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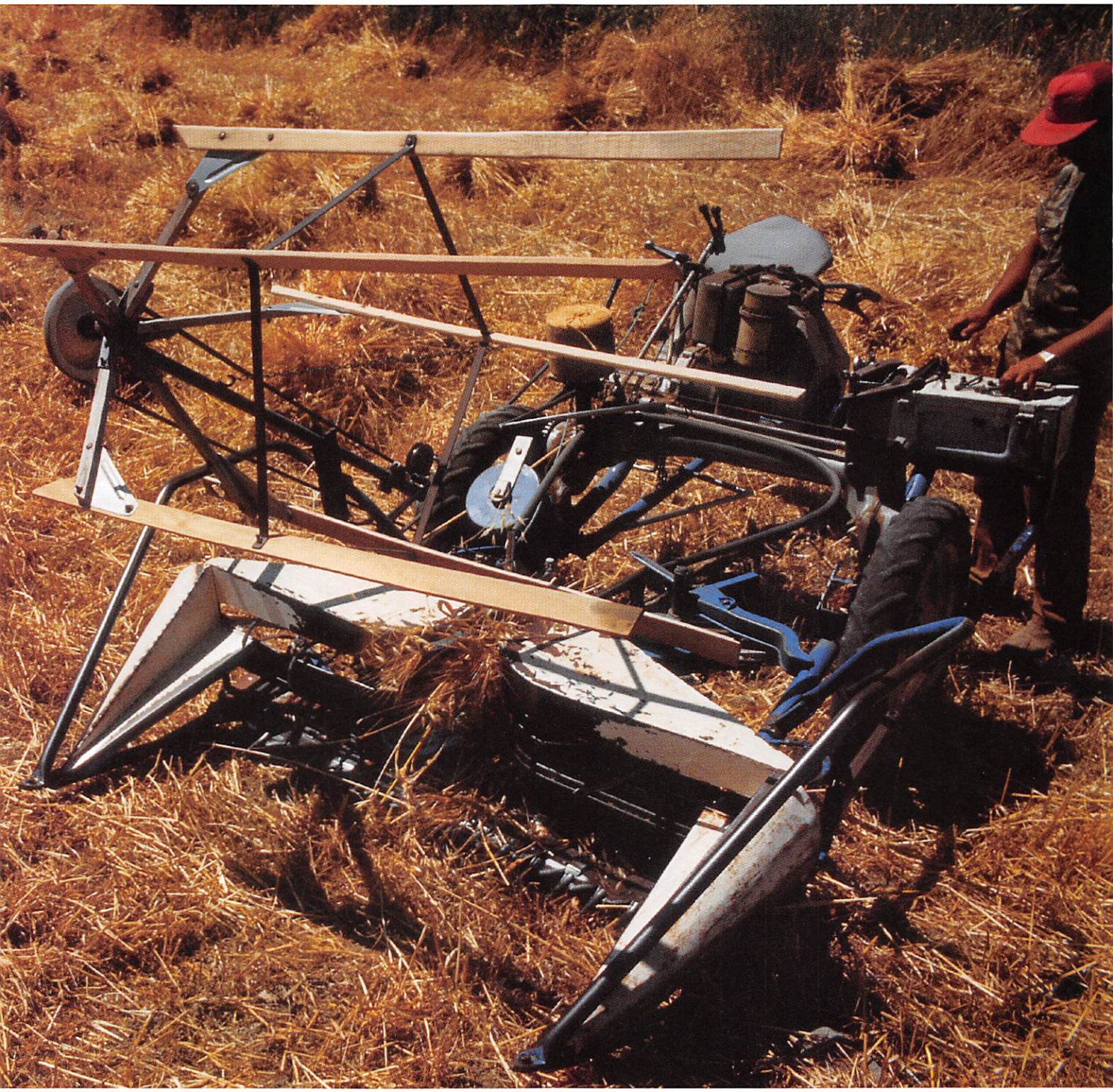

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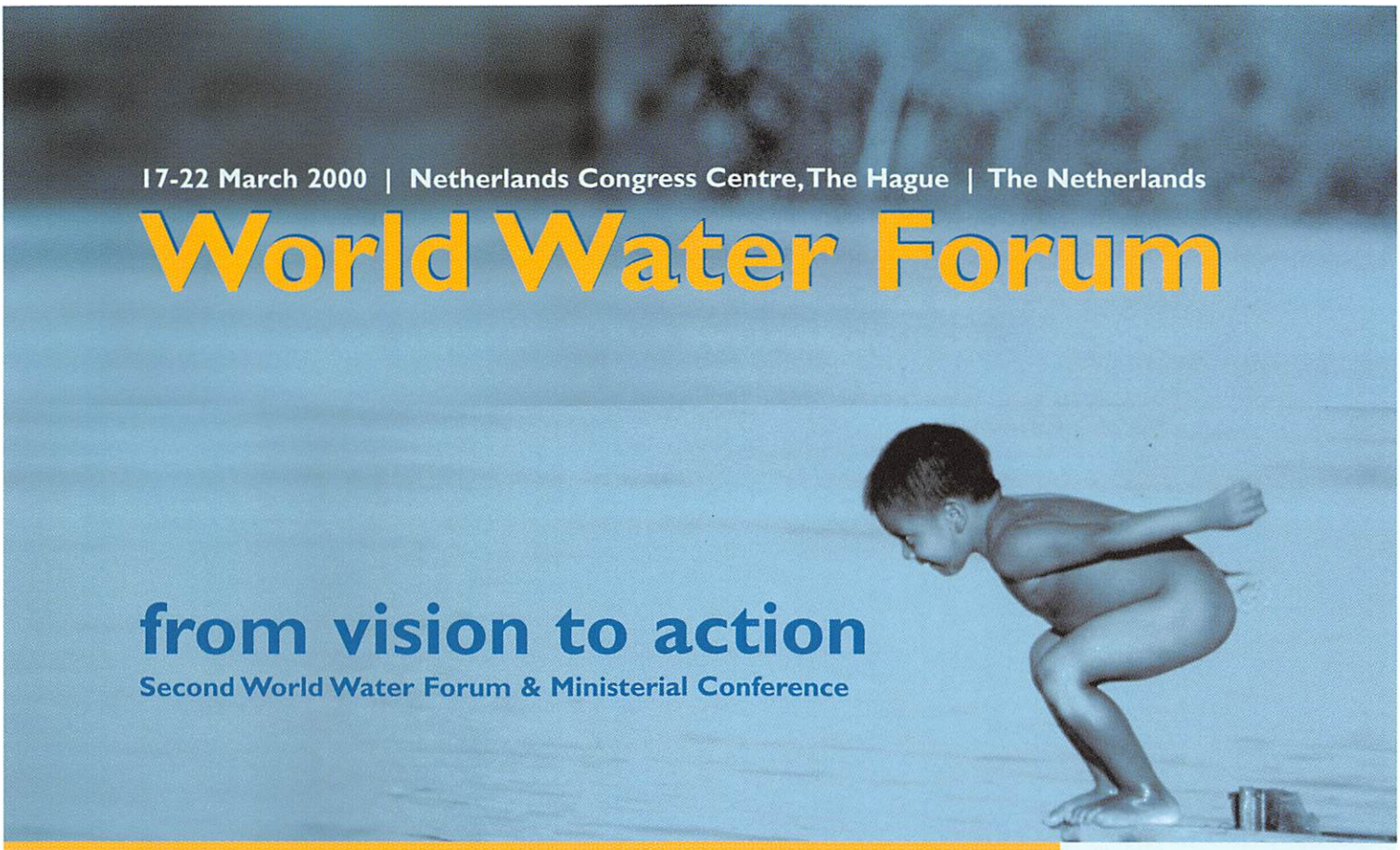

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Front cover: *Small scale mechanisation of the harvest (photo: Land Technology Ltd).*

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Water in the 21st century

Crispin Tickell

1. Introduction

Water is the life blood of our planet. It covers more than two thirds of the earth's surface and comprises more than two thirds of the composition of every human being. Life on earth started in water and without water life as we know it cannot continue.

For most humans beyond historical reckoning, water is a gift from God. In Africa water is associated with dances, while in India the arrival of the monsoon is celebrated. I remember that in rural Mexico purified water containers were once smashed: they represented an offence to God for pricing what should be free. But now almost everywhere there is the realization that water is a most precious resource. For many peoples such realization is scarcely new. Civilizations have lived and died by water: witness its control and use in the great river valleys of the Nile, Indus, Tigris and Euphrates. Yet nowhere is it valued according to its true economic cost.

This paper was presented at the Institution of Agricultural Engineers Annual Conference 'Water, the Key Factor' held at the Royal Agricultural College, Cirencester on 11th May 1999. Sir Crispin Tickell is Director of the Green College Centre for Environmental Policy & Understanding, Oxford University.

2. Environmental problems

Water is linked to everything else. There are five main related environmental problems.

First, there has been a giddy-making increase in human numbers, rising from around 1 billion at the time of Thomas Malthus (who first drew attention to the relationship between population and resources) to 2 billion in 1930 and now 6 billion. According to a United Nations report released in September last year the world population is increasing by over 80 million people each year. As the population increases, so demand for water increases, necessary for drinking water, domestic use, agriculture and industry.

Next, in spite of much increased food between the early 1950s and late 1980s, there has been an overall deterioration in land quality and soil fertility. According to the most recent United Nations Environmental Data Report of 1993/4, 17% of soils worldwide have been damaged to a greater or lesser extent since 1945. Water falling onto such degraded land is thus wasted, and extreme rainfall events can exacerbate the situation by eroding topsoil and forming gulleys.

Then there have been changes in the chemistry of the atmosphere. Acidification from industry has affected wide areas downwind. Depletion of the protective atmospheric ozone layer is permitting more ultraviolet radiation to reach the surface of the earth with so far unmeasured effects on organisms unadapted to it. Greenhouse gases are increasing at a rate which could change average world temperature, with big resulting variations in climate and rainfall patterns as well as sea levels. 1998 was the hottest year yet recorded.

Next, humans are causing extinction of other natural organisms at up to over a hundred times the normal rate. Indeed, the rate is reminiscent of the dinosaur extinction 65 million years ago. Of the 242,000 plant species surveyed by the World Conservation Union in 1997, some 14% are threatened with extinction. At the same time there is a more general impoverishment of the biosphere.

The final environmental problem relates to water, which is fundamental to life on the water planet. Some of the main issues concern salt water. There is increasing pollution of the oceans: seals found in Antarctic seas that have never seen a human have human-made chemicals in their blubber. There is increasing incidence of toxins produced by blue-green algae along rivers and coasts with associated health risks to humans and ecosystems. And there are declining fish stocks: at present, only four in every 100 one year old cod in the North Sea survive to the age of four, when they reach sexual maturity. This is causing perverse effects on reproduction. Concern about the oceans prompted the British Government Panel on Sustainable Development to propose the establishment of an Intergovernmental Panel on the Oceans in its first report of January 1995, so far without result.

Just as salt water is becoming polluted, so is fresh water. Of the water on the earth, 97% is sea water; and of the other 3%, 2% is locked up in ice at the poles. There is rising competition for the remaining 1% which is needed not only for agriculture and human consumption, but also for industry. However, the demand for fresh water doubles every 21 years and is accelerating. Yet supply in a world of 6 billion people is the same as at the time of the Roman Empire in the West and the Han Empire in the East in a world of 200 to 300 million people.

It has been estimated that the world's population currently uses 54% of all accessible fresh water flowing in rivers and streams. At projected rates of population growth humanity could use more than 70% of all accessible fresh water by 2025. Agriculture is by far the largest user of water. Some 70% of all

water withdrawn is used for irrigation and one half of that is lost to seepage and evaporation. Agriculture accounts for 87% of China's water consumption.

According to a United Nations Environment Programme (UNEP) report published in March this year 20% of the world's population in 30 countries face water shortages now, a figure that will rise to 30% of the world's population, in 50 countries, by 2025. Driven by a rising global standard of living and increasing food production water demand is increasing at twice the population growth rate. For the most part, areas least well supplied with water by nature are also those whose poverty makes them least able to afford compensating measures or are least skilled in maximising efficient use.

Conflicts may arise in the future over the quality and quantity of water. There are a number of examples. The Nile flows through nine countries which are planning to extract more water with little regard to supply or each other's needs; Turkey controls the headwaters of the Tigris and the Euphrates, via 33 dams, while downstream countries like Syria, Israel and Iraq depend completely on outside supplies; 300 million Indian farmers depend on the Ganges, but deforestation in Himalayan foothills is disrupting the flow and India blames Nepal and Bangladesh; and the United States and Mexico have had great difficulties over the Colorado: until the Mexicans were ready to retaliate by putting raw sewage into San Diego bay, the Americans removed most of the water so that a sickly salty stream was all that could reach Mexico and its once flourishing horticultural industry. Problems of supply are matched by problems of quality. In most agricultural and all urban areas there is serious deterioration of rivers and aquifers. Klaus Töpfer, Executive Director of UNEP, is "convinced that there will be a conflict over natural resources, particularly water".

Looking ahead what should we expect? Obviously the key factor is supply, and supply is dependent on climate. In its most recent assessment, the Intergovernmental Panel on Climate Change suggested rises in the average global temperature of between 1 and 3.5°C by the end of the next century and an average rise in sea level of up to half a metre (an average rate three to six times faster than that of the last 100 years). Although confidence in modelling has increased, there remain many uncertainties which make it difficult to quantify the risks involved or the regions most likely to be affected. Areas that are already wet are likely to get wetter, and arid regions may see more prolonged and severe drought.

According to a report published by the Hadley Centre last year, due to climate change alone, some 66 million extra people will live in countries with water stress and some 170 million people will live in countries which are extremely stressed. The only certainty is that there will be change, and change can be fatal to those on the margin who are dependent on a particular configuration of circumstances, and do not have the possibility of moving elsewhere.

Together these changes amount to an acceleration of environmental change unprecedented since humans became an identifiable animal species. As hunters and gatherers, our effect on the earth was confined to relatively small areas. Only recently has the scale of human expansion reached the point where it affects the planet as a whole.

3. Pressure points

For those of us in the comfortable West, the range of problems I have described often looks far away. We tend to think they will affect others and not ourselves. But there are obvious global pressure points which will affect almost everyone.

Let me take three examples. First, movement of refugees is a prime pressure point. According to the United Nations High Commission for Refugees, there were less than 6 million refugees in 1968, but over 22 million in 1994. These figures do not include the millions of undocumented aliens, asylum seekers and those simply looking for a better way of life, the so-called economic migrants. Nor do they include up to 25 million people displaced within and outside their own countries by environmental factors of unusual intensity, notably drought, flooding, storm surges, desertification, deforestation, soil erosion, and pollution. This number may double by 2010 as increasing numbers of impoverished people increase the pressure on already degraded environments, including water resources.

Refugees create a variety of problems. In some cases they can return to their countries of origin. In others they can be resettled. In others they become a lingering and self-perpetuating source of human misery and political instability. Refugees often gravitate towards cities, exacerbating the environmental problems already present. Some of the world's largest cities, including Beijing, Buenos Aires, Dhaka, Lima and Mexico City, depend heavily on groundwater for their water supply, but it is unlikely that dependence on aquifers, which take many years to recharge, will be sustainable. Refugee camps themselves put pressure on local resource use, for example fresh water supplies and overcrowding can lead to sanitation problems. The refugees from Kosovo are a stark reminder of some of these issues.

The next pressure point is changing patterns of disease. Temperature and moisture are determining factors for biological agents in the human environment: in water, food, air and soil. Variations in both affect the ability of viruses, bacteria and insects to multiply and prosper.

We are already seeing a remarkable return of certain diseases whose agents have become resistant to modern drugs as well as the arrival of new pathogens. Diseases currently causing concern include AIDS, the Ebola virus and the mutant bacteria *E. Coli 0157*. History is full of examples of societies and civilizations brought down by diseases to which local populations had no immunity. The Black Death reduced the medieval population in Europe by between a third and a half, and smallpox and measles that of the indigenous population of the Americas by over three-quarters.

