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Viewpoint

## Commercial R&D linkage with public agro-food institutions

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### Abstract

Recent changes in research policy have shown an increasing reliance on the private sector as a source of funding for public sector research institutes. Accordingly this note reveals the results of a survey into the level and type of linkage between the agro-food industries and the public research institutes. Furthermore, it addresses the motivations for linkage and whether there are any major obstructions to its growth. It concludes that the main motivation for linkage, a search for in-depth expertise, is threatened by the Government's reductions in funding levels. © 1999 Elsevier Science Ltd. All rights reserved.

*Keywords:* Agricultural R&D; Collaboration; Government policy

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### Introduction

Links between individual firms and public research institutes have occurred throughout the history of the agricultural research system. However, only since the 1980s has Government sought to develop mechanisms for collaboration and this has increasingly formed an intrinsic part of Government science planning. Firstly, a number of linkage schemes have been introduced to provide a greater incentive for firms to invest in co-funded research and development (R&D) and secondly, the public sector have been forced to seek external funds by both reducing expenditures for

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applied R&D (Read, 1989) and refocusing the Research Councils towards new markets (OST, 1993). Consequently, increased technology transfer to the commercial sector facilitates national wealth creation and is therefore intrinsic to the success of Government science policy.

Accordingly, this note reveals the results of a survey on private sector activity concerned with the directly quantifiable aspects of linkage and has two objectives. These are namely, (i) to look at levels of research expenditure dedicated to linkage and their subsequent trends since these policy changes and, (ii) to look at the reasons given by companies for either their involvement or non-involvement with the public sector in order to assess their motivations for and against association.

Public agricultural research is predominantly conducted by Biotechnology and Biological Sciences Research Council (BBSRC) institutes and units. Similarly, the agricultural colleges and the Departments of Agriculture within Universities conduct research from their own investigations, or by funds from the BBSRC. The Government also has a collection of establishments that conduct statutory research in or in support of its policy goals. However, potential misunderstandings may have occurred over the role of the public and private sectors in the survey. Firstly, there may have been some confusion by the private sector over the providers of publicly-funded R&D. This is mainly due to the recent changes in the role and structure of publicly-funded science. For instance, as the survey was conducted in 1996, the Agricultural Development and Advisory Service (ADAS), whilst aware of imminent privatization, was still in the public sector. Similarly, Horticulture Research International (HRI) still regards itself as a public sector research establishment (HRI, 1996) and was considered as such in terms of the survey analysis. A second misunderstanding may have occurred within the response by firms surveyed. Specifically, research purely in the private sector is mainly conducted by single firms. However, commercial firms can either be based within the UK or be UK subsidiaries of multi-nationals based in other countries. In conducting R&D for private gain, a number of associations have been observed. These are a collection of firms, either vertically or horizontally linked, which pool their expertise. Research firms can form these consortia across countries. However, in the survey analysis, only the percentage of a company's turnover gained in the UK was collated to remove some distortion from the data collected.

## **Method**

A survey was conducted during November and December 1996 of business units of different sectors of the agricultural and food industries with research activities in the UK. Companies were asked to give a percentage of their UK turnover within the following industries (Table 1).

Company names were gathered from trade directories and from registers provided by relevant associations. Names were then chosen randomly from these lists, irrespective of industry or geographical location. The only criterion imposed was a turnover of less than £100 million. These were considered as small- to medium-sized

Table 1  
Survey response rate by sector and definition

Industry	Definition	Response rate
Food	Processing and production of food stuffs	28% of sample
Agrochemicals	Crop chemicals, including fertilizers	17% of sample
Veterinary and medicine	Animal pharmaceuticals and welfare	14% of sample
Plant and crop	Seeds, horticulture, agronomy and farming systems	13% of sample
Animal science	Breeding, nutrition, lactation and growth	18% of sample
Agri-engineering	Farm vehicles, buildings and computer systems	10% of sample

enterprises (SME) and were first contacted to assess whether they conducted R&D and, if so, a 10-page questionnaire was posted. Of the 1000 firms contacted, 630 conducted R&D of some kind and 271 replied with useful information before the closing date of the survey. Those companies in each sector which had a turnover of over £100 million in the UK were contacted separately to gain a clearer insight into their research activities. Out of 50 large firms contacted, 37 responded. The two surveys had an overall response rate of 29%.

