agricultural engineer

Volume 50 No. 3 Autumn 1995

Agriculture

Forestry

Environment

Amenity

FIRST ANNOUNCEMENT

of

The Sixth

Silsoe College

POSTHARVEST CONVENTION

entitled

PACKAGING AND PRESENTATION OF FRESH PRODUCE

Silsoe College on Thursday, 21st March 1996
in association with
The Association of Applied Biologists and
The Institution of Agricultural Engineers

THE CONVENTION WILL INCLUDE

* Presentation of scientific papers
* Display of posters on scientific & technological developments
* Exhibition of technical equipment
* Information on training and careers

For further details please contact

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Postharvest Technology Department,
Silsoe College, Silsoe
Bedford. MK45 4DT Tel: 01525 863276 Fax: 01525 863277

Institution of Agricultural Engineers

CONFERENCE 1996, AGM AND ANNUAL DINNER

POST HARVEST STORAGE AND HANDLING

(Title to be confirmed)

Tuesday 2nd April 1996

at

Writtle College

Guest Dinner Speaker
Mike Heath, the new Director General of the Engineering Council

Details from
The Secretariat,
West End Road, Silsoe, Bedford. MK45 4DU Tel: 01525 861096

Agricultural Engineer

The Journal for Professional Engineers in Agriculture, Forestry, Environment and Amenity

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Front cover: New Renault Ceres Tractor

The Institution of Agricultural Engineers

NEWS ROUND-UP

REPORT ON THE ENGINEERING COUNCIL'S ACTIVITIES

by MIKE HEATH, CB, CBE, CEng, Director General of the Engineering Council

As we count down towards 'unification' of the profession on 1st January 1996, I welcome the opportunity to be able to give you my views on how The Engineering Council plans to address the key issues.

In the few months that I have been with the Council, it has borne in on me how much we need the coming together which unification represents.

Let me give you just three examples. Everybody now recognises the importance of the educational establishment giving proper weight to engineering and technology. Every organisation is keen to make its own contribution. But at present there is such a diversity of initiatives coming from government, industry, Institutions, The Engineering Council and many other quarters that many teachers are baffled. Not only is there a duplication of effort, but I suspect there are some gaps, too. I believe the new Council is ideally placed to work with stakeholders to improve collaboration and co-ordination of educational activities.

Secondly, almost everyone I have spoken to has emphasized the importance of professional engineering activities in the regions and this is clearly right. But Institutions mostly have their own regional structures, all with different geographical boundaries and different arrangements. Without in any way wishing to impose upon these arrangements, mutually agreed boundaries and better co-ordination of activities would increase the strength of our links with registrants, industry, educational establishments and Government at the regional level as well as perhaps making better use of resources.

Thirdly, Government is perplexed by the inconsistency of advice it gets from the profession, when all concerned give their views independently. The result of that perplexity has, in my opinion, been a major factor in our failure to influence Government policy in the way we would have wished. The Engineering Council was, of course, set up by the government to provide a focus but without the democratic basis to encourage individual bodies to sink their differences. We may not always agree, but a determined effort to achieve a corpus view is surely in all our interests. In my initial discussions, I have detected a real will to make this work and I have every confidence that we are building a durable structure. We have Sir John Fairclough to thank for brokering this vital deal.

Among the key issues that face us, the following seem particularly significant :

1. We have to construct mechanisms that will involve Institutions in every Council activity, with the Council Executive playing a facilitating role.
2. We need to have stronger links with government, earning the credibility that will enable us to become fully involved in Government policy making at the development stage.
3. We need to understand better and respond effectively to industry needs.
4. We can do more to communicate effectively with registrants who must understand what the profession is doing in their interests and have the opportunity to give their own views.
5. I want us to use our public affairs resources in ways that will raise the image of engineering to reflect the true contribution it makes to the nation's prosperity and quality of life. This is partly a deep-rooted cultural problem and has to be addressed in a planned and co-ordinated way.
6. I believe we do not know nearly enough about ourselves and I would like to develop a comprehensive picture of engineering activity, including statistics, directories and geographical dispositions.
7. We also need to look at our total resources to see whether we could not agree to co-ordinate activities jointly to increased cost-effectiveness.
8. Perhaps as important as anything else, we have to maintain a 'gold standard' regulatory frame-work covering nomination of Institutions, accreditation of courses and registration of individuals. Each Institution has to be confident that its own high standards are matched by those of others and Government, employers and public needs assurance that an engineer knows his business.

I also believe we should benchmark ourselves against the rest of the world because international standards are always rising and we dare not fall behind. We all have an interest in staying world class and not giving our precious imprimatur to those who cannot or will not make the grade.

The 'new relationship' means working together or it means nothing. Institutions have so much expertise and resources to offer their members and the nation. I am confident that with the whole profession pulling on the same rope we can produce the national contribution that has so far eluded us.

ENGINEERING COUNCIL REGISTRATION FEES FOR 1996

In setting the level of registration fees for 1996, The Engineering Council had in mind its responsibilities to those who will be accountable for the new arrangements.

It has been agreed that existing activities will continue until a revalidation exercise has been carried out under the auspices of the new Senate. This process will clearly take a little time.

Previously, the Council's registration fees have been increased by a linkage to the average earnings index. For the last five years it has also been increased by a further 50p to help fund the increasing costs of the Neighbourhood Engineers and National CPD Schemes. In order to give the new Senate time to take stock, this year, the Council, which is obliged to make early decisions on the following year's registration fees, decided that these should be increased by a figure related only to the RPI, that is, no increase in real terms.

The fees for 1996 are:-

Chartered Engineer	£17.30
Incorporated Engineer	£14.50
Engineering Technical	£7.80
Stage 1 registration - all levels	£4.60

BAGMA TAKES LEAD IN DEVELOPING MODERN APPRENTICESHIPS

Farm and garden machinery dealers, facing a skills shortage, could soon be "in real trouble" unless the Trade recruits and trains its service staff properly. This warning comes from the British Agricultural & Garden Machinery Association (BAGMA), the dealers' trade body, which has responded by investing nearly £200,000 during the past 6 months in education and training activities.

Traditionally, both agricultural and garden machinery sectors have been able to supplement the service engineers they have trained themselves by drawing on skilled personnel from other disciplines, particularly the armed forces.

Cut backs have reduced this source significantly and without prompt action the Trade could soon find itself at a "crisis level", say Mike Teanby, BAGMA's education and training manager.

"Despite recessionary pressures, machinery continues to become more technically complex and customers' expectations go on rising", says Mr Teanby. "What we need now are top craftsmen and women to ensure that after sales activities are conducted in a professional and cost-effective way".

BAGMA's solution is to develop modern apprenticeships for the agricultural and garden service engineering sectors, a scheme which has received financial backing from the Department of Employment which is keen to see BAGMA strengthen its role as an Industry training organisation and lead body.

Each training project has a team of people drawn from within the Trade, backed up by specialist help from the National Council for Vocational Qualifications and awarding bodies. All projects are aimed at encouraging young men and women to consider a career in the agricultural and garden machinery sector and at providing them with the opportunity to gain nationally recognised qualifications.

Already, BAGMA has released new career literature and apprenticeship booklets which outline what the industry has to offer. The new level 2 engineering qualification was accredited in January, and around 1,000 new engineers are expected to join the trade every year.

Additionally, working parties have started to review all the occupational standards, while a recent national survey highlighted strong support for an entirely new qualification for parts sales staff - an area representing high dealership investment.

"The results of this work will become apparent later this year as the industry starts to enrol its engineers on to modern apprenticeship schemes", pointed out Mr Teanby. "BAGMA's work over the next twelve months is crucial to the entire service sector and is expected to remain the standard well into the next century".

NEW ENGINEERING COUNCIL LAUNCH AND TV "ENGINEERING WEEK AND SEASON"

The Director General recently informed Engineering Council members of a proposed event to be held at the QEII Centre on 2nd February 1996 to mark the launch of the new Engineering Council, as well as an event on 15th November 1995, organised by the Foundation of Science and Technology, to be held at the Royal Society. The President of the Board of Trade is due to speak at this event, held to raise the awareness of the DTI's "Action for Engineering" Campaign. It is expected that the President will include a strong supportive message for our new unified body.

The larger Institutions are fully aware that the BBC TV(2) has been planning an "Engineering Week" followed by an "Engineering Season". We have persuaded the BBC to start this in the week beginning 13th November so that the "Action for Engineering" event is strengthened. For those Council members and Institutions who have been informed, the BBC plans to start:

a) **The Limit**, a six-part documentary series. These programmes will show engineers pushing back the boundaries of what is possible by building longer bridges, bigger aircraft, deeper tunnels, taller buildings, remote sensing robots and greater capacity container ships.
b) **Working principles** (a series of 15 ninety second slots). These will explore the beauty of engineering objects while explaining the principles behind them.
c) **Local heroes**, a "fun" series of six 30-minute programmes that feature reconstruction of scientific and engineering achievements from around the United Kingdom and information about the people who made them.

Other TV and radio stations controlled by the BBC are being encouraged to join in the "Engineering Season", which is expected to run until the end of the year. The BBC plan to run a one-day seminar during the week to help professional engineers to improve their television communication skills. They intend to organise this seminar in conjunction with the profession.

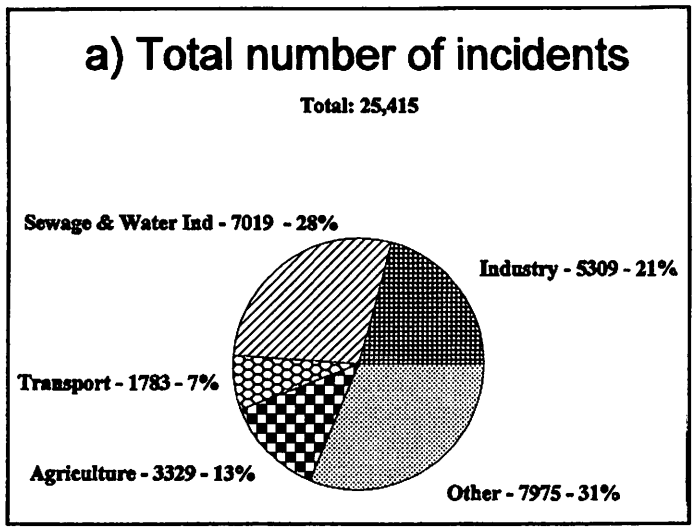
The BBC will also 'plug' its engineering programmes throughout the week and the season but also produce an engineering information pack. We are in discussion with Government departments and leading Institutions to help produce and fund the information pack that the BBC will mail out to inquirers.

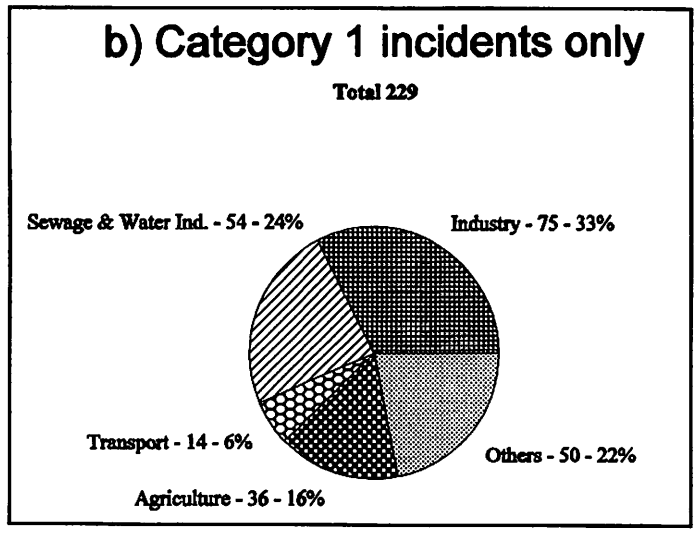
Also in that week:

* The FT is expected to run a special supplement on engineering and engineers
* Task Force Five (Action for engineering) plans to start an advertising campaign on the London Tube.
* It has been mooted that there should be a debate in the Commons.

DROP IN MAJOR POLLUTION INCIDENTS

Distribution of Substantiated pollution incidents by source, 1994





The number of major water pollution incidents, in England and Wales, fell by 31% last year. In a recently published report, "Pollution Incidents in England and Wales - 1994", the National Rivers Authority (NRA) said the dramatic fall in major (Category 1) incidents, from 331 in 1993 to 229 in 1994, provided strong evidence of the effectiveness of its pollution prevention activities.

Incidents caused by agriculture dropped by 43%, general industry by 32% and the sewage and water industry by 28%. The pie charts, (above and below) provide a breakdown of incidents by source and type of pollutant.

Despite the drop in Category 1 incidents, there was a slight increase in the overall number of confirmed incidents from 25,299 in 1993 to 25,415 in 1994.

The NRA said it was receiving more reports of minor and moderately serious incidents from members of the public, who are increasingly aware of water pollution issues. The Authority has encouraged this trend by setting up a free emergency hotline that had its first full year of operation in 1994, receiving an average 1,600 calls each week.

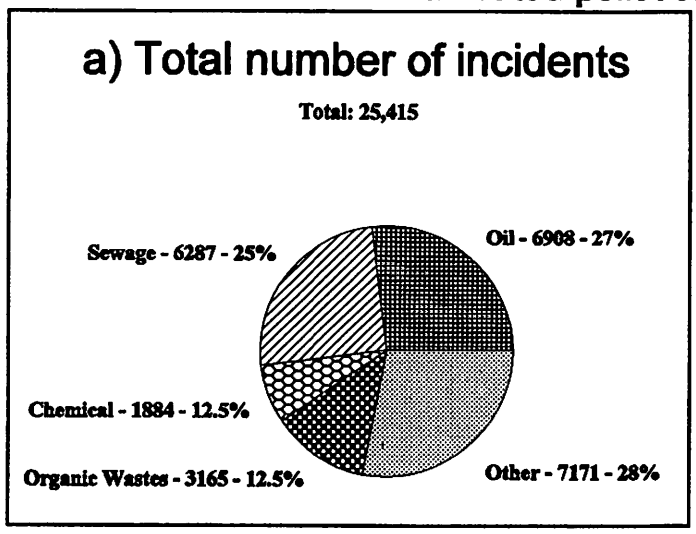
NRA Director of Water Management Dr Clive Swinnerton said: "The substantial decrease in major pollution incidents is heartening and reflects the effectiveness of the NRA's pollution prevention activities, especially the co-operative work we do with industry and farmers that includes visiting work sites to offer guidance on preventing water pollution.

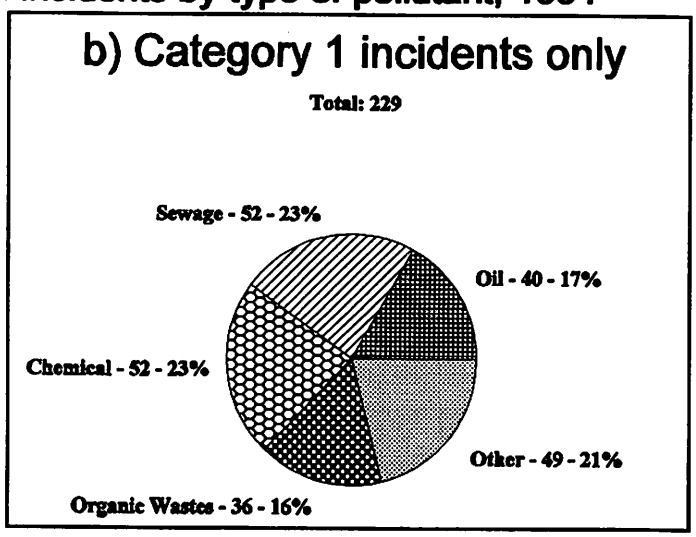
We look forward to continued reductions in major incidents, particularly for the water and sewage industry that is undertaking an extensive programme of capital works to upgrade sewers and sewage treatment plants."

Poor handling, storage and disposal of chemicals by many users, caused 23% of incidents.

Oil was responsible for 27% of all pollution incidents, making it the leading problem. The number of confirmed oil pollution incidents increased by 8% last year, from 6,373 in 1993 to 6,908. The NRA's 'Oil Care' campaign was launched in January this year with the aim of decreasing the number of oil pollution incidents by raising awareness of the need for proper handling, storage and disposal of oil. The NRA hopes to see improvements in this important area.

Distribution of substantiated pollution incidents by type of pollutant, 1994





FARM FILM RECOVERY SCHEME TAKES OFF

The new national farm-gate recovery scheme for recycling of polythene waste, the first in Europe, has achieved instant success. In the first few months of activities, the Farm Films Recovery Hotline operated by the Farm Films Producers Group Ltd. dealt with 1670 calls from farmers and collected more than 1600 tonnes of used polythene.

Discussions between the National Farmers Union, PIFA, UKASTA and the Department of the Environment led to the launch of the voluntary scheme that covers certain types of polythene films including silage bags, sheets and silage stretchwrap.

Funding for the scheme is provided by a small Environmental Protection Contribution (EPC) (equivalent to between 7p and 10p per bale or 10p per bag) paid by the film producers and importers to FFPG. However, because this funding will not take full effect until the end of the first year of operation, the initial administration and start-up costs have been provided by film manufacturers through the FFPG.

FFPG uses a national network of regional agents covering the whole of the UK to provide a quick, easy-to-use, free service, transporting used farm polythene direct from the farm for recycling into new plastic products. To arrange for collection, farmers simply call the national freephone hotline and give location details.

The new scheme anticipates the EU obligations that will be placed on the agricultural industry and the UK's 100,000 farmers to dispose of, in a more environmentally acceptable way, the 43,000 tonnes of film used.

FFPG Operations Manager, Andrew Hetherington, commented: "Growing pressure to eliminate the traditional methods of disposal - burying or burning waste material - has also created a climate where the need for an efficient, national service is essential.

It is early days but the results are extremely encouraging. We have now set a minimum collection of 250 kilogrammes (1 cu. metre) - equivalent to 250 bales/bags as a direct response to the feedback from farmers concerned that the initial one tonne minimum collection level was too high".

FFPG's Business Manager, Dave Ripley, pointed out: "Response has been enthusiastic. Most people realise that a voluntary scheme such as this will be cheaper to operate than any mandatory scheme forced on the industry by government legislation in the future. Many FFPG members are now involved in the development of similar schemes in their own countries."

To contact the Collection Service hotline, farmers are asked to ring Freephone 0800 833749

GOVERNMENT COMMENTS ON OUTCOME OF THE REVIEW OF ISOPROTURIN

Ministers have agreed that approvals for the widely used herbicide isoproturin (IPU) should be maintained subject to restrictions to reduce the compounds potential to contaminate water supplies. This follows a review of the compound by the independent Advisory Committee on Pesticides (ACP). The committee found that the compound was safe and effective in use and was able to suggest ways in which the chance of exceeding the arbitrary EC drinking water standards could be minimised.

The recommendations of the ACP were:

1. Approvals for isoproturin products will be allowed to continue with the specified label amendments;

2. The data requirements specified are appropriate. However, isoproturin is among those compounds to be considered under the EC review programme with evaluation commencing in May. In these circumstances the ACP has agreed that, for reviews where there are no safety concerns, the data will not be required in the UK and our conclusions be sent to the EC rapporteur, Germany.

3. In view of the contamination of water by isoproturin, and in particular its regular exceedance of the statutory drinking water limits of 0.1 µg/l, a package of measures is proposed in order to minimise its use as follows:

   * Emphasise cultural control measures for blackgrass by making reference to the Weed Resistance Action Group (WRAG) Guidelines for the Prevention and Control of Herbicide Resistant Blackgrass on isoproturin product labels compulsory

   * investigate what role set-aside may have to play and potential for incorporating blackgrass control in its management or arranging set-aside areas to protect water

   * Withdrawal of pre-emergence uses on wheat and barley

   * Impose as a maximum a total dose of 2.5 kg/ha isoproturin allowing flexibility in how this is applied up to the total

   * Give notice that a target rate of 1.5 kg/ha is intended for consideration when the results of ongoing research into reduced rates will be available. Data will be evaluated and the implications of such a reduction will be examined at this time

   * Include advice on the label on not using isoproturin where soils are cracked to avoid drain run off (exact wording can be agreed)

   * Revocation of aerial use

   * Where a Water Protection Zone is created, Ministers can reconsider the use of isoproturin within these

4. Research should continue to investigate whether reduced rates of isoproturin, especially in mixtures with other herbicides, can give efficacious weed control while reducing the incidence and levels at which isoproturin is detected in surface and ground waters.

NEW INDEPENDENT REPORT CALLS FOR RADICAL REFORM OF THE COMMON AGRICULTURAL POLICY

A paper setting out the case for a radical reform of the Common Agricultural Policy (CAP) has been published by the Agricultural Minister, the Rt Hon Douglas Hogg MP. The paper records the conclusions of a group of 11 independent members set up to look at the CAP.

The paper, "European Agriculture - The Case for Radical Reform", advocates a new CAP that would end the wastage of resources that the current policy involves. The reformed CAP should comprise a set of targeted and complimentary policies addressing more effectively the social, environmental and agricultural issues facing the European Union. It concludes:

* the CAP in its present form fails to respond to the needs of European farmers and the demands society puts on them to produce high quality food and to look after the countryside; European agriculture will have great difficulty in keeping its place in the world market while it is saddled with high cost bureaucratic controls on what farmers can produce; envoironmental objectives are inadequately reflected in the policy.

* the CAP should be radically reformed to enable European farming to become more competitive and meet the challenges of EU enlargement and a more open world trading environment; as part of this approach better targeted and more effective policies are required to safeguard rural areas and environmental conservation;

* in particular, competitiveness should be promoted through progressive reductions in end-price and other production-related support. As a corollary specific measures to address socio-structural difficulties, the environment and sustainable rural development, designed to respond to particular issues of the different regions of the EU, are advocated. The reformed CAP should provide an overall framework of Community rules within which Member States are required to define and pursue measures to conserve and enhance the farmed environment, according to their own procedures.

* within the overall concept of a sustainable agriculture, key environmental aims should include preservation of species and habitats, quality and depth of soil, quality of water and the maintenance of desired landscapes and countryside features. These aims should be promoted through a mix of economic instruments, advice and regulation. A substantial level of public funding would be justified.

The Minister said that this paper represented a major contribution to a debate where British ideas are gaining steadily wider support. The CAP is bound to change, for the reasons set out in the paper. I believe it to be irresponsible not to warn that change is inevitable, and to aim to work out now the principles on which future policy should be based.

That is what the CAP Review Group has attempted, with much useful advice from outside. Their intention is not to provide detailed prescriptions, but to suggest the direction that should be pursued and the priorities that any new policy must meet.

Much more detailed work will of course be needed in the future on, specific policies, how they can be negotiated, and how they should be implemented. Much care will be needed to steer farming towards the new world in ways that give the industry a fair chance, and enough time, to adapt. This paper claims to give no final views; but it is a new and positive contribution to an ongoing debate, and I look forward to the reactions it will provoke.

NRA CALLS FOR CARE WITH SHEEP DIP

The NRA is reminding farmers that dip and spent dip must be stored, handled and disposed of carefully to prevent water pollution.

Sheep dip is highly toxic to fish and other aquatic life and can also contaminate underground water supplies that are an important source of drinking water in many parts of England and Wales.

The NRA offers farmers the following general guidance to avoid water pollution from sheep dip:

* dip sheep well away from any watercourse, spring, well, or borehole;

* ensure that the dip bath will not leak or overflow;

* follow the manufacturer's instructions in preparing the dip;

* ensure that excess dip from dipped sheep drains into the dip bath;

* spread spent dip thinly on land well away from any watercourse, taking care to avoid fast-draining areas such as those where soil has been deeply cracked by dry weather;

* if suitable land for disposal is not available, spent dip must be collected and disposed of by a licensed waste disposal contractor;

* the NRA does not recommend the use of soakaways for disposing of spent dip and no new soakaways should be created for this purpose.