Over a quarter of the world's people do not have safe water to drink or proper sanitation. According to UNEP, at any given time an estimated half of people in developing countries are suffering from diseases caused either directly by infection through the consumption of contaminated water or food, or indirectly by disease-carrying organisms, such as mosquitoes that breed in water. These diseases include diarrhoea, schistosomiasis, dengue fever, malaria, river blindness and trachoma. Some 80% of diseases in poorer countries are caused by contaminated water. UNEP warns that unless action is stepped up, the number of people without access to safe water will increase to 2.3 billion by 2025, with

the number of those who die from unsafe water expected to jump sharply as well.

Further potential problems arising include poor drainage and sewage disposal; silting up of irrigation works; algal blooms from nitrate pollution; aluminium toxicity; salinization; and depletion of the natural means in forests and elsewhere to combat these problems.

My final pressure point is ecosystems. Water supply affects ecosystems in many ways: through pollution of lakes and rivers (from agriculture and industry), damages to, and exhaustion of aquifers (the Sahara, Saudi Arabia and Baja California), deforestation and depletion of top soils lead to faster run off, and disruption of the hydrological cycle with incalculable consequences for life generally. According to UNEP, 20% of freshwater fish species have been pushed to the edge of extinction by contaminated water.

4. Tackling water management

What is to be done? Obviously the issue goes wider than water, and is no more than a part of the general environmental crisis facing our civilization. It relates closely to the growing imbalances between population increase on one hand, and the use of resources and their disposal on the other. We need to change radically the way we think about our society and its management. Let me make a few suggestions.

In terms of values, we need to recast our vocabulary. Words are not only a means of expression but also the building blocks of thought. The instruments of economic analysis, in particular discounting the future, are defective. "Growth", "development", "cost benefit analysis", and "gross national product" all require redefinition. We need to change the culture. Many have lamented the division between the culture of science and the arts. They are right to do so. Our real bosses are the business managers, and they are not known for their ability to think long.

We need to recast our educational system to promote better understanding of broad issues and lateral thinking between them. Long term environmental considerations need to be brought into the centres of decision-making and we need a value system which enshrines the principle of sustainability over generations. Sustainable development may mean different things to different people, but the idea itself is simple. We must work out models for a relatively steady state society, with population in broad balance with resources.

Finally we should apply the three conditions on resource consumption suggested by the economist Hermann Daly: the rate of use of renewable resources (soil, water, forests) should not exceed the rate of regeneration; the rate of use of non-renewable sources (fossil fuels, minerals, fossil ground water) should not exceed the rate at which sustainable alternatives can be developed; and the rate of emission of pollutants should not exceed the capacity of the environment to assimilate them.

There are also a number of practical measures which can be taken. Current economics is based on scarcity. Until now there has been no general scarcity, nor prospects of such scarcity, of such goods as unused land, healthy forests, fresh water, clean air and genetic diversity. Many things cannot have monetary values attached to them, but in this case impoverishment can be given some kind of financial meaning. Natural services, or the support mechanisms of life, are indispensable to every breath we breathe. The first ever attempt at quantifying their global value, published in *Nature* in May 1997, estimated that they are on average worth around US$ 33 trillion. Compare this with the current GNP of all countries in the world, which is about US$ 28 trillion.

How does this relate to water? There seem to me some obvious points. Water should be treated as it is: a most precious resource, and priced accordingly. It may not suit politicians, consumers or even OFWAT (the regulatory body to protect consumers) but that is the reality. There should be an end to subsidies whether open or covert. We should make prices tell the truth. At present, water prices are absurdly cheap world wide as a proportion of economic cost: 60% in Israel, 22% in Britain, and still lower elsewhere. In South Africa there is a current attempt to bring them up to 100%. There should also be much wider differential prices within countries.

We must make better use of water. It is cheaper to stop leaks than to increase capacity. According to UNEP, 40-60% of water used by utilities is lost to leakage, theft and poor accounting. Making irrigation more efficient should be a top priority: drip systems are up to 95% efficient and could replace many of the traditional canal systems.

Much water used is of drinking water standard but need not be (one third of domestic use is for WCs and only 18% for drinking and food use). There is scope for two grades of water. In Australia, in areas of scarce water, rainwater tanks are used for drinking and the water from the taps is for other uses only. There are a number of water saving devices which should be more widely used, such as short flush WCs with smaller cisterns, low water use washing machines, smaller baths and tendency for showers.

We can reconstruct infrastructures for collection, distribution and sanitation: a national grid is a possibility but would entail huge capital cost. Interbasin transfers may be considered but the impact on ecology are unknown. In Britain, the areas with greatest projected increase in demand are those least able to increase capacity. Already the Welsh reservoirs supply most of the water for the Midlands. As family units get smaller and the number of households increases, demand increases disproportionally.

Water saving technologies could be introduced in agriculture, for example awareness of climate change might encourage appropriate use of crops rather than increasing irrigation use. Water saving technologies such as abstraction charging, increased charging, and greater re-use of effluent, could be used in industry. Other suggestions have included desalination plants, shipping water from France and towing of icebergs!

UNEP has estimated that the overall price to bring low-cost safe water and sanitation to all those who need it is $23-25 billion per year, over a period of eight to ten years. Current world investment is $8 billion per year. The shortfall is roughly equal to the annual pet food purchases in Europe and the USA. Water could be provided with these funds through low-cost technologies such as hand-pumps, gravity-fed systems and rainwater collection.

5. Bringing about change

Public awareness is essential: in the long term through education, and in the short term through local information campaigns. To change a way of running a society as well as a way of thinking about the world generally is no mean undertaking. The power of inertia is immensely strong.

Change usually takes place for three main reasons. First leadership by individuals from above. Margaret Thatcher gave clear leadership on climate change. She was always ready to challenge the conventional wisdom. Al Gore championed environmental issues until he became Vice President, and Mikhail Gorbachev did likewise once he had safely left office.

Second, public pressure from below, even if in sometimes irrational fashion. Many thought that Greenpeace's opposition to the dumping of the oil-platform Brent Spar was exaggerated. But the results were positive: greater public awareness of our common global inheritance, and the need to protect it; demonstration of consumer power, especially in Germany; greater sense of corporate responsibility in disposing of waste; and greater awareness of the need to build disposal into the original design of products.

Lastly, some useful catastrophes to jerk us out of our normal inertia: big but not too big; small enough but not too small; quick but not too quick; slow but not too slow. In each case, big enough to demonstrate the point. Such catastrophes could include drought or flood, a major sea level rise, millions of refugees on the march, some new Genetically Modified Organism going wild, and most likely creeping social and economic breakdown such as can already be seen in parts of Africa.

Above all we must bring water - supply and demand - with other environmental considerations into the centres of decision making. In devising prices, we should work for the greatest possible flexibility, and expect the unexpected. Management of water supplied is peculiarly subject to both natural and manmade hazard. That means enlarging our options now. We do not have to be educated by disaster. But unfortunately a disaster or the prospect of one, is sometimes necessary to push governments under pressure from pubic opinion into action. As Sam Johnson said: "Depend on it Sir, when a man knows he is to be hanged in a fortnight, it concentrates his mind wonderfully".

Electronic foaling early warning system

Five students from the University of Wales in Bangor are set to receive a grant of over £2,000 from the Audi Foundation towards developing an electronic foaling early warning system which could save breeders many sleepless nights. Charlotte Matthews (21), from Anglesey, Birmingham's Andrew Harbach (20), Sam Pollack (22), from Glanyrafon, Samau's John Story (22) and David Morris (22), from Tywyn, have formed a management team to design, produce and ultimately market its "FEWS" device.

The device is aimed at alerting the breeder or owner when a mare enters the early stages of labour by monitoring its physical condition. Skin resistivity sensors measure whether a mare is sweating - one important change which affects a foaling mare - and contractions of the animal.

"The main advantage of our FEWS unit is that it does away with the need for a person to be on hand, sometimes 24 hours a day, to observe whether a mare is starting foaling," confirmed Charlotte. "A bleeper will draw the attention of the breeder or owner when this is occurring. Our FEWS unit is fitted to the mare externally which is also beneficial compared to the products currently on the market."

"Charlotte, Andrew, Sam, John and David represent the future, the next generation of designers and engineers," added Audi Foundation Manager Michael Farmer. "The Audi Foundation exists to give a helping hand, a start to these rising stars. All too often, a good idea withers because of a lack of a few hundred pounds and that's where the Audi Foundation can help".

Audi Foundation Grant applicants must be either an individual between the age of 18-25, or at a higher education establishment or must be a not-for-profit organisation. The closing dates for the next applications are 1 September and 1 December. Farmer continued: "The Audi Foundation has £125,000 in grants available this year and we're ready to hear from any students out there with novel ideas."

This is the sixth Audi Foundation grant to be awarded. Previous successful applications have included projects for a motorised wheelchair specifically for sufferers of cerebral palsy, a single-seater motor car for use at racing driver schools, an automatic access ramp for railway carriages, an all-in-one lens and reflector unit and an environmentally friendly scooter that can store energy. Applicants interested in applying for a grant should call: **Michael Farmer on 01908 601570** for an application pack.

Kim Macfie: new AEA President

At the AEA's Annual General Meeting at the Savoy Hotel on Thursday, 15 April 1999 Mr K I Macfie (Kim), Sales and Marketing Director of Hayter Limited, was elected as the Association's President for 1999/2000.

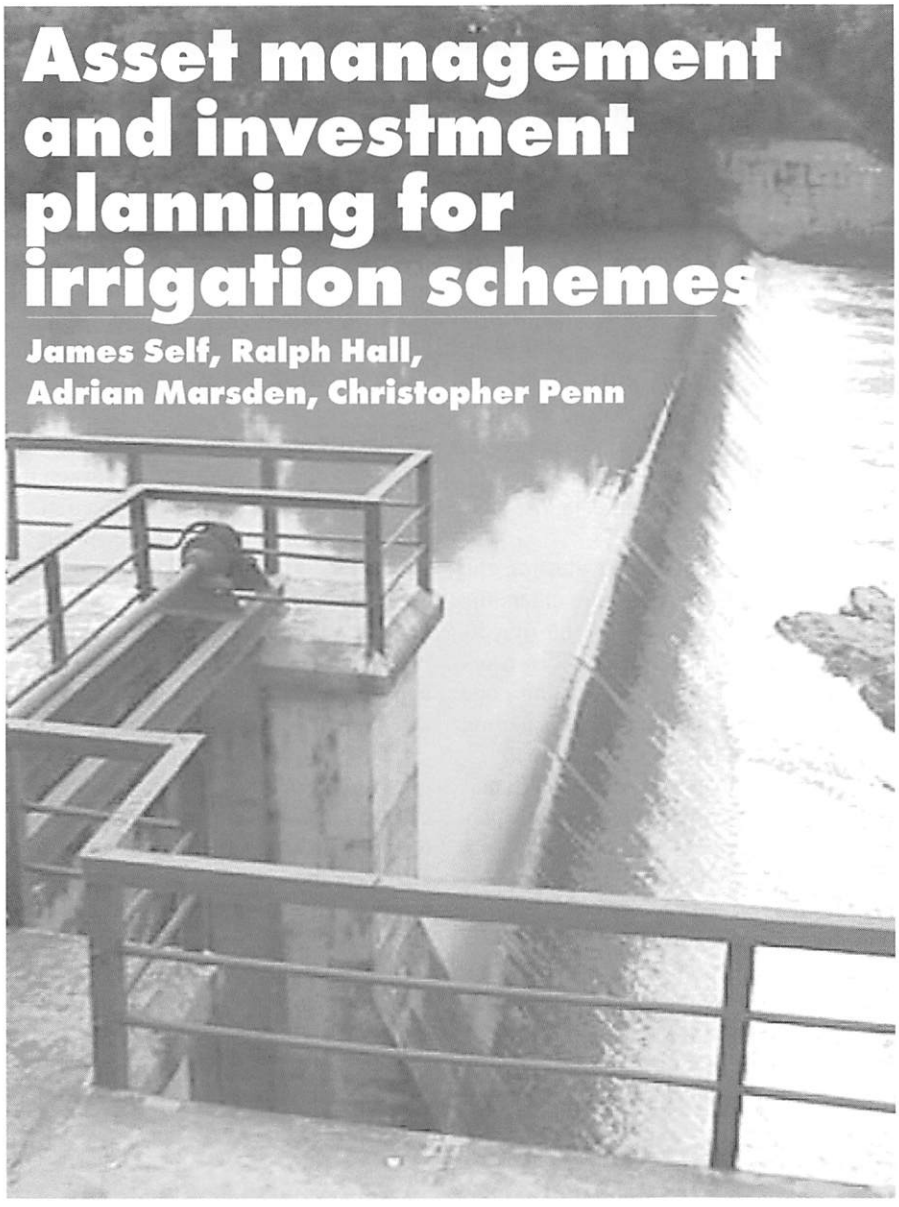
Kim has been Chairman of the AEA's Outdoor Power Equipment Council for the last two years and a member of the Finance and General Purposes Committee since 1993.

A graduate in business administration from the University of Strathclyde, Kim held positions with a number of companies, including Ransomes Grass Machinery Ltd and Cowies Eastern Tractors before joining Hayters in 1984. A year later Hayter became part of the Tomkins Group, benefiting from the associated capital investment. Kim is proud of the company achieving BS 5750/ISO 9000 as early as 1993 and is committed to a number of team working initiatives including 'Investors in People'.

Kim is one of the best known characters in the industry and widely respected for the quality of his Chairmanship of meetings, along with the sterling work he has done for the Association. A grass machinery man through and through, Kim manages to get in the occasional round of golf to test out turf management and still retains his membership of the Royal Troon Club as he has throughout his years in the south.

Asset management and investment planning for irrigation schemes

James Self, Ralph Hall,
Adrian Marsden, Christopher Penn



Dam at the irrigation headworks

Project team from L to R: Ralph Hall, Chris Penn, three members of the Scheme staff, Adrian Marsden and James Self.

As part of their final year Masters of Engineering degree at the University of Southampton students have to undertake a group design project. Four undergraduate civil engineers, Ralph Hall, Adrian Marsden, Chris Penn and James Self carried out a project looking at Asset Management and Investment Planning for Irrigation Schemes in Developing Countries. The aim of this project was to prepare an asset management plan and investment strategy for an irrigation scheme, thereby developing and testing a generic methodology for asset management and investment planning. The project was intended to extend the expertise recently developed in the UK water industry to the irrigation sector overseas.

The team had to raise sufficient funds to travel abroad to carry out field research and obtain first experience of an irrigation scheme. The *Douglas Bomford Trust* made a significant contribution to project funds.

Asset Management

Asset Management is 'business speak' for the long-term management of infrastructure such that investment requirements can be predicted and budget requirements set. To adequately manage the assets, for maximum benefit, an understanding off all the factors affecting their value and operation is needed. Applying asset management to infrastructure is a relatively new concept which brings the benefits of clarity, allowing focus to be placed on improved service to the customer, who in the case of irrigation is the farmer. Asset management can therefore be defined as a structured and auditable process for planning investment in infrastructure in a sustainable manner, to provide users with a reliable service. In theory, the asset management plan is a list of investment requirements and values for every year. Asset management is the whole process of collecting data, the storage of that data and the processing of the data to generate information on which system management decisions can be made. The team developed a strategic investment plan in conjunction with the asset management plan.

When the team undertook the project it was realised that first hand experience of an irrigation scheme in a developing country was required in order to properly test ideas. The scheme, that the project team visited, was selected by International Water Management Institute (IWMI) after consultation with the Sri Lankan government. The scheme was deemed suitable due to its medium size (2000 ha) and recent commercialisation. The scheme comprises a twenty kilometre canal feeding the main tank which then directly supplies three secondary canals and two major branch canals which are fed from the secondaries. Field channels are fed directly from the secondary canals and supply areas of between 1ha and 120ha. At present ninety-five per cent of the irrigable area is used for the growth of paddy rice with the remaining five per cent devoted to cash crops such as chillies and groundnut.

Part of the canal network

The team sub-divided fieldwork into two areas: site survey and other related works; and office data collection and interviews. For the site work, the structures along the canal were surveyed for basic detail along with performance and condition grading. The data has been used to build up an inventory of condition and performance grading criteria supported by the 200 digital photographs that were taken. Whilst in Colombo, the team visited the Government Irrigation Department and met Mrs Samarakoon the Director General who was very helpful and gave positive feedback on the team's ideas. The Government also provided the team with Operation and Maintenance information as well as the reports compiled for the government on the commercialisation of Ridi Bendi Ela.