### Level of linkage

Less than half (40%) the companies in the survey conduct some form of linkage with the public sector. Of the 165 companies having no involvement, 7% sought foreign linkage mainly because of organizational obligations, i.e. a centralized research facility in a specific country. Table 2 shows these results disaggregated into

Table 2  
Firm's research expenditure on linkage with the public sector

Industry	Expenditure on own research (£ million)	Expenditure on linkage (£ million)	Level of linkage (%)
Food	221.12	13.21	6
Agrochemical	52.87	06.54	12
Veterinary and medicine	81.96	05.95	7
Plant and crop	31.60	02.14	7
Animal science	32.92	11.29	34
Agri-engineering	13.91	00.74	5
Total	435.10	39.87	9

the six industries and reveals considerable differences in the propensity to conduct linkage with the public sector. On actual expenditures, food and animal science perform the majority of linkage. By percentage to total R&D spend, the agrochemical and animal science industries have more involvement. However, actual commercial expenditures are quite low. The percentage of total actual research expenditures given to collaborative ventures in the survey is only around 9% of total research spend. Accordingly, whilst many firms are involved with public institutions, their financial input is relatively small.

### **Trends in linkage activity**

Data from the public sector on the level of industry input are difficult to obtain. Figures from the HEI sector generally or for agriculture specifically are not available. Similarly, ADAS, before privatization did not reveal its level of industry income. However, the BBSRC gives a figure for overall external income, which includes levy boards and European Government contracts. As a percentage of its total income, this external contribution has grown from 5% in 1986/7 to 8% in 1996/7. Therefore, whilst there seems a positive movement in linkage, its size relative to Government income is still negligible.

When surveyed, the large companies were asked to say whether they were conducting more linkage with the public sector than 10 years ago. Around half (46%) were spending more, with 42% seemingly unaffected by the changes and 12% spending less on UK research linkage.

### **Encouraging linkage**

Given that the trends in linkage activity seem only nominal, the predominant questions are how linkage is formed and what obstructions there are to encouraging linkage. To understand this, firms were asked to give their opinion on linking with the public sector. The firms which had undertaken some form of linkage were asked to give an indication of their reasons for involvement with public agricultural research institutions. Similarly, those firms which had chosen not to become involved with the public sector were asked to give their rationale. The results are presented in Fig. 1.

Fig. 1 is concerned with motivation for linkage. Solely considering the areas that firms identified as 'Very Important', the most prominent reason which emerged was access to public sector expertise in a certain area. When also including the category of 'Important', firm's rated both 'Inadequate Scale of Internal Resources' and 'Similarity in Research and Development Areas'.

The predominant reason for involvement with the public sector is the acquisition of expertise in a certain area. The public institutions offer a very specialized service, giving in-depth expertise in limited subjects, which equates with the BBSRC's re-organization which aimed at creating "a base for multi-disciplinary research"

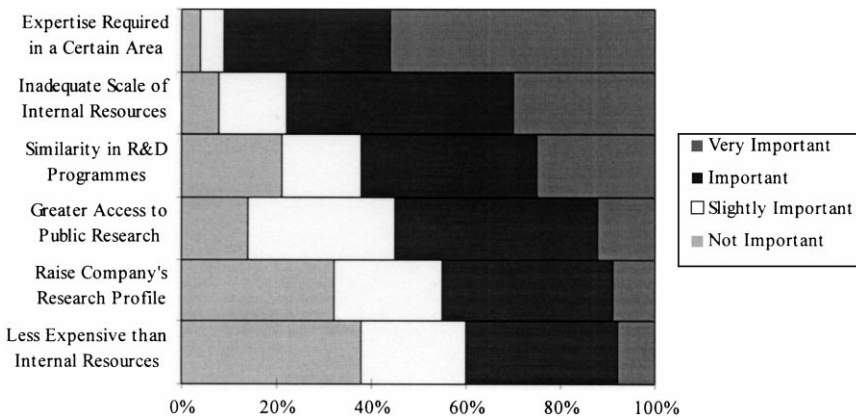


Fig. 1. Motivations of commercial firms for linkage with the public sector, percent.

(BBSRC, 1994). Similarly, the Higher Education Institutes have undergone changes to their organization, refocusing scientific and technological departments to increase their suitability to the needs of industry (Charles et al., 1988). It therefore seems that the changes have developed a more focused R&D base for exploitation by private agriculture.

