Comptroller and Auditor General

Report on the Evaluation of Effectiveness

Performance Measurement in Teagasc

September 1999

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The report was prepared on the basis of information, documentation and explanations obtained from the bodies referred to in the report.

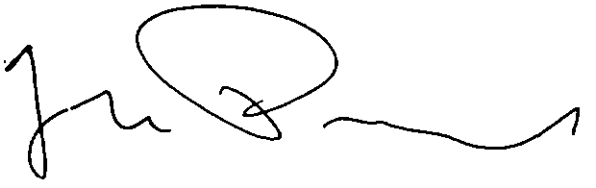
The draft report was sent to the Department of Agriculture and Food and to Teagasc and comments were requested. Where appropriate, comments received were incorporated in the final version of the report.

Report of the Comptroller and Auditor General

Performance Measurement in Teagasc

I have, in accordance with the provisions of Section 9 of the Comptroller and Auditor General (Amendment) Act, 1993, carried out an examination of the systems, procedures and practices employed by Teagasc to evaluate the effectiveness of its operations.

I hereby submit my report of the above examination for presentation to Dáil Éireann pursuant to Section 11 of the said Act.



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Comptroller and Auditor General

14 September 1999

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Summary

The effectiveness of an organisation depends on the extent to which it achieves its objectives. Determining effectiveness requires a clear definition and assessment of the impact of the activities of the organisation. This is a complex area as it requires understanding of the significance of the outputs of activities and their contribution to impacts. Many outputs and impacts are difficult to measure and in these cases some alternative means must be found to determine impact. This can be done through qualitative techniques such as comparison with similar activities elsewhere or through surveys of the client population served.

This report examines the systems and procedures employed by Teagasc to evaluate its own effectiveness. Teagasc was formed to provide services for the agriculture and food sectors in three distinct service areas – research, advisory services and training. *Teagasc 2000* is a comprehensive plan for the future delivery of services which was published in the middle of 1998. Management systems including those associated with the determination of effectiveness are being developed in light of proposals in *Teagasc 2000*.

Evaluating Programme Effectiveness

Teagasc's three service areas are divided into five programmes and 24 sub-programmes. The stated objectives for most of the sub-programmes are relatively clearly defined and susceptible to measurement, so the extent to which the desired impacts at that level are achieved can generally be evaluated. Programme objectives set are generally less clear and closer to organisational level goal statements.

While many of the elements required for a system to determine effectiveness are in place and much good work has been done, Teagasc does not have a comprehensive approach to evaluation of programme impacts. The principal limitations noted are discussed in the following paragraphs.

The agricultural production research programme is intended to benefit Irish agriculture but the objectives set lack precision and could usefully be set in context. Specific impact targets were not set in all cases, although some good examples were noted such as research to achieve the production of milk at 9 pence per litre and of mid-season lamb at 136 pence per kilogram. Where specific impact targets were set, the absence of a suitable benchmark and of a time frame for achievement of the target limits the extent of evaluation which might be performed.

A distinction is made between pre-commercial and commercial research in the food production research programme. The quality and quantity of commercial research which follows on from the pre-commercial phase is one impact indicator of pre-commercial research. The relevance of the information gained from pre-commercial research to other programme goals is also an impact indicator but this can be hard

to isolate. For commercial research proxy measures such as the participation of clients in the research and the direct improvement in processes would provide an indication of impact. Teagasc has not set impact targets for food production research and does not use techniques like cost-benefit analysis to evaluate the potential or expected contribution of the research to commercial economic returns.

Evaluating the impact of the four sub-programmes which make up the rural economy research programme is particularly difficult due to the nature of the research. Teagasc has specified performance indicators which identify and track research outputs. No formal arrangements have been made to evaluate the impact of the research or the quality of the research outputs.

The advisory services programme provides a good opportunity for implementing an impact evaluation system. The services provided are tailored to either full time or part time farmers. Many of the services are provided on a fee paying basis and Teagasc regard the willingness of clients to pay fees as a measure of successful impact. Impact targets have been identified in the programme activity plans but are not adopted formally as programme targets in *Teagasc 2000*.

The impact of the training programme is measurable in terms of the direct impact of the training provided on the knowledge and competence of the workforce in the agriculture and food production sectors. Some measures have been adopted such as the number of participants on courses and the number gaining employment and implementing the techniques learned. However, better impact measures are available such as the proportion of entrants to farming who hold the Certificate in Farming. The means to gather information about the impact of training is available through existing demographic and labour force analysis for the agricultural sector.

Evaluating Organisational Effectiveness

The system to evaluate organisational effectiveness relies on the same basic ingredients of clearly defined impact objectives and systems of measurement and evaluation as are applied at programme level. Evaluation at the corporate level is more complex due to the potential conflict between competing organisational objectives, the extent to which impacts may not be measurable and the need to consider not only the contribution of programmes but also the linkages between them. New methods of analysis, such as the balanced scorecard approach, would help with the evaluation of the achievement of multiple impact targets.

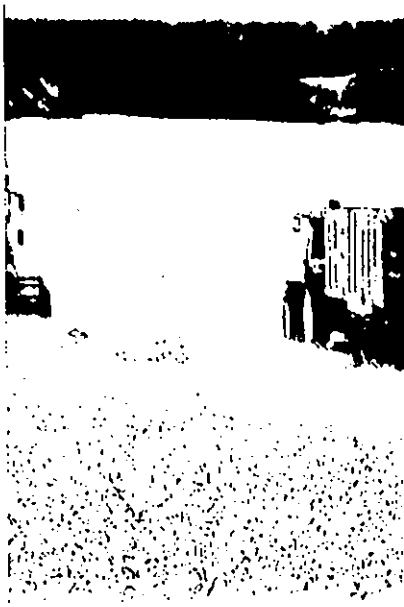
Teagasc has applied a strategic approach to the conduct of its activities since it was founded. The latest statement of strategy, in *Teagasc 2000*, sets out clear organisational objectives which were developed with appropriate consultation with stakeholders. Most of these objectives are capable of being measured.

The documentation of the evaluation of research project outputs has been strengthened since the introduction in 1998 of end-of-project reports. A special publication called *Teagasc Achievements* was introduced in 1996 to highlight particular achievements. While these initiatives are steps in the right direction, there is a need to distinguish the evaluation of impact from routine management reports of activities and end-of-project reports of outputs.

There are a number of limitations to current evaluation practices. The strategic documentation does not provide for a corporate approach to evaluating organisational impact. Specific measures or indicators to measure organisational impact have not been identified for corporate goals. The approach to evaluation of effectiveness where desired impacts are difficult to measure (such as the rural economy research) has not been worked out. There is a risk that evaluation exercises will be selective rather than comprehensive.

A good starting point for setting up a system to evaluate impact would be for Teagasc to produce a plan for the comprehensive evaluation of corporate goal achievement. The plan might harness the work of external evaluators of Teagasc such as the Department of Agriculture and Food and EU monitoring committees. The internal structures for facilitating these independent evaluations could provide a framework on which to organise the evaluation system. The level of resources required for evaluation should be defined but the development of evaluation systems should not become a rigid management procedure or an expensive data gathering exercise. The aim should be to promote a culture of impact evaluation as part of the existing strategic processes.

Performance Measurement in Teagasc



1 Introduction

1.1 Agriculture and food production form one of the most important sectors in the Irish economy in terms of its contribution to economic output, employment and exports. It has very strong linkages with other sectors of the Irish economy and relies much less on imported raw materials and services than other major export industries. The international competitiveness of the sector is therefore of major importance in Irish economic performance.

1.2 In addition to its economic importance, the agri-food sector has a significant social impact. It is the economic mainstay of many rural communities where the development of alternative industries and services has not occurred on a significant scale, despite recent Irish economic success. Agriculture and associated rural enterprises continue to have a role in spreading economic growth throughout the country.

1.3 Many factors affect the development of the agri-food sector, presenting it with both threats and opportunities. The structure of agriculture is changing in line with long-established trends, such as on-going reductions in the numbers employed and increasing productivity. Reductions in trade protection regimes internationally and changes in EU price and production support structures result in the need to improve competitiveness in agricultural production. At the same time, this has to be achieved in ways which avoid damage to the environment. There is also considerable potential to move away from the traditional production and export of commodity agricultural products (such as meat and butter) to the production and export of higher value-added food products (such as pre-cooked meals and luxury cheeses). This is taking place in a climate of heightened consumer concern, nationally and internationally, about the safety of food and the animal welfare implications of food production systems.

1.4 The rapidly changing environment for the agricultural and food industries requires them to have the capacity to identify and make appropriate changes in their structures and in the production technologies they employ. It also has implications for the training of the workforce which needs to be able to adapt quickly to technology change and to new business opportunities. This is a particular problem for the agriculture sector because changes in the ownership of farm businesses occur mainly within families and there have historically been relatively low levels of formal education and of formal training in agricultural production and business techniques.

Teagasc - The Agriculture and Food Development Authority

1.5 Teagasc was established in 1988 to undertake agricultural research and development (including research and development in relation to food processing and the food processing industry) and to provide advisory and training services for agriculture. The Authority was formed by the amalgamation of two existing, long-

established organisations: ACOT, the Agriculture, Training and Advisory Authority, and An Foras Taluntais, the Agricultural Institute.[1]

1.6 The Board of Teagasc consists of a chairman and ten members appointed by the Minister for Agriculture and Food. Five of the ordinary members are nominated for appointment by organisations representative of persons engaged in agriculture or the promotion or development of the agricultural industry. Teagasc has a staff of almost 1,500, employed at 119 locations including local, county, and regional offices, agricultural colleges, research stations and laboratories and a national headquarters located in Dublin.

1.7 Expenditure by Teagasc in 1998 was approximately £82 million. Over 78% of spending is funded by the State or the EU, with the balance being raised mainly by charges for the services provided.

1.8 Teagasc is one of the main public sector bodies focusing on medium to long-term development of the agriculture and food industry. Because of both the scale of resources it handles and the nature of the services it provides, how successful it is in achieving its intended outputs and impacts is of critical importance to the agri-food sector.