Project results

The following important results were achieved.

- A management framework to allow the transfer of irrigation projects from public to private ownership has been developed. This framework identifies the use of asset management as a key business planning tool.
- A general framework for assessing scheme and system performance has been created.
- Asset condition and performance grading criteria, supported by pictorial examples, have been developed.
- A database for storing and processing asset information has been built.
- A survey methodology for collecting the data needed for asset management planning has been created.
- An Irrigation System Investment Plan (ISIP) has been developed and applied to the Ridi Bendi Ela scheme. This ISIP has shown that a long term approach to financial planning will provide a sustainable level of service that can be afforded by the farmers.

Asset management planning can be of benefit to irrigation schemes but it is essential that the methodology is kept simple. Further development of the research undertaken in this project is required before a generic asset management plan for irrigation can be applied.

The team also concluded that asset management planning can be used to maximise the benefits of agricultural systems in developing countries where the food production is becoming increasingly important with the world population growth.

The project team have enjoyed the variety of work involved and are grateful for the ideas and support provided by those associated with the research.

It is recommended that all schemes strive towards self-management reducing the level of control exerted by the government. At present, asset management planning is viewed as being overly complicated and requires too much training for those working in the field. Therefore, future asset management developments should be carried out with scheme engineers in mind. The team also recommends that a central body is set up to control the development of asset management for irrigation. This will ensure that standardised performance/ condition criteria and a generic database are used throughout the sector.

Structures along the canal were surveyed for basic data, as well as for performance and condition grading.

Acknowledgements

The team would like to thank all those involved with the project including staff at IWMI and the University of Southampton. The experience gained through this project has been both challenging and extremely valuable and we would like to thank the Douglas Bomford Trust for their role in it.

For any further information please contact Dr Martin Burton, Department of Civil and Environmental Engineering, University of Southampton, Highfield, Southampton, SO17 1BJ.

Water for irrigation – does efficiency matter?

Melvyn Kay

Water needs

In many developing countries agricultural production relies heavily on irrigation and the demand for water in such countries is enormous – in excess of 70% of the available water resources. This figure often surprises people who tend to under-estimate the vast amounts of water needed to grow crops. Even in the UK, irrigation demand in the Anglia region can approach 50% of water demand on any day during a dry summer. Add to this the general lack of water management skills in developing countries, inadequate infrastructure and poor physical resources for water control and the result is poor water use efficiency and wastage on a grand scale that many countries can ill-afford.

This paper was presented at the Institution of Agricultural Engineers Annual Conference 'Water, the Key Factor' held at the Royal Agricultural College, Cirencester on 11th May 1999. ***Melvyn Kay FIAgrE is an Independent Consultant in irrigation water management, formerly Senior Lecturer in Irrigation Engineering, Silsoe College, Cranfield University, UK. E-mail: melvynkay@tcs.demon.co.uk***

Measuring irrigation efficiency can be a depressing experience. That is the amount of water needed to grow a crop in relation to the amount of water diverted into the system of canals and pipes from a river or reservoir. At best the efficiency is around 50% - this means that only half the water is used by the crop - at worst it can be as low as 10 to 20%. It is estimated that the average irrigation water use efficiency for the whole of China is only 30%. Even in the USA on the large irrigation schemes in California, where higher levels might be expected, the efficiency is only around 50%. Such figures seem appalling when international bodies such as the United Nations Commission on Sustainable Development (1997) say the world will be 20% short of fresh water by the year 2025 and water will be the most serious obstacle to world food security, poverty reduction and protection of the environment.

According to the Commission, the world's population is set to grow by 50% in the next 25 years. The majority of these people will be in the arid and semi-arid regions of the world where traditionally most food has been grown on rain-fed lands. But rainfed production is insecure, rainfall can be erratic, there are recurrent droughts, evaporation rates are very high and much of the rainfed capacity has been used up. In sub Saharan Africa, 95% of farmers depend on rainfed agriculture, but in the past two decades per capita production of cereals has not risen and remains below what is required to feed the present population. Irrigation has long been seen as an option to increase production. Already irrigation contributes over 40% of world food production from just 17% of cultivated land. Much of the dramatic increases in food production in recent decades have come through irrigation. The green revolution in Asia produced high yielding varieties of rice but to reap the benefits of this, timely and adequate irrigation is essential. Over 70% of all food grain in Asia since the 1960s have been grown on irrigated land.

Clearly, the potential world water crisis stems principally from the needs of food production. Domestic water supply and industrial needs, although vitally important, pale into insignificance in volumetric terms when considered alongside agriculture. But if irrigation is expected to produce the extra food how can this be reconciled with the poor efficiency of water use and the overall inadequacy of current fresh water resources to meet future demands?

There are only two ways of solving this problem. The first is to develop new water resources. There is no inherent shortage of water on the planet but it is not always in the right place at the right time. The second option is to manage existing resources better and so cut down on wastage.

Developing new resources

Developing new resources is not only expensive but can be fraught with political difficulties. Building more dams, river diversion works or drilling more boreholes will bring water from sources, often far away from the populations that need it but this can be difficult and expensive. It also puts the basics food needs of people in direct conflict with environmentalists, who in many countries seek to stop the construction of dams because they are perceived to have such an adverse effect on the environment.

In Nigeria, dams have been designed to control water supplies for domestic use and food production in the drought prone north of the country so that water from the rainy season can be made available in the dry season to match the water demands of farmers along the extensive river channels. This is challenged by the bird lobby who want to protect valuable wetland sites which migratory birds use en route across Africa and there are also serious concerns about the inundated land and

the communities which will be displaced in the reservoir areas. In the USA, new dam construction has virtually stopped because the opposition to them is now so strong not just on environmental grounds but also on aspects of safety. Trying to get a new dam built today would amount to political suicide.

In India, food security depends on irrigation and the future depends on the development of additional irrigation. But India's largest irrigation project, Sardar Sarovar, has encountered so much opposition from the environmental lobby that the World Bank has now withheld funding for this.

An alternative - demand management?

The alternative approach, and one which is finding much more favour in the developed world, is to find ways of using existing resources more efficiently. The levels of efficiency referred to earlier would seem to offer considerable scope for improvements here. The perception that water is 'lost' or used inefficiently is unwelcome and so attention has turned to this idea of 'demand management'.

Demand management first became popular in the energy sector. Increases in the demand for energy were mitigated by increasing the efficiency of energy *e.g.* insulating buildings and by changing the pattern of demand by adjusting the price of energy so that it was reallocated from low value to higher value users. So why not apply this idea to the water sector? Are there ways of increasing water use efficiency and using economic forces to re-allocate water from lower valued use to higher valued uses – treating water as an economic good?

Improving efficiency

There is significant room for efficiency gains in irrigation but they are not easily achieved. If it were simple then it would have been done long ago. One option which is often suggested is to switch from surface irrigation, which accounts for about 95% of world irrigation and is considered to be an inefficient way of applying water, to sprinkler irrigation which has an efficiency of 75% or trickle irrigation which is said to have an efficiency of 90% or more. The problem with this approach is that efficiency is not so much dependent on the technology, which is often assumed to be the case, but on how that technology is used. At best, the levels of efficiency attributed to technologies are statements about what can be achieved when all the other inputs are made properly. Unfortunately, in irrigation the inputs are many and often complex and so the resulting efficiency is often very poor.

In the UK, for example, trickle irrigation is often recommended on high-value soft fruit to reduce water consumption but on a survey of 20 farms almost half of them had levels of irrigation efficiency below 50%. They were applying double the amount of water needed to meet crop demands. The main reason appeared to be a lack of understanding about how the system should be used. Farmers were reluctant to believe that the small drops coming from the emitters were providing enough water to irrigate the crop. So they left the water running longer than scheduled just to make sure that it did the job properly. In doing so they wasted a lot of water. The problem is a psychological one – irrigation farmers like to see the water. With sprinklers and surface irrigation, you can see the water going onto the crop – with trickle you cannot.

Again in the UK, there is a movement to encourage farmers to switch from sprinkler to trickle in order to save water. The recent drought years and the growing demand for irrigation water have added to this movement. But the outcome may not be what is expected. Farmers in UK generally tend to under-irrigate their crops because of the difficulties in scheduling irrigation with rainfall and not having enough irrigation equipment to put on the full amount. Switching to trickle irrigation would mean they would have the capacity to put on the full amount at the turn of a tap – even more if they were not careful. So farmers could end up using far more water - not less, particularly as the main irrigated crop is potatoes and this is easily adapted to trickle.

In Swaziland in the sugar industry and in the Caribbean in the banana industry, trickle irrigation is being installed with water use efficiency in mind. But for simplicity the systems are operated on a daily replacement schedule and so each day the crop is irrigated to replace the water used the previous day. The key question is what happens to the rainfall which can be 600 mm or more because under this irrigation regime there is no room left in the soil to store any of it. So the result is that all the rainfall is wasted.

In South Asia, the stringent demands of careful water management for high yielding rice varieties means that substantial amounts of rainfall are often ignored. To obtain high yields, farmers must maintain control over the depth of water in their fields. If this level falls or rises from the optimum for short period then yields can suffer. So when it rains excess water is drained away. During dry periods, farmers are reluctant to allow the water levels to fall in anticipation of rainfall because they do not know in advance when it is coming and how much will fall. So the simplest approach is to ignore rainfall and manage the more certain irrigation supply.

But does efficiency matter?

Clearly there are problems in achieving higher levels of efficiency in irrigation by simply switching technology. But is efficiency the right indicator of what is being sought? Is the objective to use water more efficiently or is it to use water more effectively and to avoid unnecessary wastage *i.e.* reduce losses? It is now argued by some water resource specialists that targeting efficiency gains is taking our eye of the main target.

The International Water Management Institute (IWMI) in Sri Lanka has recently published reports showing some of the fallacies of the efficiency argument (Seckler, 1996; Keller *et al.*, 1996). Seckler neatly summarises the issues using a very simple example of water use in a domestic situation where, during droughts, we are urged to use water carefully with such comments as 'turning off the tap while you are brushing your teeth will save 40 gallons of water each week.' Or putting a brick in the toilet cistern will reduce water demand for toilet flushing by 50%. But does it? It is argued that turning off the tap leaves 40 more gallons in the distribution system for use elsewhere. But the water that was previously wasted went down the drain and if this was

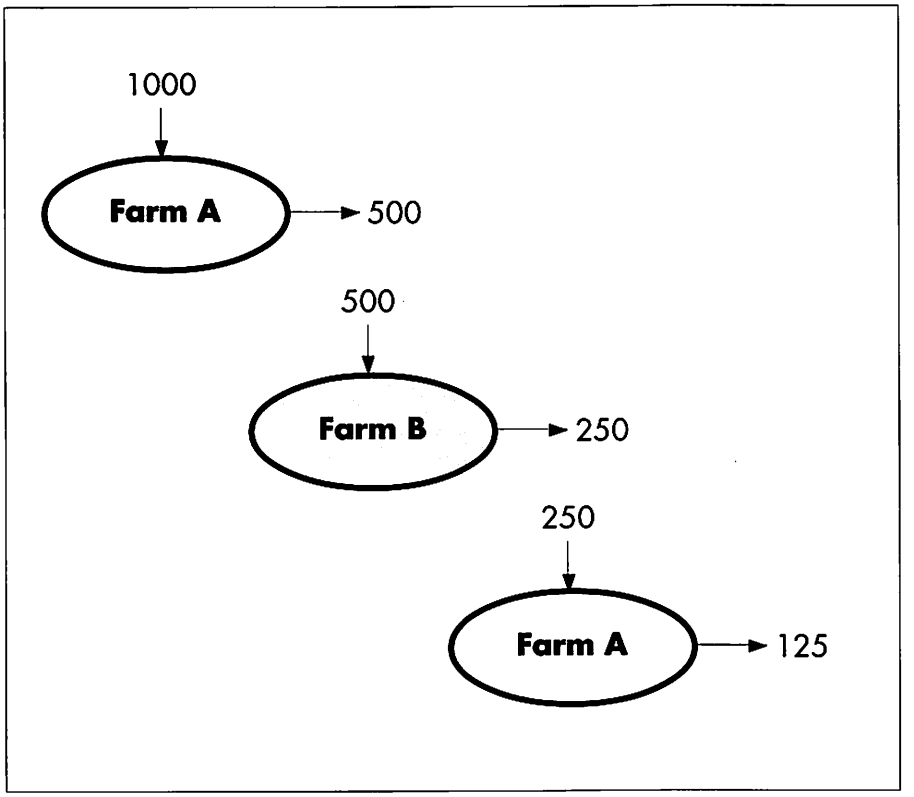


Fig.1 Irrigation efficiency in a river basin (units of water)

captured and used by someone else then wastage was not lost to the system but was still used effectively. The supply of water to the basin as a whole has not changed. So the water saved by turning off the tap was not a real saving but what the Americans call 'paper' water or 'dry' savings - these are in contrast to 'real' water or 'wet' savings. So the concept of water use efficiency at the domestic level of individual users has little meaning. Improved efficiency will reduce individual metered water bills but it will not make any more water available in the river basin. In fact, the advice to put bath water on the garden in this context is not good advice at all. Water on the garden is really lost to the system as evapotranspiration and cannot be recovered. The important point to realise is that when water is short it is important to make sure that all water that is used is put back into the system and is used as many times as possible before it is finally lost to the sea.

This concept of multiple use of water is a very important aspect of water planning and management. When data are published for water resources, they refer only to the amount of water available. But if that water can be used four times as it flows down through a basin, then there is effectively four times as much water available.

Keller *et al.* (1996) applied the same idea to irrigation. Suppose that a group of farmers irrigate in a river basin and operate at only 50% efficiency (*Figure 1*). Farmer A uses 1,000 units of water for irrigation at 50% efficiency. This means that 500 units are used as evapotranspiration and are lost but 500 units return to the system either as groundwater or surface water. Assume now that farmer B is able to pick up all of this drainage. He uses 500 units of water at 50% efficiency. Of this, 250 units go to evapotranspiration and 250 units are returned to the system. The overall efficiency of the basin has now risen to 75% as the crops have used 750 units of the original 1000. Efficiency is increased further when farmer C captures the drainage water from farmer B and so on. The overall efficiency of the basin will eventually converge on 100%.

So what happens if farmer A invests in trickle irrigation to increase his water use efficiency from 50% to 100% (assume 100% to keep the numbers simple)? He now uses only 500 units of water and leaves 500 in the river for farmer B. But this is what happened when he was operating at only 50% efficiency – the water just went via farm A rather than down the river channel. There is no increase in the availability of water or in the area that can be irrigated. Keller refers to this as a 'closed' basin, meaning that all the water is used and non goes to waste. He also argues that as the demand for water increases then eventually most basins will become closed. In this situation, any increase in efficiency on an individual farm will have no effect on the overall availability of water in the basin and the area that could be irrigated would not increase. There may well a change in the farms that practice irrigation *e.g.* if farm A switched to trickle and decided to use all 1,000 units that it originally abstracted then there would be none left for anyone else. The area irrigated on farm A would double but this would be at the expense of the farms further down the basin.

Of course, this is a very simple model and there are many reasons that can be put forward to challenge it, such as the difficulty in recovering water from farm drainage and its quality. But it is difficult to argue with the logic and it challenges one of the principles of demand management when applied to water. This is not to say that demand management does not work, it is just that Keller argues that it will not solve all the water problems and that we may be underestimating the need for new resource development. Demand management must be used with care in the water sector because water does not behave like other commodities such as energy. Energy can be stored when it is not being used but water cannot. When it is flowing in a river it must be used at that moment or it will flow past. Someone described the use of river flows like trying to sell last night's hotel rooms. It is too late – they have gone. Water can be stored in dams but only for a short time. Eventually they fill up and overflow. A common problem in the water sector is the assumption that water behaves physically like other commodities, clearly it does not.

Summary

Seckler concludes from this analysis that there is a danger that planners will simply follow the route of increasing

water use efficiency in the drive to make existing resources go further. The result of this policy will be that water scarcity in the future will be greater than is commonly assumed.

Demand management does have a significant role to play in finding ways of improving the effectiveness of existing water resources by reducing real losses and increasing the productivity of water. But demand management requires capable managers and strong institutional structures, which are lacking in many countries.

