MINISTRY OF AGRICULTURE, FISHERIES AND FOOD

CSG 15

Research and Development

Final Project Report

(Not to be used for LINK projects)

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Project title	A review of current European research on organic farming
MAFF project code	**OFO171**
Contractor organisation and location	ADAS Consulting Ltd, ADAS Redesdale, Rochester, Otterburn, Newcastle upon Tyne NE19 1SB
Total MAFF project costs	£ 45,207
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Executive summary (maximum 2 sides A4)

In support of its policy to expand organic farming, MAFF sponsors a programme of research and extension (through Organic Conversion Information Service) to provide information to producers on organic systems of production. A considerable body of information is also available from Europe, a significant proportion of which may be directly relevant to UK production systems. The purpose of this review is to provide a comprehensive framework which sets out clearly the content and key results of current European research programmes.

The overall objective was to increase the body of knowledge and information available to UK producers and extension workers, and to help direct UK research effort. The priority was to examine northern and western European research programmes i.e. those likely to have the greatest relevance for the UK. This included France, Belgium, Netherlands, Switzerland, France, Germany, Austria, Norway, Sweden, Finland, Spain, Portugal, Italy, Luxembourg, Denmark, and Ireland. The research projects included were current, or very recently completed, and therefore as yet unlikely to have been published in the scientific literature. The review concentrated on organic research rather than "low input", or 'integrated' conventional farming systems.

Key research institutions, major projects and individual researchers were identified. The data collected were compiled into two research directories. The first was a list of research organisations containing 137 entries, detailing by country each institution currently involved in organic farming research, and providing full contact details, Web sites where these exist, and an overview of the research topics undertaken. The second was a project list, containing information on 724 individual research projects, including 88 in the UK.

This included details on location, lead researcher, contact details, project title, project objectives, key words, collaborators, start date and end date. To complement hard copy, the information in both directories is also provided electronically in either Microsoft Word 6 or Microsoft Access formats.

The results enabled an overview to be provided of the range, content and organisation of organic research programmes. Research is currently being conducted in most European countries, with the greatest activity in Germany, Austria, Switzerland, Denmark, Sweden, Norway, Finland and the UK. Of the European projects listed (excluding the UK), 40% were related to crop production or soil fertility. A further 14% were on fruit or vegetable production, while 19% were related to livestock or grassland. Many aspects of research carried out in Denmark, Germany, Austria, and Northern France have potential application in UK farming. Results from these studies will be relevant to UK researchers planning new work. Valuable insight was also provided into research methodologies and analytical tools used by European researchers, as well as approaches to dissemination and participatory research.

From priorities identified during the compilation of the research directories, three specific study tours were made, focusing on aspects of organic horticulture, arable, and fruit production:-
- Weed Control in Organic Horticultural and Arable systems;
- Sustainable Nutrient Management in Organic Field Vegetable Production
- Organic Fruit Production.

Two technical workshops were also attended and reported:-
- Designing and Testing Crop Rotations for Organic Farming;
- Alternatives to the Use of Copper-Based Fungicides in Organic Systems.

Study tour reports provide detailed information on issues relevant to the UK, results and direction of each research programme. In addition, technical information was collected for technology transfer to UK producers.

The research directory and study tour reports are now widely accessible, including on the Web at http://www.adas.co.uk/organic. UK producers, processors, retailers, others in the supply chain, and ultimately the consumer will be the main beneficiaries. Key messages and findings have been provided, some for immediate incorporation into existing production systems. The results will be very valuable to MAFF, research institutes, scientists and research workers when considering current and future UK research needs. Contact with European programmes will help improve the efficiency of UK research programmes, avoid unnecessary duplication and refine research methodology. The work will facilitate further contact between European research workers, to formulate collaborative bids and develop additional sources of funding.

It is proposed that the research directories produced by this review are refined and formally updated, on an annual or biennial basis.

Scientific report (maximum 20 sides A4)

1.0 SCIENTIFIC OBJECTIVES (CSG 7)

1.1 To gain an up to date overview of research currently being undertaken by selected European states, into organic systems and methods of production.