More guidance on the storage, handling and disposal of dips is available from NRA offices and in the Ministry of Agriculture, Fisheries and Food's Code of Good Agricultural Practice for the Protection of Water.

MAFF RESEARCH STRATEGY 1995

MAFF has recently released its Research Strategy for 1995, which examines sector programmes and identifies the issues that determine the objectives that are likely to influence them over a longer period.

The Ministry uses its research budget of £127 m to fund research to inform current policies, provide scientific foresight and contribute to the identification of future policy options. Research supports the Ministry's aims of improving the economic performance of the agriculture, fishing and food industries, protecting the public, enhancing the rural and marine environment and protecting farm animals.

Within the aim of improving the economic performance of the agriculture, fishing and food industries and contributing to wealth creation, research is undertaken to provide the knowledge necessary for production to take place in economically and environmentally sustainable systems.

The growing importance of ensuring that crop varieties possess the qualities required by the final user drives research on the genetic control of varietal characteristics and new work on transformation systems and gene promoters in cereal and oil seed rape. Some of this has been undertaken in collaboration with commercial companies. Horticultural research aimed at increasing competitiveness is planned in consultation with the industry and will consider detailed foresight exercises in particular sectors including apples and mushrooms.

Within the food sector research funding will be directed towards ensuring effective technology transfer particularly to small and medium enterprises to encourage innovation and adoption of best practice.

The development of new crops and alternative uses for land is becoming increasingly important. The research programme is being expanded to ensure that scientific opportunities are taken and the potential for industrial development is exploited.

Research on animal diseases will continue to be important, with strategic research directed in the shorter term at an immunological approach and in the longer term at a genetic approach to disease resistance.

Marine fisheries research will concentrate on factors affecting stock size, recruitment and species interactions while the development of aquaculture will require research into species and novel rearing techniques as well as the effects of fish farming on the environment.

Improving the quality of life by protecting the public requires research into the causes and risks of microbiological and chemical contamination of food, the risks of health and the environment of pesticides, and the control of zoonoses. It also includes a research programme that contributes to understanding the physical processes involved in the alleviation of flooding and coastal erosion. The principal aims of the nutrition programme are to ensure that nutritional advice to the public has a sound scientific basis.

Safeguarding and enhancing the rural and marine environment involves research to support, for example, the development of management prescriptions for Environmentally Sensitive Areas, and the Ministry's role in implementing the 1991 EC Nitrate Directive, as well as the more effective management of farm waste and soil protection.

The Strategy also describes the way in which research management will develop in the Ministry, and the way in which the Ministry is implementing the Government's policies on research as set out in the White Paper *'Realising our Potential'*.

HIGH ATTENDANCE FORECAST FOR TILLAGE '95 DEMONSTRATIONS

With bookings received from most of the UK's leading manufacturers and suppliers of cultivation equipment, Tillage '95 is on course to repeat last year's successsses when more than 4,500 visitors attended three regional demonstrations.

For 1995, Tillage organisers, the AEA and ADAS, have arranged two working events. The first will take place on Tuesday, 19th September at Burcot Farm, Burcot, Oxfordshire, adjacent to the A415 Abingdon to Burcot road. A total of 29 exhibitors have booked demonstration plots for this event, which will encompass 136 working acres. There are also three static exhibits.

The second Tillage '95 event will be held on Wednesday, 4th October at Drumnagair Farm, near Laurencekirk, Montrose, Scotland. Situated alongside the main A90 Forfar to Stonehaven road, this demonstration will feature 27 companies across 124 working acres, plus three static exhibits.

In addition to a full range of primary and secondary cultivation machinery, including ploughs, presses, discs, power harrows and tined cultivators, strong interest is expected in the latest generation of combination machines capable of seedbed preparation and drilling in a single pass.

A further highlight of Tillage '95 will be a precision farming area sponsored by ING Farm Finance, a principal backer of the Tillage events for the past three years. The static display will comprise a covered area featuring some of the latest innovations in yield mapping and the varying of inputs in line with yield potential. ING Farm Finance will also be offering special finance terms to visitors at both Tillage demonstrations.

Tillage '95 in Oxfordshire and in Scotland will run from 8 am until 3 pm with a refreshments bar serving food and hot and cold drinks from approximately 7.30 am. The entrance fee has been set at £10 per vehicle or £5 for cars with one occupant.

GUIDE TO THE WORLD'S KNOWLEDGE STORE

The Patent Office Search and Advisory Service puts the world's largest store of technical information at the service of UK business, says Ted Blake, Director of Marketing at the Patent Office.

Consider three estimated facts. First,that 80% of the world's technical information is only to be found in patents. Second, 85% of all patents ever published are not in force, meaning that the information they contain is free. Third, European industries are wasting over £20 billion each year in duplicated research.

Anyone in research ignoring published patent information does so at their peril. Yet the numbers may seem daunting. Over 30 million have been published. Each year, a million new ones appear.

Happily, help is at hand. The Patent Office runs a confidential Search & Advisory Service to assist in navigating this vast store of information. The Patent Office has a staff of over 200 qualified patent examiners, each a specialist in a specific area of technology, with wide experience in searching.

At its disposal is a hard copy collection of over 4 million patents. The majority of these have been classified using the refined UK Classification key, with around 75,000 terms embracing all technological aspects. The search files include British patents for at least 50 years, American patents back to the year 1970 and all patents published by the European Patent Office and the World Intellectual Property Office since 1978.

Examiners also have access to over 40 on-line patent databases. These vary in their structure, time, geographical coverage and scope. Generally, they include abstracted records of published patents and are interrogated by entering search terms such as patent numbers, priority details, classification codes, keywords, names of companies or individual inventors to extract the most relevant information. The examiner's skill lies in their command of their subject matter and familiarity with the database.

The information contained in these databases can be put to a broad range of applications, from basic research through to product marketing. Before research is initiated, a scan of published literature to establish what is already known can save many hours of fruitless investigation.

Unforeseen difficulties may arise when scaling up for production. These may have been encountered elsewhere and their solution may lie in patent literature.

An indication of suitable markets for products can be obtained by evaluating the worldwide patent practices of possible competitors.

A thorough review of published documentation will assist in drafting a sound patent application to give your product or process the maximum degree of protection.

After a successful product launch, the product, its processes and the materials used will have to be continuously upgraded to build and maintain market position. A regular review of patent literature will help you take advantage of advances made and keep ahead of the competition.

These are some investigations the Search & Advisory Service may carry out:

* **Patentability assessments.** A search through published patents will help you form a judgement on the likelihood of a recently developed product or process receiving patent protection.
* **State-of-the-art review.** A compilation of published patent documents can provide either a broad review of a technical field, or a detailed report on the most recent developments in a particular area of technology. Study of the state of the art can be an important factor when deciding whether or not to pursue a line of research. You may discover a piece of technology you want to license in.
* **Name searches.** Investigations into a patent portfolio owned by a company or by a named inventor. A name search can be restricted to a given technology. Name searches by company can help you discover what the competition is doing or, by inventor, assist in making recruitment decisions.
* **Family searches.** Identification of equivalent patents with common priority details, published by various countries or international authorities.
* **Validity searches.** Investigations to isolate patents that might be used to attack, on the grounds of novelty or obviousness, the validity of a claimed invention.
* **Infringement searches.** Identification of patents still in force whose claimed product or process may be infringed by the manufacture, importation, sale or use of an article.
* **Patent watch.** A regular scan of recently published patents from around the world to keep track of developments in a particular area of technology or to maintain current awareness of the patenting activities of competitors.
* **Status checks.** Tracing the progress of a patent from application stage through to grant and to establish whether any post-grant actions have been taken affecting the legal rights of a patent.

The Search & Advisory Service provides a report on the search made. This will contain as much or as little commentary and analysis as required, but will generally comprise a summary of the search strategy adopted, the technical areas investigated, the references uncovered and an indication why the references are considered relevant. Copies of cited patent specifications can be supplied on request. All communications with, and investigations carried out by, the Search & Advisory Service will be treated at all times with the strictest confidence.

The Search & Advisory Service aims to provide best value for money in retrieving and analysing patent-base information. Typical charges for subject matter and bibliographic searches are available on a leaflet from the Patent Office. In addition, this Service will gladly supply estimates for specific investigations, or undertake searches within imposed cost limits.

For information about the Search & Advisory Service call 01633 811010 or Fax 01633 811020

THE YEAR OF ENGINEERING ACHIEVEMENT

This is the first in a series of Newsletters, published by Yearco Ltd, designed to keep us up to date with the progress on The Year of Engineering Achievement. Subsequent numbers will come out at regular intervals and details will be provided in this journal.

It has been decided to start YEA in the Autumn of 1996 instead of mid-1996 as was originally planned. We expect to make a public announcement in the future. The Year of Engineering Achievement will be a major national promotion designed to bring about a better understanding of the role of the engineer and of the importance of engineering for the future prosperity of the United Kingdom. YEA will be organised by Yearco Ltd. and has been granted charitable status by the Charity Commissioners. The directors of Yearco Ltd. are:

The Royal Academy of Engineering
Dr. Peter Nevitt FEng
The Institution of Electrical Engineers
Mr. David Dowle
The Institution of Mechanical Engineers
Mr. Jamie Cameron
National Power plc (To follow)
National Electric plc
Dr. Bob Clayton

A formal offer of £350,000 has been received from the DTI, together with offers of £ 100,000 from the Department of Employment and £50,000 from the Department of the Environment. Yearco Ltd. already have an offer of a grant of £20,000 from OST. In total they have so far received offers of nearly £1 million towards the cost of YEA, including £100,000 dedicated to a specific event. This is sufficient to launch YEA.

However a further £500,000 is needed if YEA is to achieve its full potential. The more that can be raised, the more activities will be funded. A new appeal is to be launched for funding and support addressed to a wider range of companies and organisations than last year's appeal.

Approaches will be made to Banks, Insurance Companies, Engineering Firms, Consulting Engineers, Management Consultants, etc. The appeal will go out over the signature of Sir Francis McWilliams GBE with the support of Sir William Barlow. Examples of support being sought are:

* A contribution to the costs of running YEA (N.B. Yearco Ltd. is a Registered Charity);
* Co-operation with the regional organising committee in running regional events;
* Sponsorship of a regional event;
* Seconding a staff member free of charge to Yearco to assist in the organisation of YEA;
* Provision of office accommodation for Yearco free of charge;
* Sponsoring a YEA publication;
* Sponsoring a special YEA travelling exhibition to go round the UK;
* Sponsoring a conference on YEA themes;
* Providing speakers for YEA events both national and regional;
* Organising an open day or days where engineering in action can be demonstrated;
* Bring already planned events or open days etc. within the YEA programme;
* Co-operating with Local/Regional/ national media to provide newsworthy events with a YEA theme;
* Publicising the YEA messages in corporate publications;
* Using YEA themes in corporate advertising;
* Other ideas for helping YEA will be welcomed.

The delay in finalising the finances has meant that the recruitment of key staff for Yearco has been delayed. Needed will be a Director General and Deputy as well as managers to take charge of aspects of YEA. Informal enquiries are being made in the first instance to identify possible candidates. Suggestion would be welcome.

Peter Corley will continue to act as Project Consultant in a co-ordinating role. Dr. David Thomas has been seconded by Nuclear Electric to assist in running YEA and is presently occupied full time on co-ordinating the regional programmes and in liaising with Academic Institutions and Museums.

YEA will place considerable emphasis on regional initiatives, supplemented by activities at national level. Over 50 organisations have already agreed to support YEA, as well as about 20 companies. The regional activities will be co-ordinated by groups drawn from the supporting organisations. As a first step a database has been assembled of more than 500 names of local contacts for these organisations. The next stage will be to call initial meetings of these representatives in each region. In many cases it is hoped that this will be in association with emerging Regional Engineering Centres, and based on Engineering Council Regions.

Last year a start was made on drawing up a list of events planned by participants in YEA. These events would be included in YEA publicity; the information contained in the database would be made available to all participants to assist in forward planning. The latest version of the database is reproduced on the next two pages. News of both regional and national events would be welcome, also provisional entries even if full details are not available at this stage.

Yearco Ltd. can be contacted at the offices provided by Nuclear Electric at Gloucester. The address is Yearco, c/o Nuclear Electric, Barnett Way, Barnwood, Gloucester. GL4 7RS Tel: 01452 654564 Fax: 01452 653454.

Members should note that the Institution of Agricultural Engineers is a supporter of the Year of Engineering Achievement.

YEAR OF ENGINEERING ACHIEVEMENT - EVENTS DATABASE

Institution	Title	Location	Dates	Description	Audience	Other	Contact
Engineering Employers Federation	West European Metal Employers Federation Plenary Meeting	To be decided	June 1996	Meeting of engineering employers from all European countries and Australia			Ian Priestner 071 222 7777
Engineering Employers Federation	Centenary Celebrations	Throughout UK	Mid 1996 to Mid 1997	Programme being developed			Ian Priestner 071 222 7777
Engineering Council	Environment Award for Engineers	Throughout UK	Winners announced in London in September	Entrants must describe current examples of good practice in an engineering product, project or process which contributes to the environment	235,000 engineers and technicians in the UK		Tony Miller 071 240 7891
Engineering Council	Young Engineers for Britain	Throughout UK	12 Regional Finals throughout UK in May, June, July. Final in London in September	Budding Engineers (11 to 19) enter inventions or adaptations	The whole country. Approximately 900 entries	Promoted through national and local press. Not open to general public	Tony Miller 071 240 7891
EnTra	Free Phone Enquiry Service	From EnTra Head Office, Watford	Continuing	Free enquiry service and literature	14 year old and upwards	Free phone could be used as central information point during YEA	Dave Roddam 0923 238441
EnTra	Insight	12 Universities throughout UK	Summer (annually)	One week courses for sixth form girls in engineering faculties	16/17 year old girls studying science subjects. Up to 500 places on offer	Designed to introduce engineering as a career and to redress the gender balance in engineering courses	Dave Roddam 0923 238441
EnTra	Engineering Exhibition (Regional)	up to 10 major cities in the UK	Not yet known	Engineering stands at major careers exhibitions	Parents pupils and teachers. 30,000 per exhibition	Could be dedicated to YEA given sufficient notice	Dave Roddam 0923 238441
EnTra	Engineering Careers Booklets	Available throughout UK	Ongoing	Wide range of careers advice literature	200,000 items issued each year to school leavers	Could be used with YEA logo	Dave Roddam 0923 238441
EnTra	Best of British Engineering Skills	Throughout UK	Mid 1996 NEC Birmingham (Finals)	Young people compete in engineering skills	Hundreds involved initially with about 50 in final	Winners often go on to compete in International Skills Olympics	Dave Roddam 0923 238441
BEAMA	Biennial Exhibition	NEC Birmingham	June 1996	Industrialists			
CBI	Annual Conference & Exhibition		November 1996	Industrialists			
Inst. of Civil Engineers	Christmas Lecture	ICE	Christmas 1996	Lecture on an interesting engineering project to attract 12-14 year olds	150		W.H.T. Spaight 071 222 7722
Inst. of Mechanical Engineers	150th Anniversary		1997				
Inst. of Chemical Engineers	75th Anniversary		1997				
Royal Society	May Exhibition	London	May 1997				

Institution	Title	Location	Dates	Description	Audience	Other	Contact
Royal Academy of Engineering	MacRobert Award for Engineering Innovation						
Royal Academy of Engineering	Joint Industrial soiree with the Royal Society						
Royal Academy of Engineering	International CAETS Convention						
Chartered Inst. of Building Service Engineers	Centenary		1997				
The Institution of Plant Engineers	Golden Jubilee		1996				Roger Pratt 071 233 2855
British Association for the Advancement of Science		Birmingham	1996				
Institution of Mechanical Engineers	6th International Conference on Vibrations in Rotating Machinery	Brighton	September 1996	Effect of vibration in a wide range of engineering fields	Professional 160		Hazel Anderson 071 973 1317
Institution of Mechanical Engineers Institution of Chemical Engineers 7 SCI	International Conference on Engineering & Food	Brighton	April 1997	All aspects of food engineering	Anyone involved in Food engineering 500-1000		Hazel Anderson 071 973 1317
Institution of Mechanical Engineers	World Tribology Conference	London	8-12th September 1997	Silver Jubilee Anniversary of the 1937 London Conference on Lubrication & Lubricants	Professional up to 1000	It is hoped to incorporate EUROTRIB, NORTRIB, ASME & ASTLE Conferences into this first World Congress	Julie Brown 071 973 1316
Institute of Measurement Control; The Royal Society; Institution of Chemical Engineers	Triennial Hartley Lecture		1997			Subject to agreement	
Institute of marine Engineers	International Festival of the Sea	Bristol	24-27th May 1996			Just outside the YEA period but could be linked in	
Institute of marine Engineers	Diamond Jubilee Review		26th June 1997		Centenary demonstration of Turbinia		
Federation of the Electronics Industry	NEPCON		March 1997	Major UK Electronics show		Possible YEA stand	
Federation of the Electronics Industry	Annual Lecture at City University					Possible YEA theme	

NEWS ROUND-UP

ADAS TO PROCEED TOWARDS PRIVATISATION

In a written answer to a Parliamentary Question Mr Waldegrave said that "The Secretary of State and I have now agreed that a number of ADAS's functions are suitable for privatisation. We have however concluded that certain of the non-R and D functions that ADAS carries out for MAFF and Welsh Office - about two thirds of this work in all, including most of that in connection with the agri-environment schemes - should remain in the public sector.

We have accordingly agreed to prepare for privatisation a body that comprises all the ADAS commercial consultancy services, its laboratory services and the remainder of the non-R and D work performed for departments. As to the present Research Centres, ownership of the sites and their facilities and arrangements for future access to both by the privatised body will be further considered. We expect, however, that the privatised body would continue to manage a proportion of our departments' existing programmes at those sites.

ADAS has met all its financial targets since it was launched as an agency. We have concluded that the precise timing for privatisation should be determined in the light of continuing improvements in its financial performance, particularly its commercial consultancy services. We have accordingly decided that ADAS will be required to recover 100% of its costs for advisory services in 1996-97 through charges to its commercial customers. If this and other objectives are met in 1996-97, we shall proceed to privatisation in the course of 1997. We do not exclude an earlier disposal if the agency's performance warrants it.

A management team has indicated that it would be interested in preparing a Management and Employee Buy-Out of a business similar to that described above. We welcome this signal from the agency's staff of their confidence in its future but will, of course, consider all bids that may be forthcoming for that business or for parts of it."

MINISTER OF AGRICULTURE EMPHASISES NEED FOR ENVIRONMENTALLY FRIENDLY FARMING

The Agriculture Minister speaking to the General Council of the Council for the Preservation of Rural England emphasised the importance of environmentally friendly farming and the need to build on achievements.

He stated that there are now 22 ESAs in England covering over 10% of our agricultural land, with 60,000 agreements covering nearly 400,000 hectares. The total expenditure on ESAs is expected to rise to £63 million by 1996-7. The ESA scheme is our flagship and is a success in promoting farming methods that conserve and enhance wildlife habitats, valued landscapes and historic features.

In addition to ESAs other schemes have been introduced under the 1992 Agri-Environment Regulation:

* The Nitrate Sensitive Areas Scheme protects groundwater sources.

* The Habitat Scheme to encourage the creation of new wildlife habitats.

* The Organic Aid Scheme to encourage conversion to organic farming.

* The Countryside Access Scheme to encourage new public access to set-aside land.

* The Moorland Scheme to help improve moorland vegetation.

* The Countryside Stewardship Scheme to integrate environmental land management Schemes.

The Minister also emphasised the significant progress made on 'cross-compliance'. The EU agreed in December 1993 that in addition to measures introduced through the Hill Livestock Compensatory Allowance Scheme (HLCA) environmental conditions could be applied to the other main livestock support schemes. These conditions have now been introduced. All payments under the main livestock support schemes are now conditional on avoiding significant over-grazing.

For set-aside too, farmers have to follow management rules designed to protect the environment, and rules now operate in a much more environmentally friendly way, thanks to pressure from the UK.

At last the Agricultural Council's agreement has been secured to a regulation linking market and environmental set-aside. This should give a real boost to the Nitrate Areas Scheme, the Habitat Scheme and forestry schemes and count it against their set-aside obligations.

The Minister concluded by looking ahead to the Rural White Paper. "The aim of this is to look at all the issues that are important to the people who live and work in and indeed those who otherwise use the countryside. Preparations are being made to the White paper within the context of the Government's sustainable Development Strategy. In doing so we are aware of the need to integrate protection of the countryside with the need for economic development."

CEREALS EVENT MOVES TO LINCOLNSHIRE

Cereal '96, the annual National Cereals and Combinable Crops Event, is to be held at Aubourn Farming on the Nevile Estate, Wellingore near Lincoln on Wednesday 12th June and Thursday 13th June 1996.

The venue was announced at the recent Cereals event held at Shuttleworth. The largest in the event's history, a crowd of 9,500 people came to see nearly 220 specialist arable companies and organisations.

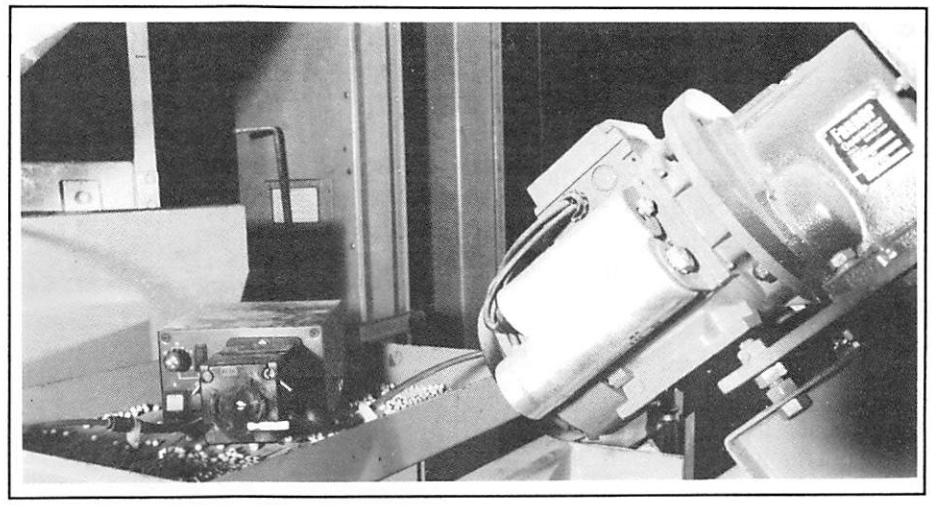
This annual focus for growers is organised by the Royal Agricultural Society of England, ADAS, HGCA and the East of England Agricultural Society in association with the Farmers Weekly. The event is sponsored by Lloyds Bank.

PERISTALTIC PUMPS

Seed treatment machines in the 'Pioneer' range from Turner Grain & Feed Milling now use a combination of Watson-Marlow pumps to meter chemical liquids and suspensions. The peristaltic pumps are used to meter chemicals to a misting chamber and are sited on exposed supporting trays to pump for 10 to 200 litre containers. The pumps provide an output of 8 to 70 litres per hour.

Turner Grain & Feed Milling switched to peristaltic pumps because they provided an accurate output, were fast and simple to operate and retained all the liquids and suspensions within the pump tubing without "real" pressure. They are also easily reversed to flush out residual chemicals.

These pumps are being used for up to eight hours per day in the seed treatment machines. To date, the silicone tubing has performed well on the thirty pumps in service.