It also requires physical engineering works without which it is not possible to control and manage water. New water resources must be developed to meet future demands and a balance must be struck between the water and food needs of the human population and the environment that must sustain this production. At present the balance has shifted towards the environment and to the socio-economic issues of development and away from technology. There is no denying that these are important issues but unless data is collected on rainfall, runoff and river flows, unless dams, river diversion works and pumping stations are built then we will not be able to begin to manage the resources that we need.

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Farmers face major challenges in handing over to the next generation

It is generally known that the average age of UK farmers is around 65. This, coupled with the weak state of the farming industry today, means that the issue of succession planning poses a significant challenge to many in the industry. Failure to address succession correctly could cause major problems for thousands of individual farmers.

Succession can take various forms: it can mean passing the business on to the next generation of the family; it could mean selling the farm and assets and living off the proceeds in retirement; another alternative is retaining ownership whilst bringing in somebody to manage the farm. Farmers may also plan to diversify the way they carry on their business or may decide to move into another business altogether. Unlike some other businesses, farmers cannot just walk away and abandon the land and livestock.

Recent legislative changes have added to the challenges facing farmers looking to tackle succession and have included the increase in Stamp Duty to a top rate of 3.5%, the proposed introduction of the Climate Change levy and last year's reform of Capital Gains tax.

Valerie Smart at PricewaterhouseCoopers states: "Capital Gains tax was changed fundamentally by last year's Finance Act and many are still getting to grips with some of the ramifications of these changes. What is clear is that since the changes were announced few farmers have looked at the structure of their operations and considered them in light of the new tax rules. "As we approach the end of this century, the farming industry is in its weakest state in living memory. Farmers should be looking for a way forward for their business and a way of life that is sustainable; minimising the tax burden is vital to ensure successful succession planning.

"They should:

- produce a business plan of where they want to be in five years time;
- address their current business structure to see if it matches up with the business plan;
- where they identify potentially large tax charges, take advice on means to reduce these; and
- whatever they do, do not make major strategic changes in isolation - it can be an expensive mistake."

PricewaterhouseCoopers, in association with The Royal Bank of Scotland and the National Farmers' Union of Scotland, hosted a meeting at the Royal Highland Show to discuss the issues facing the fanning industry today and looking forward into the next millennium so that farmers and landowners could put forward their concerns and views.

Contact: **Valerie Smart, PricewaterhouseCoopers, Edinburgh Tel: 0131 226 4488**

Sprayer test failures highlight cost of inaccuracy

Results of tests carried out on sprayers under the AEA Sprayer Test scheme highlight the justification for such a scheme, not only to enable cereals growers to meet the need for greater accuracy and comply with environmental and consumer requirements, but also to minimise over application of what is one of their most costly inputs.

Since the Sprayer Test scheme was introduced by the AEA in June 1997, nearly 700 tests have now been carried out by the network of AEA approved test centres.

Of those tested, the failure rate stands at around 25%, with worn jets accounting for the highest proportion of failures at 33%, closely followed by boom defects (30%) and worn hoses (20%).

Fault	*Failure rate, %*
Worn jets	33
Boom defects	30
Worn hoses	20
Water/hydraulic leaks	18
Faulty pressure gauge	17
Unsafe PTO	17
Unreadable sight gauge	17
Missing control labels	10

When testing jets for wear, a margin for error of 10% above the manufacturers stated output is allowable, but the high failure rate due to both worn jets and faulty pressure gauges shows the level of inaccuracy that does exist.

With sprays accounting for up to £112/ha* in winter wheat, at a time when grower margins are under pressure, the financial losses that could be easily avoided by regular maintenance and simple calibration testing are considerable. Even at just 5% inaccuracy, worn jets would be costing the grower £5.60/ha in excessive chemical use, aside from environmental considerations.

Crop	*Chemical cost, £/ha*	*Margin for error, %*	*Av.test cost,£*	*Area sprayed to recoup cost, ha*
Winter wheat	112	5	145	26
Winter barley	90	5	145	32
Sugar beet	160	5	145	18
Potatoes	425	5	145	7
Winter OSR	102	5	145	28

*Costings taken from 1999 Farm Management Pocketbook by John Nix

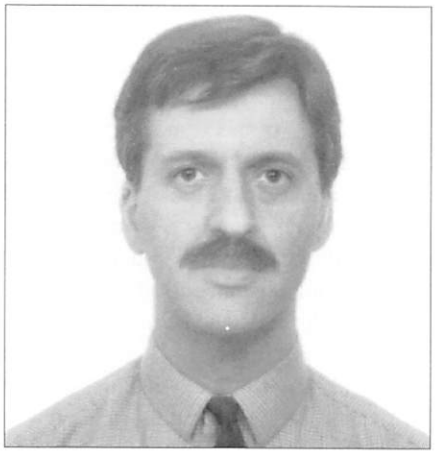
Test charges vary according to the size and nature of the sprayer, but at an average of £145, with this lower level of inaccuracy the cost of the sprayer test would be recouped after just 26ha.

The AEA Sprayer Test is a voluntary scheme covering both new and used sprayers, which is endorsed by leading industry bodies and leading sprayer manufacturers. The Test Centres are an Affiliate of the AEA and must have at least two trained examiners. It is also a requirement that the Test Centres fully meet all current legislation regarding catchment facilities.

Contact: **Duncan Russell, AEA, Samuelson House, Paxton Road, Orton Centre, Peterborough PE2 5LT.**

Tim Dowdeswell, Chairman of the AEA Farm Equipment Council, presents a cheque for £2,000 to Ken Chappell, Executive Director of the Society of Ploughmen, to launch the funding for the World Ploughing Championships to be held in England next year. The World Championship will be held on the 16th and 17th September 2000 in and around the Lincolnshire Showground and will follow immediately after the 50th British National Ploughing Championships to be held on the preceding two days at the same location. The AEA is delighted to assist the promotion of this important and popular event which encourages the skills of ploughmanship and will also be tailoring its Tillage Demonstration programme to accommodate and support the championships.

Check-up on pig ventilation



Richard W Langley

Introduction

Whilst all livestock farmers know that ventilation is important, we can easily forget the basic principles from time to time. According to British Standard 5502 Part 42 (1990), ventilation should be provided to:

- remove or dilute the level of aerial contaminants (*e.g.* noxious gases, dust and pathogenic organisms); and
- control, within limits, the air temperature with the building.

The four basic ventilation systems are shown in *Figure 1*.

Pollutants

The noxious gases normally of concern in piggeries are ammonia (produced by the decomposition of nitrogen compounds in urine and faeces), carbon dioxide and water vapour (primary by-products of respiration), hydrogen sulphide (from decomposition of manure and giving the familiar rotten eggs smell) and carbon monoxide (from inadequate combustion of fuels used for heating; and highly poisonous, of course).

The maximum recommended limits of each of these major gases is given in Table 1 (from BS5502, Part 42 1990). It is worth noting that carbon dioxide is often used as the basis for the minimum ventilation requirement; in most circumstances it is taken that the carbon dioxide level must not rise above 0.3%, or 3000 ppm. (Atmospheric carbon dioxide level is around 0.03%). The other practical consideration is that increased gas concentrations can occur when slurry is agitated or removed (especially ammonia, hydrogen sulphide and methane), and thus the maximum ventilation rate must always be used during these times.

Maximum and minimum ventilation rates

In order to satisfy the aims of BS5502, there are two fundamentally different rates demanded. The *maximum* ventilation rate is required in summer in order to prevent the building overheating; this is due to the continuous heat output of the housed animals (which can be equivalent to many electric fires!). Quite clearly therefore, this will determine the maximum number and sizes of fans needed.

On the other hand, the *minimum* ventilation rate is required in winter in order to provide oxygen and to remove the noxious materials already mentioned. It is important to remember the stockperson's requirements here also; there may be a Control of Substances Hazardous to Health (COSHH) infringement (long term or short term limit) if the dust levels are continuously higher than those recommended. Common sources of dust are animal feeds, animal debris (faeces, urine, hair, skin etc), and straw.

Going hand-in-hand with the maximum and minimum ventilation rates, is the design allowance for a cubic air space per.animal. Figures are published, for example in BS5502, which state clearly what amount of free air volume is required for any species of animal. These figures should not be compromised.

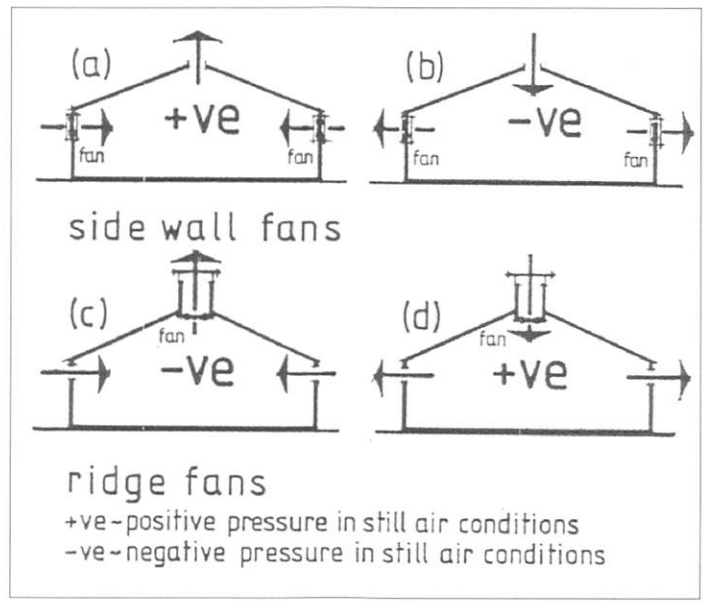


Fig. 1 The four basic forced ventilation systems (after Baxter, 1984) are still very much applicable for current piggeries; (a) and (c) tend to over-ventilate in windy conditions; and (b) and (d) are prone to under-ventilation in windy conditions.

Calculation of maximum ventilation rates

It is relatively simple to check whether or not you have the right fan capacity to cope with the maximum air movement demand. A simplified equation (after Rose, 1997) states that the maximum ventilation rate V in m^3/h is given by:

$$V = S/(0.35\ T)$$

where S is the sensible heat output of the animals in watts and T is the temperature difference between inside and outside

Table 1 Maximum allowable gas concentrations in occupied buildings

Gas	*Max. conc., ppm*
Carbon dioxide	3000
Ammonia	20
Hydrogen sulphide	5
Carbon monoxide	10

in °C. It is usually advised that the temperature rise inside should not exceed 3°C above outside. For example, take a weaner house with 200 pigs of average weight 23 kg each. Table 2 (adapted from D and P Sainsbury, 1988) shows that each pig is producing 55 watts of heat. Assume a temperature difference of 32°C.

Therefore, the ventilation rate $V = (55 \times 200)/(3 \times 0.35) = 10{,}500$ m³/h (approx). If it is assumed that 355 mm diameter fans are to be used, and they can produce 2,500 m³/h at a static pressure of 5 mm water gauge, then the number of fans required is 10,500/2,500 = 4.2. Since it might be a little difficult to purchase 0.2 of a fan, the answer would be rounded up to *5 fans*. Alternatively, if a larger fan is selected, then fewer of them would suffice. Of course, fans that will provide enough air in summer are going to be more than sufficient to cope in winter, that is so long as the controllers are capable of doing their job.

Too much ventilation

If the ventilation rate is too high, especially in cold weather, a lot of valuable animal heat will be wasted. Reference to the pig's upper and lower critical temperature requirements will confirm that outside this range, the pig 'wastes' a proportion of its energy in keeping warm (or keeping cool as the case may be). This in turn means poorer feed conversion ratios and lower efficiencies; it undoubtedly pays to maintain the environment within the ideal range.

Also, if the ventilation (air speed) is excessive, there is a strong danger of subjecting the animal to a draught. This is evidently worse if at animal level, and can lead to deaths through chilling and could lower the animal's resistance to disease-producing organisms. Most experts say that young animals are most at risk from draughts, and that an air speed should not exceed 0.25 m/s in winter. In addition, excessive air movement will mean higher fan running costs and more opportunity for irritating noise.

Too little ventilation

Should the ventilation system be insufficient, a number of problems can arise. The air becomes increasingly stagnant gaining in temperature and humidity, and the build-up of all sorts of pollutants occurs. The animals will suffer from respiratory diseases obviously affecting production, and the building can suffer from dampness. That is, the walls and floors (and bedding) can become wet exacerbating disease problems. It is worth pointing out that the combination of high humidity and low temperatures quite common in winter, are even more suitable for the spreading of disease. Added to all this, conditions are more unpleasant for the stockperson too.

Determining the temperature and ventilation rate

There are a number of ways by which the temperature and/or air movement, or lack of it, may be,checked. One of the more telling methods is to observe animal behaviour; overwarm stock will try to disperse as much as possible to cooler areas, whereas cold animals will show signs of wanting to huddle together. Cobwebs can be a useful sign; moving cobwebs will show the direction of airflow, but hanging webs often indicates an absence of any air movement at all. A simple wet finger may be sufficient to detect a draught. Similarly, if straw bedding is moving/rustling, this can indicate air movement. Air movement can be identified by the use of smoke pellets (which need to be lit) and smoke sticks - these can be helpful when trying to ascertain the direction of currents. Pellets may be purchased relatively cheaply from your local plumbers' merchant. Air speed measurement has to be done with an anemometer - this may be a specialist's tool, but is essential for accuracy. Finally, a simple regular check on the electrical consumption of the fans done over a period will indicate how much they have been running.

The temperature of the house must be checked periodically using a straight forward thermometer; this is a good way to see whether the controller is actually working at the point you think it is. (it often isn't). To get an accurate picture of what the temperature is doing over a period, it is wise to put in some type of data-logger. These can be expensive and tend to be used by specialists, but there are some cheaper ones coming onto the market that could be a useful farmer's tool.

Excessive humidity in the house can be checked using a hygrometer, but can show up practically as mould and condensation, and a general darkening of the underside of the roof material. Precise control of humidity may not be that important, but it is accepted that extremes are undesirable (for reasons mentioned earlier). A high concentration of dust can be seen by shining a bright light into the house. (This can often be

Table 2 Estimated heat output from pigs in winter (housed)

Livestock	*Approx. age, wk*	*Liveweight range, kg*	*Heat output per pig, W*
Piglet	Birth	1.1	4
	2 to 3	4.5	10
Fattening pig	7	14	37
	8	18	45
	9	23	55
	10	27	60
	13	45	82
	15	57	95
	17	58	102
	21	90	125
	26	113	162
Farrowing sow		135	200
		181	245

noticed at home too, when the sun shines directly through your bedroom window!).

Summary

It is always going to be a wise move to do some simple and basic checks on the pig buildings. Do not assume that the fans, inlets, outlets and control gear will happily cope with another winter just because they worked (or appeared to work) last year. There is no substitute for maintenance; a few minutes spent checking and monitoring, on a regular basis, will be time (and money) well spent.

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PM's search cites AGCO's 'Fieldstar' as a Millennium Product

The economic and environmental benefits of AGCO's 'Fieldstar' precision farming system has earned it Millennium Products status from the Design Council.

The news was announced in London by the Secretary for Trade and Industry, Stephen Byers, as part of the Millennium Products initiative launched by Prime Minister Tony Blair in September 1997 when, in conjunction with the Design Council, he challenged businesses to demonstrate that Britain is the creative powerhouse of the world.

With its selection as a Millennium Product, Coventry based AGCO's world leading development now becomes shortlisted for inclusion in the Millennium Dome exhibition.

British farmers have been major pioneers of the new precision farming methods using the AGCO Fieldstar system on the company's Massey Ferguson combine harvesters and tractors, and the system is now being adopted increasingly elsewhere, particularly in Germany, France, Sweden and Denmark. It allows farmers to map yields and compare crop performance between different parts of an individual field, and then automatically vary inputs, such as cultivations and agro-chemicals, across the field according to the productivity potential of each part.

Research reports and the practical experiences of growers continue to show the potential these new methods have for both improving farm profits and minimising the impact of modern agriculture on the environment. Examples include savings in herbicide use averaging 40 percent, worth £5 - £10/ha to the farmer; a profit increase of £192.50/ha for a very low yielding part of a field on a farm in the north east, and a saving of £13/ha in fertiliser use on a Lincolnshire farm.