1.2 To provide by March 1999, a comprehensive report detailing the structure, range and content of these research programmes, summarising key results and providing a preliminary assessment of their potential application to UK organic farming systems.

1.3 In consultation with MAFF, to prioritise (from the results of 2 above) specific research projects for more detailed study/visits, with particular reference to their application for the UK.

1.4 To compile by 30 June 1999 comprehensive study tour reports for the sites/projects selected under 1.3 above.

2.0 DELIVERY OF OBJECTIVES

All objectives have been met.

However, it was necessary to obtain agreement from MAFF to extend the original delivery period, due to:-

- a slower than expected rate of response to requests for information from some European countries;
- the timing of pre-arranged visits, which were also used to collect data for the research directory;
- the requirement for study tours to be undertaken by the most appropriate staff, meant that the timing of visits was dependent on the availability of visiting and receiving research scientists.

This extension significantly improved the quality of the data, and study tours reported.

2.1 Objective 1 - Overview of European organic research

2.1.1 Scope

The work was designed to complement two further MAFF funded projects; a review by CABI of published international literature on organic farming ; and a review of animal health and disease control in organic systems by the Veterinary Epidemiology and Economics Research Unit (VEERU) at Reading University.

The priority was to examine northern and western European research programmes i.e. those likely to have the greatest relevance for the UK. This included France, Belgium, Netherlands, Switzerland, France, Germany, Austria, Norway, Sweden, Finland, Spain, Italy, Portugal, Luxembourg, Denmark, and Ireland.

The research projects included were current, or very recently completed, and therefore as yet unlikely to have been published in the scientific literature. The review concentrated on organic research rather than ‘low input’, or ‘integrated’ conventional farming systems.

Following the delivery of the first draft report to MAFF, it was agreed to include UK research projects and activities, for the benefit of European research workers.

2.1.2 Methods

In order to make an inventory of current research, key research institutions, major projects and individual researchers were identified by a number of methods:

- Previous work reviewing European organic research, and published overview articles from UK and non-UK sources;
- Existing informal contacts (particularly through Welsh Institute of Rural Studies, Elm Farm Research Centre, Soil Association and ADAS), and through formal networks e.g. EU Concerted Actions;
- Given the limitations of existing databases, there was a requirement to significantly broaden and strengthen the data by a variety of methods (literature and Internet searches, conference proceedings, direct communication etc.);
- New contacts targeted and developed through attendance at a workshop on research methodologies in organic farming (October 1998), the Biennial conference on organic research in German speaking countries (February 1999), a crop rotation design workshop in Denmark (June 1999), and during a pre-arranged visit to Austria (May 1999);
- For UK research projects, existing UK lists and research contacts;

The research topics sought included arable cropping, field vegetable production, fruit and protected crops, grass/forage production, ruminant and non-ruminant livestock, environment and biodiversity. Studies were included addressing production systems, nutrient supply/management, specific issues related to weed pest and disease control, quality, product testing, economics, socio-economic studies, and decision support systems. Livestock studies included production, husbandry and economics, but excluded specific projects on animal health and disease control.

In most cases, some translation was required from the native language.

2.1.3 Results

A total of 724 organic research projects was identified.

The response to requests for information varied. Good coverage was obtained from Austria, Germany and the Scandinavian countries (Table 1). No relevant projects were found for Portugal or Luxembourg. A total of 88 projects was identified in the UK, across a range of universities, colleges and research institutions. This included commercial and EU-funded projects, to complement 28 government funded projects listed on the MAFF website.

Table 1 Number of projects obtained by country

Country	No. of projects	Country	No. of projects
Austria	74	Italy	12
Belgium	5	Netherlands	29
Denmark	47	Norway	42
(EU)	3	Spain	1
Finland	72	Sweden	207
France	18	Switzerland	51
Germany	74	UK	88
Ireland	1		
		Total	**724**

2.1.4 Compilation of a research directory

From the information gained under Objective 1, a research directory was compiled in two parts.

Institute List
This contains 137 entries, detailing by country each institution currently involved in organic farming research, including full contact details, Web sites where these exist, and an overview of the research topics undertaken.