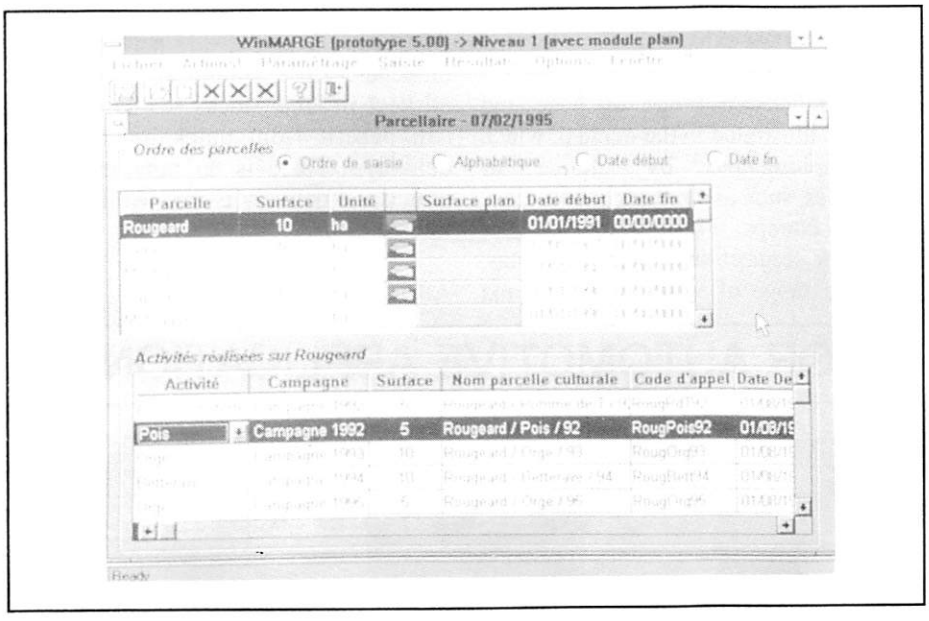
New Peristaltic Pump Catalogue

Watson-Marlow has introduced a new 52 page catalogue showing their range of peristaltic pumps, the largest range in the world.

Included is detailed tubing compatibility chart and a section on how to choose the right pump and tube for your application, the benefits of peristaltic pumping, new pumps, accessories, and other Watson-Marlow publications.

Watson-Marlow Limited, Cornwall Tel: 01236 370370

MULTIMEDIA SOFTWARE PACKAGE FOR FARMERS



Isamarge is a unique multimedia software package for farmland management developed by the French company ISAGRI S.A. and the Institut des Dereales et des Fourrages (ITCF).

Isamarge accepts a wide variety of data, including recorded vocal comments, photographs of crops, figures and text data. This information can be consulted at any time.

Isamarge prepares the data that farmers or agricultural engineers need to manage a farming operation. For example, it can calculate the cost of producing a hundredweight of wheat, a litre of wine or a head of lettuce. It can also estimate the average monthly income generated by the farm, as well as farm machinery and labour costs. The software is unique in that the user can obtain data for any period, eg a month, a season, years.

Less than one hour per week on average is required to enter data on the different operations; from ploughing, to seeding, to harvesting and sale. The data is archived by the software and remains available for later consultation.

The farmer can display and print a detailed map of his land identifying a number of production criteria for example, crops, yields and seeding dates.

The software was developed for farmers and engineers in farming consultancy firms. The programme runs under Windows on all PCs with multimedia capabilities.

ISAGRI is a leader in business computing for farmers. ITCF is a professional body specialising in technical consultancy for large-scale farming operations. ISAGRI is currently seeking UK distributors.

Monsieur Alain VIDAL, ISAGRI S.A., Rue Waguet, BP 333, 60026 Beauvais Cedex, France Tel: (0033) 44 06 40 55

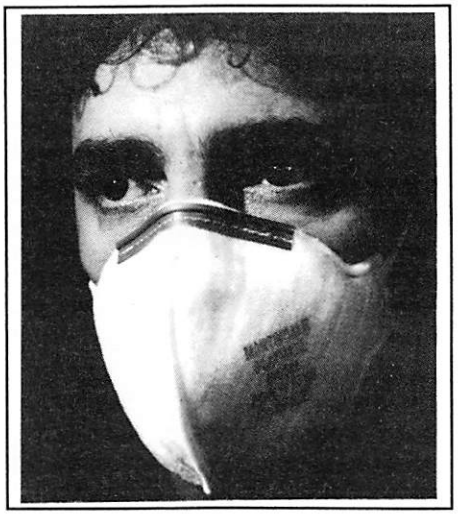
COMPANY AND PRODUCT INFORMATION

NEW 'FLATMATE' NOW AVAILABLE FROM MARTINDALE

The new style 'Flatmate"' disposable respirator is manufactured to EN 149 and marked CE. Made from a light, non-irritant filter material, the 'Flatmate' range offers protection from dust, fumes, odours, mists and sprays in the workplace. Easy to breathe and talk through, the pliable nose-clip and elasticated straps combine to provide a feeling of comfort and safety.

The 'Flatmate' will not interfere with work activities, while offering clear all-round vision. It is light and cool enough to be worn throughout the entire shift, and can be comfortably used with spectacles or goggles.

In between use, the resealable plastic bag allows the 'Flatmate' to be re-folded flat and fitted into the pocket, keeping the inside clean and re-usable at all times. Supplied in self-dispensing cartons and each respirator is hygienically sealed to prevent contamination.



Also, from Martindale, their new Silicone Centor half-mask respirator claimed to be the most comfortable mask yet. The new Centor's ergonomically designed silicone face-piece moulds to the contours of the face. This provides a high level of comfort and protection throughout a complete shift.

Martindale claims that they have not had to sacrifice safety or durability, the silicone face seal being as efficient as the best rubber masks and just as durable. Silicone Centor is CE marked and meets EN140 and the COSHH regulations.

The new Centor is fully compatible with Martindale's extensive range of low resistance FITTA filters, which offer protection against dust and gas, (or a combination of the two) and are manufactured to EN141 and EN143.

Martindale Protection Ltd, London
Tel: 0181 450 8561

ARCO HOSE, DUCTING AND FITTINGS MANUAL

More than 200 different types of hose are featured in the 193 page, hard-backed manual, each accompanied by a detailed specification and coloured illustration. New hose products include ARCO-Sil - a silicone hose for use in the food and pharmaceutical industries - and a range of multi-purpose, high quality PVC technical hose from leading manufacturer Tricoflex SA.

ARCO stocks flexible ducting in numerous sizes and materials, including PVC, thermoplastic, polyurethanes and polyethylene. New for this edition is a range of 14 branded ducting for the conveyance of air, dust and fumes, including garage exhausts.

A comprehensive range of hose end fittings is illustrated in the manual, which is complemented by choice of accessories, such as strainers and nozzles, clips and clamps. Fittings include Snap-Tite quick connect/disconnect couplings, the Geka range of water couplings and accessories designed for the horticulture industry and airline and compressor fittings.

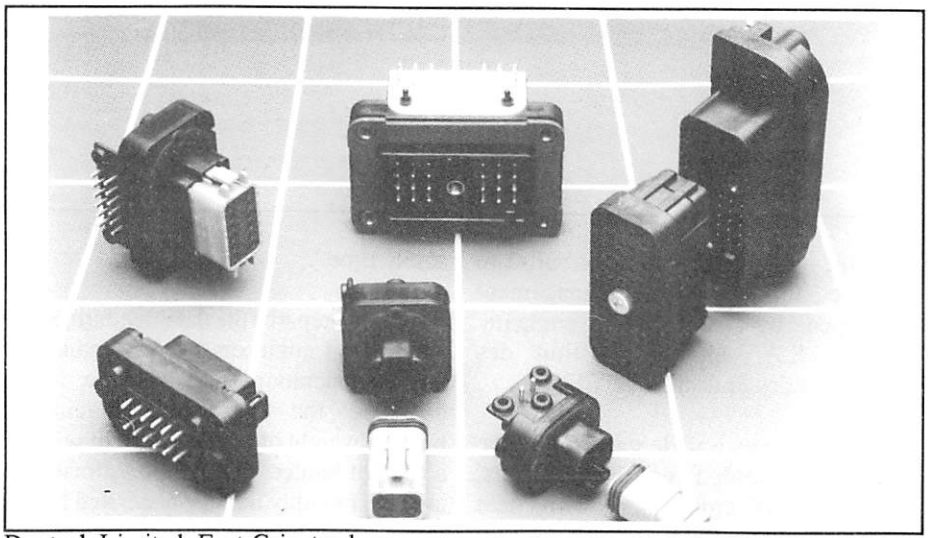
ARCO has a nationwide network of 18 branches. Hose, fittings and ducting are all kept in large stocks so the customer can benefit from quick and efficient delivery. There is no minimum order policy and delivery is free within branch trading areas.

ARCO Tel: 01482 222522

PCB CONNECTORS FOR AUTOMOTIVE APPLICATIONS

Deutsch DT and DRC Series Connectors are suitable for vehicle electrical system interconnection on off-road vehicles, including applications where small size and high contact density is required. The mounting flange has a silicone gasket to stop moisture and other contaminants from entering the module casing.

A selection of terminals are available with a choice of between 2 and 40 straight or right-angled pins. A thermoplastic housing enables the connectors to operate from -55° C to +125° C. The crimped contact system provides quick and simple installation, as well as being compatible with other Deutsch connectors to provide an integrated wiring system.



Deutsch Limited, East Grinstead Tel; 01342 410055

NEW AIRSTREAM HELMET

While retaining its original well-proven styling, the Airstream has now been upgraded to achieve CE marking under European safety standards. This has been accomplished by introducing a number of modifications including a new more durable face seal, and restraint button to prevent the visor being lifted accidentally.

The concept of the Airstream is a special safety helmet fitted with an integral motor and fan unit. The motor draws dust-contaminated air through a high grade filter at the back of the helmet. The cleaned air is then fed through the top of the helmet and supplied to the wearer's face behind a clear plastic safety visor.

The system is both cool and comfortable to wear for long periods and eliminates the fatigue and discomfort of having to inhale air through filters.

In addition to the Airstream helmet, the company designs, manufactures and supplies a wide range of CE marked respiratory protective equipment from disposable masks and powered air units, through to airline equipment and self-contained breathing apparatus.

Racal Health and Safety, Middlesex Tel: 01734 669969

NEW GENERATION RENAULT CERES

The Renault Ceres Generation II are the first tractors to result from the agreement signed last year between Renault Agriculture and John Deere. Under the agreement, Renault Agriculture now source engines for the 65 hp - 85 hp Ceres range from the Deere Power Systems (DPS) Group and will be manufacturing the Renault Ceres in John Deere livery as a complement to their range.

The change of power unit not only provides increased performance, but also ensures that Renault will meet the new EC emission regulations for new agricultural and forestry tractors from October 1997.

DPS is a specialist agricultural engine manufacturer building 170,000 engines annually, a third of which are built at Saran in France, which is only 130 miles from the Renault Agriculture plant at Le Mans.

In addition, the Ceres Generation II also incorporates a number of specification changes. A 25 amp external power socket has been fitted, and a specific hydraulic connection for loaders has been added which leaves the spool valves free for other applications.

For ease of use, the engine is both started and stopped via the ignition key.

Fitment of the DPS engine will slightly increase the tractor's wheelbase, which will further improve tractor stability.

Renault Agriculture Ltd, Shipston-on-Stour Tel: 01608 662727

FARM VERDICT ON ACCORD CX-DISC COULTER

Throughout Europe as farmer's profits are eroding a great deal of work has been carried out using non-inversion soil techniques. Often this is integrated with rotational ploughing. This has resulted in far more organic matter and crop residues on the seed bed surface.

ACCORD LANDMASCHINEN Research and Development has spent many years trying to perfect an optimum solution. Their CX-disc coulter was first presented at the Agritechnica 1993. The term CX-disc coulter stands for the unusual combination of a **convex** steel disc with a **flexible** plastic disc.

For an impartial judgement of the CX-disc coulter, during November 1994 ACCORD sent questionnaires to all end users throughout Europe. They received responses from 110 farmers in the UK, Austria, Switzerland, Belgium, Denmark and Germany, covering a total area which had been drilled with this coulter type of 16086 ha. In total 98% were very satisfied with the CX-disc coulter. 96% of the farmers reported that the CX-disc coulter turned in all conditions. 98% of farmers were very satisfied and satisfied with the depth placement. 99% of the farmers reported of none or only few grains remaining on the surface.

Ferrag Limited, St Helens, Mersey Tel: 01942 272777

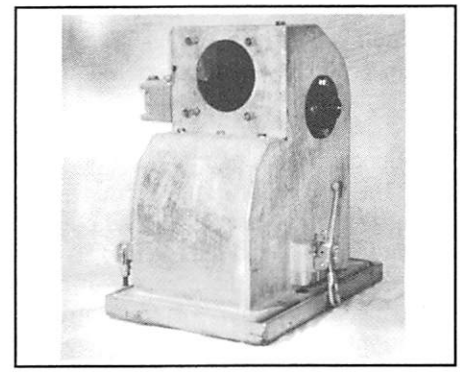
VREDO - CHOPPING FILTER FOR SLURRY TANKERS

Vredo have introduced two models of chopping filter for fitting to slurry tankers, with either pump fill/discharge or vacuum fill/discharge.

They are designed to filter out large foreign objects such as stones/brick etc into a sump and also chop hay/straw etc by means of a specially designed hydraulically unimpeded flow of slurry through the filter so causing only a smal lpressure drop. This is particlularly important for tankers when filling from a pit.

The filters can also be incorporated in a pump for umbilical hose sets, thus reducing pump damage and maintenance.

Further information is available from ANKER, 60 The Avenue, Southampton. SO17 1BD
Tel:01703 233193 Fax: 01703 339272



COMPANY AND PRODUCT INFORMATION

VERMEER'S D-24 NAVIGATOR BEATS THE QUICKSAND

For any contractor, working in Germany's many "biotopes" - environmentally protected areas - is a headache. Usually they are quite small, but they are so numerous causing a regular obstacle on many contracts. This was just the case for Haberl Kabelbau GmbH, a trenching and excavating company who were laying 4 km of sewage pipes between two small towns near Munich, as part of a local government contract. Part of the route was through a biotope, in this case a small area of marshland bordered by two rivers, with groundwater lying only 20 cm below the surface.

Trenching is not allowed in biotopes on environmental grounds and in any case, in these conditions a trencher would have sunk, so Haberl Kabelbau needed a trenchless solution, provided by Joachim Schösser of Vermeer Steinbrück GmbH and the D-24 Navigator. Using either a 72 HP Deutz or 140 HP Cummins engine, then D-24 can produce over 8,000 kg of thrust at the drill head and pullback of nearly 11,000 kg. With a maximum backream bore diameter of 400 mm for pipe installation, installing the 165 m of 160 mm PN10 pressurised sewage pipe specified for the project would normally be straightforward. However, the challenge was the soil conditions - quicksand and groundwater and because of these adverse conditions, Harberl Kabelbau was doubtful about how successful any directional drilling would be. Joachim had no doubts and offered to do the bore as a "live" demonstration.

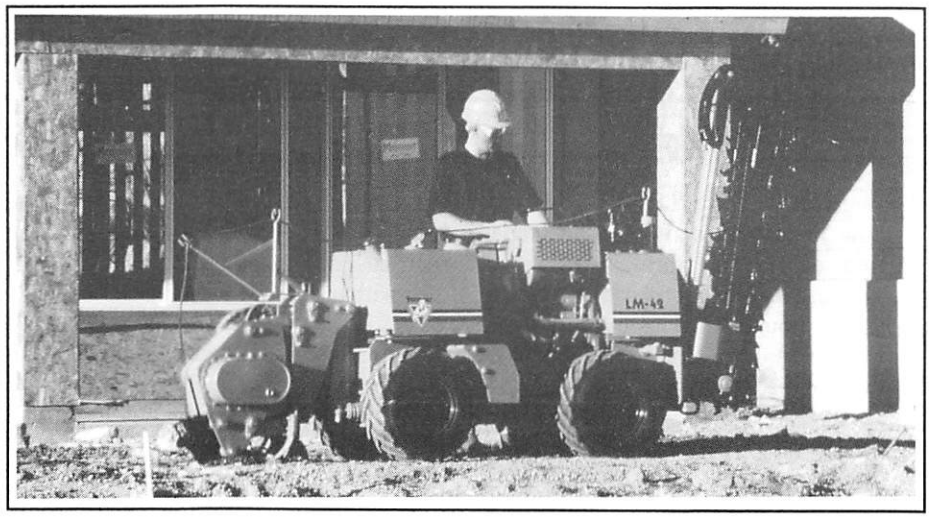
Because of the quicksand, Joachim and his team, used a specially designed 130 mm wide front blade and thickened lubricant. For the backream process they combined cutting and compaction, using a 220 mm wheel cutter, with 200 mm bell compactor attached. Having staked out the direction of the drill path, they bored under both rivers and the marsh area in a single shot. Once the boring was in place, they pulled back the 165 m of pipe in just 2½ hours.

The bore was done in early March and to make an already challenging project even more interesting, the weather decided to close in. As well as having to bore through quicksand and groundwater, Joachim and his 2-man team also had to work in sub-zero temperatures, blizzard conditions and 20 cm of snow.

Despite the adverse conditions, they successfully completed the entire project in a single day, at their first attempt. Haberl Kablebau was so impressed that the company is now considering adding a D-24 navigator to their fleet of trenchers and excavating equipment.

INCREASED PRODUCTIVITY FOR SERVICE LINE INSTALLATION

Vermeer's new compact and manoeuvrable LM-42 plough/trencher is designed to be a versatile addition to a contractor's fleet. With its optional range of attachments including a rockwheel, it is very well suited for cable TV installation, as well as other service-line installations such as electric, phone, gas and water, and irrigation applications. Also, with Vermeer's Porta-Bore attachment, the LM-42 can be used for trenchless installation under finished surfaces and landscapes.



With a three-cylinder Deutz engine delivering 43.5 HP (32.4 kw) at 3,000 RPM and 11.2 kg-m at 1,800 RPM, the new LM-42 plough/trencher has more horsepower and torque than any other machine in its class. The air-cooled engine is designed with fewer parts and hoses, for increased reliability and reduced maintenance, and the absence of a radiator means reduced vibration and more reliable performance.

The trencher lets operators dig down to over 1m with 10cm and 15cm widths. Optional side weights, that can be added for hard ground and removed for wet or soft ground, allow the operator to adapt the machine to varying ground conditions. As well as the rockwheel and Porta-Bore, the LM-42 also has optional B-500 backhoe and vibratory plough attachments.

The LM-42's standard single or optional two-speed ground drive system features reliable, low-maintenance Vermeer hydrostatic drives, for easier operation and service. It also allows the operator to match performance quickly and simply to ground conditions, reduces machine wear and tear and increases productivity. A servo-controlled ground drive pump delivers smooth trenching control.

The LM-42 has been designed for ease of use for experienced and inexperienced operators alike. There are separate controls for left/right and forward/reverse; dual 'operator presence' controls give the operator a choice of a conveniently located joystick or handlebar. Operator presence controls provide a quick-response shutdown system when either the joystick or the handlebar is released during operation. Other important safety features include centring springs on the rear attachment, which prevents any swing on uneven ground when in a raised position, making the LM-42 stable and reducing the potential for accidents. Insulated controls protect the operator from electric shock when ploughing/trenching.

PERKINS WINS SILVER MEDAL

The Perkins Group has been awarded a top accolade by the Royal Agricultural Society of England, with the presentation of a Silver Medal at the Royal Show, on Monday 3rd July. The Perkins 1000 Series engine, that offers farmers high technology engineering with outstanding flexibility, won as a result of product innovation and operating performance.

The 1000 Series, of which almost half a million are in service worldwide, is the preferred choice of internationally known original equipment manufacturers such as Caterpillar, Claas, JCB, Massey Ferguson, Landini, Matbro, Manitou, Merlo and Sanderson.

An outstanding characteristic is its revolutionary dual zone capability. This effectively gives two tractors in one - one for heavy duty ploughing and another for light haulage operation. This remarkable new torque flexibility comes from a fuel injection system specifically matched to the latest low inertia turbocharger.

It ensures that the engine always behaves in the precise way the work demands. This avoids risk of stalling, frequent gears changing, cuts fuel consumption and optimises performance. For the drivers this all adds up to less stress and superb driveabiltiy, whatever the task.

At the heart of the engines is Quadram, Perkins unique combustion system - a four-lobe bowl set in the piston crown, optimising fuel and air mixing. It increases power and torque for greater productivity as well as reducing fuel consumption and exhaust emissions.

The Perkins 1000 Series range has established an outstanding reputation for excellent performance in the toughest conditions with class leading economy and outstanding reliability.

And Perkins has always been at the leading edge of diesel technology, developing clean, tough diesels that offer increased cost efficiency with worldwide class reliability.

With a product range spanning 5 to 2500 bhp, Perkins supplies engines to more that 600 manufacturers of original equipment throughout the world and is a business of Varity Corporation.

BACTERIA CULTURES SWEETEN CATTLE AND PIG SLURRY

Cattle and pig slurry are smelly, difficult to deal with, and potentially the cause of pollution. A biotechnology company, IBS Limited, has turned its attention to this waste disposal problem. It has developed **SlurryTreat**, a specially-selected blend of naturally-occurring aerobic bacteria that accelerate and improve the slurry conditioning process, turning the slurry into a liquid fertiliser.

Added to an aerated slurry system, **SlurryTreat** dramatically increases the amount of microbial activity, thereby speeding up the breakdown of organic compounds such as ammonia. After treatment, slurry odours are minimised and **SlurryTreat** produces a nutritious free-flowing liquid fertiliser that can be easily pumped and sprayed onto fields.

In addition, free nitrates in the slurry are assimilated by the bacteria into less volatile forms, reducing the risk of contamination and improving the fertilising capacity of the treated slurry.

The bacteria in **SlurryTreat** have been specially-selected for their ability to degrade the organic matter found in cattle and pig slurries. They are naturally-occurring and have been subject to strict quality-control screening, to ensure the total absence of any pathogenic species.

SlurryTreat is remarkably cost-effective. About 50 cubic metres of slurry can be treated with just 1 kilogram of **SlurryTreat**. This equates to less than 5 pence per animal, per week!

Sold in 10kg plastic tubs, **SlurryTreat** is available from established agricultural distributors and farming supplies outlets throughout the UK and Ireland. IBS is also interested in talking to more distributors, to increase its distribution network.

300 CASE COMBINES FOR TURKMENISTAN

Case Corporation has sold 300 Case IH grain and rice combines to Turkmenistan. Totalling more than $45 million, this is the company's largest equipment sale into the agricultural region of Central Asia and is secured by a letter of credit from Turkmenistan, confirmed by the French bank Societé Generale and backed by the US Eximbank.

"This landmark sale is the result of our extensive work in the agricultural region of the former Soviet Union", said Jean-Pierre Rosso, Case president and chief executive officer. In 1994 Case shipped both combines and cotton pickers to Turkmenistan and in 1993 sold more than 100 combines to the Ukraine.

"This marks another step in our strategy of expanding into emerging agricultural and construction equipment markets around the world. We believe Turkmenistan and surrounding countries represent a large potential opportunity for our equipment," Rosso added.

Turkmenistan, with other Central Asian nations of Kazakhstan, Kyrgyzstan, Tajikstan and Uzbekistan, comprise one of the major agricultural regions of the former Soviet Union. The large farms in this region are well suited to Case IH equipment. Collectively, these countries comprise an agricultural equipment market equivalent to Western European markets, like France and the UK.

One hundred combines are enroute to Turkmenistan and are scheduled to arrive in mid-June for the early harvest season. The remaining two hundred will be sent in two shipments later this year. The majority of the combines are Case IH 2100 series, a new line introduced by Case in November 1994.

As part of the sale agreement, Case will provide service engineers to train operators and mechanics on the use and service of the combines. Case will also assist in setting up technical service centres and parts depots. In addition, the company will bring several Turkmen to Case's training centre in Germany.