Malcolm Lines, AGCO Ltd's Vice President Marketing, said: "This recognition of our Fieldstar system as a Millennium Product for its capabilities in making farming even more efficient and improving the financial viability of arable producers in the new millennium is a tribute not only to our own employees but also to the many farmers and researchers we have been working with in developing its use on UK farms. It's another reason why we look forward to the future with confidence and the continuing success of Coventry in servicing farmers everywhere".

Andrew Summers, Design Council Chief Executive, said: "We warmly congratulate AGCO on the selection of Fieldstar as a Millennium Product, and we are delighted it is going to form part of our collection of the most innovative products and services offered for the new millennium".

Contact: **Paul Lay, AGCO Limited, on 01203 851209**

This looks like any other of Massey Ferguson's big red combines bringing home the harvest, except for the stubby aerial on the cab roof harnessing information from satellites more than 12,000 miles above the earth. The technology is at the heart of 'Fieldstar', Coventry based AGCO Ltd's yield mapping and precision farming system. Developed to help arable producers cut production costs and farm in closer harmony with the environment, it has now been granted Millennium Products status by the Design Council after Prime Minister Tony Blair challenged businesses to show that Britain is the creative powerhouse of the world.

Don't fall for it, warns HSE's Chief Agricultural Inspector

Speaking at the launch of a new Health and Safety Executive (HSE) video *'Don't Fall For It'*, David Mattey, HM Chief Agricultural Inspector warned farmers and farmworkers of the risks they face when working on fragile roofs: "Twenty three people have died in agriculture in the last 10 years in incidents associated with work on farm building roofs. Many more have been injured, some so severely they have been permanently disabled."

Source	*Non-fatal high fall (over 2 m) injuries in agriculture*						
	92/3	*93/4*	*94/5*	*95/6*	*96/7*	*97/8*	*Total*
Fragile roof	8	23	22	14	11	10	88
Ladder	22	22	34	19	26	30	153

This was the message given to farmers during the launch at a special one day Agriculture Roofwork Conference held at Harper Adams University College in Newport, Shropshire. The event was organised by the Health and Safety Executive (HSE) and the Rural Design and Building Association.

Said Mr Mattey: "The video – *'Don't Fall For It'*- will help to save lives and prevent injuries. Too many farmers and farmworkers think that they can get away with walking on roofs constructed of fragile material such as fibre cement sheets or rusty corrugated metal. All too often, the material gives way and they fall through with terrible results.

"My message to them is – don't fall for it. Don't fall for thinking that walking the purlins is safe; don't fall into the trap of thinking that a quick job doesn't need precautions and don't fall for the old story of inadequate planning, lack of equipment and unsafe systems."

The conference and video form a key part of HSE's initiative on roof safety, which in 1999/2000 will be a major component of the work of inspectors dealing with agriculture. Inspectors will investigate all reported incidents of falls from roofs and take enforcement action where it is warranted, both following incidents and where routine inspections reveal that roof work is carried out without adequate precautions.

Typical incidents include:

- 1993/94, in Shropshire, a 58-years-old self-employed farmer from Shropshire fell 2.5 metres to the concrete yard, dying later of a pulmonary embolism, while using an unsecured ladder to access a barn roof;
- 1992/93, a farmer in Staffordshire died after falling 4 metres through a fragile fibre cement roof while replacing old sheets with a new steel covering - single scaffold boards were spaced at intervals along the roof to provide support, but proved inadequate;
- 1997/1998, a farm employee from the Shropshire area who had gone onto a fragile roof to do minor repairs without using crawling boards - he was repairing the guttering and sheets and fell through a ridge capping sheet approximately 7 metres to the concrete floor below, suffering severe head injuries.

Mr Mattey continued: "The 80 delegates at this conference, most of whom work day to day in the agricultural roofing industry, represent our first step in the process of making sure the industry are aware of the risks and how to control them. Speakers have outlined practical ways of accessing roofs safely, as well as the factors to take into account when designing and selecting material for roofs. The legal requirements on farmers, designers, erectors and suppliers are clear - and we will ensure that those who do not follow them come up to the standard of the best."

Also at the launch was an ex-farm worker who has been injured through work on a fragile roof. Andrew McCall, who is now wheel chair bound as a result of a fall in 1997, said: "I was lucky – I'm still here to tell my story. But if the right equipment had been available to me, and I had been properly trained for the work, luck needn't have played a part. Anyone about to work on a fragile roof should watch this video and follow its guidelines."

Copies of Agricultural Information Sheet No 32 *'Preventing falls from fragile roofs in agriculture'* are available free from HSE Books, PO Box 1999, Sudbury, Suffolk, CO10 6FS, tel: 01787-881165. Copies of the agricultural video *'Don't Fall For It'* priced £38.50 or to hire for £14.85 for five days, are available from HSE Videos, PO Box 35, Wetherby, West Yorkshire, LS23 7EX, tel :0845 741 9411.

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Membership Matters

Quarterly The Newsletter of the Institution of Agricultural Engineers Summer 1999

Award of Merit 1998 Joseph Cyril Bamford CBE

The achievements of **Joseph Cyril Bamford** in the Agricultural Engineering industry are legendary and one of the great success stories of the 20th Century. From early days making farm trailers in a small garage in Uttoxeter, Staffordshire, he progressed to designing and constructing front-end loaders for the tractors of the day. He had identified a need, the basic pre-requisite for every new development if it is to succeed, and exploited that need. It is this ability of Joe Bamford, and those who have succeeded him at the helm of JCB, to identify a need and provide a solution that makes JCB so special. His company's products have always been innovative, and have set an example for others to follow.

The story of the JCB group of companies and its products is well documented elsewhere. J C Bamford has been a central figure in that story and his contribution has been immense, to the extent that JCB is a household name and his initials are entered in the Oxford English Dictionary.

He has never been a member of our Institution but that is not to say that he has not given his support. He has been generous in kind on many occasions, providing speakers and premises for meetings and conferences in particular and outstanding hospitality whenever members and delegates have visited the company. That is direct support, equally important is the indirect support given through employment and career opportunities for members. A significant number of Wrekin Branch members are employed within the JCB group of companies.

Just as important is JCB's commitment to training and developing young engineers in our industry. Each year the company takes on sandwich year and work-experience students from a number of colleges and universities.

Whether trainees, main-stream employees or management, the philosophy of employment at JCB reflects that of its founder - commitment, loyalty and above all a pro-active approach. Some of the best agricultural engineers in the world started at JCB. Many are still there finding fulfilment and job satisfaction at the forefront of our industry.

John Weeks Past President of IAgrE paying tribute to Shiela Hollowell's contribution during her 28 years at the Institution looking after the Membership - both individually and corporately. She was presented with a beautiful floral arrangement at the Annual Conference in May, the final major gathering of Institution Members prior to her retirement in July.

© Institution of Agricultural Engineers

Gone Away

Does anyone know the whereabouts?

Oomahsankar Bissonauth
25 Rosiers Avenue, Quatre-Bornes, Mauritius

Stephen Richard Briggs
29 Flitwick Road, Westoning, Bedford MK45 5JA

Frank Clough
31 Usher Park Road, Haxby, York YO3 8RX

John Eugene Colman,
John E Colman Associates, Cobhams House, Hall Street, Long Melford, Sudbury, Suffolk CO10 9JQ

Letter to the Editor

13 May 1999
Dear Sir,

While agreeing with many of the sentiments expressed in Dr David Hatherill's letter in the latest issue of *Landwards*, I was rather surprised at his assertion that engineers need to be 'represented by a unified voice'.
Surprised because, since unification of the profession in 1996, the Engineering Council has been the voice of the profession - a fact that was formally recognised by the Government when it signed a Memorandum of Understanding with the Council in 1997.
While it is true that there may not always be total unanimity across the 37 Institutions on every single issue, it is fair to say that - through the Council - Government is now presented with a view that reflects the thinking of at least the majority of those making up the profession.
Similarly, Dr Hatherhill's view that effective lobbying could best be carried out by 'a single large organisation' also seems to overlook the Council's role. He may be interested to know, for example, that the Council has been lobbying hard on the very issue he quotes - that of only professional engineers being legally allowed to carry out certain safety critical operations.

Yours faithfully,
Malcolm Shirley
Director-General
Engineering Council, 10 Maltravers Street, London WC2 3ER

Michael Dwyer Memorial Prize awarded to Simon Wilcox

The prize is awarded to a 'mid-career' engineer who has made outstanding progress in the agricultural engineering industry and was established in memory of Michael Dwyer who died during his Presidential term of office. The recipient of the award is **Simon Wilcox** MIAgrE, Managing Director of P J Parmiter & Sons.

Simon was educated at Wellington College, Crowthorne, Berkshire and at Harper Adams Agricultural College where he gained an HND in Mechanical Engineering (Agriculture) and was awarded the Bronze Medal for second place overall in the final year. He later went on to Coventry University to obtain a Postgraduate Diploma in Manufacturing Management, participated in the Wolseley/Duke Executive Development Program at Duke University, USA, and is registered as an Incorporated Engineer.

He joined P J Parmiter & Son in 1982, directly after completing his further education at Harper Adams (having already spent his sandwich year with the company), and over a ten year period moved steadily through various aspects of the business: Sales Demonstrator; Area Sales Manager; Product Manager; and Marketing Manager. Following the serious downturn in the agricultural machinery industry in the 1990s, Simon remained with the Parmiter business but with a major change in role – he moved over to the operations side first as Purchasing Manager, then as Production Manager followed by Operations Manager. Whilst continuing to run the Parmiter factory, he also studied manufacturing management at Coventry, supported by an 'advanced engineering best practice' grant. In 1996, he took over as Director/General Manager, and in 1997 was appointed Managing Director.

Mrs Brenda Dwyer presenting the Michael Dwyer Memorial Prize to Simon Wilcox.

In February of this year, he led a Management Buy-out for Parmiters from its parent company Wolseley plc. At the same time, he also successfully negotiayed the purchase by Parmiter of 50% of a company called Autoguide Equipment to form a joint venture.

Since taking up employment, he has kept in touch with Harper Adams; and through his interest in the training of agricultural engineers, he has been, and still is, an active member of their Industrial Liaison Committee, regurly attends student project presentation days, has provided project work for final year students, sat on validation and accreditation panels and provided industrial training over a number of years. He is a member of the IAgrE Western Branch Committee and of the AEA Farm Equipment Council.

Douglas Bomford Paper Award

The Douglas Bomford Paper Award is presented to the author(s), at least one of whom is an Institution member, who demonstrate originality and technical excellence in a scientific paper published during the previous year in either the Institution Journal *Landwards* or in the *Journal of Agricultural Engineering Research.* Assessment criteria include: engineering content; potential for practical and commercial use; relevance to the current problems and needs of industry; as well as quality of presentation and the authors' authority in the subject material.

The Board of Trustees were pleased to announce that the award this year is presented to **Ian Scotford** AMIAgrE, **Dr Trevor Cumby** MIAgrE at Silsoe Research Institute (SRI) and their two co-authors, one of whom is also from SRI and the other from Beijing Agricultural Engineering University in China.

The paper presents the development of a prototype nutrient sensing system for livestock slurries. Previous work had shown good relationships between the nutrient (nitrogen, phosphorus and potassium) status and the physical/chemical properties of both cattle and pig slurries. In particular, the ammoniacal nitrogen and the potassium contents of the slurries correlated with their electrical conductivities. The best indication of the available phosphorus was given by total solids and specific gravity. Based on these findings, a prototype sensing system to measure the physical and chemical properties was designed, built and tested on 41 slurries. The system was able to detect the effect of dilution on any given slurry; and to estimate ammoniacal nitrogen in all the slurries and phosphorus in cattle slurries. It established the feasibility of the approach and provided a basis for the development of subsequent versions for installation on slurry tankers.

Ian Scotford (right), on behalf of the authors, receiving the Douglas Bomford Paper Award from Mr John Fox HonFIAgrE who represented the Trust at the Awards Ceremony and acted as Conference Chairman. The sponsorship which was provided by the Douglas Bomford Trust for the event was also gratefully acknowledged by the conference organiser and the IAgrE. Cowering underneath the microphone are former IAgrE Secretary John Neville (centre left), CIGR President Professor Bill Stout (middle), and IAgrE Chief Executive Christopher Whetnall (centre right).

Scotford I M; Cumby T R; Han L; Richards P A (1998). Development of a prototype nutrient sensing system for livestock slurries. *Journal of Agricultural Engineering Research*, **69**, 217 - 228

The World Food Prize

The World Food Prize Foundation requests nominations for the year 2000 World Food Prize, which recognizes outstanding individual achievement in improving the quality, quantity, or availability of food in the world. The Prize emphasizes the importance of a nutritious and sustainable food supply for all people and recognizes that improving the world's food supply for the long term depends on nurturing the quality of land, water, forests, and other natural resources.

Nominees should be individuals who have worked successfully toward this goal in any field involved in the world food supply, including food and agricultural science and technology, manufacturing, marketing, nutrition, economics, political leadership, social sciences, and other related fields that have brought food to tables of a significant number of people across the world.

The laureate will receive $250,000 and a sculpture created by world-renowned designer Saul Bass. The award is based solely on individual achievement with no consideration of nationality, ethnicity, political persuasion, religion, sex, or age. The deadline for submission of nominations for the year 2000 World Food Prize is December 31, 1999.

For a brochure detailing nomination procedures, contact The World Food Prize, Office of the Secretariat, David Acker, College of Agriculture, Iowa State University, Ames, IA 50011-1050; e-mail: bjelland@iastate.edu; or http://www.wfpf.org.

East Midlands Branch - Special Wastes visit

The collection and recycling of waste oils, used filters, brake fluid, antifreeze, batteries, oily rags, all designated Special Wastes by the Environment Agency, were the subject of a highly rewarding visit by East Midland Branch Members recently to Oakwood Fuels in Bilsthorpe, Nottinghamshire.

Steve Tooley, MD of Oakwood Fuels, together with Gareth Lowry fully explained the Special Waste Regulations and together with other staff members demonstrated the wide variety of services offered by Oakwood Fuels. The Company collects this wide range of special wastes from garages, farms, engineering and manufacturing businesses within an area extending from Yorkshire down to Cambridgeshire.

A significant part of the service offered included all the necessary consignment notes and supporting paper work for the Environment Agency, these being linked to routine or ad hoc collections as per a contract with the business producing the wastes. Duty of Care was explained and the responsibilities of the Waste Producers under the Waste Management Licensing Regulations, Oakwood Fuels try to make life as simple as possible for the Producers supplying them.

Multi compartment specialist lorries, developed by the company carry out all collections with all arrivals at the site checked for traceability and then all fluids sampled for various parameters, flashpoint etc. before the load is transferred for storage prior to treatment. Mixed fuels and oils were seen passing through a screening and centrifuge separation process where it is possible to control the separation of mixed waste oils to oil, water and carbon type deposits. This special equipment has been developed in house to enable the company to meet the ever more stringent requirements of its customers for the reclaimed oil. Although they are able to remove all solids down to 3 microns, it was explained that the energy required to crack the additives in the base oil so that it could be made back into lubricating oil for use by motor vehicles, plant etc., is greater than the energy content of the oil. At present the oil product is sold as heating oil to large manufacturing companies.

Oil filter crushing and handling equipment was demonstrated, each crush representing 150 000 miles of someone's motoring, the final pack being destined for steel production. Problems with localised hot spots in steel production generated with early crushing trials were discussed, this problem now overcome by the drainage and impacting equipment developed.

A thoroughly informative and entertaining evening was spent when impressions of an underhand dog in the manger industry were dispelled by a company committed to providing a professional service. The engineering developments achieved by a small but dedicated company were clearly shown to be meeting the needs of environmental and legislative control through innovative thought and engineering application.

Oakwood Fuels can be contacted on 01623 871964 or on email : oakwood.fuels@virgin.net

Bill Basford, Information Officer, East Midlands Branch

Attention younger Institution members!