Project List
The project list catalogues 724 individual projects, including details on location, lead researcher, contact details, project title, project objectives, key words, collaborators, start date and end date. Project details vary in completeness depending on the quality and quantity of data obtained. E-mail addresses for individual researchers are given where these could be determined. Full institute details can be found by cross-reference to the Institute list.

To complement hard copy, the information in both directories is also provided electronically. This enables the data to be more easily interrogated, in either Microsoft Word 6 or Microsoft Access formats.

2.2 Objective 2 - Report on the structure, range and content of European research programmes

Drawing on information collected during the compilation of the research directory, a report (Part 1 - Section 4.0 below) was provided to give an overview of research programmes in the European countries selected.

2.2.1 Extent of European research

Research in organic agriculture is currently being conducted in most European countries, with the greatest activity in Germany, Austria, Switzerland, Denmark, Sweden, Norway, Finland and the UK. In Southern Europe, there is relatively little research, although efforts have been made to co-ordinate activities for the region as a whole. The research avenues followed tend to reflect cropping patterns (e.g. olives, citrus fruits, wine, early vegetables) and particular problems of the Mediterranean region (e.g. maintenance of soil organic matter).

The precise level of funding allocated to organic research was difficult to quantify, due to the range and interaction of funding sources available, overlap with other non-organic studies, and the relatively dynamic nature of funding in some regions at the present time. Lampkin *et al* 1999 estimated that total public organic research spending in 1996 was approximately ECU 15 million in the countries of the EU. This does not include projects funded by private donors and foundations, or research effort covered by core funding to academic institutions. For each country covered in the directory, estimates of total research funding for organic farming were given (Report Part 1 - section 4.0).

The greatest proportion of funding comes from regional and national governments and European Union research programmes (AIR, FAIR). Especially in southern Europe, many organic projects are funded out of low input sustainable or integrated farming budgets. Private research institutions (particularly those involved in advisory activity - NORSOK in Norway, FiBL in Switzerland) also rely on farmer subscriptions. However, given the increase in public spending on organic agriculture, the proportion of external funding for FiBL, for example, has fallen from two thirds to approximately 10%. There is some financial support for research from retailers e.g. in Austria, Switzerland and UK. Private foundations also provide significant funds towards organic research activities.

Lampkin, N., Foster, C., Padel, S., and Midmore, P (1999) *The policy and regulatory environment for organic farming in Europe*. Organic Farming in Europe, Economics and Policy, Vol 1 and 2, University of Hohenheim, Hohenheim.

2.2.2 Organisations involved in organic research

A range of institutions and organisations involved in organic research were identified;

- Public research stations and institutes specialising in organic research, for example in Denmark, Sweden and Finland;

- Private research institutes specialising in organic research exist in Norway (NORSOK), Sweden (Biodynamic Research Institute, Jarna), Netherlands (Louis Bolk Institute), Switzerland (FiBL), Austria (Ludwig-Bolzman Institute), Germany (Research Institute for Biodynamic Agriculture) and the United Kingdom (Elm Farm Research Centre). In many instances, research in organic farming began at these independent institutions;
- Chairs of ecological agriculture exist in Denmark, Germany, Austria, Netherlands, Sweden and Norway, combining research and teaching activities;
- In many countries, mainstream research institutes and universities carry out a range of research into organic, conventional and integrated farming systems;
- Farmer groups are involved in aspects of applied research in several countries, for example, in France through technical institutes;

2.2.3 Research topics

Research projects are categorised in the research directory under 22 topic headings (Table 2). These were chosen to give a broad overview of the main subject area for each project. More specific details can be taken from the project title, project objectives, and key word columns.