RULES, REGULATIONS AND CODES

CE MARKING OF INSTALATIONS

by Andy Newbold, Principal Engineer, Newmac

The implementation of the European Machinery Directive (EMD) 89/399/EEC and its subsequent amending Directives 91/368/EEC, 93/44/EEC and 93/68/EEC as the Supply of Machinery (Safety) Regulations 1992 and Amendments 1994 in the UK, regarding machine safety of design and operation, has been documented and discussed at length.

This legislation has been introduced by the Department of Trade and Industry(DTI) and is being enforced by the Health and Safety Executive. It would appear however, that the main emphasis of enforcement and assistance with compliance has been, to date towards individual machines, for instance tractor mounted equipment and specific pieces of fixed equipment.

The Supply of Machinery (Safety) Regulations 1992 defines "machinery" in Part 2 Application, as "(b) an assembly of machines, that is to say, an assembly of items of machinery as referred to in paragraph (a) above which, to achieve the same end, are arranged and controlled so that they function as an integral whole notwithstanding that the items of machinery may themselves be relevant machinery and accordingly severally required to comply with these Regulations"

This clearly states that any assembly of machines, for instance a fixed installation such as a grain store and drier or a controlled environment vegetable store must also comply with the Supply of Machinery (Safety) Regulations 1992 and Amendments 1994 and hence be CE marked as a "machine" in its own right.

This however creates some practical problems as the majority of these systems in the agricultural industry are manufactured or supplied as component parts by one party, to a dealer usually, who installs the system for the customer often through a third party, the contractor. The Regulations are clear that the compliance procedure must be followed by the manufacturer of the system, which in this case is the third party contractor.

Generally these contractors are farm builders, and as such do not have the time, expertise or resources available to follow the correct compliance procedure, if indeed they are even aware of their obligations.

Many of the manufacturers of such system components (with a few notable exceptions) although having all the necessary information and skilled staff, have conveniently "turned a blind eye" to this part of the legislation. However, they are still CE marking their machines and issuing the correct Certificate of Conformity or Incorporation as appropriate.

The manufacturers do however have a responsibility, not specifically with regard to the Supply of Machinery (Safety) Regulations 1992 and Amendments 1994 but to ensure that any installation using their equipment is in fact safe.

To conclude, it is suggested that manufacturers and suppliers of equipment to be used in these situations should take a more active role in ensuring that any installations involving their equipment do comply with the Supply of Machinery (Safety) regulations 1992 and Amendments 1994. Rather than is currently the case, merely CE marking the equipment as it leaves the factory and relying on contractors to fulfil their obligations, particularly when the majority of these installation contractors do not have the ability to follow the specified compliance procedures.

Andy Newbold is a principal engineer for NewMac, a specialist Health and Safety Agency.

"KEEP YOUR TOP ON"

HSE EXTENDS SUNBURN WARNING TO WIDER GROUPS OF OUTDOOR WORKERS.

A warning to farm and building-site workers of the dangers of excessive exposure to the sun has been extended to include other outdoor groups such as market gardeners and outdoor activity workers. The new warning - in a free leaflet, "Keep Your Top On" - is from the Health and Safety Executive (HSE)

"It is extremely important for outdoor workers to realise the danger of over-exposing the skin to the sun", said Dr Paul Davies, a senior health policy official at HSE. "Too much sunlight can be damaging - especially to people with sun-sensitive skin. Excessive exposure can prematurely age the skin, leaving it wrinkled and leathery, and increase the chance of skin cancer in later life.

In our climate the sun is not, of course, as strong or as intense as in the tropics. But workers are advised to protect their skin from undue exposure to the sun while working out of doors in the summer - particularly during the three or four hours round the middle of the day. The risks, however, can be almost totally avoided by following the advice contained in our newly revised leaflet. Recommended precautions include, the wearing of a long-sleeved top and a hat - particularly one with a wide brim that will shade the face, head and the back of the neck"

The leaflet also explains that some people are more sensitive to the sun than others and gives simple advice on how to recognise skin types most at risk. The publication is issued as part of HSE's current "Good Health is Good Business' campaign, which aims to reduce the number of people who suffer ill health caused or made worse by work. The message complements the public health initiatives being undertaken by the Department of Health, the Health Education Authority and the Cancer Research Campaign.

Copies of the leaflet 'Keep Your Top On - Health Risks From Working in the Sun', ref IND(G)147(L) are available free from HSE Books, PO Box 1999, Sudbury, Suffolk CO10 6FS TEL: 01787 881165 FAX; 01787 313995

COMMON SENSE APPROACH KEY TO TACKLING STRESS AT WORK - *says HSE Guidance*

There is no simple solution to work-related stress. A great deal can be done by adopting a common-sense approach based on sensible organisation, good two way communication and plain good management. This is the message of the guidance for employers on work-related Stress published by the Health and Safety Executive (HSE).

The guidance, called 'Stress at Work - A Guide for Employers', launched at a conference on occupational stress organised by the Confederation of British Industry (CBI) in conjunction with the HSE and Trades Union Congress (TUC), outlines the main causes and effects of occupational stress. It also sets out the practical steps employers can take to prevent unnecessary levels of stress.

The guidance draws attention to the wide range of factors in the workplace that are now commonly agreed can contribute to stress. These include excessive periods of repetitive or monotonous work, uncertainty, lack of clear objectives, interpersonal conflict, and inflexible or over-demanding work schedules.

Dr Davies said "The concern is not the normal day-to-day pressures which are an inevitable part of any job. It is with excessive and unreasonable pressures or demands which pose a threat to health. Where stress is a significant risk to health in this way, employers have a general responsibility under health and safety law to take action to deal with it.

The guidance does not prescribe the action which employers must take. Instead, it offers a broad framework for action which employers can draw on and adapt to their needs. The emphasis is on practical prevention. This does not mean introducing complex or costly assessment and control procedures but common-sense measures such as raising awareness of stress as a serious health and safety issue and ensuring it is taken into account in the day-to-day organisation and planning of work.

Clearly defined tasks and responsibilities, work targets that are stretching but reasonable and good two-way communication are just a few of the practical issues which employers can consider to help prevent excessive stress in their organisations.

Knowledge of stress is still developing. There are a number of areas where further research is required and work is now being commissioned. The guidance we have published today represents a first positive step in promoting more effective workplace controls. In time, and with further research, HSE hopes to be able to build on the advice and guidance it can provide."

THE DAIRY PRODUCTS (HYGIENE) REGULATIONS 1995

The Dairy Products (Hygiene) Regulations 1995 (Statutory Instrument 1995 No. 1086) came into force on the 9th May 1995. These regulations form part of the Food Safety Act 1990 and replace, the long in the tooth, Milk and Dairies Regulation 1959 (M&D Regs).

Although these regulations incorporate many of those that were part of the M&D Regs, additional regulations have been included to bring them in line with Council Directive 92/46/EEC, as amended 92/118/EEC and 94/71/EC and Directive 92/47/EEC.

The M&D Regs only dealt with milk produced from cows. However, the new regulations now cover sheep, goats and buffaloes as well. Milk producers had to be registered under the M&D Regs and registration continues under the new regulations. However, any production holding which is registered as a dairy farm before the coming into force of the new regulations and is in operation as such on the date before the date on which the new regulations came into force, shall be deemed to be premises registered under and subject to the provisions of the Regulations as a production holding.

The new regulations are divided into various parts and schedules as follows:

Parts

I Preliminary
II Registration and use of Production Holdings
III Approval and use of Dairy Establishments
IV Cancellation of Registration and Revocation of Approvals
V Conditions for the Handling and Marketing of Dairy Products
VI Conditions Relating to All Dairy Establishments
VII Transitional Provisions Relating to Dairy Farms and Dairy Establishments
VIII Enforcement, Supervision and Penalties
IX Miscellaneous and Supplementary

Schedules

1 Conditions for Registration of Production Holdings
- Part I A. General Conditions of Hygiene for Production Holdings
  B. General Conditions of Hygiene Applicable to Staff
- Part II Conditions for Housing of Animals
- Part III Conditions for Milking and the Handling, Cooling and Storage of Raw Milk on the Production Holding
- Part IV Conditions for Milking and Filtering Operations

2 Conditions for Approval of Dairy Establishments
3 Requirements for Raw Milk
4 Requirements for Drinking Milk
5 Requirements for Milk Used for the manufacture of Milk-Based Products
6 Requirements for Milk-Based Products
7 Storage Requirements
8 Transport Requirements
- Part I Temperature
- Part II Hygiene
- Part III Commercial Document

9 Wrapping and Packaging
10 Labelling and Health Marking
11 Methods of Analysis
12 Revocations
13 Amendment of the Food Labelling Regulations 1984

FARM DEATHS IN WALES HIGHEST FOR FIVE YEARS

The Health and Safety Executive (HSE) launched 'TRACTOR ACTION', a major agricultural training initiative for tractor drivers in Wales, at the Royal Welsh show in Builth Wells.

The launch coincides with the release earlier this month of HSE's Fatal Injury Report in Agriculture, which reveals the highest number of farm deaths in Wales for five years. Speaking at the show, Frank Lindsay, HM Chief Agricultural In spector said; "We need to target the main causes of death and in ury on farms. HSE produced Tractor Action in response to the analysis of over 1,000 tractor related accidents in Great Britain in a five year period between 1987 and 1993.

The analysis revealed a total of 136 deaths and 398 injuries. Eighteen of the deaths and 27 of the seriously injured were in Wales. It showed that tractor operators, particularly those between 15 and 25 years failed to follow the basic safety principles, and the main reason identified for people not following these principles is lack of adequate information and training. Tractor Action aims to fill that gap."

Part of the initiative designed to reduce tractor accidents at all levels is the action pack for use by lecturers and trainers in colleges, and during work based training. The pack including a safety guide, video and poster has been distributed free to agricultural colleges throughout Wales.

Key operations identified as causing accidents are; incorrect hitching, incorrect mounting and dismounting; approaching machinery and moving parts before the tractor is stopped and being struck by the tractoror its attachment, and use of tractors on sloping terrain.

"I am quite sure this training package will help reduce the number of accidents. It targets the key age range and aims to positively influence young people entering the industry, but older drivers can learn from it too". Added Mr. Lindsay "HSE's Tractor Action campaign is particularly important to farmers in Wales. Last year (1994-95) nine farmers died at work in Wales - disturb ingly eight of them in Dyfed - and three in incidents involving tractors. In 1993-94 two of Wales' four fatalities involved tractors and in 1992-92 no less than four out of five fatalities involved tractors".

Brian Neale, HM Principal Inspector for Wales, said farm deaths in Wales for 1994-95 were up by over 50% on the previous year, and the highest for the past five years. "Nine people died in the industry, and I am very disappointed and saddened by this. Most fatalities were due to either poor maintenance, lack of guarding or unsafe working practices. Four deaths involved farm vehicles, two were from farmer's lung, one involved a big baler, one an unguarded PTO and one was caused by a bullock".

Added Mr. Neale; 'My colleagues and I in Wales are working closely with everyone in the industry to try to reduce this unnecessary toll. We are working with agricultural colleges, the Agriculture Training Board and the Young Farmers Club movement to devise ways to heighten Health and Safety awareness among young people. An increasing number of self-employed feature in the accident statistics, and it is important that they take advantage of the opportunities for health and safety training that are available."

Mr John Lloyd Jones, National Farmers Union Chairman of Welsh Council said; "We fully support this extremely important campaign. Every single farming family in Wales today will know of a tractor fatality or bad injury suffered by someone in their community. This is a tragic state of affairs."

FREE AGRICULTURAL SAFETY VIDEO FROM HSE

The Health and Safety Executive has launched a free compilation video featuring agricultural safety and training. 'Agricultural Video Trailers' has been sent to every agricultural college in Britain and to each of the national Farmers Union group offices.

The video contains 20 minutes of compiled HSE programmes designed for people working in the agricultural, horticultural and forestry industries. It summarises almost two hours of safety videos, highlighting the need for training, how to assess risks and avoid possible hazards. The video is aimed at trainers, students and farmers.

On average 50 to 60 people, including children die due to agricultural accidents each year. There are also an estimated 18,000 accidents that require more than three days off work. For the year 1994-95, 54 people were killed at work in agriculture (the highest for three years). Thirty-six of the deaths involved the self-employed and two children under 16 were killed.

HSE's range of videos aim to increase awareness in the industry of how potentially dangerous working in agriculture can be.

'Agricultural Video Trailers' is available free while stocks last from: CFL Vision, PO Box 35, Wetherby, West Yorkshire. LS23 7EX Tel: 01937 541010 or Fax: 01937 541083

NEW STANDARDS FOR DRIVES

The British Standards Institution announces the publication of BS 3790: 1995 "Specification for endless wedge belts and endless V-belt drives".

This standard specifies dimensions and certain other properties of endless wedge belts and V-belts and their corresponding grooved pulleys, when used for power transmission. This supersedes BS 3790: 1981.

Membership matters....

THE NEWSLETTER OF THE INSTITUTION OF AGRICULTURAL ENGINEERS

PERSONAL CAREER DEVELOPMENT
Special Emphasis on Membership

Did you have the time to read **CPD LINK**, The Engineering Council Newsletter which was distributed to Members with the Summer 1995 issue of The Agricultural Engineer? If not, take a closer look or borrow a colleague's copy if yours has found its way into the wastepaper basket! The Newsletter includes a lot of information how CPD is helping engineers to develop their careers. This article in our series is looking at the relationship between Institution Membership, Personal Career Development and of course the 'in' topic of CPD.

In the 1993 Membership Survey, eight out of ten members stated that Professional Registration was an important professional service within our Institution. Professional Registration is closely linked to the requirements included within the membership grading structure. Satisfying these requirements represents a public, professionally recognised statement of an engineer's achievements in his or her career. This recognition is valuable to Members whether advancing within an organisation or when changing jobs. In an increasingly competitive world, it could mean the difference between success and failure. Membership grading is therefore a clear statement of what is required to satisfy the need for personal career development.

Do read a copy of **CPD LINK**, or read it again if you have already done so but with the above thoughts in mind. Issue number 8 contains many interesting ideas. The relationship between employers and employees is discussed including the concept of the 'Virtual Organisation', that is those organisations heavily engaged in subcontracting. Subcontracting places searching demands on employees skills and professional standing and IT IS COMMON PRACTICE WITHIN THE AGRICULTURAL ENGINEERING INDUSTRIES. PERSONAL CAREER DEVELOPMENT INCLUDING registration AND PERSONALLY ACHIEVING and maintaining the highest membership grades are clearly important in this context.

What do you think of the concept of 'The Business Engineer' which is discussed on the centre pages of **CPD LINK**? Do you think that our Institution should introduce the idea of 'mentoring' into our emerging CPD arrangements? Such an approach might help Members to gain a better understanding of the personal benefits of working to improve their membership grades. How about a letter to the Editor of The Agricultural Engineer? CPD, PCD and Membership would be an ideal subject to start a series of 'letters to the Editor'. Please let us know what you think!

AGRO-INDUSTRIAL PRODUCTS SPECIALIST GROUP

The success of this year's conference "Engineering Crops for Industry", well illustrated the growing interest in non-food products from agriculture.

In order to pursue this interest , a group of members met at the conference to explore the feasibility of setting up a Specialist Group. Nine volunteers from this group agreed to form a provisional committee and at a meeting at Silsoe on 20th June, the following officers were elected:

Chairman	Mike Dwyer
Vice-chairman	Harry Gilbertson
Secretary	David Bruce
Treasurer	David Hatherill

The other committee members are Bill Ladbrooke, Gareth Ellis, Peter Redman, Chris Jeffery, Derek Sutton, David Smith and Brian Fraser-Smith.

It was agreed that the scope of activities should be as wide as possible. In effect, nothing related to the non-food products of is ruled out, except forestry, which is already catered for by its own Specialist Group. However, there may be some overlap with the Forestry Engineering and other Specialist Groups in various areas when we would hope to liaise. In fact, there may be plenty of scope for joint action.

Non-food animal products were included as well as non-food crops, although it was felt that the main interest was likely to be in crops. Similarly, activities need not be restricted to UK applications, but can, take account of the worldwide scene.

It was difficult to find a name for the Group that would not be exclusive and negative. Finally we agreed on "Agro-Industrial Products", which hopefully will cover our activities. In the immediate future we see the growing, harvesting and processing of crops for fuel, fibre, oils and polymers as probably the areas of greatest interest.

As far as activities are concerned, we expect to be similar to other Groups, i.e. conferences, workshops, seminars and visits. We are hoping to organise our first event in the Autumn on coppice for electricity generation. Obviously, planning is at a very early stage, but we are exploring a venue that will enable us to combine the presentation of papers with a visit to an appropriate site.

Many thanks to all those who returned the slips indicating their interest. You have all now been registered as group members. Others who are interested will have the opportunity to register, when you renew your subscription. Meanwhile, look out for news of our first event in the Autumn, when we hope to see as many as possible, whether or not you are registered with the Group.

The first obituary printed below appeared in the previous issue of the journal with a number of typographical errors for which the Editor apologises to all concerned and in particular to John Chamber's family.

JOHN MALET CHAMBERS 1909 - 1995

John Chambers, brilliant engineer, much loved father, and husband of Daphne, died in early May after a distinguished career which saw his other child, the 'little grey Fergie', burst upon the Post-War agricultural scene and become the world standard for tractor design.

A shy and retiring man by nature John nevertheless became Chief Engineer of Harry Ferguson Limited, President of the Institution of Agricultural Engineers (1957-1959), a Founder Governor of the National College of Agricultural Engineering (now Silsoe College of Cranfield University) and for forty years a pillar of the West Midlands Branch of the Institution. In recognition of his many outstanding achievements he was awarded the Institutions highest honour, that of Honorary Fellow, in 1969.

John's career began in 1932 when he left the family farm in Downpatrick and went to sea as a junior engineer aboard the *Atholl Princess*, a tanker of the United Molasses Company Line, but later that same year he decided seafaring was not for him and joined Harry Ferguson in Belfast, where Harry was working on the prototype 'Black Tractor'. John's first small triumph came in 1933 when his own father purchased the the very first Black Tractor to be offered for public sale and put it to work at Downpatrick, and it was soon followed by many other and greater successes.

There followed a brief association between Harry Ferguson and David Brown, when John was involved with the production of the short-lived David Brown Ferguson Tractor at Meltham and then, in the mid 1930's, John and Daphne accompanied Harry Ferguson to Detroit, where two of his sons and 306,000 Ford Ferguson tractors were born.

Moving to Banner Lane, Coventry, after the war he became Chief Engineer of Harry Ferguson Limited, and was responsible for introducing the American range of Ferguson implements into production in the UK. This involved many problems, particularly with the Trailer and Mower, both of which needed extensive redesign to meet the requirements of the British market.

There followed years during which many changes took place; the Company was sold to Massey Harris to become Massey-Harris-Ferguson and later Massey-Ferguson, and John finally left in the early 1960s to found New Idea UK with Trevor Knox and others.

It is as an outstanding engineer, innovator and devoted family man that we remember John, as well as for his magnificent Delauney-Belleville motorcar, for many years his other pride and joy. Typically, he kept a drawing board beside his bed, claiming that many of his best ideas came while he was asleep; he would leap out of bed and record them before they slipped away with the dawn. One such was the brilliantly simple spring-loop linch-pin for implement hitches - today as indispensable and as much a part of everyday farming life as a ball-point pen.

John was indeed one of the great agricultural engineers of our time - his contribution to tractor development was immense and enduring, but the profound changes which have overtaken the industry in recent years mean that almost certainly we shall not see his like again.

BERNICE BERNARD MSC, CENG, MIAGRE, MICE, MIMECHE 1921 - 1995

Bernice Bernard, Member of the Institutions of Agricultural, Mechanical and Civil Engineers, joined this Institution in 1944 and received her 50 year Long Service Certificate at a meeting of the Welsh Branch in March 1994. She died on 14 July 1995.

Bernice was a Manchester University mechanical engineering graduate, and entered agricultural engineering in 1943 through machinery testing work with the National Institute of Agricultural Engineering at Askham Bryan, and later in design work with Salopian Engineering. Bernice subsequently gained an MSc in Structural Engineering and joined British Railways research department, carrying out specialist bridge engineering work in Britain, Europe, North America and Ceylon. Several years were spent in Utrecht, where she established an international reputation as an engineer, diplomat and facilitator.

Bernice took a passionate interest in the environment and the responsibility engineers have for the environment. The training of engineers, from the teaching of mathematics to eleven year olds to Engineering Council responsibilities were her concerns. Bernice was a founder member of the International Network of Engineers and Scientists for Global Responsibility, a leading figure in Engineers for Nuclear Disarmament, elected to the Engineering Assembly at its inception and continued to be active in Engineering Council matters. Her views were respected nationally and internationally in engineering circles. Those of us who were privileged to hear her short acceptance speech at the presentation of her 50 years Long Service Certificate to the Institution will remember she took very seriously the injunction in the Royal Charter of the Institution of Civil Engineers - 'to serve man' meaning any person on earth, the duty of all, and particularly agricultural engineers.

INSTITUTION MEMBERSHIP CHANGES

Admissions - A warm welcome to the following new members

Associate Member: D. Bissonauth (Mauritius), A P Casebow (Channel Islands), C.D.Forsyth (Cumbria), G.M. Hughes (Wales), S.P.Irwin (Oxon), S.E.Jackman (Devon), M.D.B. Young (Oxon)

Associate: M.B.Lacey (Ireland), T.M.Varga (Canada)

Student: A.A. Ball (Derby), H. Korte (Tyne and Wear), H.B. Leyendecker (Tyne and Wear), A. Sanaei (Tyne and Wear), Md K.U.Sarker (Beds)

Re-admission: K.V. Searson (Ireland)

Re-instatement: P.W. Jones (Staffs)

Transfers - Congratulations on achieving a further phase of their professional development

to Member: O. Bissonauth (Mauritius), R. Chilvers (Cambs), D.A. Cotterell (Cambs), L. Kailondo (London), B.G.F. Mathew (Somerset), E.C. Mubaya (Zimbabwe), A.I. Olorunfemi (Nigeria), C.T. Pratt (Warwicks), D.W. Seccombe (Cambs)

Deaths - with great sadness we report the death of: G. Fear (S.Africa), P.R. Hill (Shrops)

Movements: - members who have changed their addresses, except where they remain in the same English county or, elsewhere, in the same country. We hope the move has proved beneficial.

Mem. No	Name	From	To
6363	E.F. Asante	Bucks	Rwanda
6479	K.N. Baguant	Beds	Mauritius
6219	D.J. Baldwin	Beds	Lancs
5701	S.S. M Davies	Wales	Shrops
6359	N.A.L. Gunn	Essex	Kenya
6378	A.I.J. Heather	Leics	W Midlands
6188	R.J. Merrall	Dorset	Beds
3929	W.D. Parnell	Mexico	Cornwall
5121	T. Reeves	Nigeria	Leics
6435	L.N. Storey	Shrops	Essex
2640	J.F. Washbourne	Lincs	Yorks

Gone Away

Name	Last Known Address	Date
S.M. Friederich	23 Cotissement les Dominaus, 97220 Trinite, Martinique, French West Indies	17.7.95
J.A.J. Gander	Smitsweg 13, 3765 CA, Soest, Netherlands	12.7.95
N.R. Houseman	34 Church Street, Bromyard, Hereford HR7 4DP	21.6.95
B.H. Parker	Unit 102 Cannon Workshops, West India Dock, London. E14 4AS	26.6.95

Dr David Crolla (Fellow) has become Chairman of the Automobile Division of the Institution of Mechanical Engineers for the 1995/96 session. David, who used to work at Silsoe Research Institute, is Professor of Automotive Engineering at Leeds University, where he heads a group concerned with vehicle dynamics, brake materials and performance, powertrain analysis and structural crash-worthiness. David is well known in this institution for his work on off-road and agricultural vehicle research.