Measuring Organisational Effectiveness

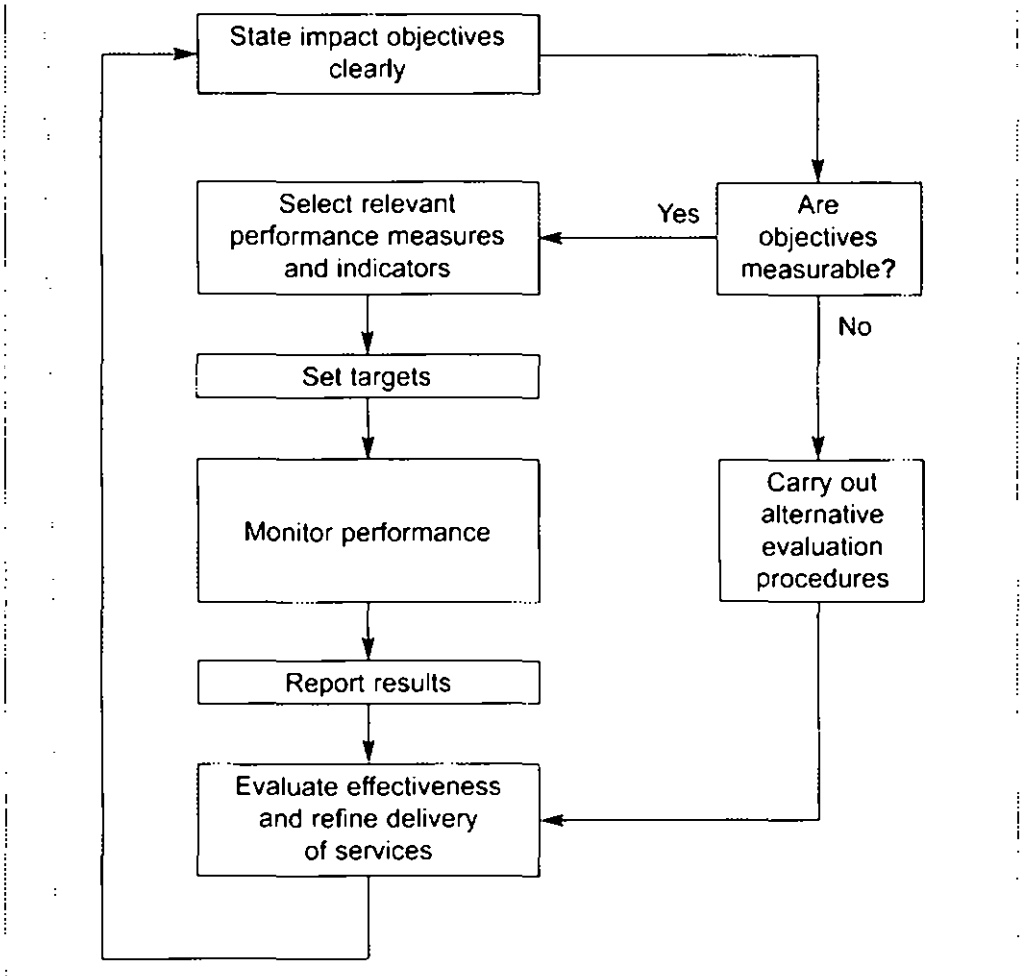
1.9 The term value for money is generally understood to encompass issues of economy, efficiency and effectiveness. The need for an organisation to achieve effectiveness is the most important of these three elements. Being economic and efficient in the use of resources is of little value in itself if the intended outcomes and impacts of the organisation are not achieved.

1.10 Most organisations in the public service have traditionally concentrated on planning and managing inputs and outputs. Recent public sector initiatives, particularly the strategic management initiative, emphasise the importance of developing a stronger focus on impacts and on planning and managing to achieve effectiveness. An ability to evaluate effectiveness is one of the primary requirements for such a system.

1.11 The main elements that are required for evaluating effectiveness are presented in Figure 1.1. Essentially, this is a cyclical process which should progressively improve as the cycle is repeated over time. While it would be desirable that all the elements of the evaluation system are developed together, building a strong capability to evaluate effectiveness is more likely to be a gradual process with progress being achieved at different rates in different areas. The development of anorganisational culture which embraces effectiveness evaluation also takes time.

[1] *Teagasc was established under the Agriculture (Research, Training and Advice) Act, 1988*

Figure 1.1 Evaluating effectiveness



1.12 The clearer an organisation is about its intended outputs and impacts, the greater the degree of effectiveness it is likely to achieve in terms of delivering on those objectives. By identifying which of its activities contribute most to the realisation of the stated goals, the organisation can progressively fine-tune its activities so that it approaches an optimum level of effectiveness.

1.13 To determine the extent to which objectives have been achieved, it is first necessary, as far as possible, to define objectives or other intended effects in a way which allows them to be measured. This means that targets can be set and intended outputs and impacts can be assessed in relation to relevant benchmark values.

1.14 Where the desired impacts for an organisation or programme cannot be measured, alternative methods of carrying out effectiveness evaluation need to be developed. This often consists of qualitative or judgment-based assessments of the impacts achieved, such as review of the processes adopted in trying to achieve objectives, opinion surveys of client groups, independent evaluations of effectiveness and peer reviews.

1.15 Many public sector organisations are complex and are intended to achieve a variety of objectives. These may conflict with one another in a variety of ways. For example, the development of agricultural systems to reduce harmful environmental impacts or to improve animal welfare may conflict directly with work to reduce the costs of agricultural production. Competition for resources within the organisation may lead to indirect conflict in the degree to which different areas of activity achieve effectiveness. Evaluating the effectiveness of the organisation as a whole needs to take account of such conflicts.

1.16 A comprehensive plan for the future delivery of Teagasc's services to the agri-food sector, entitled *Teagasc 2000*, was published in July 1998. This is the latest in a series of planning documents which Teagasc has produced since its establishment. Management systems, elements of which contribute to Teagasc's ability to evaluate its effectiveness, are being developed in the light of the proposals contained in *Teagasc 2000*.

Scope and Objectives of the Examination

1.17 The Comptroller and Auditor General (Amendment) Act, 1993 provides for examinations of the systems, procedures and practices used by organisations to evaluate the effectiveness of their operations.

1.18 This examination was concerned with the extent to which Teagasc currently has systems in place to evaluate the effectiveness of its operations in the context of the plans set out in *Teagasc 2000* and evolving management practices and systems. The examination did not assess the effectiveness of the organisation or explore the level of economy or efficiency achieved.

1.19 The objectives of the examination were

- to identify and assess Teagasc's systems for evaluating the effectiveness of individual programmes of activity
- to assess how Teagasc approaches evaluation of its overall effectiveness as an organisation.

Methodology

1.20 The examination was carried out by staff of the Office of the Comptroller and Auditor General. A number of approaches to the evaluation of effectiveness were identified. Teagasc files, systems and practices were reviewed during the course of the examination and visits were made to a number of Teagasc sites. Meetings were held with relevant officials from both Teagasc and the Department of Agriculture and Food.

2 Evaluating Programme Effectiveness

2.1 The legislation providing for the establishment of Teagasc specifies three principal kinds of activity which the Authority may undertake. These are

- research
- provision of agricultural advisory services to farmers and
- training of those working in, or about to enter, agriculture.

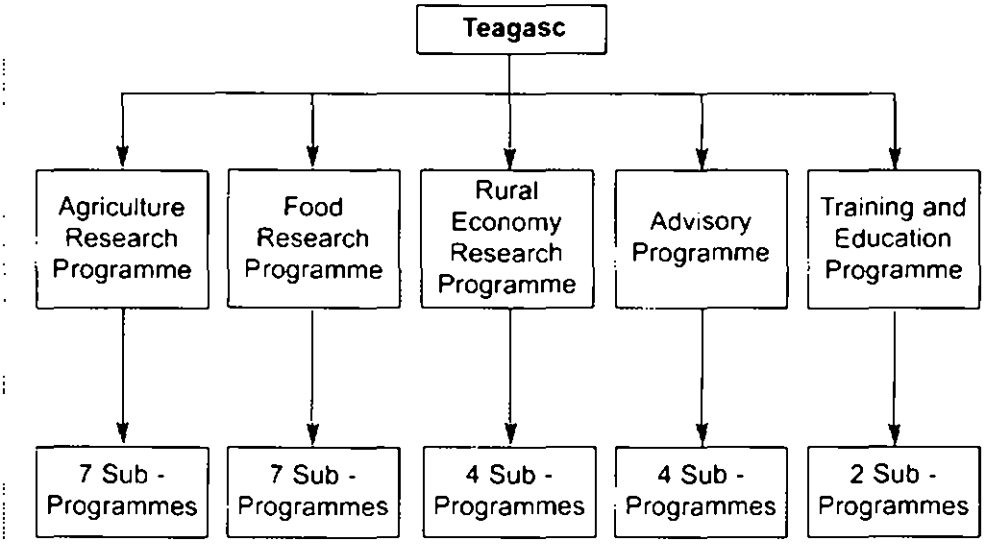
Teagasc is organised into three main service areas, reflecting this mandate. In 1998, research services accounted for 44% of expenditure; advisory services accounted for around 38%, while 18% went on training services.

Teagasc's Programme Structure

2.2 The strategic framework underlying *Teagasc 2000* divides its services into five distinct programmes, based on the overall mission statement adopted for the Authority (see Figure 2.1). Each of the programmes is divided in turn into a number of sub-programmes focusing on aspects of the agriculture and food sectors where the Authority seeks to have an impact. The range of activities Teagasc plans to pursue to achieve those objectives is also specified. The programme and sub-programme objectives stated in *Teagasc 2000* are presented in Appendix A of this report.

2.3 As impact objectives have been adopted for both programmes and sub-programmes, Teagasc's effectiveness can potentially be evaluated at either or both levels. In practice, evaluation of effectiveness at sub-programme level is likely to be

Figure 2.1 Teagasc's Programmes



easier because the objectives are more explicit and the desired impacts more amenable to being measured. Evaluation of sub-programme effectiveness should also be of particular interest to specific producer groups (such as cereal, sheep or beef farmers or dairy food manufacturers) around whose interests the sub-programmes are generally focused. The programme objectives are much broader and consequently target the interests of much larger client groups such as 'all farmers' or the 'food industry' in general. In addition, because the programme objectives correspond closely to the overall corporate goals adopted by Teagasc, its effectiveness in achieving those objectives may best be considered in the context of evaluating overall organisational effectiveness.

2.4 This chapter looks at Teagasc's capacity to evaluate its effectiveness within each of the five programme areas. Case studies are used to illustrate some of the difficulties which arise in doing so and the practical solutions adopted. The relationship between the objectives set for the programmes and Teagasc's overall organisational goals is considered in Chapter 3.