Scholarships for MSc, MEng, MBA and PhD - a rare opportunity

A number of EU funded scholarships are available for studies leading to various Masters degrees and for PhD fieldwork at the Asian Institute of Technology (AIT) in Bangkok, Thailand. The awards are for appropriately qualified nationals of EU member countries and cover all costs of air travel, board and lodging, tuition and related expenses for 20 months (Masters degrees) or 8 – 12 months (PhD). AIT is a regional education and research centre established in 1959 at a delightful, well-equipped, campus just outside Bangkok. A wide range of technologies is covered through Schools of Environment; Resources and Development; Civil Engineering; Advanced Technology and Management.

Further details: **Prof. Gajendra Singh e-mail singhg@ait.ac.th** or web site **http://www/ait.ac.th** or contact derek.sutton@bbsrc.ac.uk

Membership movements

Mem No	*Name*	*From*	*To*
5533	J A G Bird	Oxford	Switzerland
6706	A D Brawn	Buckinghamshire	Lincolnshire
6441	S R B Done	Lincolnshire	Berkshire
2421	R 0 **A** Drew	Warwickshire	Berkshire
5113	J P Grindey	Thailand	India
2772	W Hancox	Cambridgeshire	Lincolnshire
5367	C W Hayes	Scotland	West Sussex
3941	A B Howard	Bedfordshire	South Devon
5857	G V Marks	Middlesex	Northern Ireland
4127	G R Rudd	Belgium	Buckinghamshire
5090	J H Shedden	Hampshire	West Sussex
6266	C Thaung	Nigeria	Myanmar
6167	R W Thompson	Swaziland	Zambia
6009	A E Turner	Lincoln	Kent

Andrew Miller wins the Johnson New Holland Award

Andrew Miller has been awarded the Johnson New Holland Trophy Award in 1997 for his work on a method of calibrating a cam clutch that protects the gathering mechanism of a baler.

The Award is presented annually, with the object of encouraging and recognising innovation by younger students, to the best final year project submitted by a student or group of students, as part of a first Degree, Higher National Diploma or Higher National Certificate course in Agricultural Engineering. In addition to the student prize, the college submitting the prize-winning project receives the trophy to hold for one year. This year, the presentation was made by Mr George Ayres of New Holland UK Ltd, the kind sponsors of the Johnson New Holland Award

Andrew Miller (left) obtaining a brief glimpse of the trophy for the Johnson New Holland Award presented by Mr George Ayres

The report for his BEng honours project at Silsoe College examined the design process to develop a method of calibrating the gathering cylinder cam clutch on the John Deere 680 and 690 large square balers. This cam clutch is set to disconnect the drive from the feed rake cylinder when the torque in the input shaft exceeds 13 kNm and to re-engage as soon as the torque drops below this value, best achieved by disengaging the tractor p.t.o. and applying the flywheel brake. This method of re-engaging the drive ensures that the clutch does a minimum number of turns before the clutch is able to reset and the baler cleared of the blockage. However, if the clutch is allowed to cycle a number of times before the baler is stopped, the drive points in the cam clutch begin to wear. This causes the pre-set torque to drop. The baler will then disengage the drive to the gathering cylinder more often, making the problem occur at an ever-increasing frequency.

At present, a new or reconditioned unit is provided and the unserviceable clutch assemblies are shipped back to the Krone factory in Germany where the worn parts are replaced and the clutch re-calibrated, a very costly and time consuming procedure. The aim of this project was to devise a system, where the clutch housing did not need to be removed in order to re-calibrate the clutch, and enabling the calibration to be done anywhere.

A test beam was constructed using high tensile steel and the measurement was taken using a modified hydraulic ram. The beam was used to block the baler, and the tractor was then used to apply a force to the beam through the p.t.o. shaft. It was found that the calibration rig measurements were very time dependent but, for a constant engagement time, the device was very accurate and consistent.

The possibility and way of fitting the Waltershield drive-line control unit to the baler was also investigated and a suitable position suggested. Such a device would enable the operator to vary the feedrate and maintain a consistently high torque loading below the pre-set value, thus maximising productivity whilst avoiding overload and clutch slippage, instead of relying on a visual assessment of the variable crop conditions.

Andrew Miller is from a farming family and one of his main interests is horse riding. This covers a range of activities, such as point to point training, eventing and tetrathlon which includes shooting, swimming, running and cross country riding. He has competed for the UK and was captain of the team on a trip to the USA in 1995.

He is currently employed by John Deere Ltd, Nottingham, as an Instructor in the UK Training Centre, having gained a 2.1 Honours degree. He also won the New Holland Prize for the top engineering student, and was jointly awarded the JCB Team Prize for the best group project in the final year. During the course, he spent a six months industrial placement at John Deere, influencing not only his choice of project but also his initial career opportunity.

Institution Membership changes

Admissions – a warm welcome to the following new members

Member
E D Chesmore (Yorkshire)
D H Kellaway (Warwickshire)
S J Pugh (Somerset)

Associate Member
J S Eastham (Lancashire)
R G Elrick (Scotland)
I O Falola (Ukraine)

Student
D Chan (Bedfordshire)
C Knight (Bedfordshire)
M J Y Snell (Bedfordshire)

Readmission
R M Hibbott (Wiltshire)
J M Walton (Lincolnshire)

Reinstatement
J A Smith (Staffordshire)

Transfers
Member
V R Hamilton (Essex)
G T Queen (Scotland)

Engineering Council Registrations
CEng
V R Hamilton (Essex)

Branch Meritorious Awards

David Stephenson (left) and William Waddilove (right) separately receiving their Parchments of Appreciation from the IAgrE President Professor Brian Legg.

David J Stephenson AMIAgrE has been a Committee Member almost from the formation of the Southern Branch and as such is the longest serving, active member of the Branch. Although never having held office, David's contribution over this long period of time has been considerable.

He has consistently contributed more ideas and suggestions to the annual formation of the Branch programme of technical presentations and visits than any other member. By virtue of his employment at Rycotewood College, he has a very wide range of contacts, throughout the agricultural engineering industry, whom he is always willing to prevail upon to find speakers and locations for visits. He has used his good offices within the College to secure a regularly used venue for committee and technical meetings at no or reduced cost to the Institution. He has been active in encouraging students from the College to attend meetings, frequently arranging min-bus transport to away locations, and rarely misses a meeting. The Southern Branch enthusiastically supports his nomination for the Branch Meritorious Award.

There can be absolutely no doubt that **William Waddilove MIAgrE** has been a tremendous asset to the West Midlands Branch. His enthusiasm and persistence in getting things done are legendary. He has been a very active Branch Committee member for at least 12 years, being Chairman from 1991 to 1993. The Branch Committee would like to pay particular tribute to William's work in representing the Branch on other committees and organisations, not forgetting his contribution to the Institution at national level as a Member of Council, of the Executive Committee and of the Education and Training Committee. He is the Midlands Region Representative and Engineering Council PEI Member, keeping the Branch Committee very well appraised of the events and developments and, as a regular attender at Austin Court, he is currently in the process of arranging for an IAgrE plaque to be displayed permanently there.

William Waddilove is also currently Chairman of the Pioneering Technology Specialist Group, and it was through his effort and enthusiasm that the Group was established. He assisted in the design and production of the Institution display stand. He organised the seminar on 'High Speed Tractors and the Law' in 1998 almost single-handed, and has played his part in encouraging the development of joint meetings with the IMechE and other professional institutions. These few words do scant justice to everything William has contributed to the Branch and to the Institution itself, and the West Midlands Branch wholeheartedly support his nomination for the Branch Meritorious Award.

Southern Branch Annual Dinner

Jeff Beck, Chairman of Southern Branch, presenting a set of Institution tumblers to Peter Loveridge, the retiring Branch Treasurer, with Kathy Chicken who was Guest of Honour at the Annual Dinner on 10 March 1999. Kathy had recently retired from the British Potato Council where she was Secretary to Oliver Statham and, although he is titular Branch Secretary, she deserves full credit for much of the work for the Branch over the past eleven years.

Douglas Bomford Trust Language Centre

The Douglas Bomford Trust Language Centre at Silsoe Campus, Cranfield University was formally opened by Mr Bruce Bomford, a relative of the Trust family, who had travelled from Carlisle with his wife to the ceremony on 13th April 1999. The Trustees are delighted that it has been possible to allocate Trust funds for equipping this Language Centre. At the event, Professor Brian Witney, Chairman of the Board of Trustees said: 'We believe that the pump priming provided will have a substantial multiplier effect in improving language skills and in the dissemination of knowledge through extension and consultancy activities worldwide'.

The college's provision of foreign language training for UK engineers gives some indication of its international dimension. Recently, for example, third year undergraduate engineering students have undertaken work experience in: Germany, Italy, Greece, Croatia and Holland in Europe; Mozambique and Malawi in Africa; and Dubai in the Middle East; as well as in half a dozen English speaking countries.

The international status of the college is further emphasised by staff involvement in professional visits, consultancies and training programmes worldwide. The dissemination and application of agricultural engineering technology in both developed and developing countries is enhanced by appropriate foreign language skills which can best be gained through quality in-house facilities.

The college's mission is international. There are between 50 and 60 countries, in many of which English is not the first language, represented at Silsoe at any one time. The presence of many international students is conditional upon intensive language training; to remain competitive, state of the art equipment is essential.

The development of a new Language Centre, as part of the £450,000 library extension project, is designed to equip both students and staff with some of the language skills which are much in demand in agricultural engineering's multilingual environment. The new library building was completed in October 1997, and now the Technology Enhanced Language Learning (TELL) facilities implement the 'Languages for All' policy.

The new language facilities are a major innovation, intended to provide opportunities for structured foreign language study for the whole college. They provide audio, video, interactive multi-media computer software and satellite television as well as the traditional library resources. They also offer multilingual access to the Internet, thereby enabling students to use real, up to the minute study materials. Location within the new library's integrated security system means that self-access use of the Language Centre will be available during library opening hours, which include evenings and weekends.

Recent trends in language learning have emphasised the importance of student autonomy and the development of 'resource based learning'. This means providing learners with a range of study materials which they need to use in their own time as an integral part of their programme. The long term aim is to develop a wide range of languages as learning resources, offering not only the mainstream European languages but also, to cite two recent examples, catering for users wishing to learn some Amharic prior to working in Ethiopia or some Bahasa Indonesia before working in Java. This initiative is driven by the commitment to enhancing student autonomy in response to employers' demands for graduates who think creatively and work independently. In today's terms, 'transferable skills' are in demand.

The college intends to enter the new Language Centre for a Department of Trade and Industry 'Languages for Export' training award.Douglas Bomford, in whose memory the trust was founded, was closely associated with the establishment of the National College of Agricultural Engineering – now Silsoe Campus of Cranfield University. The *Douglas Bomford Trust* was founded in 1972 for the advancement of education, training and research in the science and practice of agricultural engineering and allied industries. These disciplines direct and apply the resources of nature for the use and convenience of man: by further developing primary food production; by adapting materials, designing machinery, and devising mechanical methods; and by improving the social infrastructure and conserving the environment. Each year, the Trust supports a range of research studies to explore the potential of emerging technologies as applied to agriculture and the rural environment, as well as providing travel and language awards to assist students in accepting often voluntary positions on work experience programmes for remote rural communities or to undertake industrial training.

Mr Bruce Bomford (centre left) opening the Douglas Bomford Trust Language Centre at Silsoe Campus, with Professor Frank Hartley (left) Vice Chancellor of Cranfield University, Professor Brian Witney (centre right) Chairman of the Board for the Douglas Bomford Trust, and Bruce Medaney (right) who is in charge of the language facility.

Accolade for Gordon Spoor

The Award of Recognition of Professor Gordon Spoor by the International Programme for Water Management in Agriculture, Ohio State University, for his contribution to the development of Land Drainage Practices on heavy clay soils, particularly mole drainage, was bestowed on 20th May 1999 at Ohio State University, Columbus, Ohio, USA. *Congratulations.*

1998 HONOREE
Thirty-eight years of service in teaching, research, and international training and advising.

Professor of Applied Soil Physics, School of Agriculture, Food, and Environment; Department of Agricultural and Environmental Engineering, Silsoe College, Cranfield University, Bedfordshire, United Kingdom.

President, British Society of Soil Science, 1989 and 1990.

Chairman, Institute of Professional Soil Scientists, 1991.

Chairman and Secretary, Southeast Midlands Branch, Institution of Agricultural Engineering (10 years).

Deputy Editor, The Agricultural Engineer, Journal of the Institution of Agricultural Engineers (3 years).

Governor, Rycotewood College, Thame (10 years).

Gordon's contribution to drainage has been in the application of science to soil management in which drainage plays an important role. His early work with tillage and drainage ploughs for both mole and trenchless drainage helped our understanding of water flow in soils and allowed significant advances in the way in which both tillage and drainage equipment was used, particularly on heavy clay soils.

Gordon is perhaps best known for his contributions to workshops for farmers and drainage contractors, including his contributions to courses and projects in the United Kingdom, North America, Pakistan, Egypt, China, Australia, and Jordan. He presents the module on drainage of heavy soils at the International Land Drainage Course in Wageningen, The Netherlands, each year. Gordon is a very gifted teacher who commands the attention of his students and inspires them to greater things. He is frequently invited to address farming audiences because of his unique communication skills and his ability to present arguments for a more logical approach to drainage so well. As pointed out by one of his nominators, "Gordon has a wonderful ability to bring knowledge of soil physics, soil chemistry, plant ecology, and hydrology to bear on solving soil and water management problems".

Although Gordon Spoor is widely known for his pioneering work in mole drainage, his contribution and impact cover a much broader field. Indeed, he has always placed the need for drainage in a broad agricultural, land management and environmental perspective. His sound judgement and strong voice have greatly contributed in defining the positive role of drainage in modern agriculture. Gordon deserves to be recognized not only for is work in drainage, but because he has helped us all see that drainage is a part of the overall management of the soil environment.

A productive researcher, a fine teacher and writer. In all his presentations, he inspires new thinking and leaves a lasting impression.

News of Members

Richard Goldsmith is now managing the development of a 500 ha coffee estate in Zambia for the African Plantations Company ltd. This development will include dam construction, drip and centre pivot irrigation systems, and a coffee processing factory.

Norman Skea is still in China, where he is engineering manager of an ice-cream factory for Nestle.

Dave Gee-Clough has now retired from the Asian Institute of Technology, but is still living in Thailand, and can be contacted at 50/127 Baan Thipmongkol, 501 Wat Naam Daeng, Bangkaew, Bang Phli, Samut Prakhan 10540, Thailand Tel: 753 7287.

Kenneth Brown has retired from his position as Engineering Manager at FMC (UK) Ltd and is now working as a freelance engineer. He can be contacted at KGB Design & Consultancy, 13 Highlow Road, New Costessey, Norwich, NR5 0HP Telephone 01603 742201.

If anyone is visiting the Netherlands (say to Wageningen) and would like to stay for a weekend on a beautiful farm not too far away, **John Gander** and his wife do bed and breakfast, and you would be made very welcome.

Congratulations to **J R Edmunds** who has been awarded the OBE.

Richard (Jock) Thompson has moved from being Field Services Manager with CDC cane projects in Swaziland and has joined Tate and Lyle Sugar in London. However, he has been seconded to Zambia Sugar as Agricultural Services Manager, and can be contacted either through Tate and Lyle head office in London or through Email: rthompson@zamsugar.zm or Zambia Sugar, P O Box 670240, Mazabuka, Zambia.

Produced by: Land Technology Ltd, Edinburgh

Printed by: Barr Printers, Glenrothes

Book reviews

An Illustrated History of Tractors

by Jim Wilkie
Publisher: Ian Allan
Price: £18.99

Well presented text, over 250 illustrations and informative supporting text. In essence all the ingredients required for the long line of historic farm machinery books. But this volume is rather more than that, it has really tried to cover in greater detail the progress of tractor technology.

The publishers have a good track record with similar titles for the London Buses, British Motor Cycles, etc. They have found the right blend of excellent photographs and well developed text which makes this book so worthwhile.

The contents are subdivided by age; 1901-1919, 1919-1930 and so on. Seems blisteringly obvious but not so; many other similar texts are written in a quite inexplicable order, so a special 'well done' to the author.

Another unusual and welcome addition is the first chapter – 'Finding out more'. In this, the author identifies a problem with any book of this type, that is the impossibility of covering every development/model. The encouraging aspect is that he addresses this problem by devoting this chapter to helping the reader identify likely sources which could help. Not really a reference list, more a guide to books, videos, 16mm film, magazines and others which may well lead to your interest.