Firms claiming that the size of internal resources was an issue in linkage could predominantly be found in the SME sector. Consequently, this seems to indicate a point raised by Ruttan (1982), that public R&D existed to promote fairer competition within industries. Similarity in research was also rated as an important reason for linkage. Comparing the perceived similarity between public and private sectors could be a major motivation for increasing linking. This point was analyzed by sector, and whilst high similarity was evenly voiced by most sectors, agri-engineering proved an exception with only 27% of all firms claiming any similarity between their work and that offered by the public sector. This can be explained by the high degree of development work in proportion to the other sectors in the survey. As such there seems an indication that agri-engineering may have suffered the severest of the cuts in public research under the 'near-market' policy. However, it has long been considered that the engineering sector has been the least able to benefit from public agricultural research (Lesser and Lee, 1993). Research work in vehicles is highly appropriable and it is questionable whether public research should intervene in this field.

Fig. 2, below, examines the reasons given by firms for not having become involved with public sector research institutions. However the results are less clear with around 40 to 50 percent of firms stating that all the reasons specified in the survey questionnaire were not important. Nevertheless what does emerge is that, when considering the category of 'Very Important' on its own, firms have voiced concern over a public institute's management of copyright and secrecy. Secondly, including the category 'Important' once again, firms have expressed apprehension over the fact that public

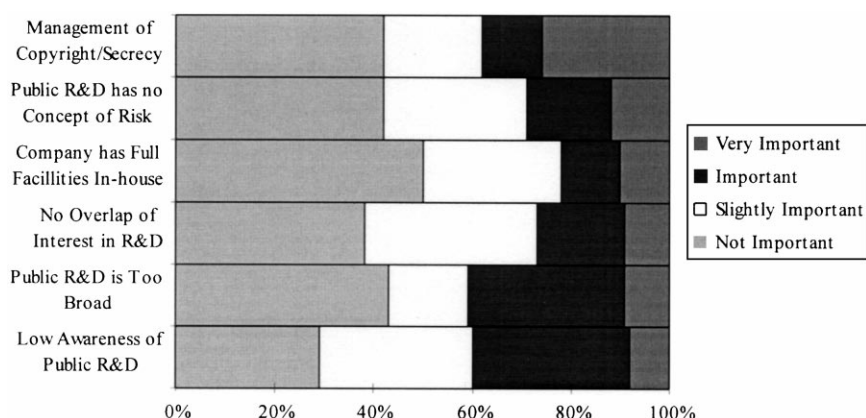


Fig. 2. Obstructions commercial firms for linkage with the public sector, percent.

research programmes may be too broad for their research needs. Similarly, around 40% of firms stated that they have a low awareness of public research programmes.

What emerges as the predominant obstruction to linkage is the management of copyright and secrecy within public institutions. The environment and culture of public R&D is such that secrecy may be difficult to maintain. Similarly, the length of time needed to negotiate contracts is seen as causing a prohibitively high legal cost on the type and level of linkage conducted. The multi-disciplinary nature of public R&D, which encourages discussion between researchers, may be hindered by concerns over the management of secrecy. A potential conflict between the support of the public science base and the encouragement of funding could emerge. As the Government aims for more influence by industry (MAFF, 1996) there is a danger that the multi-disciplinary element of public research will be affected.

That firms will not link with the public sector because the programmes are too broad indicates that the cost of re-organization of the BBSRC may be the depth of expertise lost in releasing personnel and research units. Accordingly, whilst promoting multi-disciplinarity, the public research service may not now be able to accommodate the variety needed to support agricultural research in the UK commercial sector.

Regarding the point raised on low awareness of public programmes, this may reflect a point expressed by Pavitt (1991). A major reason why private firms funded basic research, he stated, was to enable scientific researchers to understand advances in research in both their own and other areas. Consequently, this response may have emerged from the firms which conduct no basic or strategic research. This is an important consideration on the success of linkage policy. As the public sector traditionally conducts the majority of basic research, as opposed to industry, the onus on creating more linkage is on the public research institutes to further increase awareness and relevance of their research to the commercial sector.

## Conclusions

Reduced funds for agricultural R&D are a reality and the science base needs to be increasingly maintained by external sources. On the above evidence the growth in levels of linkage appear to be largely due to the depth of public expertise that the commercial sector values. UK citation rates for agricultural and agricultural-related research disciplines are still high (May, 1997). However, with research suffering from long lags between actual expenditure and final output, which have been estimated from 16 years and upwards, this healthy research base may soon begin to show signs of the cuts inflicted since the mid-1980s. Accordingly, the main motivation for linkage, a search for in-depth expertise, is threatened by the Government's reductions in funding levels. While the Government response to such a situation may be to pump more money into the system, once the expertise and image of scientific excellence is lost it may be difficult to regain.

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