After 18 years as Pesticide Application Specialist at Shell Research, **Alan Lavers** took early retirement. Alan says that during his career with Shell he was able to address pesticide application problems in nearly 70 countries. Since "retiring" Alan has completed consultant missions for the F.A.O. of the United Nations as well as for three companies making spray equipment. Alan has also acted as a visiting lecturer for certain Universities and hopes to develop an interest in training for safe pesticide application.

Congratulations to **John Neville** who, as reported in the last issue of the Journal, has been made an Honorary Fellow of the Institution. This has been granted in recognition of his outstanding contribution to the work and development of the Institution and to the advancement of agricultural engineering, particularly in the field of education and training.

S.A.G. Perera has recently retired as Director of Engineering Services at Plateau Agricultural Development Programme in Nigeria, which has been supported by the World Bank. He says that he is looking forward to settling down in Sri-Lanka, and intends to keep busy with short-term consultancies.

Laurence West, who has now retired to Somerset and has been a member of the Institution for more than 40 years, has spent most of his time working in Lincolnshire and Yorkshire. His career has covered machinery distribution in the UK and some academic and research work both at home and abroad. He says that he is looking forward to attending Branch meetings and meeting old friends.

John Norman who has moved to Devon says that he is glad to have escaped the fumes of London and to be able to enjoy the countryside. He tells me that as well as doing abstracts of French patents for an agency, he practises Chiropody (which many local feet badly need). John is also involved with helping to maintain his nephew's fleet of ageing tractors.

Niall Pigott who has had several short term contracts in UK since graduating from Silsoe College in 1992 is hoping to find a more permanent post.

Pollard Blakeley is working on a two year assignment in the Ukraine as programme manager of the British Know How Fund Agricultural Restructuring Programme. He runs an office known as the Agricultural Restructuring Unit (ARU) which supports the liberalisation and structural adjustment of the agricultural sector. Its activities include:

a) Support for project implementation. The main restructuring projects are: the Marketing Chain Restructuring Programme, which is concerned with vegetable marketing, and the Large Farm Restructuring Programme that will help 10 farms to privatise and develop feasible business plans.
b) Identifying and facilitating implementation of pilot and regionally based restructuring programmes.
c) Giving policy advice to the First Vice-Prime Minister and the Minister of Agriculture, and to Government staff.
d) Ensuring that experience from pilot programmes is disseminated.
e) Assisting Ukrainian enterprises to access Western business advice and investment.
f) Promoting investment in the agricultural sector
g) Developing publicity and information tours for key players in the restructuring process.

Pollard says that his office also functions as an information office for British Companies who are interested in investing in the Ukraine, and would be happy to assist any Institution members who are visiting the Ukraine. He may be contacted at Artioma Street 1-5, Kiev 252053, Ukraine.

Roy Streatfield has moved to the USA to become Chief Engineer to the PIM Corporation. Roy says that in 1980 while working for D.J.Ryan & Sons, he helped devise a pipe-bursting process, of which he is joint Patent holder, for the renewal of underground gas, water and sewer pipes insitu, with polythene. He has been very much involved in the area of "trenchless technology" ever since. From a simple beginning this technique is now used worldwide for the replacement of gas and potable water mains as well as sewer pipe. Starting with a 4" bore cast iron, the system has progressed until it is now possible to replace pipe to the size range 3" - 20" bore and renew not only in the same size, but also to up-size. Roy has been involved with development and manufacture and the introduction of new equipment around the world. This has included producing full training packages for operators and maintenance personnel.

After leaving Ryan's in 1990 he operated as a consultant until the end of 1994. He worked on projects in Eastern and Western Europe. He was then offered his new job in America. His wife, who teaches music, was expected to join him there after the end of the summer term. Roy says that if it was not for Gordon Spoor and his soil mechanics lectures, there is every chance that he would not have progressed with pipe bursting.

In June 1994, **Patrick Mushave** completed his MSc (Agr.) in environ mental resource management at University College, Dublin, and returned to Zimbabwe to resume his duties with the Zimbabwe Forestry Commissions Forestry Research Centre. He is a senior research officer (silviculture and management of natural forests) and his current interests are Miombo Kalahri and forest ecosystem studies. He will chair the editorial sub-committee for the 15th Commonwealth Forestry Conference in May 1997 at Victoria Falls, Zimbabwe.

Edwin F.Asante, who works with World Vision International as an Agricultural Project Officer, has recently been posted to the Rwanda office. His duties range from general project management to specialised technical work, such as irrigation, mathematical modelling of agricultural issues, and the rehabilitation of the agricultural infrastructure of the country. Edwin says that the political situation in Rwanda is now more stable than it was a year ago, but there still remains a lot of restructuring before the agricultural sector gets back on its feet.

LONG SERVICE CERTIFICATES SENT TO MEMBERS

NAME	GRADE	DATE
25 Years		
Anthony J Barrett	MIAgrE	16.04.95
Clive W Felstead	Eng Tech AMIgrE	16.04.95
Lionel S Foreman	IEng MIAgrE	16.04.95
Richard P Heath	IEng MIAgrE	16.04.95
Ibitayo Ilori	CEng MIAgrE	16.04.95
Shiraz H Jeevunjee	AMIAgrE	16.04.95
Bernard C Lewis	IEng MIAgrE	16.04.95
James G Shiach	HonFIAgrE	16.04.95
Richard G Spiller	EngTech AMIAgrE	16.04.95
James M Swanson	MIAgrE	16.04.95
Alistair J Tulloch	AIAgrE	16.04.95
Edward D Weekes	CEng MIAgrE	01.01.95
35 Years		
Timothy J Blake	IEng MIAgrE	10.02.95
Wilfred E Klinner	CEng FIAgrE	08.03.95
Alexander MacInnes	AIAgrE	10.02.95
Peter H S Smith	IEng MIAgrE	08 03.95
Geoffrey F D Wakeham	Eur Ing CEng MIAgrE	08.03.95
William J Foxwell	CEng FIAgrE	12.04.95
Peter Hargreaves	IEng MIAgrE	12.04.95
Alfred A Cox	IEng MIAgrE	28.06.95
Eric L Minter	MIAgrE	28.06.95
James A Pascal	IEng MIAgrE	28.06.95
John B Underwood	MIAgrE	28.06.95
50 Years		
Geoffrey E Lawson	IEng MIAgrE	09.01.95
Peter H Isle	IEng MIAgrE	31.05.95
Thomas S Bowett	MIAgrE	14.02.95

MINIATURE TRACTOR PULL COMPETITION 1996

The 1996 Miniature Tractor Pull Competition, which now has two classes being students up to degree level and an open class, will take place in 1996 at Writtle College during the Annual Conference and AGM. A full set of new rules and an entry form are now available from the Secretariat, John Kilgour at Silsoe College: Tel. 01525 863000, Richard Green at Harper Adams Agricultural College: Tel. 01952 820280 or Graham Thompstone at Writtle College: Tel: 01245 420705. Remember, the competition is now open to all.

JOHN YOUNG - PRESIDENT IN EUROPE

John Young, Deputy Group Managing Director of Wolseley plc, was appointed President of the CEMA - The European Association for Manufacturing of Tractors and Equipment for Agriculture, Forestry, Horticulture, and Amenity Grass - at the recent General Assembly in Helsinki, Finland.

Membership is open to National Trade Associations like the AEA - Agricultural Engineers Association - throughout Europe. Currently there are 16 member national bodies. The Association provides strong inputs into the European Commission on a range of issues including harmonisation, safety, standards, and market dimensions.

The UK Association will hold the Presidency for one year and also holds the Chair of the Economics Experts Committee.

John Young has been involved with Agricultural Engineering businesses throughout his career.

UK TRACTOR REGISTRATIONS

The UK Registration of agricultural tractors (over 40 HP) in the first six months increased 7.7% over the first half year 1994

This strong market is underpinned by improved arable receipts and as tractor suppliers have high order levels. It now appears that the full year 1995 will be above 1994 levels. Over recent months tractors have not been in free supply, although the situation is showing signs of improvement.

NEAR FAMINE TO RELATIVE FEAST

Which is worse, having few orders or having plenty of orders and not being able to supply? Well of course that is a facetious question and is caricature of the position that companies find themselves in but nevertheless the fact is that the industry has gone from near famine to relative feast in a matter of a couple of years.

Changes of this magnitude bring their own problems - the most obvious is the inability to supply product when the farmer requires it. Companies certainly found it difficult to increase production last year when the market rose but this year output is more constrained by lack of component supply. In each case this is caused by the caution of companies reluctant to increase capacity for a demand which might be temporary.

One curious phenomenon is the inability to pass on price increases. This appears to be common through much of British industry where power appears to have passed to the final purchaser, who is less willing to pay the price asked.

Some two-thirds of farm machinery used by British farmers is manufactured overseas and much of this in strong currency countries, so sooner or later the depreciation of Sterling must result in higher prices. This is not the end of the story as shortages of raw materials and components have led to input price increases on top of currency costs. Companies are indeed raising prices to farmers but at a lower rate than their own costs are increasing. Also some dealers are managing to increase margins but there are many tales of considerable discounting, even in such strong demand conditions.

There has to be an underlying concern that profitability is not what it could and should be in the industry. When the market first turned up some two years ago some companies did immediately benefit from higher volumes and reduced cost structure resulting from the rationalisation which took place in the recession of the early 1990s. However, since that time such advantages have diminished.

A major question on the minds of many suppliers is how long will the market remain strong. This is extremely difficult to answer but many observers consider that the current favourable conditions for agriculture could continue for three or four years and that therefore demand for machinery could also remain strong.

It is really quite remarkable how much money is now flowing through many sectors of farming and there is little sign of this changing in the near future.

There are potential negative influences. Further reform of the CAP is being proposed most recently by the think tank set up by Mr Waldegrave when at MAFF, but it is generally agreed that this will not happen immediately and probably not before the Eastern European countries are brought forward for EU membership. There is always the possibility of a poor harvest but certainly not this year. Then of course higher levels of inflation would eat away at farming support prices but at present levels this would take some years.

With underlying farming conditions being extraordinarily kind, immediate prospects remain good but the industry must judge the balance of demand knowing that much replacement has taken place and that requirement will inevitably decline.

Reaction to change will be vital and companies are presently investing heavily in improving their interface with the dealership network and thus with the end user.

Electronic transfer of data has been developed over a number of years and some companies have active systems in place but it now seems that a critical mass is about to be reached where commercial products are sufficiently advanced to provide an essential service, especially on parts ordering.

With the harvest in full swing (at the time of writing) provision of service, and parts, is at is most crucial with 24-hour backup available for combines. Major companies can provided guaranteed next morning delivery on urgent parts and even faster response on panic situations. The logistics systems are some of the most impressive elements of computing power.

The AEA is keen to widen the debate on the application of such technology to the supplier/distribution network and will feature it at a conference later this year as well as at the Association's Farm Equipment and Outdoor Power Councils.

ANNUAL CONFERENCE PAPER 1

ENGINEERING CROPS FOR INDUSTRY

The Institutions 50th annual conference held at Silsoe College on 16th May covered the above topic. The next three papers reproduced in this edition oj the Journal were presented at the conference and we are grateful to those speakers for their efforts in producing them.

Paper No 1
UK HEMP PRODUCTION AND FIBRE EXTRACTION

by IAN LOW, HEMCORE LIMITED

Three years ago the partners of Hemcore commenced what for all of us has been a most exciting, demanding and at times frustrating programme to develop the growing, production and marketing of Hemp in the UK. Hemcore is a joint company between: Robert Lukies, who farms 1000 arable acres in Essex and runs a seed processing company R.J.L. Seeds, and Harlow Agricultural Merchants Ltd, a privately owned merchanting business, who, in addition to their main line activities in seed, fertiliser, chemical and grain trading, have had considerable experience in introducing new crops and new varieties to UK agriculture.

Whilst we consider there is a long way to go in the development of hemp in the UK, we can look back on considerable progress in the last three years, namely:

- seed sourced of suitable standard and low narcotic level
- licences obtained from the UK Home Office for the crop
- a good understanding of crop agronomy gained from 3 years of trials and 2 years of commercial crops, 600 ha in 1993 and 800 ha in 1994.
- discovered how to process this incredibly strong fibre to obtain our finished products
- marketed these products into existing markets and started to create new ones

What is Hemp

Hemp (Cannabis sativa) is one of the oldest crops known to man and has been cultivated since ancient times for the provision of fibre for many practical purposes. It is a fast growing annual and has been grown in many countries throughout the world. There has, however, been a decrease in the amount grown over the last 20 years, though it is possible that this trend is about to be reversed. One reason for the decline has been the association of hemp with drug production and in the UK it is a banned crop under the 1971 Misuse of Drugs Act and can only be grown under licence from the Home Office. There does exist within the plant species, considerable variation in the levels of the narcotic THC (Tetrahydrocannabinol) and so varieties are available below the maiximum level of 0.3% permitted by law. Even these low drug varieties can only be grown under licence and it is essential that all crops are sited so as to be inaccessible to the public.

The Growing Crop

Once the licensing procedure is complete the grower can turn to the actual farming operation:

Planting - Like many small seeded spring crops hemp is very responsive to a good, fine seedbed avoiding any compaction. Seed should be drilled 2-3 cm deep on 10-18 cm row widths at a rate of approximately 50 kg/ha. There are undoubted benefits from growing hemp on soils that warm up quickly in the Spring, enabling the crop to get away and not to be checked. We have done a lot of trials on date of drilling and whilst it is possible to bring drilling forward into April, the early growth period is then slower and a later drilled crop will often catch up. Like all farming decisions, it is best to be guided by the weather and seedbed conditions and not purely by the calender.

Fertilizer - Hemp is very responsive to N.P. & K. and subject to soil type and yield expectations usage is in the region of 120 kg/ha of Nitrogen, 100 kg/ha of Phosphate and 160 kg/ha of Potash. These should be applied pre-drilling.

Chemical Usage - None. We have not found it necessary to use herbicides, insecticides or fungicides on the crop and have no reason to think this will change in the future.

Growing Period - The impressive growth rate of the hemp crop is already well known and our crops have lived up to these expectations. Average heights reached have been 3 - 3.5 m. The crop very quickly achieves complete ground cover hence suppressing any weeds and we have noted reductions in the levels of weed species such as couch grass. The crop is very deep rooting and has proved to be a very beneficial break crop, cleaning the ground, providing a good disease break and helping the soil structure. In 1993 we had problems with plants being stolen from some of our crops by people looking for a drug source. This year the message seems to have got round that our crops do not provide any narcotic benefit and we have been left in peace.

Harvest - This is the most critical part of the growing season, but after two years and around 1400 ha, we can speak with some level of confidence. In many of the traditional growing areas, harvest was an extremely labour intensive operation that we do not believe is realistic for UK conditions. Hence we have set out to achieve harvesting methods that can be easily applied and with as high a degree of mechanisation as possible. This has resulted in the crop being swathed, left to rot in the field and then baled in big round bales prior to storage and then delivery to the factory. Table 1 gives an idea of dates

for these operations and it can be seen that the 1994 harvest was completed much quicker than in 1993 and we would hope this pattern can be repeated in the future.

Yields - Researchers have declared yields for hemp in the range of 6 to 20 tonnes per hectare. Our own experience is as shown at Table 2:

As can be seen there is a long way to go in increasing yields, but we have made a good start this year and there is a lot more potential with better varieties and better growing techniques. Even at the level we are at this year, hemp is one, if not the best producer of fibre per unit area.

The Market

The crop is moved from grower to our factory in North Essex where the fibre and core are seperated. The processing of this crop has been the most difficult part of the whole venture and would be a key feature in any future expansion. There has been some thought of mobile processing of fibre crops in the UK, but in our experience this is unrealistic with the amount of equipment required. There would, however, be the possibility of regional production units doing the primary processing, thus minimising transport requirements. The markets for fibre are into specialist papers and in time textiles. The core or shive is going into the livestock bedding market specifically for horses. The advantages of the shive for this market are its tremendous absorbency that is 50% greater than that of wood shavings that is its main competitor. It is also much easier to dispose of as it degrades very quickly into compost. There are a number of other markets that are under investigation and there is no doubt that every part of this very versatile crop can be used.

		Start	Finish
1993	Swathing	28th August	21st October
	Baling	16th October	4th November
1994	Swathing	26th August	2nd October
	Baling	19th September	21st October

Table 1 - Operational Dates

	1992 t/ha	1993 t/ha	1994 t/ha
Trials (average)	10.3	9.9	10.9
Commercial Crops			
Best	-	9.2	N/A (yet)
Average	-	5.0	Est 6.0

Table 2 - Experience of Yields

Summary

There has been tremendous interest from around the world in UK hemp growing and there are a number of countries looking at embarking on projects to promote the crop. It is important that this expansion is controlled and realistic. Many people see hemp as a world saving miracle crop, we would prefer to see it as:

- an excellent break crop for farmers
- an excellent crop for the environment
- a great benefit for the rural economy
- a sustainable source of fibre for paper production
- an alternative source of fibre for textiles
- a source of material for bedding and other novel purposes

Paper 2
COMPOSITES FROM NON-WOOD MATERIALS

by JAMIE HAGUE, THE BIOCOMPOSITES CENTRE, UNIVERSITY OF WALES, BANGOR, GWYNEDD. LL57 2UW

1. Introduction

Composite materials comprise two or more components; the principal components common to all composites are fibres and a matrix material (adhesive). Composite materials can broadly be divided into two distinct groups:

- High matrix composites: these materials are commonly used for high performance structural applications, and typically contain between 30 and 70% man-made fibre by weight as reinforcement.
- Low matrix composites: these materials are better known as wood-based panels, and usually contain between 85 and 95% wood fibre by weight.

The potential for using UK grown non-wood fibres in place of both man-made and wood fibres in these materials is discussed briefly below; the particular problems associated with the use of non-wood fibres are highlighted, and some possible solutions for overcoming these problems are presented.

2. High Matrix Composites

High matrix composites comprise a multitude of materials, with a vast range of properties. A range of fibre types is used to reinforce matrix materials, giving materials with improved strength and stiffness properties when compared with the matrix material alone. Man-made fibres used for reinforcement include carbon, aramid and glass, and whiskers made from a variety of materials, e.g. graphite, SiC, SiN_4. Matrix materials used, included metals (aluminium alloys), ceramics, cement and polymers. On a worldwide consumption basis, materials comprising polymers reinforced with carbon, aramid and glass fibres are by far the most important (1). It is within these materials that non-wood fibres are considered to have the most potential for replacing man-made fibres.

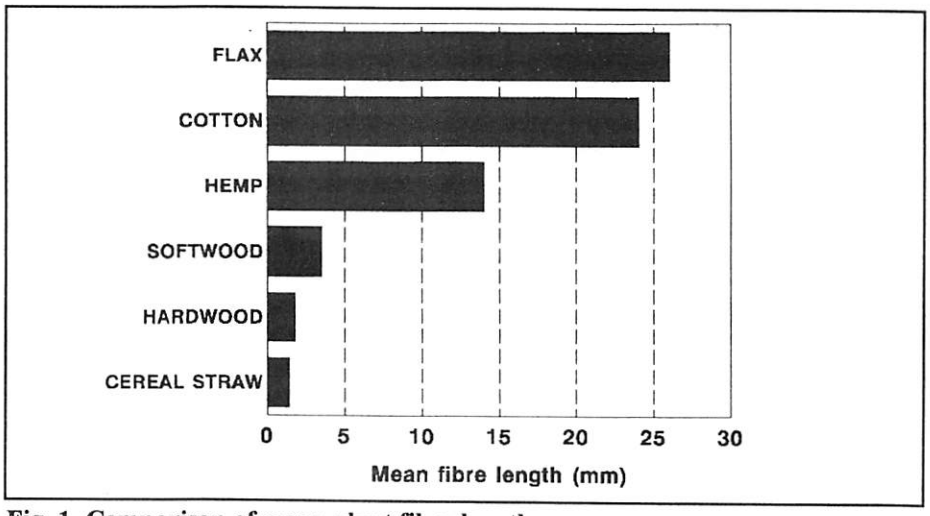


Fig. 1. Comparison of mean plant fibre lengths

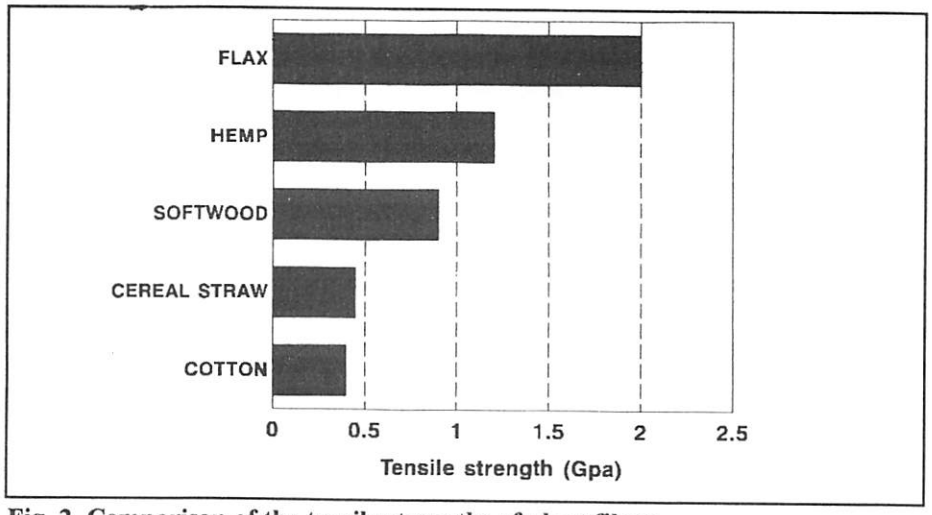


Fig. 2. Comparison of the tensile strengths of plant fibres.

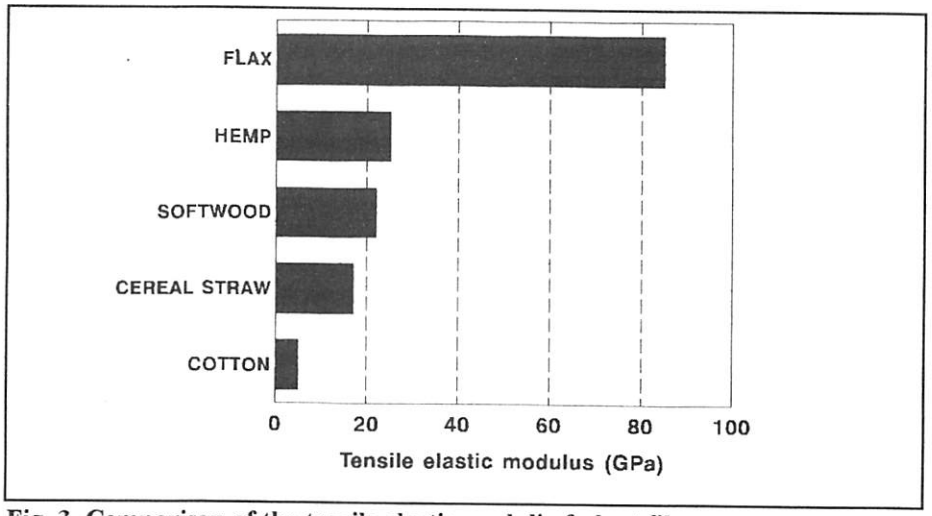


Fig. 3. Comparison of the tensile elastic moduli of plant fibres.

The polymer matrix materials used in composites are either thermoplastics or thermoset resins. For higher performance applications, thermoset resins are commonly used e.g. epoxies, polyesters, phenolics etc., reinforced with carbon, aramid or glass fibres. Glass fibres are the most widely used reinforcement fibre. Carbon and aramid fibres are used in limited specialist applications where the requirement is for very high strength and/or stiffness; these fibres account for less than 1% of the fibre reinforcement market. In these applications the fibres give improved strength and stiffness to components, when compared with the properties of the matrix material alone.