An Illustrated History of Tractors will of course appeal to all interested in rural machinery history. I recommend it to you as an excellent example of its kind.

M J Hann

Bridge Hydraulics

by Les Hamill
Publisher: E & F N Spon
Price: £75.00 (hardback)

rsonal note, I warmed immediately to the author. "Why ?", you ask. Well, he has a healthy disrespect for the "Computer Package"; *i.e.* people frequently believe that, because computers are capable of giving answers to 20 places of decimal, everything that comes out of them is correct and accurate.

His point is that knowing what is put in and the practical values of coefficients *etc.* is very important, let alone the fact that there are mistakes in programmes.

He has devoted his book to instruction based on a lifetimes experience to the choice of empirical formulae and coefficients which are relevant to the case being studied, *i.e.* to avoid CAD (computer aided disaster).

The book, therefore, is assured at being complementary to software able to explain fundamentals and provide a means of checking software output. What a breath of fresh air, all students and practising engineers, take note. There is a great lesson to be learnt from the Preface alone!

The book is based on an explanation of research and design expressions and how to use them in given situations. Coming to the authors presentation, it is first class, each chapter dealing with a component of the topic in a very 'hands on' approach. Typical chapters include:

Chapter 1 Putting things into perspective;
Chapter 2 How a bridge affects river flow;
Chapter 4 How to calculate discharge and efflux;
Chapter 7 How to improve flow through a bridge.

Each chapter is well stocked with clear relevant illustrations and very well structured examples of guidance procedures, they also contain an excellent reference section.

The subject is dealt with in great detail but is still written in an easy to follow script and well developed mathematical procedures.

The subject area is specialised as it should be and therefore will be of interest to a specialist group of practitioners. To them, I recommend this text wholeheartedly. Also, I would like to draw it to the attention of all students and lecturing staff involved in channel hydraulics. You will find it an invaluable reference on this important section of the hydraulics discipline.

M J Hann

County: a pictorial review

by Stuart Gibbard
Publisher: Farming Press
Price: £17.95

I am close to running out of description for the number of "Review books of Agricultural Machinery Company's" we receive. The problem is that it reminds us of how many are gone and how good they were in their heyday, posing the inevitable question: "What went wrong?" This text, 168 pages, 290 photographs, all excellent quality and 155 of them in colour, is very good value at £17.95. It is no doubt a very good pictorial review, illustrating the diverse range of products manufactured by County Commercial Cars. There is also a brief history of the company within the captions provided with each plate.

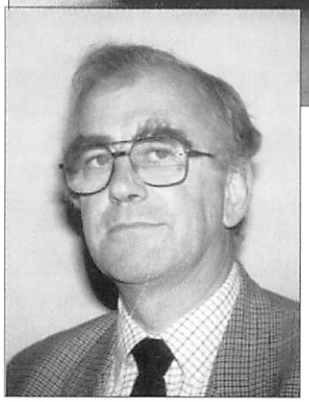
It was fun to flick through, I am sure that, for the enthusiast, it is a must; many of the photos are rare, (towing aircraft, launching lifeboats) and thereby 'collectors items'.

I can recommend it to those who crave history and remember our manufacturing past.

M J Hann

Engineering technicians and artisans: a personal view

Any product requires full technician support to succeed.



Geoffrey F D Wakeham

There is an increasing awareness of the shortage of sub graduate engineers. The current down turn in engineering is not resulting in any lessening of the problem of finding technically able and dextrous staff. A recent enquiry from a small service engineering company seeking staff echoed the complaints of a large international engineering manufacturer who is unable to recruit the technician engineers they require to become the solid core of their engineering activities. These individual cases support the findings of Grant Thornton as reported in the Daily Telegraph on 24 May. This survey showed that 25% of small businesses were worried about skills shortages, a five fold increase on 5 years ago.

The future does not look any brighter, with a continuing decline in students taking Higher National Diploma (HND) and Higher National Certificate (HNC) in engineering. BTEC Edexcel claim 60% of HNDs go on to do degrees so reducing the numbers further.

It is the author's opinion that the modern HND no longer recruits the students who enjoy manipulation of numbers and the derivation of theoretical relationships, yet colleges are encouraged to reduce the practical content of such courses for financial reasons. This leads to diplomates with weak understanding of engineering principles and a lack of marketable practical skills.

Some would continue to maintain that an HND is a Higher Education qualification and therefore an intellectual qualification, and should not aim to provide skills training. This may have been true when only a small percentage of engineers studied for degrees. Today, approaching a third of school leavers go on to obtain degrees. In 1998, only 257 UK students started HNDs in Mechanical Engineering while 3430 started degrees in the same subject area. These figures for HNDs are down over 8% on 1994 figures.

If there is to be reversal of the increasing shortage of good practical hands-on engineers, then both companies and education establishments need to re-think their attitude to their education.

There is a need for engineering companies to encourage school children to want to become practical engineers. J C Bamford Ltd have shown that, by becoming involved with

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their local schools, they have dramatically increased the pool of young people interested in becoming employed throughout engineering. They use their graduate trainees to assist in engineering clubs, they provide expertise and guidance and sell the excitement of their enterprise. They have shown it is possible to reverse the trend in engineering in Britain. It is now necessary for education establishments to adapt and adjust their courses to provide both students and industry with what they want.

Is it necessary for the HND courses to re-market themselves as a positive route to employment and not as a second class route to a degree title? If this is true, then it will be necessary for colleges to be given additional financial investment in workshops and hardware at the expense of courses with few employment opportunities. Maybe it is necessary for more colleges and companies or groups of companies to get together and devise packages that provide financial support for students throughout their education and provide them with a range of skills relevant to current practice.

These courses need to be either part time and form part of an agreed in work training programme or be sandwich courses based round 45 weeks in college and 45 weeks in employment. The work based period needs to include some 750 hours of college assessed work and be highly structured.

It is the responsibility of senior engineers to ensure the long term sustainability of their companies. Without practical development engineers, competent design technicians, multi skilled plant maintenance staff, demonstrators and customer service technicians, British manufacturers will be unable to compete and long term decline will be all that is sustained. Senior engineers need to act now, it is their future that is at stake.

New guidance leaflet on the safe use of All Terrain Vehicles (ATVs)

A national campaign to cut the number of deaths and major injuries in accidents involving all-terrain vehicles (ATVS) was launched by the Health and Safety Executive (HSE) with the publication of a new free guidance leaflet *"Safe Use of All-terrain Vehicles (ATVS) in Agriculture and Forestry"*. Greg Bungay, head of HSE's Agricultural and Wood sector said: "We will be pushing hard for users to adopt higher safety standards. Seventeen people have died in accidents involving ATVs at work in the last ten years in agriculture and forestry, including three in March this year. Non fatal accidents are poorly reported but are estimated at about 1000 serious injuries per year. "The main causes of such accidents were a result of lack of training; excessive speed; carrying a passenger or unbalanced load and towing excessive loads.

He added: "The guidance leaflet covers both the quad bike type of ATV (where the rider sits astride their machine) and other all-terrain vehicles which have conventional seating. On the latter machines, roll-over protection and seat belts are both practical and available. They are required for any work situation where there is a risk of overturning. The leaflet clearly differentiates between these two types of ATV.

HSE has historically spent much time and money in research attempting to evaluate means of protection for riders on ATVs. From this research, HSE has concluded that at present roll-over protection is not suitable for the quad bike type of ATV and could in fact increase injuries.

"This means users have to use to the full other means of safeguarding their lives and limbs. In particular, these include:

- formal training;
- the use of helmets and other protective clothing;
- and good maintenance of their ATV.

Other causes of accidents are carrying passengers, excessive speeds and using un-braked trailers with excessive loads. Passengers must never be carried either on the ATV or in a trailer. Safe riding of an ATV depends on the rider's ability to move their body to stabilise the ATV, carrying a passenger will prevent this.

Many accidents are contributed to by changes in conditions. A slope may be safe to descend with a load on a dry day but the next morning with a light dew it can be lethal. HSE Inspectors will be enforcing and advising on these and other aspects of ATV safe use in the coming months.

Finally, the need for formal training is paramount. Even experienced riders can learn new aspects to the safe handling of ATVs from such a training course. Training is widely available through Lantra, the Forestry Commission, agricultural training groups, agricultural colleges and through some dealers."

Copies of HSE Agricultural Information Sheet 33 *"Safe Use of All-terrain Vehicles (ATVs) in Agriculture and Forestry"* are available free from HSE Books, PO Box 1999. Sudbury, Suffolk, CO10 6FS, tel: 01787-313995

Buffer zone scheme

New controls over certain pesticides used in ground crop sprayers have been announced to protect watercourses from spray drift. This places a legal obligation on farmers to conduct and record a Local Environmental Risk Assessment for Pesticides (LERAP) which must be made available for inspection. The scheme also introduces a new method for measuring buffer zones.

Jeff Rooker, the Food Safety Minister said: "By complying with the new rules, farmers may be able to reduce buffer zones for some pesticides where it is safe to do so. However, for insecticides containing organophosphates (OPs) and synthetic pyrethroids users must retain the larger buffer zone. The new scheme also provides a clear opportunity for spray machinery manufacturers to develop technical solutions to minimise spray drift. I believe the scheme will prove good for the environment and good for farmers."

Mr Rooker continued: "The scheme has been developed following two rounds of consultation in 1997 and 1998 and was agreed by the Advisory Committee on Pesticides. The new system of environmental protection has the support of English Nature and the Environment Agency. The agrochemical and farming industry are also in broad support."

The LERAP scheme is being publicised in the farming press and a guidance leaflet is being sent to all arable farmers in the United Kingdom. A variety of agricultural and environmental organisations, which have regular contact with farmers, are also helping to promote the new arrangements.

Buffer zones are applied to approvals for the most environmentally hazardous pesticides to prevent unacceptable levels of spray drift reaching the watercourse. In arable situations, buffer zones have previously been fixed at 6 metres. About 400 agricultural pesticide products containing about 40 different active ingredients are currently subject to buffer zones. This represents about 10% of the total number of approved agricultural pesticide products.

In conducting the LERAP, farmers can take account of three local factors:

- the size of the water course
- the type of sprayer being used
- the rate of application of the pesticides.

Copies of a guidance leaflet on completing a LERAP are available free from: **MAFF Publications, Admail 6000, London SW1A 2XX.**

Greening Aberdeenshire

SAC and Aberdeenshire Council develop composting system for household waste

Following a feasibility study carried out by SAC, environmentally-friendly Aberdeenshire Council's waste team proposes to place before its elected members a report, which lays out details of a system to separate and compost mixed household waste. Subject to financial considerations the system could be up and running by early 2000.

The SAC study looked at the practicalities and economics of bringing back into operation an existing Dano drum pulveriser to gently separate household waste into inorganic and compostable fractions which would then be fed into a new 75 tonne per day purpose built composting plant. Production of compost from household wastes by this method could save the Council enough in land fill taxes and waste treatment materials to finance the operation. According to the SAC study, two-thirds of this investment could be funded from savings in landfill gate fees and landfill tax. The balance could be found from using the compost produced as daily cover to spread over newly tipped landfill waste, saving the cost of purchasing mineral soil cover, required by law, to contain smells.

However, the proposed composting facility has a dual purpose. While it will be used on a daily basis by Aberdeenshire Council to divert waste from landfill, its will also be used for experimental work on composting which SAC will lead. SAC's experimental work aims to optimise the composting process, leading to the production of a 'cookery book' for compost plant operators and waste managers. The Aberdeenshire facility will be evaluated to assess whether, in future, composting plants could be reduced in complexity. The potential for separation of the inorganic stream into its component material types will be examined in an attempt to improve the recovery of material for recycling.

For the longer term, the compost produced from the mixed waste will be analysed to find which constituents would prevent the compost being spread on to land as a soil improver. Householders in pilot areas will be asked to remove these contaminants at source to assess the likelihood of the success of this approach.

The aim of the project is to develop a more sustainable system of waste management where the maximum amount of household waste is diverted away from landfill for the minimum cost, and the compostable fraction is spread to land.

For further information contact: **Bob Pringle, SAC, Environmental Division. Tel: 01224 711093**

£1 Billion net trade balance

The UK Agricultural and Outdoor Power Industries earned a record favourable balance of trade of £1 billion in 1998, an improvement of 25.7% on the previous year.

Exports

The total value of exports fell marginally last year to £1,629 million (-0.5%). This can be regarded as a particularly favourable performance, given the on-going strength of Sterling at a time when there were strong recessionary forces in several parts of the world.

Imports

The value of imports fell 25.3% which reflects the reduction of the domestic market following, a significant fall in UK farm incomes.

Balance of Trade

The net result of static exports and falling imports is that the balance of trade forced ahead to record levels. Within the grand total, the greatest contribution comes from the tractor sector which regularly features as one the UK's top net exporting industries.

At the same time as applauding these results, we must record that these are unlikely to be repeated in 1999 as we expect a distinct downturn in many overseas markets for agricultural equipment which 'will reduce export potential, especially so if the currency remains strong. This will combine with an expected small recovery of imports into the UK domestic market which is now stabilising and showing tentative signs of recovery.

Contact: **J Vowles, Director General, AEA**

UK Agricultural & Outdoor Power Engineering Trade

	1997 (£m)	1998 prov. (£m)	% Change 1998/97
Exports			
Agricultural Machinery*	263.2	263.5	0.1
Tractors*	1081.5	1059.2	-2.1
TOTAL*	**1344.7**	**1322.7**	**-1.6**
Engines for Tractors	114.8	110.9	-3.4
TOTAL inc. ENGINES	**1459.5**	**1433.6**	**-1.8**
Other Agricultural Machinery	44.7	53.8	20.4
Other Agricultural Tractors (inc. Used)	71.8	86.0	19.8
Other Outdoor Power Equipment	48.2	44.4	-7.9
Engines for Outdoor Power Equipment	12.3	11.0	-10.6
GRAND TOTAL	**1636.5**	**1628.8**	**-0.5**
Imports			
Agricultural Machinery*	464.8	364.7	-21.5
Tractors*	219.6	127.1	-42.1
TOTAL*	**684.4**	**491.8**	**-28.1**
Engines for Tractors	18.7	8.9	-52.4
TOTAL inc. ENGINES	**703.1**	**500.7**	**-28.8**
Other Agricultural Machinery	43.7	34.4	-21.3
Other Agricultural Tractors (inc. Used)	13.8	8.1	-41.3
Other Outdoor Power Equipment	50.6	49.4	-2.4
Engines for Outdoor Power Equipment	29.3	35.6	21.5
GRAND TOTAL	**840.5**	**628.2**	**-25.3**
Balance			
Agricultural Machinery*	-201.6	-101.2	(49.8)
Tractors*	861.9	932.1	8.1
TOTAL*	**660.3**	**830.9**	**25.8**
Engines for Tractors	96.1	102.0	6.1
TOTAL inc. ENGINES	**756.4**	**932.9**	**23.3**
Other Agricultural Machinery	1.0	19.4	-
Other Agricultural Tractors (inc. Used)	58.0	77.9	34.3
Other Outdoor Power Equipment	-2.4	-5.0	(-108.3)
Engines for Outdoor Power Equipment	-17.0	-24.6	(-44.7)
GRAND TOTAL	**798.0**	**1000.6**	**25.7**

* Agricultural Machinery & Tractor sub-totals are aligned with PRODCOM (acronym for 'PRODucts of the European COMmunity'), the harmonised EU statistical enquiry for collection of manufacturing sales data. This provides an opportunity for consistency in measuring the industry's sales and trade throughout the Community. All data incorporate factors supplied by ONS to account for companies under-reporting or failing to report trade to the Intrastat data collection.

23-Mar-99
Source: HM Customs & Excise

Surviving or thriving

A company can only justify its existence by generating wealth for its owners. Yet Plimsoll Publishing in its latest analysis of the *Landscapers & Agri-Contractors* industry shows that 54% of the industry is consuming rather than increasing the wealth of the owners. This loss of wealth amounted to £37million last year. In contrast these companies are being squeezed by the 34% of the industry rated Strong or Good by the Plimsoll's analysis who are generating wealth.