Table 2 Research projects by subject area

Topic	Subjects covered	No. of projects
Composting		16
Crops	Includes potatoes.	215
Engineering	Development of specialised equipment.	2
Economics		27
Environment	Includes biodiversity, nutrient leaching, gaseous emissions etc.	37
Farming Systems Study	Whole-farm or large-scale system comparisons, usually non-replicated; pilot farms; research farms.	21
Food		30
Fruit		43
Glasshouse crops		4
Grassland		25
Horticulture	Projects covering both vegetables and fruit; ornamentals.	13
Information provision	Studies on the transfer of R&D results to farmers and growers; demonstration farms.	15
Landscape		8
Livestock	Including dairy, beef, pigs, poultry and sheep production	109
Modelling		4
Policy	Analysis of effects of EU and government policy.	20
Research co-ordination	Projects co-ordinating research and communications between scientists at a national and EU level.	2
Socio-economics		9
Soil fertility	Includes nutrient supply and budgets, manures, soil structure, soil microbiology.	73
Trees	Trees for purposes other than fruit production.	2
Vegetables		43
Viniculture	Grapes and wine production.	6
	Total	**724**

European programmes tend to have a high proportion of research related to soil fertility and crop production systems. Of the European projects listed (excluding the UK), 40% were related to crop production or soil fertility. A further 14% were on fruit or vegetable production, while 19% were related to livestock or grassland.

Much of the research programme is at an applied level, designed to tackle specific technical issues. Many of the problems of organic agriculture in northern Europe are common to the UK - rotation design, perennial weed

control, pathogen control etc. However, there is a general understanding between researchers that to make further progress there is a need to study underlying mechanisms such as the relationships between soil, plants and mycorrhiza. This provides good opportunities for the combination of fundamental and applied research.

Research into livestock production has generally started with dairying and pig production. Research into poultry systems is developing, but to date beef and sheep research is mainly limited to the UK. In Scandinavia and Germany/Austria, research is developing into ethnological and welfare needs of organic livestock, and the implications for husbandry and housing requirements.

Implications for UK organic research programmes are given below (section 2.2.6).

2.2.4 National research and extension programmes

In addition, for each individual country, a detailed account has been given (Report Part 1) of the extent of research and extension efforts, the specific institutions and locations involved, and differences in national approach.

In Denmark, Norway, Sweden, Finland and Germany, research in organic farming is part of a national programme. State centres for co-ordinating organic research operate in Denmark (Research Centre for Organic Farming) and Sweden (Centre for Organic Agriculture). These produce annual summaries of research activities, and integrate research policy into national development plans for organic farming as a whole. National co-ordination efforts in Austria and France are less formal.

In Scandinavia and German speaking countries, organic advisory services are relatively well developed, and tend to be embedded in the conventional (often state run) advisory services. Given the greater emphasis on participatory research, some countries (e.g. Norway) have developed formal procedures for exchange of ideas and information between researchers and farmers. In Scandinavia, in particular, information from experiments is often publicised as the research progresses, without waiting for final completion, or scientific publication.

2.2.5 European co-operation

With the overall increase in research activities, the evolution of e-mail and other media, and the co-ordinating role of the EU, there is increasing co-operation amongst European researchers.

In Scandinavia, the Nordic Joint Committee for Agricultural Research (NKJ) promotes and supports co-operation on agricultural research between the national research councils in five Nordic countries. A newsletter ('Research Notes on Ecological Agriculture in the Nordic Countries') is produced by ten Nordic universities and research institutes in co-operation with the Nordic Association of Agricultural Scientists. In the German speaking states (Germany, Austria, Switzerland and Luxembourg), a Biennial conference is organised. Over 200 scientific papers were presented in March 1999.

In the Mediterranean region, the Centre International de Hautes Etudes Agronomiques Mediterraneennes (CIHEAM) , involving four Mediterranean agronomic institutes, provides training and research on environmental and agricultural policy, resource use and food issues.

The EU supports research projects involving collaborating EU partners, and working groups/networks as part of Concerted Action activities such as European Network for Organic Farming (ENOF) completed in 1998, and the Network for Animal Health and Welfare in Organic Agriculture (NAHWOA). Information about EU funded research projects e.g. under FAIR, is available through the Community Research and Development Information service (CORDIS). DOCEA (Documentation of Ecological Agriculture) was established (1995-1999) with EU funding to assess and improve documentation systems for literature and publications related to ecological agriculture.

2.2.6 Comparison of European programmes with research in the UK

Many aspects of research carried out in Denmark, Germany, Austria, and Northern France have potential application in UK farming, for example in, cultivations, soil fertility, cropping, nutrient management systems, livestock production, and horticulture. Elements of Swedish, Norwegian and Finnish work, particularly related to livestock husbandry and horticulture, will also be relevant. Results from these studies should be considered by UK researchers planning new work. The applicability of husbandry techniques and research results to UK conditions, are considered in the specific study tour reports.