Effectiveness of Agricultural Production Research

2.5 The overall objective of Teagasc's agricultural production research is to develop livestock and crop production systems which are designed to reduce on-farm production costs while providing food of assured safety and consistent quality, in ways that are compatible with environmental protection and animal welfare. *Teagasc 2000* details seven sub-programmes which address this objective. These are research into

- grassland systems for dairy, beef and sheep production
- animal nutrition and supplementary feeding
- animal breeding and reproduction
- animal health and welfare
- tillage crops and horticulture
- rural environment
- technical services (e.g. soil analysis).

2.6 The agriculture research sub-programmes are concerned in almost all cases with improving production technologies or developing best practice production methods. Teagasc has stated that research is undertaken on the basis of a possible benefit to Irish agriculture but the objectives could be set in more precise contexts. For example, it is not clear generally whether research is intended to identify technologies which are applicable across a range of circumstances typically found in Irish farming or to identify ideal production technologies, elements of which may be adopted as circumstances permit.

Key point: Impact measures or targets have been set for very few of the agricultural research sub-programmes

2.7 Specific impact targets have been set for the sub-programme of research into grassland systems used in the production of beef, lamb and milk (see case study 1). For example, the aim is to develop grassland systems which will allow the production of milk at a cost of 9p/litre and of mid-season lamb at a cost of 136p/kg.

2.8 Similar impact measures and targets have not been set for the other sub-programmes, which are expressed in more general terms. For example, the animal breeding and reproduction sub-programme is intended "to improve the reproductive efficiency of farm animals". This could be measured in terms of the reproductive prolificacy of animals e.g. the average number of lambs per breeding ewe. Similarly, average yield per acre could be used as a measure of impact for

Case study 1

Grassland research programme – dairy, cattle, sheep

The Irish climate provides a much longer grazing season than most other EU countries which potentially gives Irish farmers a significant commercial advantage in producing cattle, sheep and milk, compared to producers who are more reliant on supplementary feeding. This sub-programme seeks to develop systems which allow maximum benefits to be extracted from grassland production.

The objective of the sub-programme, as stated in *Teagasc 2000*, is to develop systems for "the production of low cost milk (9p/litre); suckler beef (143p/kg of carcass weight) and mid season lamb (136p/kg of carcass weight) of the required quality and safety with minimum impact on the environment".

The research undertaken includes

- developing grass based systems which reduce feed costs while meeting quality, safety, environmental and animal welfare requirements
- developing strategies to increase grass production, seasonal growth, quality and utilisation
- assessing grass and clover varieties to provide increased dry matter production, improved grass quality and extended grazing season
- re-defining the relationship between nitrogen use, land use and the extent to which clover based production systems can replace nitrogen fertiliser.

The objectives of the sub-programme are stated in very clear terms. Production cost is adopted as the central performance measure. Precise target production costs are set for the main grass-based commodities but there is no specific target date or period over which the target is to be achieved. Teagasc have indicated that in setting the objectives information on production costs in competitor countries was taken into account. However, the opportunity was not taken to specify relevant benchmark production costs which are important for evaluation purposes.

research into tillage crop production. Targets could also be set for rural environment research in terms of pollution loads (e.g. the level of nitrogen and/or phosphorous discharges to watercourses) generated by agricultural production systems.

Key point: Targets should be related to relevant benchmarks and should indicate planned timeframes

2.9 In setting impact or effectiveness targets, there is a need to identify a relevant benchmark against which to measure the extent of the improvements achieved. In case study 1, for example, the current national average on-farm production cost for milk, beef or lamb or the unit production cost achievable by applying current best practice systems could be stated to give a meaningful context for the target values. Without such contexts, it is hard to assess the extent or value of the desired improvement. The time period over which the technology improvement sought is to be achieved should also be specified. Teagasc has indicated that this information is available and that there is no problem in stating such targets.

2.10 In *Teagasc 2000*, most agricultural production research sub-programmes have a primary impact objective. This objective is generally concerned with one of a number of issues including production cost, product quality, food safety, animal welfare or environmental impact. Some of the other issues may act as a constraint in achieving the primary objective. These need to be taken into account in setting targets and in assessing and evaluating achievements. Consequently, target values both for the primary objectives of a programme and for relevant constraints should be stated. For example, the establishment of an average milk production price target of 9p/litre would be more meaningful if a certain minimum quality of milk (expressed perhaps in terms of average protein content) and appropriate measures of animal welfare and food safety were explicitly stated. Teagasc have indicated that the constraints applying to commercial farming would be met but did not consider it necessary to state this.

2.11 In evaluating effectiveness, consideration has to be given to unintended impacts which may or may not be beneficial. For example, research has clearly shown that selective breeding of milk cows can increase the average milk output thereby increasing profitability. This approach has been taken on selected farms with commercial dairy herds, in partnership with Teagasc. However, there is evidence that fertility rates in those herds have fallen. Further research is being undertaken to investigate the relationship between milk output and fertility levels.

2.12 Stakeholders are involved in the formulation and monitoring of the research programme. For example, representatives of farmer organisations and dairy co-operatives participate in a liaison group for the dairy research programme. Teagasc liaises with a similar group representing beef producers and processors in relation to the beef research programme. Such liaison arrangements could be developed to

include involvement of stakeholders in comprehensive evaluation of the research programmes.

2.13 A computerised database (referred to as the Agricultural Research Management Information System or ARMIS) is used to assist in controlling and monitoring Teagasc's research projects. In addition to information about the expected costs and timing of individual projects, the system records statements of the project objectives and expected benefits, including the gaps in existing knowledge which the project is expected to fill. The objectives and benefits are rarely expressed in terms of the contribution the projects are likely to make to the achievement of sub-programme objectives.

2.14 Consultants engaged by Teagasc have evaluated research on potato breeding and milking machines[1]. Cost-benefit analyses were used to estimate the returns on the research in these areas. Teagasc plans to integrate this cost-benefit methodology into its programme management system so it can be used more generally to evaluate the effectiveness of research.

Effectiveness of Research into Food Production

2.15 The objectives of Teagasc's food research programme are to ensure that the outputs of the Irish food industry are consistently produced to the highest standards of safety, quality and nutritional value and to contribute to the development of the industry through product innovation and improved product sophistication. The programme is divided into seven sub-programmes. These are

- **food safety** research
- development of **cheese and fermented dairy products**
- development of **food ingredients** (such as milk powders and protein concentrates used in formulated foods)
- research into **production and processing** of beef, lamb and pig meat
- production of **prepared consumer food** (such as pre-prepared meals, frozen pizzas, pastas)
- **food nutrition**
- **technology transfer** through consultancy services, training of food industry employees and contract research (including analysis of composition, quality and safety of food products).

[1] *Similar evaluations have been carried out on the advisory programme and the major part of the agricultural training programme*

Key point: Clearer and more specific effectiveness objectives could be set for food research sub-programmes

2.16 While the objectives for each of the sub-programmes are relevant to the overall effectiveness objectives for the food research programme, they could be stated in clearer and more specific terms. For example, the objective of food safety research (see case study 2) is 'to develop preventative measures to ensure the microbiological and chemical purity of Irish foods' but the concepts of microbiological and chemical purity are not specified. Teagasc has stated that it was assumed that internationally accepted standards, such as the Codex Alimentarius, would be used.

2.17 A distinction is drawn by Teagasc between 'pre-commercial' and 'commercial' food research. Pre-commercial research is concerned with the development of new products and technologies which have commercial potential, following a sequence of stages from basic research through application trials and pilot-scale validation.

Case study 2

Food safety research programme

Consumer confidence in the safety and purity of food, both in Ireland and in export markets for Irish food products, has been damaged in recent years by highly publicised food-related crises and scares in a number of countries. Consumers are increasingly concerned about the human health implications of BSE in cattle; the likelihood of deaths and serious illness due to contamination of food by pathogens such as salmonella and E-coli 0157; the use of preservatives and additives in the production of foods; and the presence in foodstuffs of drug, pesticide and other residues. Consequently, the continued competitiveness of the Irish agri-food industry depends on its being able to ensure food safety and purity.

Teagasc has a programme of research into food safety issues. The objective of the programme, as stated in *Teagasc 2000*, is "to develop preventative measures to ensure the microbiological and chemical safety of Irish food".

The research undertaken includes

- development of more sensitive methods for detecting pathogens and residues in food products
- development of techniques to control spoilage organisms
- modelling pathogen growth in food products
- evaluating the effects of processing methods on food safety
- compilation of a National Food Purity Database to capture details of drug, pesticide and other residues in foodstuffs and
- development of a programme to verify industry food safety systems.

No specific effectiveness measures have been identified for the food safety research programme. Programme targets have not been set.

This is followed by the commercial research phase which includes the carrying out of industry trials and market testing, leading to commercial production or the adoption of new technologies and practices in companies. The commercial research undertaken by the Teagasc Food Centres almost invariably arises from its pre-commercial research activity.

2.18 Pre-commercial research undertaken by Teagasc includes research which many Irish companies, because of their scale, could not afford to carry out. Commercial research is generally carried out in partnership with or on behalf of companies with a direct or immediate business interest in the issues or products studied.

2.19 Because of the direct link between commercial and pre-commercial research, the quality and quantity of commercial research undertaken is a direct measure of the impact of pre-commercial research.

Ket point: Impact indicators have been identified for food research activity but no targets have been set

2.20 The performance indicators specified in *Teagasc 2000* in relation to food research include some which reflect the potential commercial value of the innovative technologies. For example, the quality and commercial viability of the technologies developed will be assessed in terms of the proportion of the programme which is commissioned or by the proportion of projects where in-company products or processes are improved. These are reasonable proxy measures of the impact of the research sub-programmes.

2.21 No targets have been set for any of the food research impact indicators. Without targets (and associated information about the current situation and planned time frames), the evaluation of effectiveness will not be possible.

2.22 Since food research (both commercial and pre-commercial) is ultimately intended to contribute to industrial output, cost-benefit analysis techniques could be used to appraise projects and to evaluate programme outturns. While there are practical measurement difficulties involved, such techniques are often applied in private sector research and development operations.

