daly	December 2012
4	Systems to quantify the impact of the research activities for the industrial partners should be envisaged.	<ul style="list-style-type: none"> - A mechanism to measure impact of the work programme will be established. 	P. Daly	December 2012