In Southern Europe, the research avenues followed tend to reflect cropping patterns and particular problems of the Mediterranean region. Compared with the UK, the contrast in climate, farming and cropping patterns is large. In these areas, the most rapid expansion has been in permanent crops and stockless systems, which can pose problems for sustainability under semi-arid conditions. These studies may become more relevant depending on the rate of climate change in the UK.

It is generally recognised that by its nature, research into organic systems, for example rotation design, requires evaluation over a significant time period. This can cause problems regarding the stability of research funding, which is often allocated over a much shorter time period. This comment was received from many researchers.

In addition, organic production is likely to be affected to a greater degree by site, management and climatic conditions than conventional systems relying on a higher level of external input. The interpretation of the EU organic regulation varies across Europe and this brings problems in comparability between countries. For example, the quantities of organic manures that can be imported vary considerably.

For these reasons, computer simulation modelling could be a valuable tool to aid the interpretation of research results, and to predict outcomes in commercial practice.

There is a greater emphasis on participatory research in Europe, involving greater dialogue and involvement of producers in the development, testing and demonstration of organic research. Some UK projects do have a considerable continuing access to farmers and others with a useful two-way dialogue, but others apparently run to completion with almost no outside contact. In Denmark, one element of the research programme allows for some developmental research to be conducted on commercial farms under the supervision of local advisors or research staff.

To account for the trend away from mixed farms, to separate specialist cropping and livestock units, some studies are beginning on developing a relationship between several specialised farms in a locality that can be linked together to provide a larger ‘mixed’ unit. This will involve trading of crop products for manures to achieve a better overall energy balance. However, this would be unrealistic with the current UK farm-type distribution, and would have added transport energy inputs.

European research has also begun to diversify away from primary production into food quality, storage and processing issues. Depending on national perspectives and consumer expectations, studies are also beginning to address landscape, socio-economic and energy use aspects of organic farming. These studies may be useful in planning the methodology for similar studies in the UK.

Initiatives have begun with the aim of improving the methodology and analytical techniques for organic farming research, recognising the need for more ‘holistic’ approaches, and the strengths and weaknesses of

more reductionist techniques. FAO support a working group on the topic of 'Research methodologies in Organic farming'.

Some projects involve 'soft science' approaches, attempting to build in the human element, which is sometimes seen as a critical component in the development and application of research results.

While most organic research is conducted on organically managed land, there are some circumstances where results are extrapolated from conventional or integrated systems. Some projects, such as the Danish crop rotation experiments, are done on organically-managed, but non-registered land, to allow the inclusion of comparative treatments that are not allowed in that county's standards. This would probably not be allowed in the UK and needs to be borne in mind when developing EU wide projects.

There is a generally a strong emphasis on collaboration between research institutes nationally, and internationally according to the compatibility of research and farming conditions.

It is universally recognised that transfer of practical information to producers is a vital element of research. While circumstances and structures vary considerably from country to country, issues related to adequate dissemination, collaboration and co-ordination of research effort, synthesis of new and existing information, and the provision of information to specialist organic producers and advisers are common.

The methods and efficiency with which dissemination is achieved varies within Europe, with the best examples tending to be the Scandinavian and Swiss models. The Danish Centre for Organic Research was set up specifically to foster linkages in research, dissemination and training at all levels. This infrastructure is greatly facilitated by the co-existence and collaboration of state funded research and advisory services. The Research Institute for Organic Farming in Switzerland also supports its own advisory service, and has an important role in generating information for a growing number of organic advisers.

Although farmer-friendly technical literature is produced, there is increasing emphasis on the internet as a more cost effective dissemination medium, to the extent that the acquisition of written material can attract a premium charge.

There is a view that the production of management blueprints for organic systems is not the correct approach because of the large number of interacting variables. Instead, there is often greater emphasis on the relationship of adviser and farmer in developing management strategies appropriate to individual circumstances.

Development needs cited include, better training of organic researchers, improved networking and interdisciplinary contact, suitable outlets for publication and peer review.