2.23 Teagasc believes that there are severe limitations to the use of cost-benefit analysis techniques as a tool to evaluate alternative research proposals before they are undertaken. For example, they state that the outcome of the analysis will be dependent on the assumptions made about the timescale for the uptake of the technology. However, the particular advantage of using such techniques is that they require the expected benefits to be specified and the underlying assumptions to be spelled out.

2.24 The National Food Purity Database, currently being developed by Teagasc as one of the projects in the food safety research programme (see case study 2) should, when completed, contribute to the Authority's ability to establish the current position in relation to food safety and to monitor the impact of the research programme.

Effectiveness of Research into the Rural Economy

2.25 Long-term trends are continuing to have an impact on the structure of agriculture at a time when fundamental changes are also occurring in EU policies on agriculture, trade and rural development. Against that background, Teagasc has identified an on-going need for research and analysis of the agri-food sector and of the economy and social structure of rural areas. Continuing assessment of the relative economic importance of farm enterprises and trends in market demand for food products are also regarded as essential inputs to the development of national policies and strategies.

2.26 Rural economic research is grouped into four sub-programmes

- **agri-food economics**, focusing on the impacts of policy developments (proposed or actual) on the agri-food sector
- economic and policy models of **rural development**
- creation of **agri-food and rural development databases** (including the annual sample-based National Farm Survey)
- **economic and statistical services** to national and international agencies.

2.27 The objectives stated for rural economy research are generally expressed in terms of planned activities rather than as a set of desired outcomes or impacts. For example, the objective for agri-food economics research is "to project the impact of policy developments and changes ... on the competitiveness of the agri-food industry". In that case, the Authority can achieve its objective by carrying out the planned research activity but this would not demonstrate that the research had impact or was effective in any way.

Key point: No formal arrangements are in place to evaluate the impact of the rural economy research programme

2.28 The effectiveness of rural economy research depends on the quality of the work undertaken. Evaluation of performance should therefore reflect aspects of quality such as relevance of issues, comprehensiveness of the research programme and depth and reliability of analysis. Since these aspects are difficult to quantify, establishing the effectiveness of the programme would probably involve finding out the opinions of stakeholders and of relevant independent analysts. There are no

formal arrangements of this kind for evaluating performance for this programme, although stakeholders are involved in approving and monitoring the relevance and quality of some individual projects. By extending this kind of involvement of stakeholders, a more comprehensive system for evaluating programme effectiveness could be developed.

2.29 Teagasc has identified four performance indicators in relation to its rural economy research programme (see Appendix A). As in the other research areas, most of these indicators relate to the efficiency of project management. This reflects the particular difficulty in quantifying programme impacts in this area.

Effectiveness of the Advisory Services

2.30 Teagasc's advisory services are designed to assist farm families to maximise income (both from farming and other sources) and to exploit opportunities for development. They also aim to help farmers deal with the many changes in world trade, agricultural policy, consumer expectations and technological change which are impacting on agriculture.

2.31 Different kinds of advisory services for different kinds of farmers are proposed in *Teagasc 2000*.

- Teagasc estimates that around 20,000 full-time farmers operate commercial farm business enterprises. This classification is based on the scale and intensity of agricultural production. Teagasc's **Technology and Business Service** will establish a client base of 15,000 farmers from within this group with a staff of around 140 advisers and specialist consultants.
- The remaining 110,000 farmers operate less intensively or on a smaller scale, on a full-time or part-time basis. This group is the target population for the **Rural Viability Service**. Teagasc aims to deliver this service to about 50,000 of these farmers, using a staff of approximately 240 advisers and farm business planners.

2.32 Advice is delivered to farmers on a one-to-one basis (through office consultations and on-farm visits), by means of group events such as discussion groups, on-farm demonstrations and open days, lectures/presentations and dissemination of advisory documentation.

2.33 Most advisory services are provided on a fee-paying basis. The level of fees charged is based on the size of the farm business and the amount of time involved in the delivery of one-to-one services. The expected level of cost recovery is higher for Technology and Business Service clients than for the Rural Viability Service clients. Advisory services are provided free of charge for around 2,000 smaller farmers who have been identified as having significant development potential.

2.34 The overall objective for the advisory services is to assist farm families to adopt improved practices and better business management, thereby increasing output and income. Four priority advisory sub-programmes have been identified

- a sub-programme for **improving the competitiveness of all farm enterprises**, through the adoption of low-cost production technologies and business practices
- a **rural viability and diversification** sub-programme, aimed at helping farm families, whose farming businesses are under commercial pressure, to improve the viability of their farms and to encourage diversification and exploitation of additional income opportunities both on and off the farm
- a **sustainable farming** sub-programme, particularly in terms of minimising negative environmental impacts of agricultural practice, with special attention given to better fertiliser use and waste management strategies
- a **food safety and quality** sub-programme to ensure that on-farm producers adopt the technology needed to meet the standards of food safety and quality assurance schemes.

Key point: Clear and relevant impact objectives have been set for the advisory service

2.35 In *Teagasc 2000*, the objectives of each of the advisory sub-programmes are generally expressed in terms of impacts on farming practice and business. For example, the objectives for improving the competitiveness of agriculture include the objectives of 'producing lowest cost milk and meat' and 'reducing grain production costs'. These objectives are clear and relevant to the achievement of overall advisory service objectives but require refinement in terms of identifying how impact is to be measured and what targets are to be achieved.

2.36 It is not clear from *Teagasc 2000* if the sub-programme objectives are to be achieved in relation to farmers who are Teagasc clients or in relation to farmers generally. This has implications for the design and conduct of effectiveness evaluations which should be carried out from the point of view of the target group. Teagasc states that the impact of its advisory programmes must be assessed primarily in relation to its clients.

2.37 The performance measures for the advisory services adopted in *Teagasc 2000* generally relate to advisory activity or outputs rather than to impacts. For example, performance will be measured in terms of the number of clients of the Business and Technology and Rural Viability Services. Other measures include the number of discussion groups established and the number of participants in the groups.

2.38 The proportion of all farmers who are clients of Teagasc is a measure of the activity of the advisory programme. As farmers have a choice in whether they avail of the Teagasc advisory service, it can also be used as an indicator of effectiveness.

Key point: **Impact targets have been stated in advisory service annual activity plans but have not been adopted formally as programme targets**

2.39 The annual activity planning for the advisory services contains elements of impact quantification and target setting. Typically, plans are set out in terms of types of agricultural production (dairying, beef production, tillage, etc.) or special initiatives such as the 'Cash in on Grass' promotion, designed to maximise exploitation of Ireland's natural advantage in grass-based agricultural production systems. In most cases, the focus of the plans is clearly on the achievement of impacts on on-farm production systems. Case study 3 describes the target impacts in relation to dairy production costs indicated in the 1998 advisory service plan.

2.40 In practice, Teagasc has set impact targets for many of the aspects of the advisory service in the annual service plan. This provides a basis for identifying and adopting appropriate medium-term impact targets for the advisory sub-programmes.

Case study 3

Profitability in dairying

The 1998 advisory programme plan for dairying enterprises has the following stated objectives

- to improve dairy herd profitability
- to improve milk protein percentage
- to improve grassland management
- to support/promote quality assurance/food safety
- to optimise benefits from agricultural support schemes.

The plan identifies a long term impact target in relation to the improvement of dairy profitability. (Targets are also set for the other objectives.) The aim is to reduce the average cost of production of a litre of milk by 15,000 advisory service clients to 9p by 2005

The objective is clearly stated and is capable of measurement. The impact target is precise and includes a time frame over which the target is to be achieved. The plan refers to the national average unit cost of producing milk in 1996 (12.4p/litre, according to the National Farm Survey) as a baseline. While this is useful in providing a context for the target, it may not be particularly relevant in establishing the impact of the advisory service in improving profitability of the target 15,000 dairy farmers, some of whom already have a unit production cost significantly lower than the national average. The advisory programme plan acknowledges that some of Teagasc's better-performing clients already produce milk at a cost of 9p/litre.

Effectiveness of Training

2.41 Training and education in agricultural production systems and in the business skills necessary for successful farm enterprises are regarded by Teagasc as a central element in the achievement of its overall objectives of increasing farm output and farm incomes. They are a primary mechanism for transferring technology to the farming community.

2.42 The training and education programme is divided into a number of streams, reflecting the needs of different parts of the agriculture workforce and rural community. The bulk of the training resources (around 90%) are concentrated on services for new entrants to agriculture and horticulture with the balance being used to provide training and education for those already engaged in agriculture or rural enterprise. The training programme includes separate training plans for

- prospective entrants to full-time farming, with more specialised training for those expecting to work full-time in commercial farming
- prospective entrants to part-time farming
- prospective entrants to horticulture at supervisory or managerial level
- other workers, including prospective employees or operatives in agriculture or horticulture
- adult education for practising farmers and horticulturists, rural women and people engaged in or considering diversified rural enterprises.

2.43 The Certificate in Farming (CIF) is regarded as the key training scheme for new entrants to farming. Initiated in 1983, over 11,000 people have completed the three-year course, which includes a three-month farm placement. For most participants, the course is provided in one of a number of agricultural colleges, some of which are run by Teagasc itself and some privately-run but substantially funded by Teagasc. There are also part-time and distance learning options for participation in the CIF to meet the needs of students who are not in a position to attend a college full-time or to undertake the prescribed farm placement.

2.44 Changes in the structure of training for new entrants to farming were set out in *Teagasc 2000*. These include a reduction in the duration of the CIF from three to two years, by concentration of the course work element. Part-time and distance learning options for participation will continue. In addition, the option of pursuing a three-year Diploma in Agriculture course will be available for those planning on taking over the operation of full-time commercial farms. This will usually include a first year of full-time course work in common with CIF students, a one-year farm placement and a further year at an agricultural college with specialisation in one of a number of options such as dairying, arable crops, pig or poultry management, or farm machinery.

2.45 The training and education courses offered by Teagasc are designed to have a direct impact on the knowledge and competence base of the workforce in the agricultural and related sectors. The objectives for most of the courses are expressed in those terms and emphasise the development of both technical and business skills in the workforce.