Thermoplastics are more commonly mixed with cheaper fillers, e.g. talc, to reduce product cost. The addition of fillers frequently gives improved stiffness properties when compared with the matrix material alone, but can lead to a reduction in strength properties.

Some more important physical properties of fibres, which to a large extent will determine their suitability for use as reinforcements in composites, include: strength, stiffness (modulus of elasticity), length, and aspect ratio (the ratio of fibre length to width). Figs. 1, 2 and 3 show the length, strength and stiffness properties of a range of fibres. Cotton, one of the few plant fibres used to date for commercial composite reinforcement purposes, is included for comparison.

It is evident from Figs. 1, 2 and 3 that, in terms of properties, the bast fibres derived from both flax (*Linum usitatissimum*) and hemp (*Cannabis sativa*) and are among the most promising of the available plant fibres that have the potential to be grown in the UK. Also, the strength and stiffness properties of these fibres compare very favourably with those of cotton that, as mentioned above, is already used commercially for reinforcing some composite materials.

In order for plant fibres to be considered as realistic replacements for man-made fibres, they will have to compare favourably in terms of strength and stiffness. Figs 4 and 5 show a comparison of the specific strength and stiffness (property divided by specific gravity) of the most promising plant fibres (flax and hemp) and the three most commonly used man-made fibres. It is evident from Figs. 4 and 5 that both types of plant fibre, and in particular flax, do indeed compare quite favourably with man-made fibres, and on this evidence, a good case can be made for at least considering plant fibres as alternatives for glass fibres. Additional support for this view is provided in Fig. 6, which shows a comparison of the strength properties of two commercial plant fibre reinforced composites, and some typical values for glass fibre reinforced composite materials made from the same matrix materials (some caution needs to be exercised when comparing the values in Fig. 6; the methods of composite manufacture, the form of the fibre, and the fibre volume fractions, were not identical. The values are used only as guides to the potential performance of plant fibres).

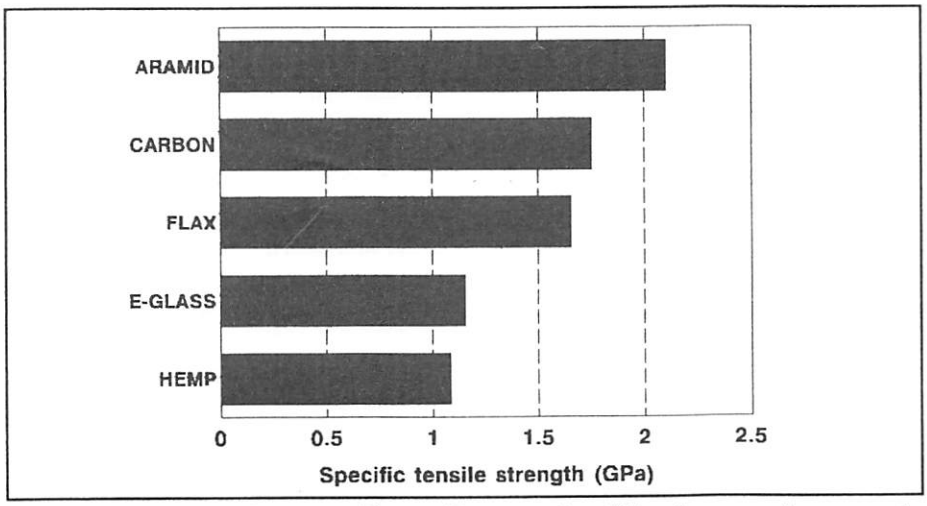


Fig. 4. Comparison of the specific tensile strengths of flax, hemp and man-made fibres.

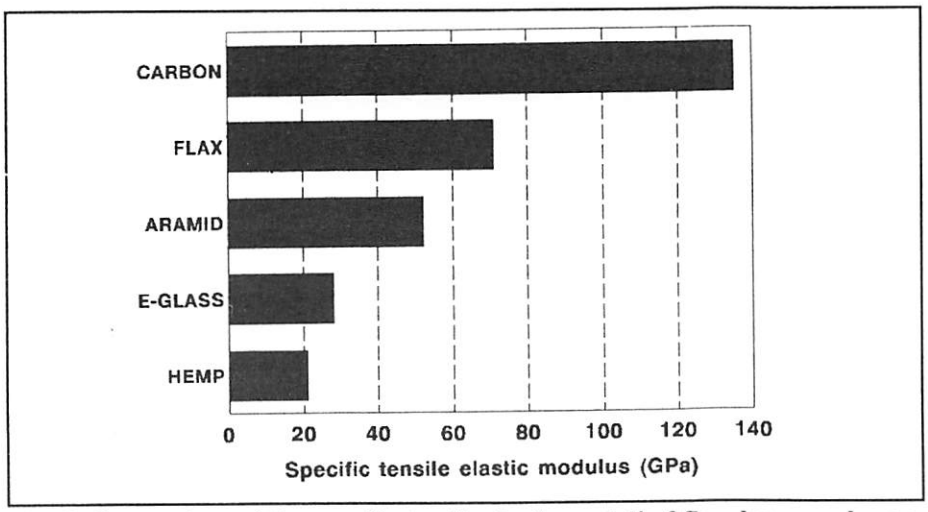


Fig. 5. Comparison of the specific tensile elastic moduli of flax, hemp and man-made fibres.

The concerns surrounding the use of glass fibres, and in particular their impact on the environment and health in the workplace, have led in recent years to increasing interest in the potential for using plant fibres as alternatives. Other advantages plant fibres may offer when used in place of glass fibres include:

* Lower energy content: the energy content of glass fibre is approximately five times that of plant fibres.
* Lower cost: the cost of glass fibre varies, depending on grade, from £1,200/tonne to £3,000/tonne. Plant fibres may offer a significant cost saving.
* Lower density: the specific gravity of plant fibres is significantly lower than that of glass fibres. The use of plant fibres could offer designers appreciable weight savings in components.

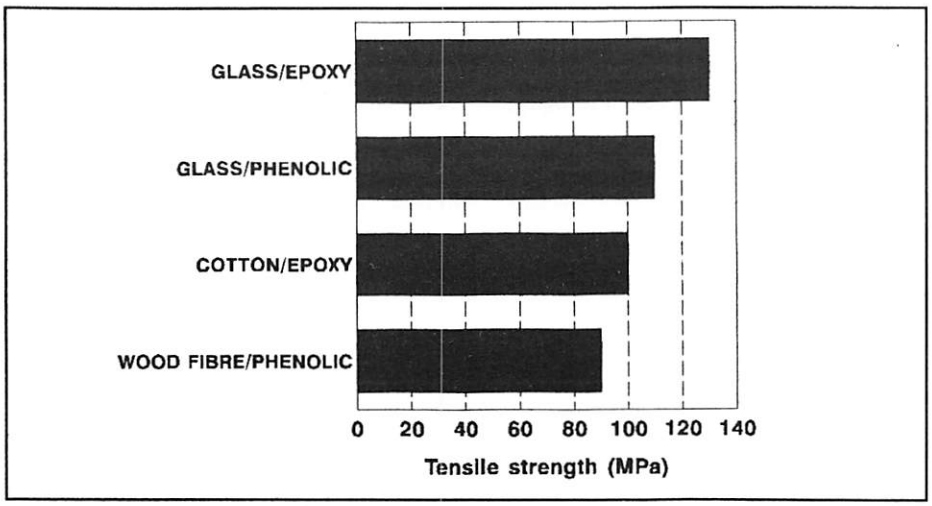


Fig. 6. Comparison of the strength properties of thermoset composites reinforced with plant and glass fibres.

* Higher product toughness
* Reduced tool wear for end-users of products

Despite these perceived advantages, relatively few products containing plant fibres are currently produced commercially. Those that do exist predominantly contain wood flour, used in the form of a filler, in products designed for non-structural applications. Factors contributing to this lack of commercial success include:

* The reactivity of plant fibres with water. Plant fibres are highly reactive with water, and swell when taking up moisture. The forces associated with swelling are very large, and can result in rapid degradation of the composite material, and a subsequent reduction in physical properties. For example, the immersion of plant fibre reinforced composites in water for relatively short periods of time can result in four to five-fold decreases in the strength of the material.

* Poor compatibility between the fibre surface and many matrix materials. This leads to poor bonding between the fibres and the matrix, resulting in products with relatively low strength properties.

* Plant fibres are biodegradable, photosensitive, and combustible.

* The potential strength properties of plant fibres are rarely realised in practice, due to damage induced during extraction and processing. For example scutching, which is a commonly used method for extracting the bast fibres of flax, can result in a halving of the tensile strength of the fibres; other methods of extraction may reduce fibre strengths to a greater or lesser degree (see Fig. 7).

There are a number of approaches which can be taken to overcome these problems. Pesticides can be incorporated into products to combat biodegradation, and flame retardants can be applied to reduce the propensity for flaming combustion. Grafting and coupling agents may also be applied to improve the bonding between the matrix and the fibre surfaces. Chemical modification of the plant fibres, using either monofunctional or difunctional reagents, has the potential to overcome many of the problems. The possible benefits of such an approach can be seen in Fig. 8, which shows the effect of chemical modification of plant fibres, using di-functional isocyanates, on the internal bond strength of a composite material made from an isocyanate matrix material. It is evident that chemical modification produces an increase in the dry strength of the material but, perhaps more importantly, the strength of the material is also largely unaffected by boiling it in water if the plant fibres are chemically modified.

While it is clearly possible to solve many of the problems associated with using plant fibres in composites, any approach adopted will increase the costs associated with their use. The challenge currently facing researchers is to find the optimum solution in terms of both cost and product properties.

3. Low Matrix Composites (Wood-based Panels)

The principal types of wood-based panel that are manufactured world-wide are plywood, particleboard and fibre building board. There is a range of different types of both particleboard and fibre building board. Chipboard, oriented strand board (OSB) and cement bonded particleboard are the principal forms of particleboard, while hardboard, medium density fibreboard (MDF) and softboard (insulation board) represents the more common fibre building boards. The main types of wood-based panel manufactured in the UK are chipboard, MDF and OSB; smaller quantities of cement bonded particleboard are also produced. A new mill in south Wales, producing hardboard,

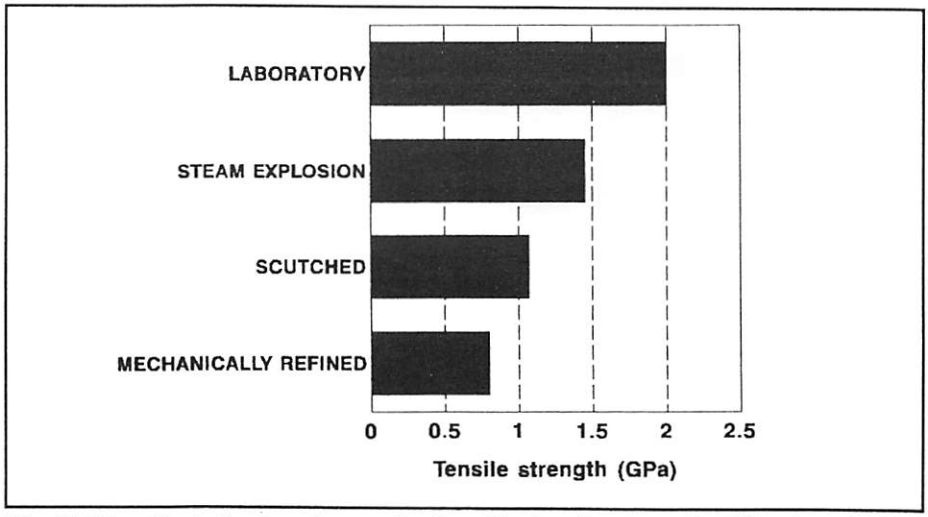


Fig. 7. The effect of extraction method on the tensile strength of flax bast fibres.

is due to come into production at the end of 1995. There are no producers of plywood in the UK.

Softwoods are the principal raw material used to manufacture wood-based panels in the UK. They provide a relatively homogeneous source of fibres, with a mean length of approximately 3mm. Smaller quantities of hardwoods are also used, but in general they are not preferred; their lower mean fibre length (when compared with softwoods) can increase resin consumption, and their high extractive content can lead to problems with adhesion and increase effluent levels. The most common resin used to bind particles together is urea formaldehyde (UF). Where some moisture resistance is required, melamine reinforced UF's (MUF) are used. For exterior uses, phenol formaldehyde (PF) and isocyanates (ISO) are the preferred choice. On a 100% solids basis, the cost of these resins varies from approximately £450/tonne for UF's to £1,700/tonne for ISO's.

In regions of the world where wood is scarce, both particleboards and fibreboards are already produced from non-wood raw materials. The most common raw materials used are bagasse (sugar cane residues), rice straw and bamboo. However, when manufactured with the same types and quantities of resin, these products generally have poorer properties than those made from wood. This is illustrated in Figs. 9 and 10, which show a comparison of the strength properties of particle-boards made from wood and two different non-wood materials (Papyrus, from the swamps of central and east Africa, and *Echinochloa polystachya*, a floating grass from the Amazonia swamps).

The particles used in both the wood and non-wood boards were of the same nominal dimensions, and the resin content and type, and the hot pressing schedules used, were identical. For comparison, the minimum requirements for each board property, specified in BS5669 for C1 grade boards, are included. It is evident that while the bending strength of non-wood boards compared quite favourably with that of boards made from wood and the specified required minimum, the internal bond strengths of the same boards were

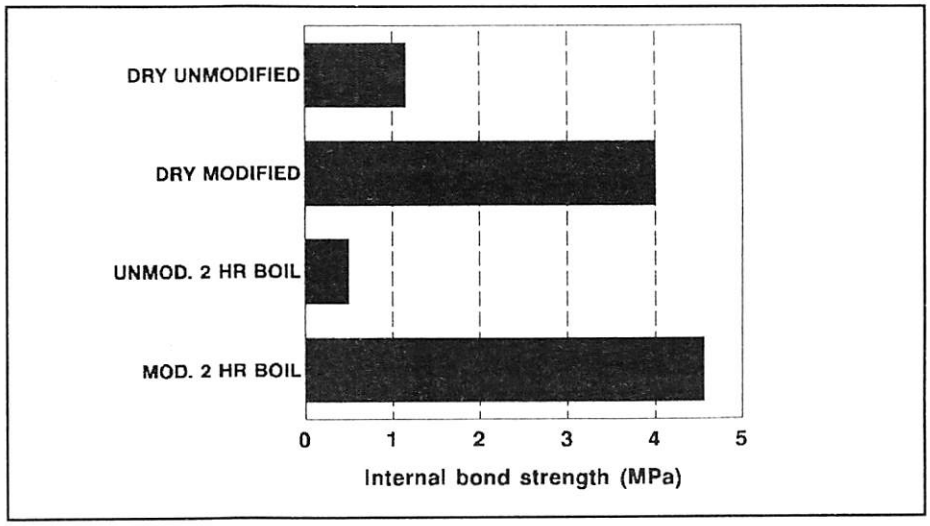


Fig. 8. The effect of chemical modification on the strength properties of plant fibre reinforced composites.

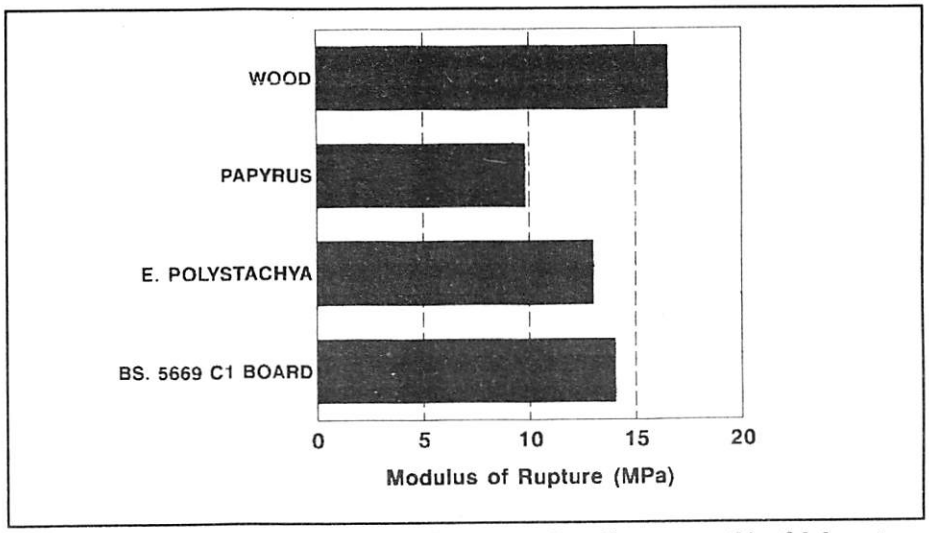


Fig. 9: Comparison of the moduli of rupture (bending strength) of laboratory particleboards made from wood and non-wood raw materials.

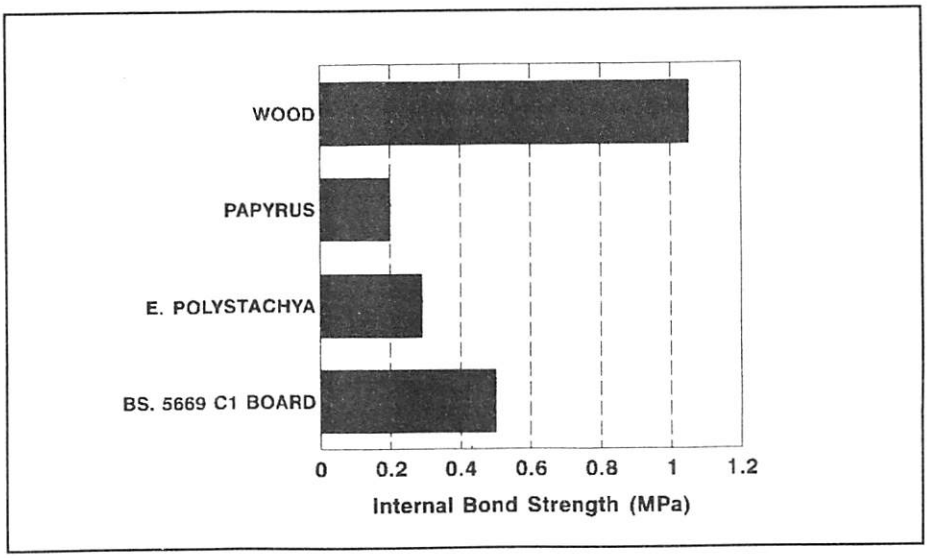


Fig. 10: Comparison of the internal bond strength of laboratory particleboards made from wood and non-wood raw materials.

distinctly inferior to those of boards made from wood, and fell well short of the required minimum.

A range of UK grown non-wood fibre sources could potentially be used as raw materials for particleboards and fibreboards, including by-products from agriculture e.g. cereal, linseed and rape seed straws, or other specialist fibre crops: some that have been suggested include Miscanthus, Hemp (either the whole stem, or separated shive material), Reed Canary Grass. However, there are a number of factors that will determine their suitability and acceptance for use as raw materials in wood-based panels. Some of the more important factors are outlined below:

* **Fibre properties**. Most non-wood fibre sources comprise a heterogeneous mixture of cell and fibre types. When processed, this can result in relatively high dust levels in both particleboard and fibreboard furnishes, which can increase resin consumption and processing costs (in particular, the hot pressing time of boards is likely to be increased). In addition, many of the smaller cell types e.g. parenchyma, are quite fragile when compared with other fibre types, which can result in weak bonds between particles (see Fig. 10).

* **Extractives content.** Many non-wood materials contain high levels of water soluble compounds e.g. pectins, hemicelluloses. As much as 15% of the dry matter may be soluble in hot water. High levels of extractives can potentially be detrimental for a number of reasons, including: low yields of fibre; increased effluent; poor adhesion between particles; increased biodegradation of products; unpleasant odour in products.

* **Waxes**. A number of non-wood raw materials possess waxy coatings e.g. cereal straws. When used in particleboards, the wax can reduce the bonding efficiency of many cheaper conventional resin systems.

* **Silica**. A number of non-wood raw materials contain relatively high levels of silica when compared with wood. The presence of silica can potentially increase tool wear for both the manufacturer and the end-users of the products.

A possible solution to these problems is fractionation, in which the less desirable (water soluble and short fibre fractions) components are removed before the raw material is used for board manufacture; to be economically viable such an approach would probably rely on alternative uses being found for the different fractions. Another approach is to develop improved resin systems for use specifically with non-wood materials.

The equipment presently employed for manufacturing wood-based panels in the UK is designed specifically for processing wood. This fact alone is likely to prevent non-wood raw materials from being used exclusively as raw materials for panel products, since major re-investment in equipment would, in all probability, be required in order to successfully process these alternative materials. However, recent work carried out at the BioComposites Centre has shown that non-wood raw materials can be successfully incorporated into panel products at relatively low substitution levels. This has been proved on both a pilot and industrial scale. In the short term, and in particular with the current pressure from industry on the wood raw material supply, this approach may offer the best chance for non-wood raw materials to gain acceptance as alternatives to wood in the wood-based panels industry.

4. Conclusions

When the strength properties of the better non-wood fibres are compared with those of glass fibres, and a range of other factors are taken in account, a good case can be made for considering the use of flax and hemp bast fibres as reinforcements in high matrix composites. The potentially high price that these fibres might command is also attractive. However, a number of problems remain to be overcome before these fibres can be utilised successfully, in particular the propensity for fibres to swell when exposed to moisture, and the poor compatibility of fibre surfaces with some matrix materials. While chemical modification may offer one solution, much work remains to be done to realise cost effective and acceptable solutions.

Non-wood materials are already used as raw materials for wood-based panels in parts of the world where wood is scarce. However, due largely to their chemical composition and their heterogeneous fibre make-up, the products made from non-wood materials tend to have inferior properties when compared with those made from wood. Possible solutions include fractionation, in which undesirable fractions are removed, and the development of improved resin systems. An alternative approach, and one that is likely to be attractive to board manufacturers from the point of view of capital investment, is to substitute a proportion (10-20% by weight) of the wood currently used with non-wood materials.

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Paper 3
NOVEL END USES FOR NATURAL FIBRES FROM INDUSTRIAL CROPS: GEOTEXTILES FOR ENVIRONMENTAL PROTECTION

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Introduction

The current shift away from food crop production in the European Community is likely to lead to an increased field area of industrial, non-food crops. One consequence of the increasing emphasis on growing these crops is the need to identify and attract new markets for the raw materials produced.

Many industrial crops are grown for their fibre content, which can be processed and manufactured in different ways to produce a variety of products ranging from high quality paper through to packaging materials.

While many of the traditional markets for fibre such as clothing are well established and difficult to penetrate (for economic and technical reasons), novel markets are being sought for the increasingly available fibres produced from industrial crops.

One way in which such fibres may be used is in the manufacture of geotextiles. This paper outlines the various end uses of these products and why geotextiles made from natural fibres are exceptionally effective in certain applications. Finally, having identified the promising technical performance of natural fibred-geotextiles, the potential markets for such products are also discussed.

Definitions and End Uses of Geotextiles

A geotextile is "any permeable textile material, used with foundation, soil, rock, earth or any geotechnical engineering related material" (John, 1987). These products are used primarily by civil engineers for:

filtration,
separation of distinct subsurface layers,
drainage,
slope reinforcement,
soil erosion control and
vegetation establishment (or suppression).

Most of these applications require geotextiles manufactured from synthetic textiles, where precise technical data on parameters such as porosity, permeability, resistance to puncturing or tensile strength, and longevity have to be specified and met for any given end use.

These qualities are relatively easy to measure - the methodology for this has been in place for many years now, and for most geotechnical applications these properties have to be constant over space and time. Many synthetic geotextiles have to conform to very precise British and EU Standards.