2.3 Objective 3 - To prioritise specific research projects for more detailed study/visits

Study tours followed logically from the compilation of the research directory, listing European projects and research institutes. Under the CSG7 submitted for the project, up to four tours were to be undertaken, targeting projects or subject areas of particular relevance to UK organic farming.

2.3.1 Identification of potential study tours

Using the directory as a base, technical subjects were shortlisted by the research contractors (ADAS, EFRC & WIRS) in formal consultation with MAFF, HDRA, and Eco-Stopes Consultancy. A priority list was compiled on the basis of current UK research activity, industry needs and the existence of appropriate research activity in Europe. This list included: 1) Weed control in horticulture systems; 2) Weed control in arable systems; 3) Arable rotation design; 4) Nutrient management in horticultural systems; 5) Disease control in horticultural

systems; 6) Protected crops; 7) Development of an animal welfare index; 8) Eco-auditing; 9) Dairy breeding; 10) Food quality assessments. Topics covered by recently awarded MAFF Open Competitions were excluded, notably pigs, poultry, and control of potato blight.

The final choice of study tour was also influenced by the availability of the most appropriate researcher for that specialism. Given the topics finally chosen, need for specialist expertise and economic delivery through existing contacts, a proportion of work was undertaken outside the original contractor/sub-contractor base, by HDRA.

2.3.2 Study tours undertaken

In the event, 5 individual pieces of work were undertaken:

- Three tours were completed covering 4 points of highest priority on the above list.
- A supplementary report provided an update on aspects of organic fruit production, to augment earlier MAFF-funded research (Project OF0150).
- A meeting of European researchers was reported, addressing alternatives to the use of copper-based fungicides in organic farming.

The principal study tours were conducted during the second half of 1999, according to the availability of visiting and receiving research scientists.

2.4 Study tour reports

Full study tour reports have been submitted to MAFF (Part 2 - Section 4.0 below). A brief summary for each study is given below.

2.4.1 Study 1 - Designing and Testing Crop Rotations for Organic Farming

Location: Borris Landbrugsskole (Agricultural School), Vestergade 42, DK-6900 Skjern, Denmark.

Dates: European Workshop, June 14 to 16, 1999.

Report by: Dr W F Cormack: ADAS Terrington.

Summary: Crop rotation design is a major challenge for organic farmers, as well as for agronomic research. Different aspects of crop rotation have been investigated by a range of methods, including long-term trials, factorial experiments and on-farm monitoring. There has, however, been little effort into bringing these results and experiences together into a common understanding of the functioning of crop rotations and the methods by which they are best explored. A European workshop was convened in Denmark which brought together European researchers working with different aspects of crop rotations for organic farming. The workshop had two main themes 1) Functional aspects of crop rotations for organic farming, and 2) Methods of evaluating and testing crop rotations. The workshop consisted of field visits to large rotational experiments, and technical sessions.

Active participation in the workshop provided a useful opportunity to discuss technical aspects of rotation design and research methodology, and allowed comparison with UK work, including the stockless arable system at ADAS Terrington.

An interpretative summary was made of each paper presented. Further conclusions and recommendations relating to the UK situation are drawn from experimental site visits, plenary sessions and discussions with other European research scientists.

2.4.2 Study 2 - European Study Tour of Weed Control in Organic Horticultural and Arable Systems

Location: Danish Institute for Agricultural Sciences, Research Centre Foulem; Danish Agricultural Advisory Centre, Skejby; Swedish Agricultural University (SLU), Alnarp.

Dates: 26 August to 2 September 1999

Report by: Josie Bevan, for HDRA.

Summary: The recent MAFF funded review of organic weed control (Bond & Grundy, 1998) supported the view that direct methods of weed control, such as mechanical and thermal weed control, are amongst the most important methods available for organic farmers but their use alone are not sufficient to control weeds in organic systems. Preventative methods such as crop rotation, cover cropping, primary and secondary tillage are also required to keep weeds at a manageable level.

The objective of the study was to assess what advances had been made on the continent in weed control for organic arable and vegetable production systems, in particular the development and optimum use of mechanical weeders and flame/thermal weeders, when combined with cultural methods, i.e. rotations, covercropping, intercropping, primary and secondary tillage.