Key point: Teagasc has adopted some impact measures for training but better measures are available

2.46 The performance measures for training and education as adopted in *Teagasc 2000* are relevant to the stated impact objectives but need to be developed further for purposes of effectiveness evaluation. The measures chosen are: the number of participants in courses and the number of course graduates obtaining relevant employment or implementing the improved practices learned. Better measures in terms of impact would include, for example, 'the proportion of entrants to full/part-time farming who have obtained the CIF', or 'the proportion of full-time farmers who

Case study 4

Evaluation of the effectiveness of the Certificate in Farming

The objective of Teagasc's training programme for prospective full-time farmers as stated in *Teagasc 2000* is 'to ensure that entrants to full-time farming acquire the technical and managerial knowledge and skills required for successful commercial farming'. The main scheme for delivery of the knowledge and skill is the Certificate in Farming (CIF) which has been running since 1983.

In 1996, Teagasc conducted a postal survey of a 10% sample of the almost 8,000 recipients of the CIF between 1986 and 1994. The main findings were

- At the time the survey was undertaken, 72% of the respondents were in full-time farming and a further 20% were in part-time farming.
- 63% of full time farmers and 48% of part-time farmers either own or lease all or part of the farm. This was higher than expected given the relative youth of many of the respondents (most being in the range 22 to 30).
- 50% of respondents working full-time in farming stated they are the sole or main decision makers on the farm. A further 38% stated they had a significant input into farm decisions.
- 75% of those engaged full-time in farming and 63% of those engaged part-time were clients of Teagasc's Advisory Service.
- 24% of respondents stated that a new enterprise had started on the home farm since they had completed the CIF.

The survey provides valuable information about the extent to which CIF graduates are employed in farming or the wider agriculture industry and the likelihood that they may have an impact on agricultural production practice. This kind of evaluation could be broadened out to obtain information about the qualifications of all entrants to farming in a particular period to establish what proportion of entrants Teagasc provides with the necessary knowledge and skills.

hold the CIF (or have equivalent competence)'. Measures like these would help Teagasc to focus on the adequacy of the scale of training provided in terms of the skills requirement in agriculture.

2.47 Teagasc undertakes demographic and labour force analysis of the structure of the agricultural/rural community. Supplementing this with further analysis of achieved training or qualifications (such as that described in case study 4) should allow them to establish the existing situation in relation to training needs and assist in setting impact targets for the future.

Conclusions

2.48 Teagasc has in place many of the elements of a system to evaluate the effectiveness of its programmes but key aspects are missing.

- There is a strong focus on impacts in the statement of sub-programme objectives in *Teagasc 2000*.
- Many of Teagasc's planned programme impacts can be quantified but with very few exceptions, Teagasc has not set impact targets.
- Where impacts cannot be quantified, alternative means of evaluation need to be adopted but formal arrangements for such evaluations have not been put in place.
- Evaluations of effectiveness of some sub-programmes have only occasionally been carried out.

3 Evaluating Organisational Effectiveness

3.1 Evaluating the overall effectiveness of a public sector organisation is a more complex process than the evaluation of individual programmes or sub-programmes, though the basic approach is similar. Thus, the following elements are required in evaluating the overall effectiveness of an organisation,

- a clear statement of the impact objectives which the organisation aims to achieve
- a set of performance measures which are relevant to the stated objectives, where possible, with targets to be achieved in specified time periods and reliable systems to monitor achievements on an ongoing basis
- alternative approaches to evaluation of effectiveness where the planned impact objectives are not amenable to measurement
- well structured evaluations at the right time across the full range of the organisation's activities.

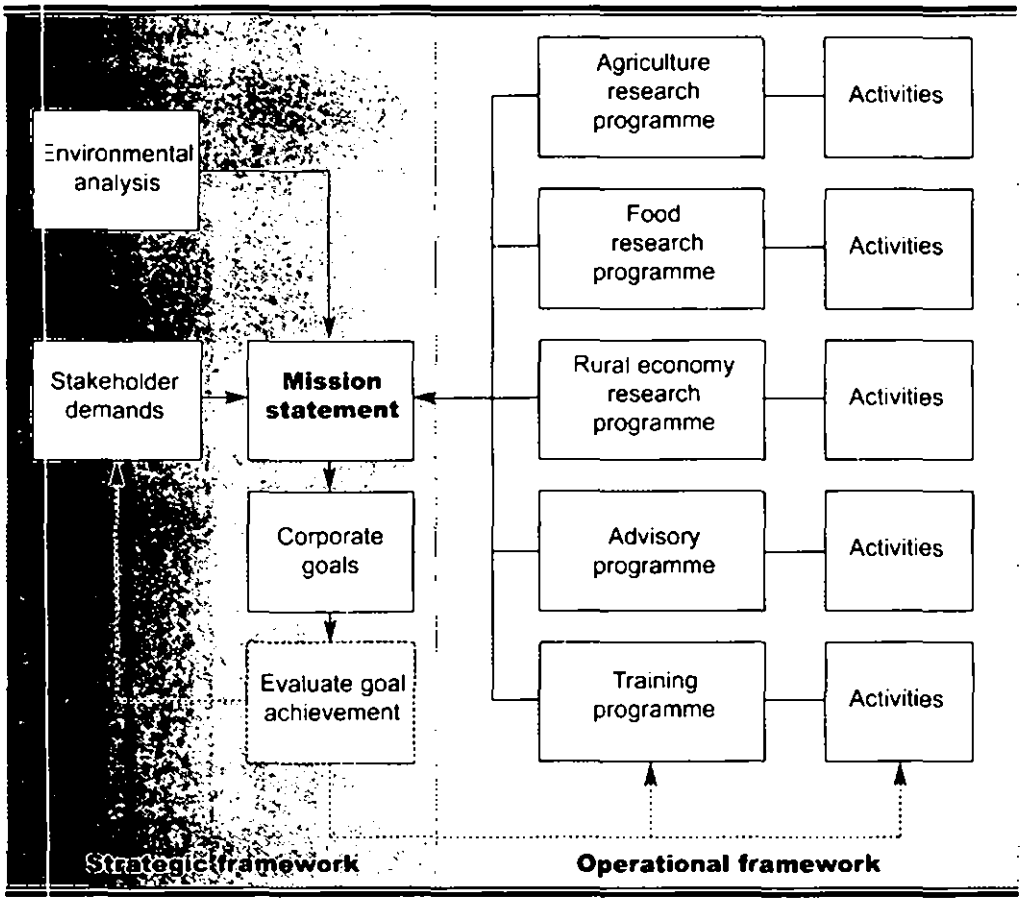
3.2 The extra complexity in evaluating overall organisational effectiveness arises because public sector organisations typically aim to achieve several impacts simultaneously, some of which may conflict. For example, in Teagasc, advice aimed at improving food safety by changing on-farm production/handling methods for cattle may result in technologies which increase the costs of production of beef. Even when objectives are not directly in conflict, the activities designed to achieve different objectives may be in competition for scarce resources.

Identifying the Organisation's Impact Objectives

3.3 Teagasc adopted a strategic management approach to its operations from its establishment. It has produced a series of major strategic planning documents since 1990 of which *Teagasc 2000* (published in July 1998) is the most recent.

3.4 The strategic planning model used in developing the *Teagasc 2000* statement of strategy (see Figure 3.1) is similar to that adopted by many organisations in the public sector. It involved extensive consultation with Teagasc's stakeholder groups to identify their needs and priorities. This was coupled with analysis of the Authority's operating environment, including analysis of the implications for its effectiveness of external opportunities and threats. The potential of the organisation's resources to deliver the kinds of services required by stakeholders was also taken into account. Based on this process, an overall organisational mission statement and associated corporate goals were drawn up.

Figure 3.1 Teagasc's strategic planning model



3.5 Evaluation of the achievement of Teagasc's corporate goals should form a key part of the strategic planning framework. It would serve the dual purpose of informing the stakeholders in Teagasc about how well the organisation is serving their needs and of identifying for Teagasc management how programmes and activities might be adapted better to meet the corporate goals.

Key point: Teagasc 2000 does not identify how the achievement of corporate goals will be evaluated

3.6 *Teagasc 2000* describes the Authority's role in terms of serving the needs of three distinct communities of interest

- agricultural and rural communities
- the food production industry
- those involved in the development of policy and services for agriculture, food production and rural development, including government departments, interest groups, academic and other researchers.

Figure 3.2 Teagasc's mission statement and corporate goals

Mission statement

To provide innovation and technology transfer services for the sustainable development of the agri-food sector and rural communities through integrated research, advisory and training programmes

Corporate Goals

- the development of the human resources required in agriculture, the food industry and rural development
- the production and manufacture of food products of assured safety and consistent quality and food ingredients with improved functional attributes
- the further development and more extensive application of sustainable grass-based milk, beef and sheep production systems, and also crop and pig production systems
- the provision of policy analysis in relation to the agri-food industry and rural development and supporting the establishment of alternative farm enterprises and rural businesses.

Teagasc's mission statement and corporate goals (see Figure 3.2) are expressed in terms of meeting the needs of its three target communities except for the corporate goal relating to rural policy analysis. In that case, the goal focuses on outputs. The focus on the needs of the target communities provides a clear starting point for carrying out effectiveness evaluations.

3.7 The corporate goals are very similar to the statements of objectives for Teagasc's five programmes. This suggests that carrying out the planned programme activities should result in the achievement of the desired impacts. Comprehensive evaluation of the extent to which the corporate goals are achieved would be a basic test of the consistency between overall corporate goals and the objectives of operational activity.

Contributing to the National Science and Technology Capability

3.8 Although it is not included in the corporate goals set out in *Teagasc 2000*, Teagasc management state that the Authority has a further primary objective. This relates to the extent to which Teagasc contributes to the national scientific and technological capacity and particularly to the scientific and technological capacity needed to develop the agriculture and food sectors. They argue that vibrant research programmes involving young researchers at the peak of their creativity are needed to drive innovation and technology transfer, leading to continued growth. They propose that scientific and technological capacity should be assessed in terms of indicators such as the level of expenditure on research, the average age of researchers and the level of international recognition of the work produced.