However, in the specific applications of soil erosion control and vegetation management, it has been shown that other geotextile properties determine geotextile effectiveness (Rickson, 1989). Characteristics such as percentage cover, water holding capacity, fibre thickness, fibre roughness and fibre/yarn orientation affect the ability of any geotextile to perform these two end uses. This being the case, natural fibres are able to meet the requirements of geotextiles for both erosion control and vegetation management more efficiently and effectively than synthetic ones. Also, it appears that very little processing of the fibres is necessary to enhance performance. For example, often the crudest, roughest fibres are most effective in controlling overland flow erosion.

Precise engineering parameters such as tensile strength and resistance to puncturing tell us little of how these geotextile products can control erosion or aid vegetation growth.

Another advantage of having geotextiles made from natural fibres is that erosion control geotextiles need only offer *temporary* protection to the soil. A typical scenario is a recently constructed road embankment or cutting. The slope is left devoid of vegetation and is often heavily compacted after disturbance. Such slopes are very susceptible to soil detachment and transport by the agents of rainfall and runoff. Rates of over 480 tonnes of soil per hectare per annum have been recorded from such sites (Diseker and Richardson, 1962). If soil erosion is not controlled, the consequences can be devastating to the environment.

Slopes have to be reseeded at considerable expense to the contractor. Eroded sediment gets into rivers, streams, lakes and reservoirs, where the environmental impacts can be irreversible.

High sediment concentrations in watercourses affect light penetration, oxygen levels and water temperature, so affecting the delicate ecological balance. Chemicals such as phosphorous are preferentially carried by eroded sediments. When the sediment is deposited in waterbodies, excessive nutrients are released, causing massive algal growth, which can deplete supplies of oxygen for other lifeforms in the water.

The critical time for slope protection is between completion of the engineering works and the establishment of vegetation. Geotextiles have an important role to play at that time as they afford immediate protection to the slope, while at the same time allowing (and even favouring) the establishment of vegetation underneath the geotextile.

Once vegetation establishes on that site, erosion risk is minimal, and there may be distinct disadvantages of retaining the geotextile on-site (e.g. difficulties in cutting the vegetation for maintenance). Natural geotextiles have the advantage that they are biodegradable over time.

Products Currently Available.

Natural erosion control mats currently on the market are made from a wide range of materials including jute fibres, coir fibres, straw, paper, cotton waste, wood shavings or a combination of these. Some products comprise natural fibres spun into yarns that are then woven.

Other natural products comprise loose fibres held together in a lightweight mesh. The vast majority of the natural erosion control mats are completely biodegradable. Even the lightweight plastic mesh used in many of the mulch mat type products is sensitive to ultraviolet light, and will break down over time.

Some manufacturers claim that on degradation, the natural products add organic matter and nutrients to the soil, so enhancing soil fertility. However, there is little quantified data on this, and the effects are probably accumulated only in the long term.

It is assumed that as the natural mats degrade, so vegetation will emerge from beneath, and begin to take over the role of soil erosion control. In environments where degradation of the erosion control mats is rapid (for example the humid tropics), it is argued that vegetation establishment and growth are equally rapid.

New products are coming onto the market every year, and on-going developments include the manufacture of non-woven geotextiles made from decorticated flax fibres, as part of the LINK funded FIBRELIN project, co-ordinated at the Silsoe Research Institute.

The main constraint to the use of these various natural geotextiles is the lack of data concerning their technical performance. As mentioned above, the performance of these products cannot be assessed by their physical properties (such as tensile strength etc.) as is the case for geotextiles used in filtration for example.

The only way to assess their performance (and thus the qualities which enhance or suppress their performance) is through experimentation, involving the simulation of the conditions in which these products are likely to be used. Before now, little research had been carried out in this field. Hence, a series of experiments were carried out at Silsoe College to determine the performance of a number of geotextiles for erosion control.

Erosion control mat	Composition	% of dry weight at saturation
Geojute	Jute woven	577
Fine Geojute	Jute woven	443
Environmat	Wood chip mulch	323
Enkamat	Nylon synthetic	120
Tensarmat	Polypropylene synthetic	74
Bachbettgewebe	Coir woven	253

Table 1: Water holding capacities of selected erosion control mats (Rickson, 1987)

It was hoped that the results of these tests could identify which characteristics were most important in controlling erosion processes. The experiments were designed to evaluate why the products performed as they did, and which properties determined the products performance. The data generated could help contractors and design engineers to specify certain products for given conditions, and to enable manufacturers to improve the design and manufacture of the products in the future.

Experimental programme.

The experiments to date have simulated a range of environmental conditions where geotextiles may be used for erosion control. By using rainfall and runoff simulation a number of different storms and surface water flows can be generated. Varying degrees of slope and different soil types have also been included in the experimental design.

The results and details of the various experiments undertaken can be found elsewhere (Rickson, 1989; 1990; 1992). The major conclusions are presented in this paper.

All the experiments showed marked differences in the ability of different products to control erosion. Figure 1 shows the results from just one experimental set up. In all tests, the geotextiles made from natural fibres (such as jute and flax) performed extremely well at controlling soil erosion.

Best performance was given by the products with high percentage cover, which intercepts erosive raindrops and surface runoff. The rate of soil detachment is known to decrease expontentially with increasing percentage cover (Laflen and Colvin, 1981). Natural fibres also performed well as they are able to absorb significant volumes of water, so reducing the amount of surface flow that could cause erosion (Table 1).

For example, jute fibres can absorb over five times their dry weight when saturated. Flax fibres are also effective in this respect. The water held within the natural fibres then evaporates or is slowly released, at non-erosive velocities, often after rainfall has ceased.

Another benefit of a high water holding capacity is that when wet, the weight of the geotextile increases and the product is able to conform to any slope irregularities on site. This "drapability" helps prevent

Treatment	Depth of flow (mm)	Velocity of flow (m/sec)	Mannings n	Rank	Soil loss rank
Control (bare soil)	0.68	0.0	0.06	6.00	6.00
Geojute	3.00	0.03	0.26	2.00	1.00
Fine Geojute	2.00	0.02	0.28	1.00	2.00
Environmat	2.00	0.04	0.19	5.00	5.00
Enkamat	0.68	0.03	0.10	3.00	4.00
Bachbettgewebe	2.00	0.05	0.12	4.00	3.00

Table 2. Reduction in flow velocity due to geotextile induced roughness.

the geotextile being undermined by surface flow. For example, the flexibility of flax fibres when wet made them particularly suited to the manufacture of rope and twine (Turner, 1987).

Natural fibres tend to be rougher and thicker compared with synthetics. This means that surface water is intercepted by the fibres, and flow velocities are reduced, as more energy is used in overcoming the turbulence initiated by the rough fibres. This reduction in velocity has a dramatic effect on the ability of the overland flow to both detach and transport eroded particles (Table 2).

There is close agreement between the ability of the geotextile to reduce velocity of flow and its ability to control soil losses.

Thick, irregular natural fibres are effective at intercepting soil and ponding water, especially if woven geotextiles are used. The weft yarns running across the slope act as miniature dams in intercepting flow of water and sediment downslope.

The same methodology is currently being used to evaluate the effectiveness of new, non-woven erosion control blankets made from 100% flax fibre.

One objective of the project is to manufacture non-woven flax erosion control blankets from decorticated flax fibre, and then to test the effectiveness of these products both for erosion control and to enhance vegetation establishment. These tests are on-going, but it is hoped that the results will confirm the potential of flax fibres for this end use.

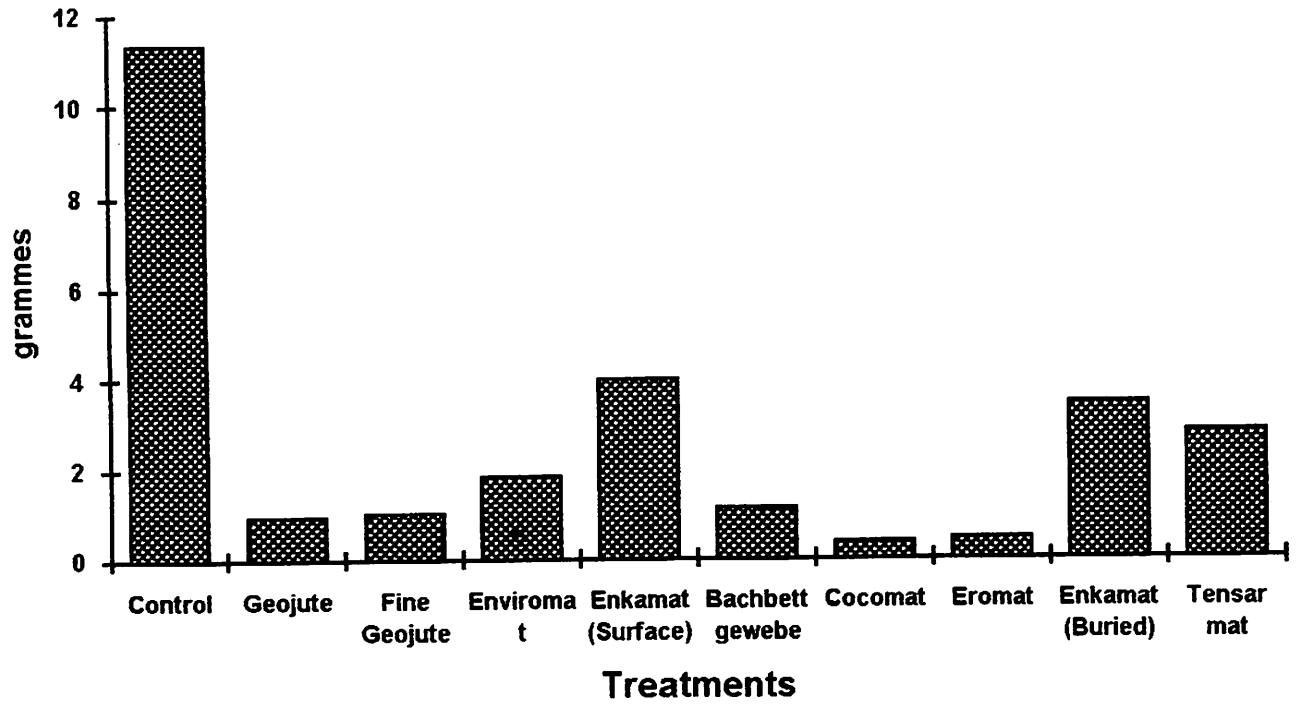
Suitability of Natural Fibres for Vegetation Management.

Geotextiles made from natural fibres can be very effective in aiding vegetation growth too. First, the geotextile creates a stable environment by preventing erosion (see above). Then the product can improve site conditions for plant growth. The effectiveness of a geotextile will be determined by the product itself, the soil and climatic conditions and the vegetation growing. However, a number of general points seem to be universal.

Soil moisture content can be increased due to the water holding properties of the natural fibres and the reduction in evaporation due to the geotextile covering the soil surface. Moisture content is one of the limiting factors determining seed germination. Dudeck et al (1970) found significant differences in soil water content with and without geotextiles on a silty clay loam in Nebraska, under adequate precipitation for grass establishment.

For a straw and jute geotextile respectively, soil water percentages were 23.3% and 20.8%. For the bare soil plot, with no geotextiles, soil water percentage was only 13.2%. There may be a negative effect, in that geotextiles with high water holding capacities may actually reduce effective rainfall at a site

Figure 1: Soil erosion losses from various geotextile treatments under high intensity rainfall (Rickson, 1992).



NOTES:

Rainfall was applied at 95 mm/hr. Soil type was sandy loam. Runoff was generated as plot length was 1m.

because of higher evaporation losses from the geotextile itself.

Geotextiles can also reduce diurnal fluctuations in soil temperature. Fifield et al (1987) refer to this as the "greenhouse effect". High daytime temperatures are suppressed (due to the higher moisture contents and reduced solar insolation through the geotextile).

At night, the insulation effect of the geotextile prevents heat loss from the soil and soil temperatures remain relatively high. It is also claimed that as natural fibres degrade, soil fertility is enhanced. Nutrients within the fibres become available to the vegetation and the organic matter content of the soil increases.

Non-woven geotextiles can also be effective in suppressing vegetation. By covering the soil surface completely with their felt-like structure, light and moisture (i.e. rainfall) penetration through the mat is restricted, so limiting vegetation emergence. Even if seedlings do emerge, penetration through the mat is difficult and within a few days the seedlings die due to light starvation.

Selective "slot" planting of vegetation can be used, and there will be little or no competition for nutrients or soil moisture from any weed species.

Market Potential of Natural Fibre Geotextiles.

Geotextiles comprising natural fibres have considerable potential for erosion control and vegetation management. However, no matter how well they perform, their potential to generate income for the grower of the source crop is dependent on the potential market for such products.

According to the Industrial Fabrics Association, in 1991 the erosion control geotextile market for the US alone was 19 million square yards (15.8 million square metres). Of this, 80 - 85% were natural products (=12.6 million square metres), most of which are manufactured with natural fibres such as jute, coir, flax, hemp, wool, cotton and sisal.

If silt fences are also included then these figures would be doubled (i.e. 25 million square metres). Jagielski (1991) estimates that these figures represent only half of the world-wide demand for such products. Growth in this sector is estimated as 15% annually.

Conclusions.

Natural fibres can meet many technical requirements needed for erosion control and vegetation management. Research has shown that geotextiles made from natural fibres and fabrics are more effective at controlling erosion compared with synthetic products.

For vegetation management, little data exists to compare natural and synthetic products, but again, the potential of natural fibre geotextiles for these end uses cannot be denied.

Given the technical performance of and existing markets for natural fibred-geotextiles, demands in the future are likely to increase. This demand can be met with the increasing supply of fibre from numerous industrial crops.

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MUCK: FROM WASTE TO RESOURCE UTILISATION: THE IMPACTS AND IMPLICATIONS

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SUMMARY

Organic manures are valuable sources of plant available nutrients. However, utilisation of their nutrient content on farms is poor at present. Recent and ongoing research has provided an improved understanding of manure nutrient characteristics and of the fate of nitrogen; this will enable a better quantification of plant available N supply following land application and losses by ammonia volatilisation and nitrate leaching.

The use of on-farm analysis monitoring techniques is likely to play an increasingly important role, enabling farmers to rapidly characterise their manures. These developments, with the adoption of improved spreading technologies that will im prove the farmer's ability to apply manures evenly and at a target rate selected in relation to the crop nutrient demand, will assist farmers to utilise manure nutrients efficiently. Often only small changes in farm practice, involving little extra cost, will allow improvements without compromising crop yield and quality and minimised environmental pollution. To achieve these improvements, the wide dissemination of available and new information on manure management techniques, will be of paramount importance.

1. INTRODUCTION

Organic manures, recycled to agricultural land, supply valuable quantities of plant nutrients and organic matter, which can help meet crop nutrient requirements and maintain soil fertility. Recent calculations have suggested that nearly 80 million tonnes of animal excreta (slurry/solid manure) are collected annually in farm buildings and yards in the UK, requiring handling, storage and subsequent land application (Smith & Chambers, 1993). The nitrogen (N) content of these manures has an estimated potential (crop "available") value of around £56 million, and total phosphate (P_2O_5) and potash (K_2O) of £71 million and £77 million, respectively.

2. IMPACTS ON CURRENT PRACTICE

Current realisation of this large potential economic benefit is poor, due to farmers not fully appreciating the fertiliser value of manures and to the adoption of management practices that lead inevitably to nutrient losses following application. A number of factors appear likely to have had a major impact on current farm practice.

2.1 Availability of inorganic fertilisers.

Annual statistics on fertiliser use (eg Burnhill et al 1994) confirm that farmer perception of the fertiliser value of organic manures is poor in relation to high-quality inorganic fertiliser products that are relatively inexpensive and much more convenient to use.

Crop	Cropping Area (ha x 10^3)	Crop Area receiving manure (%)	Fertiliser allowances (kg/ha)*		
			Nitrogen (N)	Phosphate (P_2O_5)	Potash (K_2O)
Winter wheat	1818	12	-22	+1	
Potatoes (maincrop)	84	35	-4	-24	-12
Grass for silage	1262	66	-11	-4	-5

* Negative values indicate a reduced rate of inorganic fertiliser use on fields receiving organic manure.

Table 1: **Apparent reduction in inorganic fertiliser applied to crops treated with organic manures compared to untreated crops.**
(Source: Survey of Fertiliser Practice, England and Wales, 1988-1993)

The data on Table 1 represent the difference between fertiliser use on manure treated fields compared to untreated fields (weighted mean data) for three major field crops in England and Wales. Even on crops like silage grass and potatoes that are an important outlet for manures (66% and 35% of crop area treated, respectively), allowance for the nutrient contribution from manure is, to say the least, modest. Bearing in mind the nutrients applied in a "typical" dairy cattle slurry dressing of 50m³/ha (assuming 6% dry matter), at 45 kg/ha plant available N (spring surface applied), 60 kg/ha P_2O_5 and 175 kg/ha K_2O, or for a "typical" 30 t/ha cattle FYM at 36 kg/ha plant available N (Spring, surface applied), 105 kg/ha P_2O_5 and 240 kg/ha K_2O: it could be said that the nutrient contribution from manures is virtually ignored.

2.2 Nutrient content of manures

The nutrient content of farm manures is strongly affected by the class of stock, their diet and water intake, the amount and type of litter used, nutrient losses occurring during storage, and above all, by the dilution arising from washing water or rain water entry into the store. 'Standard values, based on the analysis of large numbers of individual samples, are available from the literature (see table 3) (MAFF, 1994a). This data is useful for general planning purposes and for policy considerations (Archer, 1992). However, standard figures inevitably represent only the mean of a sometimes very wide range

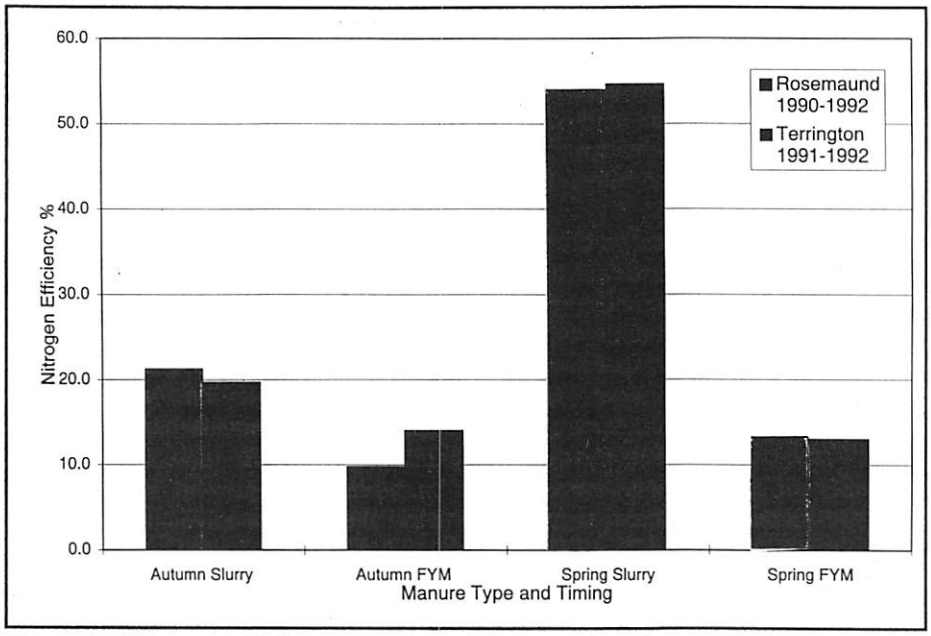

Figure 1 - **Nitrogen efficiency of autumn/winter and spring applied manures compared to N for cereal crops**

of values (Smith et al 1993) and can be seriously misleading when applied to an individual farm situation without careful interpretation. Analysis of representative manure samples is a far more reliable basis for adjustment of application rate and farm fertiliser policy.

Slurry nitrogen meters (eg 'Agros', 'Quantofix'), which directly measure ammonium-N content, are now available and are a valuable tool for assessing the potential plant available N content of slurries. In combination with a slurry dry matter estimate, made with a slurry hydrometer, an estimate of likely ammonia volatilisation losses can be made, and hence, the likely crop available N supply calculated. Additionally, the hydrometer estimate of slurry dry matter content can provide a reliable estimate of total P_2O_5 content. 'Tactical' monitoring of slurry nutrient characteristics, linked with an occasional laboratory analysis check, with correct fertiliser planning, can form part of a general strategy to increase the confidence of farmers in the use of slurry as a nutrient source. At present very few farmers (2.5% claimed) use any on-farm analysis equipment, with the majority (50%) preferring to base estimates of nutrient value on 'experience' (J Fairgrieve, private communication).

Apart from the difference in slurry nutrient contents between farms, variability in slurry composition even within a single store is almost inevitable due, for example, to the heterogeneous range of inputs to the store and the rapid solids settlement, especially in pig slurry. The liquid fraction of slurry is dominated by mineral-N, potash and other salts, with the solids rich in organic matter, organic N and phosphate.

Thorough mixing will help, but regular monitoring and sensible selection of slurry spreading rate and supplementation with fertiliser nutrients will, together, minimise the impact of slurry variability.

2.3 Application timing.

To make the most efficient use of manure/slurry N, applications should be made in relation to crop demand. Experiments on grassland (eg Unwin et al 1987, Rees et al 1993) and arable crop ping (eg Vetter and Steffens 1979, Smith et al 1994, Chambers et al 1994a) have consistently shown spring applications of slurry or poultry manure to be more N efficient than autumn/winter dressings. Such improvements are largely the result of reduced nitrate leaching losses (fig 3). However there is usually no clear difference in N efficiency between autumn and spring applications of solid FYM (see figures 1 & 3) (Smith et al 1994). These differences in N efficiency can usually be explained in terms of the mineral (ammonium) N applied in slurries and FYM or, in the case of poultry manures, in terms of the ammonium and uric acid N content (Chambers et al 1994a).

Although the technical and environmental justification for moving from autumn/winter, towards late winter/spring application of high 'available N' manures (slurries, poultry manure) is clear, the economic argument is less convincing. Manure storage costs are very high and it is doubtful, even if fertiliser costs in creased several-fold, that this extra investment could be

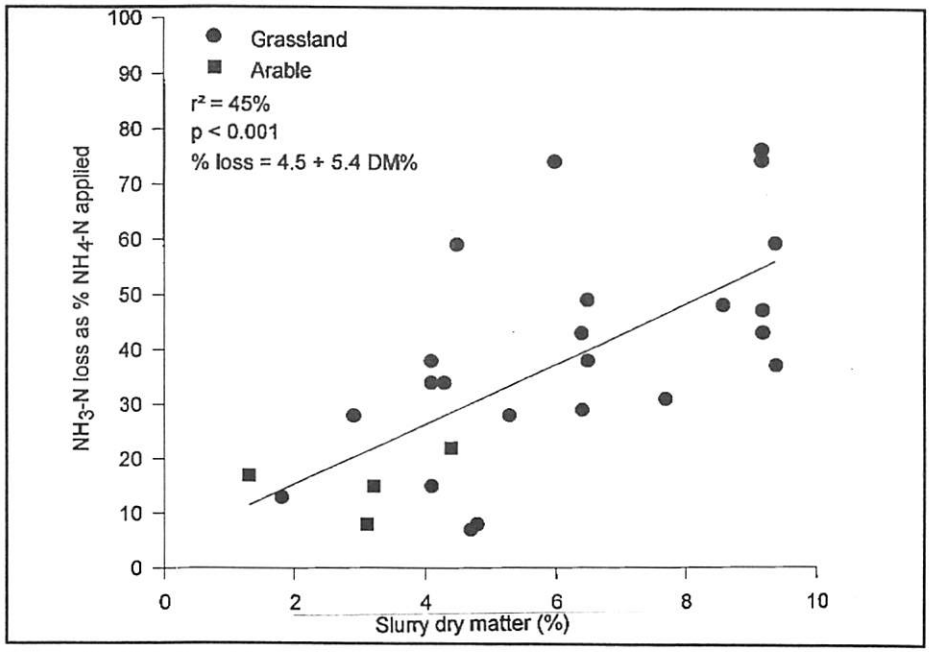

Figure 2 - **Relationship between slurry dry matter content and ammonia loss following (IGER/ADAS data) (27 experimental measurements - 23 grass, 4 arable**

justified purely in terms of improved N utilisation.