Bond, W. & Grundy (1998) *Desk study on the control of weeds in organic arable and horticultural production systems*. MAFF Project Report OF0152.

Visits were made targeting weed research programmes in Denmark and Sweden. Information was also obtained from two research projects in the Netherlands.

A comprehensive report was compiled describing the context and approach to weed control research particularly in Sweden and Denmark. Research programmes and experiments were studied across a range of crop types. Details are given on the practical application, effectiveness and economic implications of specific weed control techniques (including mechanical, flame, infrared, photocontrol, cultural and other novel methods of control). The broader effect of husbandry and rotation are also put in context. The potential of new technology such as computer vision system, and automatic sensory detection are considered. Approaches to advisory work, dissemination and provision of technical literature are documented. Husbandry guidelines are provided for assimilation by UK producers.

2.4.3 Study 3 - Research and Development on Rotation Design and Sustainable Nutrient Management in Organic Field Vegetable Production.

Location: Danish Institute of Plant and Soil Science, Research Centre Aarslev, Denmark; Swedish University of Agricultural Sciences, Horticultural Research Station, Uppsala, Sweden; and Louis Bolk Institute, Driebergen The Netherlands.

Dates: Various dates between 3 September and 28 October 1999

Report by: Margi Lennartsson, HDRA

Summary: If the UK organic vegetable sector is to expand successfully, it will be crucial to design and manage crop rotations with a suitable balance between cash crops, fertility building crops and brought-in fertility. The overall objective is achieving optimum use of nutrients, so that the agronomic and the financial demands of the rotation can be met.

The purpose of this study tour was to see how the development and adoption of sustainable rotations and soil nutrient management strategies for organic field scale vegetable production has been addressed in research from other EU countries. Visits were made to three research institutes with active research programmes on nutrient management in organic field scale vegetable production. The common aim of the research programmes visited was to develop sustainable organic vegetable rotations, which make optimum use of nutrients, and fertility building crops. At these sites, the approach was to monitor rotations as case studies, as opposed to comparing different rotations set up as treatments in long-term replicated field trials.

Currently available information is assessed in relation to rotation design for long-term sustainable management of nutrients, and gaps in knowledge identified. A comprehensive overview is given of the research programmes across the three sites, covering a range of vegetable crops and cropping sequences. In particular, the effects of rotation, green manuring and the use of organic waste are considered. To date, investigations have mainly focused on the effect of fertility building crops on soil nitrogen dynamics and their potential to maintain and improve soil fertility. However, research has begun on the use of deep rooting fertility building crops to translocate potassium from the subsoil to the topsoil, as well as the effects of green manures on root rot and arbuscular mycorrhizal fungi of peas, and the relationship between biological processes in the soil to above ground biological process (control of insect pests). The potential use of computer models, both as tools to interpret research data and as tools to predict the effects of different nutrient management strategies under practical conditions, is highlighted.

Results are related to UK research and commercial production of organic vegetables.

2.4.4 Study 4 - European Study Tour of Organic Fruit Production

Location: Danish Institute of Agricultural Sciences, Research Centre Årslev.

Date: 31 August 1999

Report by: Josie Bevan: for HDRA.

Summary: The study focused on organic fruit research at the Danish Institute of Agricultural Sciences, Research Centre Årslev. The study complements a previous MAFF funded review 'Organic Fruit Production; A Review of Current Practice and Knowledge (OF0150)'.

Specific experimental work was considered for organic apple (varietal choice, effect of botanical composition of the alleyway on crop nutrition and biodiversity, biological and cultural control of scab, pheromone trapping), strawberry (controlling grey mould, processing, and seasonality of supply) and blackcurrant production. Husbandry guidelines are derived from the work for each of these crops.

During the compilation of the research directory, additional organic fruit projects were also identified in Austria, Finland, Germany and Norway. New and existing contacts were approached, to provide an update of research activities in Finland, Germany, Norway and Switzerland. The research approach and results of the

work at Årslev are discussed in relation to programmes in Switzerland and the Netherlands, visited as part of OF0150.