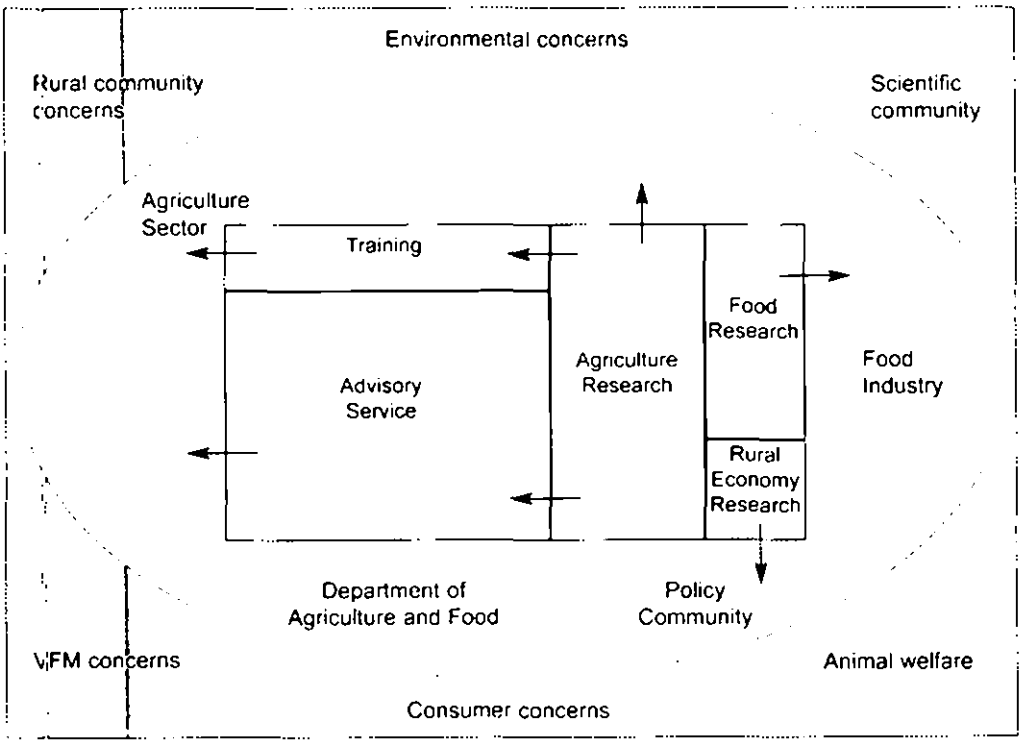
3.9 The argument in favour of Teagasc contributing to the development of a national scientific and technological capacity suggests that having such a capacity is an end in itself. In fact, that capacity is a means to achieving desired impacts such as economic growth or technological advances in industry or agriculture. Consequently, the degree to which Teagasc contributes to the national scientific and technological capacity should not form part of the assessment of its effectiveness.

Effectiveness Evaluation Strategy

Key point: Organisations should evaluate their effectiveness from the point of view of those they serve

3.10 The effectiveness of an organisation should be evaluated from the point of view of those the organisation plans to serve. Representatives of the stakeholders affected by Teagasc operations are consulted in a variety of ways. For example, agriculture producers and food processors are involved in research programme liaison groups. Teagasc receives feedback on advisory and training services through discussion groups and from local farmer bodies. Stakeholders are also represented on the board of Teagasc. This network of contacts provides a sound base for stakeholder involvement in a comprehensive effectiveness evaluation system. Figure 3.3 summarises Teagasc activities in relation to its target communities and the wider operating environment.

Figure 3.3 Operating environment for Teagasc activities



3.11 Teagasc's mission statement and corporate goals are expressed in terms of impacts on the agriculture and food sectors as a whole. Consequently, whole-sector impacts should be established to evaluate Teagasc's overall organisational effectiveness. Some of Teagasc's programmes focus on meeting the needs of its (mostly fee paying) clients and should be evaluated from their point of view. However, it cannot be assumed in such cases that programme effectiveness is evidence of overall organisational effectiveness.

3.12 From the agricultural community's point of view, Teagasc's impact as an organisation should be assessed in terms of changes in technology used on farms. Developing increasingly sophisticated agricultural technologies on the research side could indicate better programme effectiveness but would not increase overall organisational effectiveness unless the advisory and training sides were capable of transferring those technologies to farms on a substantial scale.

3.13 While the ultimate test of organisational effectiveness is the impact the organisation has on the target communities, effectiveness evaluations can examine all the activities within the organisation which contribute to the achievement of impacts. Thus, the links and relationships between relevant elements of different programmes can be evaluated. This is recognised within Teagasc. Case study 5 describes a review of Teagasc activity in relation to sheep production which reviewed both sheep research and the process of ensuring the take-up of best practice by sheep farmers.

Measurable Impacts

3.14 Teagasc has not selected performance measures or indicators in relation to the achievement of any of its corporate goals. Consequently, there are no quantified impact targets for what it is trying to achieve.

Key point: Most of the impacts which Teagasc is trying to achieve could be measured

3.15 Many of the kinds of impacts which Teagasc seeks to have nationally are amenable to measurement, target setting, monitoring and evaluation. The kind of impact measures set for the advisory programmes could also serve as overall organisational impact goals. For example, the corporate goal of achieving

> *the further development and more extensive application of sustainable grass-based milk, beef and sheep production systems*

is closely related to the objective of the grassland research sub-programme. This aims to develop systems for

> *the production of low cost milk (9p/litre), suckler beef (143p/kg carcass) and mid-season lamb (136p/kg carcass) of the required quality and safety with minimum impact on the environment.*

Case study 5

Review of Teagasc sheep research and technology transfer

Teagasc commissioned consultants from New Zealand to carry out a comprehensive review of its research and technology transfer for the sheep industry. Taking into account the level of resources committed to sheep production technology, the review assessed

- the relevance of the research activity to current and future national needs
- the strengths and weaknesses of the research activity
- the international quality of the research activity
- the effectiveness of the technology transfer between the research and advisory services and to end users
- the dynamics of the sheep research and technology transfer and their further development towards higher quality and new goals
- areas for potential co-operation, both national and international.

The review was completed in October 1998. It included analysis of the current situation in relation to sheep farming and the lamb meat processing industry. Among the main findings and recommendations were

- Integrated best practice sheep production systems should be developed in conjunction with an 'enthusiasts' group of 150 to 200 sheep farmers selected from among Teagasc's clients. This group would have a major influence on the priorities for research and development, technology evaluation on farms and technology transfer. The approach would involve
  - collection of physical and financial data at whole farm enterprise level
  - structured analysis of the data
  - benchmarking of individual farmers against the group
  - group interaction through workshops led by specialist Teagasc advisers
  - interaction with individual farmers by general Teagasc advisers.
- The current systems to assess research and development projects and for prioritising research areas should be further developed and formalised.

It should be noted, however, that the target production price and quality levels to be achieved nationally would probably be considerably different to those specified for experimental best-practice systems.

3.16 It may be necessary to set more than one impact target in relation to some of the activities Teagasc is trying to influence. For example, in relation to the more extensive application of sustainable production systems for milk or sheep meat, (national average) production price and product quality targets could be set. Alternatively, a target could be set for the percentage of farms nationally which meet specified production system criteria. Achievements in relation to the environmental sustainability of production methods could be measured across different types of production systems in terms of national pollutant discharge levels.

3.17 With multiple related targets, it would probably be necessary to develop a scorecard system for monitoring of achievements. This would list all the targets

together in a framework which emphasises the relationships between the various measures and reveal when achievements in one respect were out of balance with achievements in other areas.

Non-measurable Impacts

3.18 Teagasc's goals for research into rural economy are not so amenable to quantification. The quality and relevance of the analysis produced are the most important aspects of the research. Alternative non-measurement based means of evaluating effectiveness, such as independent peer reviews of the work programme and outputs, need to be adopted.

Systems for Effectiveness Evaluation

3.19 Teagasc's existing arrangements for carrying out evaluations are included in a document describing the Authority's programme management system, produced in October 1998. Appendix B reproduces the diagrams in the document which summarise the programme management arrangements.

3.20 The current system does not distinguish clearly between reports which form part of Teagasc's output (such as scientific publications and end-of-project reports), routine management reports on operations and activities and evaluations of the outputs and impacts achieved. The system should be amended to show the specific provisions for evaluation as a separate section.

3.21 The production of end-of-project reports for all completed multi-annual research projects is a relatively recent initiative in Teagasc. These are designed to document the results of the research programme and to improve the transfer of knowledge about new technologies to the advisory and training services through compilation of a comprehensive technical digest. This kind of reporting of results may be effective as a vehicle for technology transfer and is a step in the right direction but it does not constitute evaluation of the research programme because the impacts are not assessed (see case study 6).

Key point: Teagasc should produce a plan for comprehensive evaluation of goal achievement

3.22 Teagasc's existing arrangements carry a strong risk that the evaluations which are carried out and reported on will be selective rather than comprehensive.

- Cost-benefit analyses of impacts have been carried out for a number of programme areas and Teagasc intends to apply the methodology developed to

other areas in the future. It also intends that where impacts cannot readily be quantified, reviews by external experts focusing on quality and relevance will be progressively undertaken on a number of programmes. This indicates a commitment to carrying out evaluations. However, a schedule of evaluations to be carried out within a given time frame covering all aspects of Teagasc's operations should be drawn up.

- According to the programme management system document, Teagasc highlights the more important research results given in its end-of-project reports, along with important outputs of the advisory and training services, in a publication entitled *Teagasc Achievements*. This is intended to be an annual publication but only one edition has so far been produced (in 1996). The title of the publication and the content of the 1996 edition suggests a strong element of selectivity, with only positive results being publicised. While the 1996 document may have been useful for a range of Teagasc purposes, it is not a substitute for formal effectiveness evaluation reporting.

Selectivity is inconsistent with the need to evaluate all aspects of operations and to recognise areas which need improvement as well as those where good results are already being achieved.

3.23 Some evaluations of Teagasc's impacts are carried out by other agencies for a variety of purposes. For example, external evaluators have been appointed by the EU and the Department of Agriculture and Food to assess Teagasc's performance in relation to the achievement of targets for EU-funded programmes. To the extent that such external studies address adequately the issues identified in Teagasc's effectiveness evaluation schedule, they may reduce the need for Teagasc to commission its own studies. Ultimately however, Teagasc retains the responsibility for ensuring that its effectiveness is comprehensively and adequately evaluated.

Case study 6

Two examples of end-of-project report findings

- The end-of-project report on research into methods of testing food samples for the presence of pathogens concluded that the project had identified a means of reducing the waiting time for reliable results from 3 days to 15 minutes and which was suitable for use in industry. The report did not explore what impact this technology could have on the economics of food production.

- The end-of-project report on research into herbicide use in cereal growing concluded that the project had established that herbicide used at 50% of the manufacturers' recommended rates gives only slightly lower levels of weed control than full application rates but does not lower grain yield. The impact of this finding, e.g. in terms of percentage reduction in cereal production costs or environmental impacts, was not considered.