2.4 Gaseous nitrogen losses

Ammonia volatilisation is an important loss process following the land application of organic manures. Losses are often large, but also variable (Jarvis & Pain 1990). With slurries, losses occur rapidly following application;

40-50% of total loss within 6 hours,
70% within 24 hrs, and
more than 90% over 5 days.

To be effective as a means of reducing ammonia losses, soil incorporation must be immediate, eg injection, or very rapid, eg cultivation within a few hours of the application. Where slurries are surface applied, dry matter (DM) content has a large influence on ammonia losses (fig 2), with losses generally increased by around 6% of ammonium-N applied per 1% increase in slurry DM. From IGER/ADAS measurements there are clearly a number of other factors that will affect ammonia losses eg air temperature, wind speed, soil infiltration rate etc. However, slurry DM content does appear to be of overriding importance. Reduced losses from low DM slurries are attributed to more rapid infiltration into soils, compared to high DM slurries that remain on the soil/plant surface for longer. Smith and Chambers (1992) have also reported an inverse relationship between slurry solid's content and N efficiency in experiments with cattle/pig slurry applied to cereals as a top dressing in spring.

2.5 Nitrate leaching

Manure application timing and manure type have important effects on nitrate leaching losses. Recent experiments on freely draining sandy and shallow soils over chalk have shown that, where high 'available N' manures are applied to grassland (Smith et al 1993) or to arable cropping (Smith et al 1994) in the period September to November, considerable nitrate leaching losses are likely to occur. However, straw based FYM, applied in this period, represents a con siderably lower nitrate leaching risk, reflecting the lower ammonium N content (fig 3). Proposed restrictions on manure ap plication timings within NVZ's are

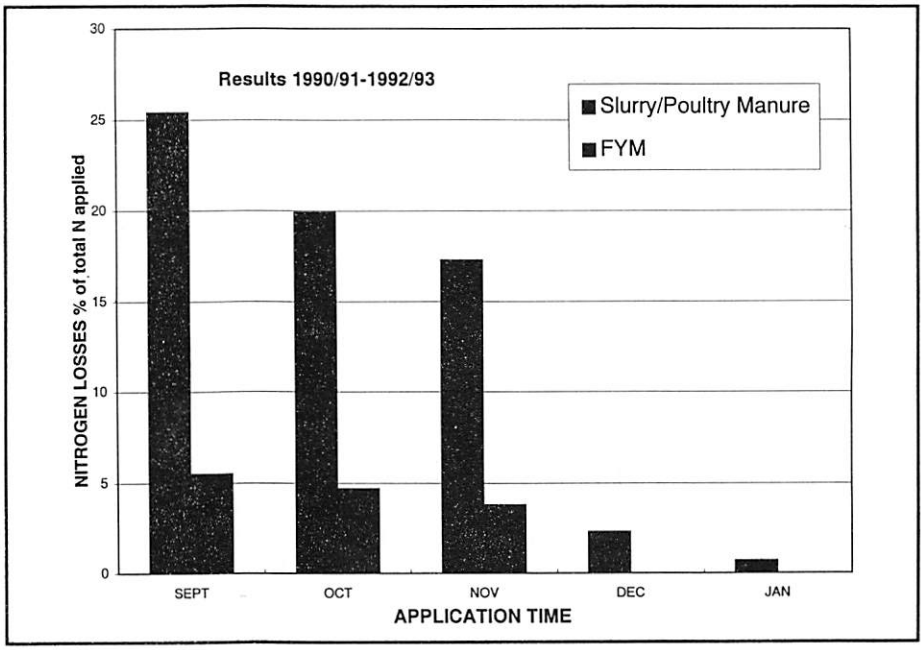

Figure 3 - **Over-winter nitrate leaching losses following monthly applications of slurry, poultry manure and FYM to arable soils (results from three sites 1990/91 - 1992/93).**

applied only to high 'available N' manures on sandy and shallow soils (MAFF 1994b)

2.6 Application rate

Farmer concern about applying slurry or manure to grassland in early spring, is generally related to the possibility of smothering/scorch negatively affecting early grass growth, and/or solids contaminating and affecting the fermentation of conserved grass. Smith et al (1995) reported yield depressions following slurry applications in Feb/March, of up 20% in grass dry matter accumulation at early grazing stage, and up to 5% at first cut silage. The threshold for these negative effects was estimated at 3-4 t/ha of slurry solids applied, at 6% DM content equivalent to an application of 50-65 m³/ha, supplying in the region of 150-200 kg/ha total N. Therefore, it is unlikely that spring applied slurry will cause any serious restriction in grass growth due to smothering/scorch unless applied at rates in excess of good ergonomic practice.

It is well known from consultancy experience, that excessive manure application rates are often used, and that these lead to number of crop-related problems, eg lodging and harvesting difficulties in cereals, excessive top growth and yield reduction in potatoes, and quality (amino-N) problems in sugar beet (Fletcher 1993). Applying manures at agronomically sensible rates will help avoid these problems, and make the most cost efficient use of the manure nutrients.

2.7 Application technique

Clearly there is little benefit in knowing sensible target application rate for manures if this cannot be achieved consistently in practice. Vetter et al (1981) tested application rates and evenness of pattern achieved by 17 slurry spreaders around a target application rate of 25 m³/ha. Actual mean application rates were in the range 17-55 m³/ha, with only 5 of the 17 spreaders achieving a coefficient of variation (cv) of less than 30%.

Satisfactory performance has been achieved in recent experiments, eg cv 28% for cattle slurry applied at 19 m³/ha (Chambers & Smith 1994b), using a boom attachment to a conventional slurry tanker; also cv's of 22 and 23% for broiler litter applied at 5 and 9 t/ha, respectively, using a rear discharge solid's spreader. The importance of correct calibration and management of machines however, cannot be over emphasised.

The ability of currently available equipment and new technologies, to apply manures at target application rates,

uniformly, needs urgent evaluation if farmers are to make the improvements in manure utilisation likely to be required by both environmental and economic considerations.

2.8 Crop availability of manure nutrients

While chemical analysis measures the nutrient content of organic manures, the effectiveness or 'availability' to crops can only be assessed by field experimentation. Where manures are surface applied and/or crop uptake of manure N does not occur soon after application, significant N losses can occur (see section 2.4 & 2.5); these losses need to be quantified/estimated if farmers are to have any confidence in utilising what remains. Past advice (MAFF 1986) was based only on limited experimental work, which often provided a far from complete picture of N dynamics follow ing land application; this, no doubt, contributed to the general lack of confidence in manure N utilisation by the industry.

Current advice (MAFF 1994a), has been improved to take account of ammonia losses, nitrate leaching, application technique, soil type, manure type and analysis, and can therefore be applied with greater confidence than in the past. In addition, measurement techniques are now available, which allow a more precise estimate of soil N supply, based on measurement of soil mineral N (eg Vaidyanathan et al 1991 for arable crops; Titchen and Scholefield 1992 for grassland) enabling farmers to better estimate crop fertiliser requirements, including taking account of N residues following organic manure applications.

In the case of phosphate and potash, although in the short term, there is a need to consider P and K availability where manures are applied on responsive crops, agronomic experiments have shown that, in the long term, manure P and K values can be regarded as equivalent to fertiliser P and K (Smith and van Dijk 1987).

3. IMPLICATIONS OF IMPROVED UTILISATION

It is envisaged that improvements in technology, application equipment and information transfer, alongside legislative control measures, will enable the farming industry to progress away from the current 'disposal' philosophy towards one of utilisation. As this occurs, there will be a number of significant implications.

3.1 Fertiliser savings

The clear potential for major fertiliser savings to UK farming has been demonstrated; both in small plot experiments and with larger field scale plots, using commercially available equipment (Hayward et al 1993)

Any minor uncertainties in using manure/slurries as N sources can be compensated for by applying only part of the crop N requirement using slurry/manure (MAFF 1994a). It is recommended that farmers rely on the organic manure to supply not more than 50-70% of the crop N requirements for optimum yield (i.e. recommended N level). In this way, the importance of any shortfall/surplus in crop N supply arising from the organic manure, is much less than if the farmer relied completely on organic sources. The additive effect of slurry and fertiliser N when applied to the same crop was shown clearly in experiments on silage grass by Pain et al (1986)

In the case of phosphate and potash, it is likely that the industry allows for much less than 10% of the potential P & K value of manures. The problems associated with P & K utilisation are less than for N, and improved information transfer should make a significant impact.

It is of interest, in this context, also to look at recent Danish experience on demonstration farms. Knudsen and Østergaard (1994) showed a steady increase in the efficiency of utilisation of N in pig slurry from 35% to 58%, and in cattle slurry from 29% to 49% in a demonstration project run from 1990-1993. Alongside, there was an overall reduction in fertiliser N use of 40%, without any decrease in crop productivity.

3.2 Improved crop quality

The data of Hayward et al (1993) demonstrate the potential for problems associated with incorrect attribution of nitrogen value, in this case following cattle slurry application to winter wheat (Table 2).

Where fertiliser N was applied at the optimum rate (147 kg/ha N) no lodging was recorded. However, at super-optimal N rates, lodging occurred with associated reduction in grain specific weight. Where slurry was applied, the fertiliser N optimum was reduced and lodging and

Main plot manure treatment	Inorganic Fertiliser N applied Kg/ha	Grain yields (85% DM) t/ha	Lodging %	Specific weight (at 85% dry matter) kg/hl
Nil	0	5.37	0	77.0
	60	7.44	0	77.9
	120	8.57	0	78.0
	180	8.54	2	77.7
	250	8.29	65	75.2
	300	7.82	87	74.6
Slurry supplying 160 kg/ha Total N	0	7.10	0	77.3
	60	8.27	0	77.8
	120	8.52	15	77.7
	180	7.95	60	75.5
	240	7.52	87	74.8
	300	7.35	87	73.2
SED (main plots		0.31	8.9	0.56
SED (split plots)		0.29	8.8	0.51

Adverse effects already mentioned on grass (Smith et al 1995) and sugar beet (Fletcher 1993) can be avoided by adjusting applica tion rates on the basis of nutrient supply and crop nutrient requirement.

Table 2 - **Winter wheat grain yield, lodging at harvest and grain specific weight from cattle slurry and fertiliser nitrogen (ADAS Bridgets, 1992)**

specific weight reductions occurred at a lower level of applied fertiliser N. Not only was there a clear benefit from allowing for the manure N contribution, in terms of fertiliser savings, but a potential quality penalty for ignoring it, as a consequence of applying too much inorganic fertiliser N.

3.3 Reduced environmental pollution

Ammonia volatilisation losses following the land spreading of livestock manures have been estimated at 60,000 tonnes of NH_3-N per annum (Jarvis & Pain 1990). Slurry injection and rapid incorporation of manures have potential to reduce ammonia emissions. However, rapid manure incorporation is not practical in many situations, and the ability of shallow injection to consistently reduce ammonia emissions compared to broadcast application has yet to be demonstrated in the UK. Nevertheless, it is likely that alternative application techniques and strategies and slurry treatment, will have a significant role to play in reducing this N loss process.

Nitrate leaching losses following autumn-winter applications, which are typical of current farm practice in the UK, have been estimated at around 58,000 tonnes of NO_3-N per annum. Experiments on sandy soils have shown that it is possible for almost complete loss of the soluble/mineral nitrogen content of manures to occur via nitrate leaching losses over winter following autumn application (Unwin et al 1991). It is clear from monitoring of land within the UK Nitrate Sensitive Area Scheme, which in some areas, manures are the major source of nitrate pollution. Controlling the rate and timing of high available N manure applications, has been one of the strategies that has had a major im pact in reducing nitrate leaching within the NSA scheme (Lord 1994)

Point source pollution of surface water via field run off is also an area of great concern; over 15% of substantiated farm pollution incidents in 1993 were attributed to land runoff (NRA 1994). Improved spreading practice (especially timing and rate) clearly has an important contribution to make in reducing point-source pollution, which includes organic and microbiological contaminants as well as plant nutrients. Diffuse pollution is less easily defined but also very important; the accelerated eutrophication of most UK freshwater is thought to be limited by P rather than N inputs. Particulate P, including P sorbed by soil particles and organic matter eroded during runoff, constitutes the major portion (75-95%) of P loss from tillage land (Sharpley et al 1994). It is clearly therefore important that excessive P enrichment of soils in erosion sensitive catchments is avoided.

Manure	DM%	Nitrogen		Phosphate	N:P# ratio
		Total	"Available"*		
Cattle FYM	25	6.0	1.2	3.5	0.3
Pig FYM	25	7.0	1.4	7.0	0.2
Cattle slurry	6	3.0	0.9	1.2	0.75
Pig slurry	6	5.0	1.8	3.0	0.6
Broiler litter	60	29	10	25	0.4
Layer manure	30	15	5.3	13	0.4

* assumes spring surface application
\# based on "available" N content

Table 3 - **Typical nitrogen and phosphate content of manures (kg/tonne), (MAFF 1994a)**

In relation to typical crop requirements the N and P content of manures is not correctly balanced; for example, where cattle slurry or FYM is applied in line with the Code of Good Agricultural Practice (MAFF 1991) supplying 250 kg/ha total N, this will supply also 100 kg/ha or 145 kg/ha, P_2O_5 respectively. In the case of an 8 t/ha winter wheat crop or a three cut silage crop requirement is in the region of 3-5, whereas the (available) N:P ratio of organic manures is well below this. (table 3) Clearly there is a real danger of significant soil P enrichment if the manure P contribution is not adequately accounted for within a properly managed fertiliser plan.

4. CONCLUSIONS

Current utilisation of organic manure nutrients within UK farming, on the basis of statistical information and farm experience is, to say the least, poor. Improved understanding of the nutrient supply characteristics of organic manures through recent and ongoing research and the adoption of improved management practices should allow significantly better utilisation. In many cases, only small changes, involving little or no extra costs for farmers, will be required.

Perhaps major current restriction to improved manure utilisation is a lack of awareness among farmers of the potential value of manures, and how this potential can be realised. Further dissemination of the available research information is urgently required, accompanied by on-farm development work to encourage uptake at farm level. Recent Danish experience (Knudsen & Østergaard 1994) provides a pioneering lead in this area; farmers are now successfully using manure nutrients, providing considerable fertiliser savings and reduced environmental risks.

Then there are the controls and regulations. In the words of Steffens and Benedetti, (1991) 'Legal regulations cannot replace the necessary efforts in research, in advice and in the installation of technical equipment, but they can support this'. Perhaps some of the existing and proposed legislation will help to encourage the changes needed to improve utilisation, to the considerable benefit of farmers and the environment.

5. ACKNOWLEDGEMENTS

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Published by Farming Press Books, Wharfdale Road, IPSWICH IP1 4LG Tel; 01473 241122 Cost; £ 18.50 plus £ 2.50 P&P

Review by John Kilgour.

CONFERENCE INFORMATION

ROYAL THAI GOVERNMENT TO HOST WORLDTECH'95 THAILAND

During November and December 1995, Thailand will host the inaugural Worldtech'95 Thailand - an international technology exhibition, and the first of its kind in Southeast Asia. The exhibition is being held 259 kilometres northeast of Bangkok at the Technopolis of Suranaree University of Technology in Nakhon Ratchasima Province (Korat) and will run from 4 November - 16 December.

Worldtech'95 Thailand, which is said to be one of the biggest and most important exhibitions of its kind this year, is estimated to attract 3-5 million visitors including members of the general public; major representatives of the Thai business community and government; entrepreneurs in agriculture, industry and the environment; and business people and investors from 30 countries worldwide. The primary objective of Worldwide'95 is to create a forum for the exchange of ideas, processes and new technology in the spheres of agriculture, industry and the environment.

The main focus of the exhibition is 'In Search of Better living', and will be presented under three themes - **Food for the World, Living with Technology,** and **In harmony with Nature.**

Food for the World concentrates on discovering efficient technology for producing nutritious food and enhancing crop fertility. **Living with Technology** is centred upon industrial technology which includes telecommunications, aerospace, and remote sensing technology. **In Harmony with Nature** features technology for environmental protection and conservation of natural resources.

Sumonta Nakornthab, UK director, Tourism Authority of Thailand, comments: "Southeast Asia is a growing technological area and the success of Worldtech'95 Thailand will encourage future events of this kind. It also provides an excellent opportunity to promote Thailand's conference, business and tourism facilities. We would like to encourage the visitors of Worldtech'95 to experience the diversity of Thailand by incorporating a few extra days into their trip to enjoy our numerous attractions."

CRUCIAL DIRECTIVE IMPLICATIONS

The first UK seminar on the EC Draft Directive on Pressure Equipment will be given by the British Compressed Air Society (BCAS) in London on Tuesday 26th September 1995. The seminar will detail the essential requirements and legal implications of the Directive (93/C/246/01, COM (93) 319 final - SYN 462), and its undoubted impact on manufacturers, importers, suppliers and installers of pressure equipment and pressure-containing parts (where the allowable pressure exceeds 0.5 bar), all of whom will be required by law to comply with the Directive.

The team of experts who will address this seminar - which will be held at the London Business School, Regent's Park, London NW1 - will be spearheaded by the UK Government's chief negotiator to Brussels in connection with this Directive, Mr Terry Pilcher, and will include a leading contributor from the Health and Safety Executive Technical Health Science Division, and a contributor from the Policy Division.

Key issues to be addressed will include the Council Decision concerning modules for the various phases of the conformity assessment procedures that are intended to be used in the technical harmonisation directives. The seminar will also deal clearly with the scope and means of compliance for manufacturers and related activities that will be discussed in relation to the new areas of skills and experience required to deal with matters outside simple pressure vessels and traditional Factories Act inspections.

Two open 'question-and-answer' sessions will be included in the programme, and delegates will receive a set of speakers' papers and a copy of the BCAS Pressure Equipment Directive publication. Further information and seminar reservation forms from BCAS, 33-34 Devonshire Street, London W1N 1RF. Tel 0171 935 2464 Fax: 0171 935 3077

19th - 23rd September 1995
Agro-Tech '95 International Supplements and Machinery Fair in Antalya, Turkey. Details available from Hüsamettin Ünsal, FS Fuarcilik AS, CC. 120 80303 Mecidiyeköy - Instanbul, Turkey. Fax: (90) 212 288 92 46

20th - 23rd September 1995
Agricultural & Biological Engineering: New Horizons - New Challenges. International conference at Newcastle University. Details from: Marion Turner Tel: 0191 222 6891.

21st - 22nd September 1995
Engineering for Sustainable Development - expectations and responses on manufacturing and transport, Queen Elizabeth II Centre, London Further information from Christa Langan, Royal Academy of Engineering, 29 Great Peter Street, Westminster, London. SW1P 3LW Tel: 01(+44)71-222 2688 Fax: 01(+44)71-233 0054

25th - 28th September 1995
Energy and Agriculture - international meeting considering energy production and mangement - CIGR section IV. Further details from P. Epinatjeff, Universität Hohenheim, Institut für Agrartechnik, D-70593 Stuttgart. Tel: (07 11) 459-2508 Fax: (07 11) 459-2519

16th -17th October 1995
International Livestock Odor Conference '95. The aim of the scientific programme is to globally expand overall knowledge regarding livestock odour research. Further details from Stephen Gorton, Iowa State University, 208 Science I, Ames, Iowa. Tel: 515 294-4406 Fax: 515 294 6019 Internet: sgorton@iastate.edu

17th - 20th October 1995
Techmart Africa (COMESA) '95, Lusaka, Zambia. A technology initiative to assist the region to develop its Agro/food industry. Further details and compendium entry forms from The Technology Exchange, Wrest Park, Silsoe, Bedford MK45 4HAS Tel: 01525 860333 Fax: 01525 860664

7th - 9th November 1995
IWEX '95 9th International Water & Effluent Treatment Exhibition and TRENCHLESS TECHNOLOGY '95 National Agricultural Centre, Birmingham. For information contact Paul Tweedale or Howard Phillips, Turret Group plc. Tel: (+44) 01 923 228577 Fax: (+44) 01 923 221346

28 November - 2 December 1995
Agritech Lebanon '95, Beirut, The international exhibition for agricultural technology, farming and irrigation equipment, and food processing and packaging machinery. Further information from International Fairs and Promotions, City Exhibition Centre, Martyrs' Square P.O. Box 55576, Beirut, Lebanon. Tel/Fax: 961 1 499 235

June 1996
New uses for old rural buildings in the context of landscape planning - International seminar of the second technical section of CIGR, Piacneza, Italy. Further details from Istituto di Genio Rurale, Università Cattolica del Sacro Cuore, Via Emilia Parmense, 84 29100 Piacenza (Italy) Tel: 0039 (523) 599.241 Fax: 0039 (523) 599.124 Email: GENUR@PC.UNICATT.IT

Short Courses at Silsoe College

October 1995
Postharvest Technology of Grains, 10 week continuing professional development programme

27th November - 1st December 1995
"Postharvest Technology and Commodity Marketing" - Conference in Accra, Ghana with Exhibition of Agriculture, Irrigation, Forestry and Food Processing Equipment.

January 1996
Postharvest Technology of Fruit, Vegetables and Root Crops, 10 week continuing professional development programme.

Further information can be obtained from Mrs Gill Burrows, Cranfield University, Silsoe Bedford. MK45 4DT. Tel: 01(+44)525 863349. Fax: 01(+44)525 863344

BRANCH DIARY

Southern Branch

19th October at 1930hrs
Technical design of the steering system and rubber tracks employed on the Caterpillar Challenger. Speaker to be confirmed. At Sparshott College, Winchester, Hants.

15th November at 1930hrs
Professional grass cutting machinery. Speaker Robin Blackford, Training Manager, Hayter Grass Cutting Machinery At Shillingford Bridge Hotel, Shillingford. Oxon

West Midlands Branch

9th Ocober at 20.00 hrs
Fed-Ricardo Ltd. Mike Savage; His Companys' work in developing power drive trains from 1950, when Harry Ferguson founded the company, to the present day. At Warwickshire College

30th October at 19.30 hrs
Factory visit to Massey Ferguson,Banner Lane, Coventry

13th November at 20.00 hrs
Sparex Ltd. Jim Goodwin; The manufacture and supply of quality replacement parts. At Pershore College

11th December at 20.00 hrs
T.I.L.Irrigation Ltd. Graham Francis; Amenity irrigation from design through installation to operation. At Warwickshire College.

8th January at 20.00 hrs
Spearhead Ltd. Martin Loll The growth and development of a new company. At Bomford Turner
Main Caterpillar agents to look at the repair and sales shops. Commencing; 7pm at Watling St., Cannock, Staffs.

South East Midlands Branch

10th October at 20.00 hrs
Project Thunderbird - The use of rapid prototyping. V.Goode and S.Wood, Triumph Motorcycles. Joint meeting with the IMechE. At Silsoe College

6th November at 19.30 hrs
Animal Traction. Mr. P. Starkey, Consultant. At Silsoe College

4th December at 19.30 hrs
Engineering Animal Welfare, Prof. C. Wathes, Silsoe Research Institute. At Silsoe College

5th December at 20.00 hrs
Vehicle Dynamics, Theory into Practice. Prof. D. Crolla, IMechE AD President, IMechE meeting, Guests welcome.
At Silsoe Research Institute

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