2.4.5 Report on a Meeting in Switzerland Concerned with the Removal of Copper Fungicides from Organic Agriculture

Location: Research Institute for Organic Agriculture (FiBL), Frick, Switzerland,

Date: 22 and 23 February 1999

Report by: Martin S Wolfe: Elm Farm Research Centre.

Summary: The current schedule for the prohibition of copper fungicides by 2002 is regarded as one of the key problems facing organic agriculture. Proposals for a gradual replacement of copper fungicides, taken together with the current call for EU 5th Framework bids for research funding, led to the initiative to bring together a group of scientists concerned with organic agriculture, to discuss the potential for a European-scale research approach to the problem. This meeting is reported for information, given the importance of this subject, and its direct relevance to MAFF Project OF0167.

Three major problem areas were identified, namely late blight of potato (and tomato), downy mildew of grape, and apple scab. For each, there was wide-ranging discussion on methods that could be developed for disease control in the absence of copper fungicides. This led to the view that it was essential to develop a widely-based initiative, to make best use of the limited resources available for a collaborative European programme. The group formulated an outline strategy for a research proposal, for submission to the EU in November 1999. Further details of the progress of this bid may be obtained from the author.

3.0 Reports

The work has been reported in three parts.

A review of current European Research on Organic Farming (Part 1). Research Directory. Keatinge, R., Cormack, W, Padel and Wolfe, M. February 2000, 122pp.

A review of current European Research on Organic Farming (Part 2). Study tour reports. Cormack, W, Bevan, J., Lennartsson, M., Wolfe, M. and Keatinge R. February 2000, 127 pp.

A review of current European Research on Organic Farming (Part 3). Implications for UK organic research programmes. Keatinge, R., Cormack, W, Padel, S. Bevan, J., and Lennartsson, M. March 2000, 9pp.

4.0 Technology transfer

The availability of the research directory will be widely publicised, accessible to all interested parties.

Initially, 50 hard copies of the directory, supported by electronic copies were distributed, according to a priority list made up of MAFF Policy and Science Divisions, DANI, SERAD, Organic Sector Bodies, organic and conventional advisory bodies, MAFF research contractors (particularly those involved in organic and sustainable systems research), Universities, UK multiple retailers, and key research organisations in Europe.

The review will be publicised nationally in Organic Farming (Soil Association Technical Magazine), and internationally, in Ecology and Farming, the magazine of IFOAM (International Federation of Organic Agriculture Movements).

From 1st April 2000, the directory and study tour reports will be available on the Web, at http://www.adas.co.uk/organic. Other Web sites, including Elm Farm Research Centre, WIRS, SAC, will be invited to provide links from their own sites. The directory is also being publicised electronically, through the Rural Business Network (RBN) run by ADAS, National Farmers Union and Country Landowners Association.

For organic producers, technical messages distilled from the study tour reports will be offered for publication in 'Organic Farming' and EFRC Research Bulletin. In addition, study tour reports have been sent to the editor of the Soil Association Series of Technical Leaflets, currently being developed, so as to optimise the inclusion of information into Soil Association publications, or alternatively to avoid duplication.

5.0 Intellectual property

No issues relating to intellectual property arose because of this work.

6.0 Future work

While funding for organic research has increased substantially in Europe, it is recognised that research efforts need to be sustained and further developed in order to meet the market and technological demand.

Priorities for future applied and strategic research will continue to be examined at national, EU and international levels. In setting its own research priorities, for example through UKROFS, the UK needs to be aware of evolving research programmes in its closest European neighbours. Closer contact and easier communications with Europe facilitate much better opportunities for dialogue and collaboration.

Technically, many common problems are recognised. With research funds limited, it is appropriate that current European research in a particular topic area is evaluated in the formulation of new research proposals. In addition, UK researchers should play a part in developing research methodology, communicating developments and adaptations to colleagues in the research field.

Policymakers need to be aware of European examples of research co-ordination and dissemination of results. The UK needs to consider how these aspects are being handled in Europe, so that appropriate strategies can be adapted and incorporated into UK research programmes.

Given the above considerations and the contacts already generated, it is recommended that the research directories produced by this review are refined and formally updated, on an annual or biennial basis.

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