3.24 Teagasc's research into rural economics and the compilation of statistical databases (such as the National Farm Survey and food safety databases) contribute to its ability to monitor many of the areas where it seeks to have impact. Together with data from other sources, such as the Central Statistics Office's estimates of agricultural output, land holding and use patterns and demographic and labour force trends, these should facilitate the setting of targets, the monitoring of progress and the periodic evaluation of effectiveness.

3.25 Teagasc's system for evaluation should identify who within the organisation is responsible for ensuring that an adequate programme of evaluation is carried out and for overseeing the design and conduct of studies. The way in which representatives of stakeholders are to be involved in effectiveness evaluation should also be clarified.

3.26 The level of resources available for evaluations should be defined. Many evaluations carried out in the past or currently underway have been commissioned from independent consultants or experts, including specialists from agricultural research bodies in other countries. To date, Teagasc has preferred to use consultants rather than establish an in-house evaluation unit but it has not ruled out following the latter approach.

3.27 The adoption of formal systems for evaluation of effectiveness should not be allowed to result in rigid procedures and unnecessarily expensive data gathering exercises. Instead, the aim should be to develop a culture of evaluation within the organisation and to make maximum use of existing management systems in evaluating effectiveness.

Conclusions

3.28 Teagasc currently has in place many of the elements required to evaluate the effectiveness of its operations. The remaining elements required could be developed relatively easily, particularly in light of the statement of impact objectives articulated in *Teagasc 2000*. The crucial missing element is a set of quantified targets, showing as accurately as possible how the current situation is expected to change over a defined period as a result of Teagasc's activities. In situations where quantified targets cannot be established, alternative evaluation processes should be adopted.

3.29 Teagasc should draw up a cyclical plan for the systematic evaluation of organisational effectiveness over a defined period. This should include designation of the resources required for carrying out the evaluations. The arrangements for carrying out the evaluation work, including the extent to which external consultants will be used, should be set out more clearly.

Appendices

Appendix A Objectives and Performance Measures for Teagasc Programmes, 2000-2005

Programme Objectives	Sub-Programme Objectives	Performance Indicators
Agriculture Research To develop livestock and crop production systems designed to reduce production costs and produce food of assured safety and consistent quality in a way that is compatible with environmental protection and animal welfare	*Grassland - Dairy, Beef and Sheep*: The production of low cost milk (9p/litre), suckler beef (143p/kg of carcass) and mid-season lamb (136p/kg of carcass) of the required quality and safety with minimum impact on the environment *Animal Nutrition and Supplementary Feeding*: To develop feed regimes for efficient and consistent quality animal production *Animal Breeding and Reproduction*: To improve the reproductive efficiency of farm animals and to identify the most suitable breeds and/or genotypes for different feed and management systems *Animal Health and Welfare*: To develop management strategies to promote positive herd health and welfare status so as to efficiently produce safe and quality food *Tillage Crops and Horticulture*: To develop improved crop production with particular regard to increasing production efficiencies while improving product quality and safety and minimising environmental impacts *Rural Environment*: To quantify the environmental response of various agricultural systems and to make available to farmers the information required to ensure environmental sustainability *Technical Services*: To provide a range of analytical and consultancy services to farmers, agri-businesses and other public and private clients	Number of projects/contracts completed on schedule Number of end-of-project reports completed on schedule Number of scientific/technical/popular publications Number of open days, training courses, workshops and symposia Number of in-service training courses for advisors/trainers Amount of industry commissioned research and consultancy Number of EU Framework contracts Number of outcomes with commercial/economic potential Level of cost recovery in Technical Services Programme

Appendix A continued

Programme Objectives	Sub-Programme Objectives	Performance Indicators
Food Research Ensure the highest standards of safety, quality and nutrition are consistently achieved in food products Provide the necessary scientific and technological enabling capacity in food products and ingredients	*Food Safety*: To develop preventative measures to ensure the microbiological and chemical safety of Irish food *Cheeses and Fermented Dairy Products*: To improve the flavour, texture, functionality and yield of cheeses and fermented dairy products as a support for competitiveness in product development and differentiation *Food Ingredients*: To identify the compositional and processing determinants of the functionality of food ingredients and develop technologies which improve the functional and nutritional attributes of ingredients and enhance expertise in their use in formulated foods *Beef, Lamb and Pig Meats*: To develop technologies, including packaging systems, for the efficient production of fresh meat products of consistent quality, and convenience meat products that are both wholesome and nutritious *Prepared Consumer Foods*: To identify the major factors which determine the quality of prepared food products and to evaluate processes and functional ingredients for the improvement of existing products and to facilitate the development of new products *Food Nutrition*: To investigate new technologies for the nutritional enhancement of food products and to support product development and marketing strategies that are better informed of diet-health relationships *Technology Transfer*: To raise the innovative capacity of the major food companies and support the development of small and medium scale food businesses through contract research, consultancy and training services	Number of projects/contracts completed on schedule Number of end-of-project reports completed on schedule Number of scientific/technical/popular publications Number of training courses, workshops and symposia Number of EU Framework contracts Number of patents Number of applications trials/pilot plant validations successfully completed Number of product/process innovations tendered to industry Amount of industry commissioned research and consultancy Uptake of research by industry for industrial trials Number of products in market test by industry Number of demonstrated in-company product/process improvements Number of licences Level of cost recovery in Technology Transfer Services

Appendix A continued

Programme Objectives	Sub-Programme Objectives	Performance Indicators
Rural Economy Research To project the impact of policies and other changes on the agri-food sector and rural areas To assess the performance of farm enterprises and changes in market demand for food products and to analyse adjustment processes in rural areas	*Agri-Food Economics*: To project the impact of policy developments and changes in the economic performance of farm enterprises and consumer markets on the competitiveness of the agri-food industry *Rural Development*: To provide the strategic knowledge base to support the continued viability of rural areas *Agri-Food and Rural Development Databases*: To provide comprehensive interactive databases in agriculture, food and rural development related areas *Economic Services*: To provide national and international agencies with up to date statistics on farm enterprises, together with analysis and consultancy services on agri- food economics and rural development	Number of projects/contracts completed on schedule Number of end-of-project reports completed on schedule Number of publications Number of outcomes with national policy or social potential
Advisory Programme To increase farm output and income by ● assisting farm families to adopt improved practices and better management ● developing local leadership and enterprise	*Advisory Programme on Improving Competitiveness*: ● Producing lowest cost milk and meat from grazed grass by animals selected for their ability to perform in grass based systems ● Reducing grain production costs ● Further developing mushrooms, nursery stock and soft fruit enterprises ● Further expansion of pig production together with improved feed conversion through superior breeding, feeding and housing *Rural Viability and Diversification Advisory Programme*: To proactively encourage, stimulate and support farm families who are 'under pressure' to achieve viability through a structured advisory and development programme *Sustainable Farming Programme*: To provide the planning and advisory services that will ensure that farming systems are sustainable, with particular attention to improving fertiliser use, animal manure management, grazing and other management practices *Food Safety and Quality Programme*: To ensure that the producers have the protocols, the knowledge and the skills necessary to meet the standards of food safety and quality assurance schemes	Number of clients of the Business and Technology Service Number of Discussion Groups established Number of participants in the Discussion Groups Number of Monitor Farms established Number of Clients in the Rural Viability Service Number of active participants in the Rural Viability Programme Number of REPS plans prepared and supported Number of people undergoing training for off-farm employment opportunities and for the establishment of new diversified enterprises Number of farms accredited to the recognised Quality Assurance Schemes Number of non-REPS nutrient management plans prepared

Appendix A continued

Programme Objectives	Sub-Programme Objectives	Performance Indicators
Training and Education Programme To ensure entrants to full time agriculture and horticulture acquire the necessary technical and managerial knowledge and skills To ensure that entrants to part time farming have access to appropriate training To provide quality training in agriculture and horticulture to as broad a range of applicants as possible To update the technical and business knowledge and skills of practising farmers and horticulturists To meet the specific training needs of rural women and of people engaged in or considering diversified rural enterprises	*New Entrants to Agriculture* ● To ensure that entrants to full-time farming acquire the technical and managerial knowledge and skills required for successful commercial farming ● To ensure that entrants to part-time farming have access to appropriate training in agriculture and where necessary have access to training for another income generating activity ● To ensure that entrants to horticulture at supervisory and/or management level acquire the technical and business knowledge and expertise required in a modern horticulture enterprise ● To provide quality training in agriculture and horticulture to as broad a range of applicants as possible thereby enhancing the skills base of the sector *Provision of Adult Education*: To update the technical and business knowledge and skills of practising farmers and horticulturists and to meet the specific training needs of rural women and of people engaged in or considering diversified rural enterprises	Numbers of people successfully completing each of the courses on offer Number of course graduates obtaining relevant employment or implementing the improved practices taught in the course

Appendix B Teagasc's Programme Management System

The following tables show the programme management system in place in Teagasc and have been re-produced from the document entitled *Teagasc's Programme Management System*.

Table B.1

Teagasc's Annual Programme Management System

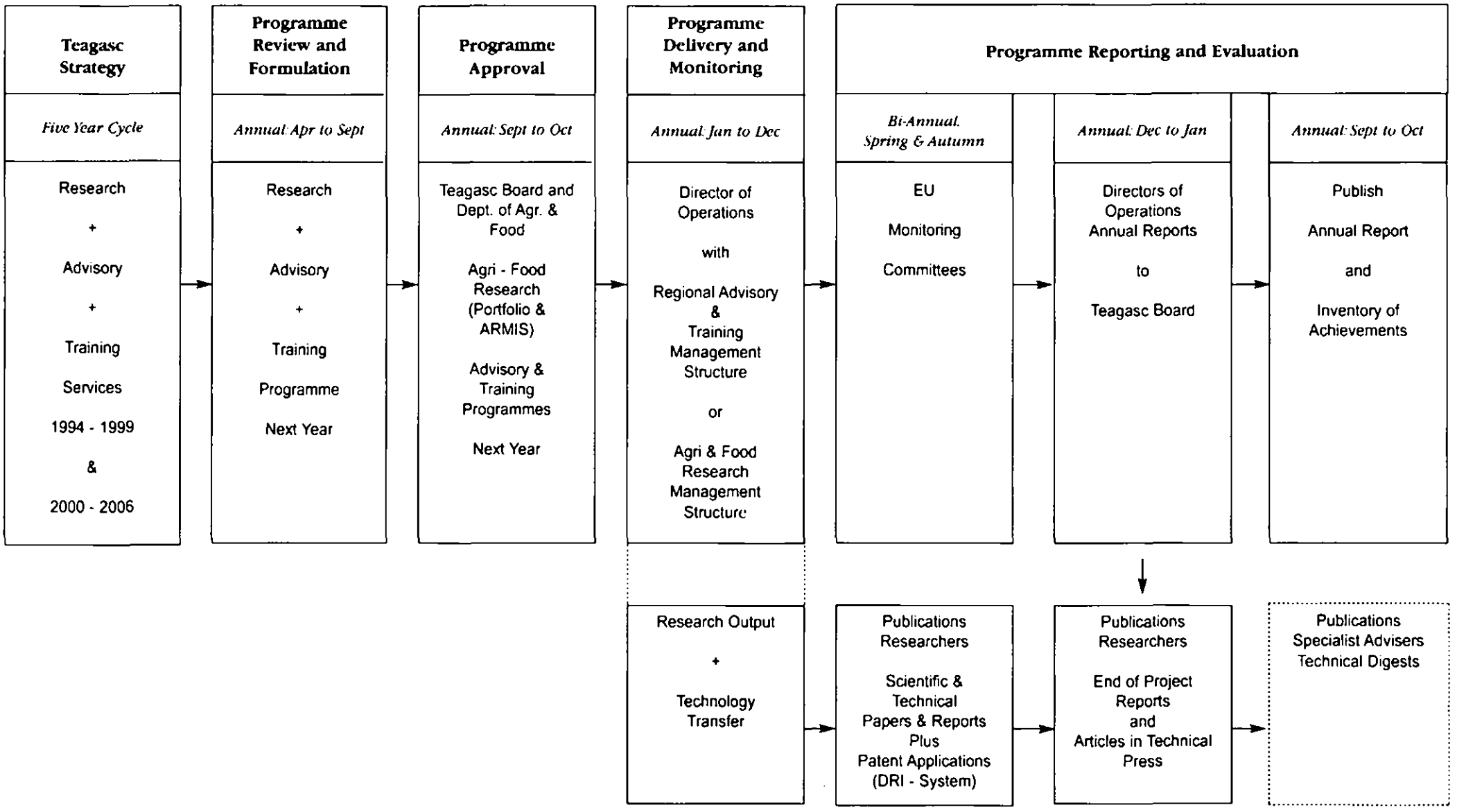


Table B.2

Teagasc Research Programme Management System

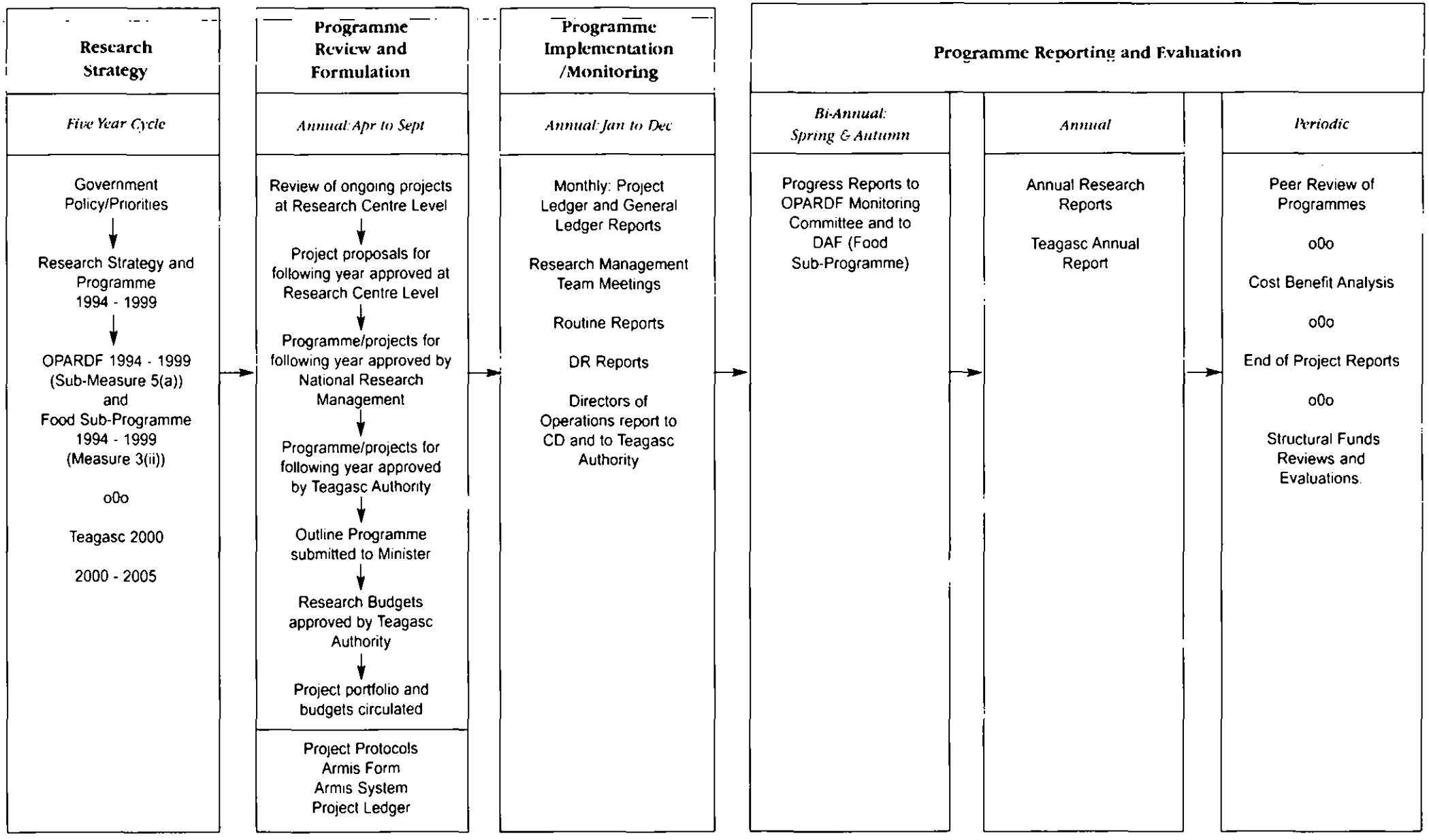


Table B.3

Teagasc Advisory Services Programme Management System

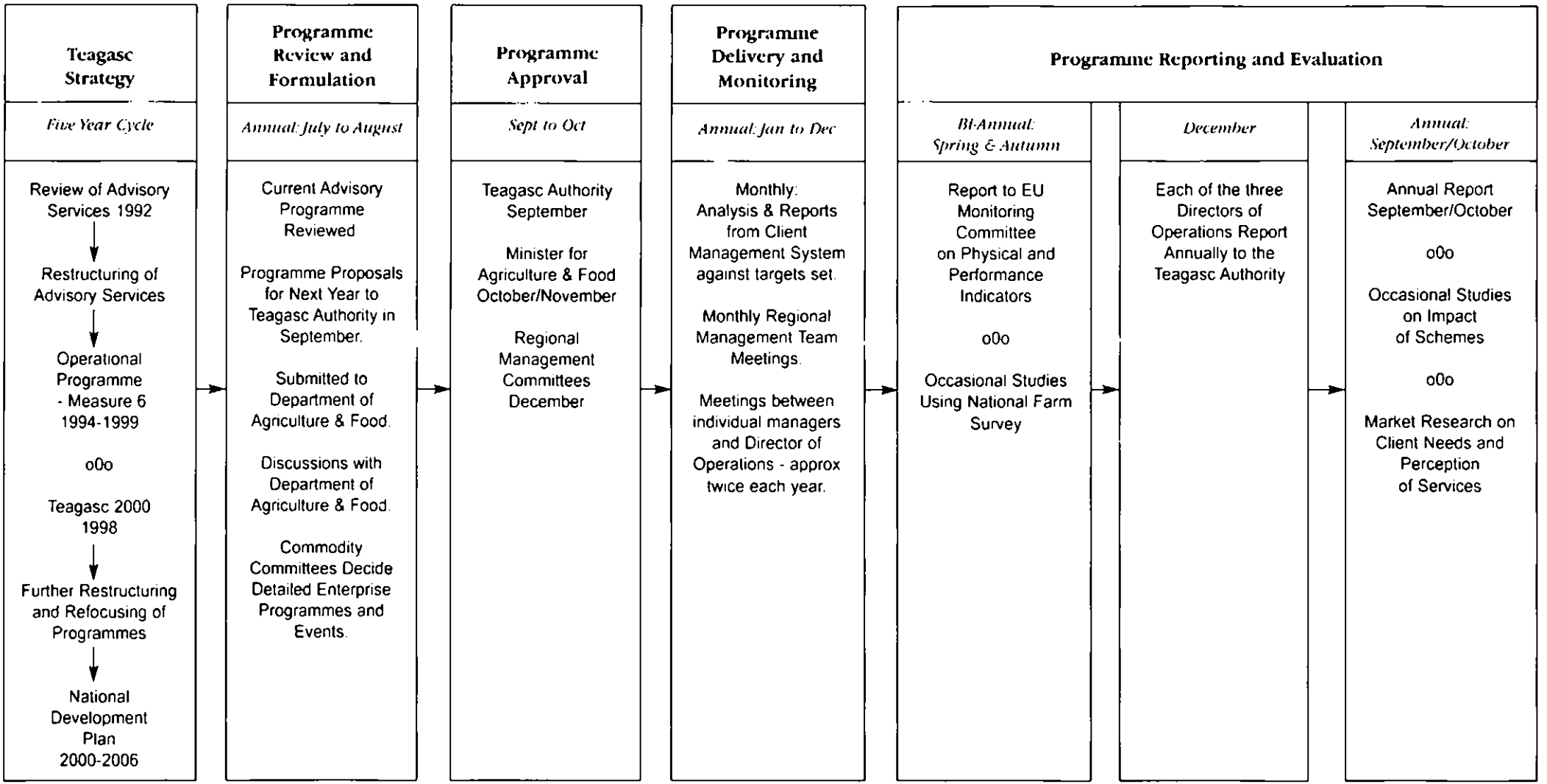


Table B.4

Teagasc Training Services Programme Management System