The latest results from the Plimsoll analysis in June on the landscapers & agri-contractors industry showed that out of the companies available for analysis, 304 have been rated as caution or danger. These companies must change radically or their survival will come into question. This is slightly better than last year's results that showed 319 companies in financial difficulties.

Perhaps it is no surprise that the smaller companies in the industry are getting squeezed the most. Almost 60% of companies making less than £1 million in total sales are under financial pressure compared to 39% of companies making over £5 million in total sales. This is slightly better than last year with 62% of the smaller companies in financial difficulties as compared to 35% of the larger companies.

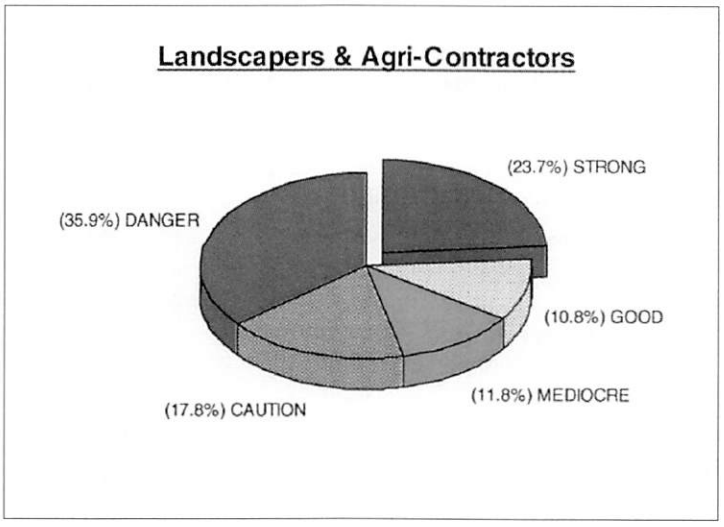
On the other side of the coin, Plimsoll's latest results found that 34% of the landscapers & agri-contractors industry was rated as financially strong or good. Plimsoll rates strong companies as companies that have been improving in financial strength over a four-year period. Good companies are maintaining their financial strength but not improving.

Plimsoll has broken down the 747 companies of the landscapers & agri-contractors industry into five categories of performance based on Plimsoll's unique method of monitoring company performance.

For those companies rated as caution or danger, immediate action must be taken to ensure their survival. These companies cannot continue to destroy wealth.

Only 100 companies improved their rating out of caution or danger last year. Even though this shows that it can be done, for companies wanting to improve their rating radical changes must first take place. For many companies, what is essential is creating a return to profitability. This may mean serious cost cutting, job losses, and the like in the first instance before they attempt a push for greater sales.

For those companies looking to improve their financial standings, Phmsoll has just published their *'Survival Pack, Second Edition 1999'* which includes all 747 individually analysed companies using the normal four years of audited accounts. However, it takes the 304 companies which are under financial pressure and gives them the survival plan for turning the company around by adding a 5th computer generated future year bringing these companies back to a 10% return on assets. This artificial survival plan is designed to stimulate the thinking of the 'busy manager'. Some of them have a limited time in which to generate successful ideas.



In contrast, Plimsoll has found a band of companies to which many companies in the landscapers & agri-contractors industry should aspire; the Top 10 most successful companies are:

1. ENVIRONMENTAL CONSULTANCY LTD
2. G SPRATT LANDSCAPING LTD
3. JOSEPH JONES CONTRACT GARDENERS LTD
4. NOTCUTTS LTD
5. O C S GROUP LTD
6. R P S GROUP PLC
7. RENELEC LTD
8. SAVILLS PLC
9. TERENCE O'ROURKE PLC
10. THAMES WATER CONTRACTING PLC

Success, a word often used yet difficult to describe, has been defined by Plimsoll as those companies who have combined both financial strength and terrific sales growth.

This elite group of companies make up about one-fifth of the top percent of all companies in the UK. To be in with these companies, you would have to have a rating of 'Strong' on the Plimsoll Model, an average sales growth of 23%, a 6% average pre tax profit margin and an average of 13% return on assets. These are real wealth creators.

The essence of competition is the survival of the fittest. To survive, your company will have to go up against 'the fittest'. They are stretching the boundaries of the industry. Not every company rated danger will make it next year. But trying and failing is better than never trying at all.

To jump start your company into survival mode, Plimsoll are offering a special *'Survival Pack, Second Edition 1999'* for the Landscapers & Agri-Contractors industry. Within this pack is a bound book and electronic version of 747 of the major players in the Landscapers & Agri-Contractors industry individually analysed using the company's last four years audited accounts. In addition, is a separate bound book of all 304 companies individually analysed and added on to each analysis is a 'survival analysis' fifth year. This computer generated future year demonstrates how to put each company back to a 10% return on assets.

Contact: **Jennifer Ovington at Plimsoll on 01642 257800** and order your *'Survival Pack, Second Edition 1999 - Landscapers & Agri- Contractors'* for £450 including next day delivery. *Readers of Landwards qualify for a 5% discount if they mention the journal title when ordering.*

Appointment of new IEAust Chief Executive

The Institution of Engineers Australia (IEAust) has appointed Mr John Boshier as Chief Executive of the 65,000 strong organisation.

National President, Mr Ian Pedersen, said today that Mr Boshier was the outstanding candidate from an international search, and concluded: "Mr Boshier is an engineer who has chief-executive and change-management skills and experience that will be most valuable to the IEAust."

Mr Boshier was, until recently, the General Manager, Strategic Development, of the Electricity Corporation of New Zealand. He has spent much of his professional life in the New Zealand energy industry.

Mr Pedersen said that among the challenges facing Mr Boshier was how the IEAust could best serve a profession which was managing change both in terms of the place of engineering in society and in terms of expectations of the profession. "Communities and their governments are looking for solutions about how to better manage our environment and our resources and they are looking to engineers to provide innovative solutions," Mr Pedersen said. Members are looking to the IEAust to provide leadership and direction in these areas.

Mr Boshier is expected to take up his appointment on 15 June 1999. He replaces Dr John Webster, who coincidentally has moved to New Zealand as Chief Executive of the University of Technology, in Auckland.

Plough in the furrow or on-land

Available this autumn in versions with up to 12 furrows, the Lemken Vari-Titan articulated plough from Tri-Ag can be set up to work in the furrow or on-land. This unique feature is in line with customer demands for equipment that is more flexible and able to meet changing needs within a given enterprise.

The plough headstock has four main settings. These are used to set up the plough for in the furrow or on-land ploughing and to also adjust the front furrow width. A key design aim was to make the plough relatively simple to switch between operating systems to ensure its versatility is readily accessible.

Suitable for use behind tracked, standard or dual wheeled tractors of 180 kW plus, the Vari-Titan also incorporates variable hydraulic furrow width adjustment as standard. This adjusts furrow widths from 30 to 53 cm per body and enables the plough to be adjusted to suit a wide range of soils. At its widest setting, the plough has a 6.36 m working width.

A problem with a long plough is maintaining a consistent ploughing depth across all furrows when working undulating land. The existing approach is essentially to allow these large ploughs to articulate in a vertical plane at some point along the beam. In work, the plough in effect is able to flex to accommodate humps and hollows.

Lemken have sought to improve depth control by developing a universal articulation point and tandem undercarriage for the Vari-Titan. These combined features allow the rear section to accurately maintain the correct depth setting of the plough in difficult conditions to enter the soil quickly, thereby maintaining a narrow headland.

The undercarriage is fitted with 500 mm wide by 980 mm diameter tyres. These support the rear plough section just behind the articulation point. In work, the undercarriage runs with one wheel in the furrow to provide the depth reference point.

The wheels on the undercarriage also take the weight of the plough during a headland turn and in transport. This reduces the load on the tractor linkages and also provides extra stability as the plough is reversed. This is of particular benefit when working on sloping ground.

Two double acting cylinders reverse the plough, the articulation point automatically locking as the plough turns. To further ease turning on the headland, the plough has a 90 degree steering angle at the headstock to enable tight turns to be made and return to work times to be reduced.

Tri-ag Ltd, based in Wymondham, Norfolk, operates two sales divisions, LEMKEN and HOWARD, and has a turnover of £5 million. The LEMKEN range of products includes a market leading range of ploughs, tined and powered cultivators, box and pneumatic drills. The HOWARD range of equipment includes powered and draft cultivators, disc harrows, Nordsten seed drills and loaders. C-DAX ATV Accessories, which includes spraying and spreading attachments, is also handled by this division.

Contact: **Mervyn Hutton, Tri-ag Ltd, Eleven Mile Lane, Suton, Wymondham, Norfolk, NR18 9LR. Tel: 01953 605151.**

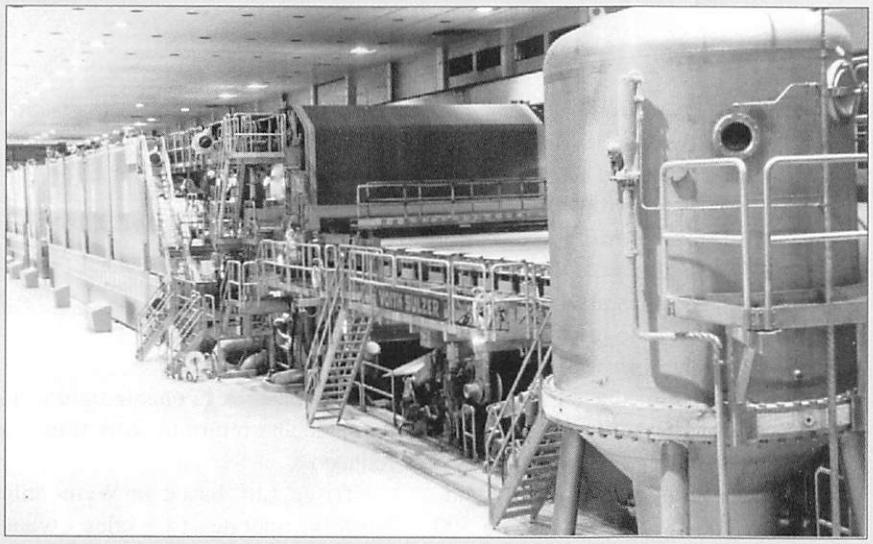
Significant investment for efficient European kraft paper production

Higher quality, improved paper strength, better printing and converting qualities are the results of a major investment in the latest kraft paper production technology by international paper manufacturing group, UPM-Kymmene. It will also contribute to higher environmental standards and greater energy conservation.

A FIM 200 million (Euro 33.4 million) investment has just been completed in its Wisapaper kraft paper manufacturing facilities at Pietarsaari in Finland. The refurbishment of paper machine, PM1, has increased capacity of the Wisapaper kraft paper range by 25,000 tonnes to 160,000 tonnes a year. This plant is now believed to be the largest of its kind in Europe. "The rebuilding of the kraft-making machine represents the first major investment in kraft and sack paper within UPM since the 1970s," says Berndt Brunow, President of UPM Converting, the second largest division within the group.

Kraft paper is a relatively small but significant part of the paper products industry representing around 4 per cent of total production world-wide. "This investment represents commitment. It signals a clear message that we are in this business to stay," points out Soren Slotte, UPM-Kymmene Wisapaper marketing director.

"The aim is to provide a competitively priced packaging material into the next millennium. We intend to be recognised as meeting the needs of our customers better than anyone else in the industry", states Brunow.



The refurbished PMI at UPM-Kymmene plants in Pietarsaari in Finland now has a capacity of 160,000 tonnes a year making it the largest of its kind in Europe.

This investment is mainly aimed at improving the quality and key characteristics of kraft paper such as increased strength, printability, and runnability demanded by customers. These enhanced characteristics add up to savings in material and time in converting. For example, in sackmaking, the number of paper plies can be reduced from three to two, and grammage or paper used cut from 90 g/m^2 to 80 g/m^2. UPM-Kymmene customers convert kraft paper into a wide range of packaging and other products such as reel wraps, food packaging and shopping bags. The machine makes white and brown kraft paper that is sold under the SwanWhite, WisaKraft, WisaForte and WisaBase brands.

The refurbished machine, rebuilt by the German engineering firm, Voith Sulzer Ravensburg, now operates to higher energy efficiency and environmental standards. The steam consumption was reduced remarkably.

Alongside this investment, UPM Converting has also invested FIM 120 million (Euro 20 million) at its sack paper mill at Tervasaari mill in Finland. This has raised capacity to 115 000 tonnes a year, while increasing the overall quality and strength of the product.

Today UPM-Kymmene is the fourth largest paper products manufacturing group world-wide. It has a workforce of 32,000 producing more than 8 Mt of paper products annually. Turnover during 1998 was FIM 49.7 billion (Euro 8.4 bn).

Contact: **Alf Houghton, UPM Specialty Papers Ltd, 2 Victoria Street, Altrincham, WA14 1ET. Tel:+44 161 929 4547.**

New company offers independent advice on machinery selection

Farmers bewildered by the choice of increasingly sophisticated machines on the market, the suitability of their specification and final cost, can now contact a new company, Compass Machinery Data Limited, for independent advice.

Justin Nichols, Joint Managing Director of the new venture, has wide experience of the agricultural machinery industry. He points out that farmers now regularly use professional advice in agronomy, livestock feed preparation, veterinary help and for office management support - specialists in latest techniques and products to ensure efficiency and cost control.

"Considering that machinery poses the highest fixed cost on many farms", he says, "there is every reason for accepting professional advice in this sector. Using our industry knowledge and customer feedback, we are able to ensure that money is invested in the right specification for the job in hand."

His own background consists of several years experience in the farm machinery industry in both retail and wholesale aspects with major companies. He foresaw a need for independent advice and help as farmers and contractors became bogged down in the welter of sales benefits, specifications, options and prices on offer and too often ended up with a machine that failed to fit the purpose.

His company basically works as a consultancy which customers can use to assess machines according to their specific requirements. Compass will evaluate specifications to fit a brief and also provide comparative prices and sources. In situations where trade-in equipment is involved, Compass can also provide a service to sell this independently of the transaction for the new machinery which helps both customer and supplier.

Started towards the end of last year, Compass Machinery Data Limited has already established a portfolio of customers for whom they provide completely independent assessments of required products together with prices and sources. In some instances they have also taken out and independently sold second hand equipment.

The company can operate as a full on-farm consultancy giving customers a review of machinery policy, new machine market analysis and performance information. Customers also get automatic registration of all existing equipment which is linked into Compass's 'machines wanted' register. This constant cross-matching will search for any opportunity to contain depreciation losses by reducing replacement costs. Justin believes that every machine on the farm should have a price: "A change in market demand could make replacement figures add up," he points out.

Compass also undertakes trade-in appraisal to value machines that are surplus to requirements or about to be replaced. This, in turn, enables the company to offer a used machinery location and marketing service. "Our database is becoming more and more effective as the registrations grow", says Justin. "The advantage is that customers can take a longer term view of buying and selling and cash-in on market fluctuations."

Annual fee for the consultancy service is £200 which includes four hours of consultancy and unlimited access to an open 'phone line for day to day advice.

Additional work is charged at £50/h. "We can reliably expect to save several times this money through better matching of equipment to requirements and cost savings", says Justin Nichols. "Also our ability to move on second hand machines gives the customer a far better opportunity for savings on a new machine."

Used equipment is sold on a commission basis ranging from 1.5 to 2.5%, depending on its value.

Big savings

Two Compass Machinery Data customers are Mr Jeremy Finnis who manages a big arable holding in Essex and Mr Geoffrey Armstrong who farms in Somerset.

Jeremy Finnis has been using Justin Nichols since he started in business. "There are no real independent machinery specialists around", he says, and Justin is able to compare different types of machine that do the same job. We have saved several thousands of pounds on the deals we have done through his company. It is a valuable service".

In Somerset Mr Armstrong has used Compass for one 'search' for a reliable 225 kW tractor. "Me service enabled us to source machines of the right specification for our needs. The process was so much quicker than our doing it ourselves which saved a lot of time, gave us the right specification and also probably saved money on the deal itself."

Contact: **Justin Nichols, Compass Machinery Data Limited, 4 Hollands Road, Haverhill, Suffolk, CB9 8PP. Tel: 01440 705800.**

New groundwater regulations

For the first time, new regulations, implementing the European Groundwater Directive (80/68/EEC), give comprehensive protection to English and Welsh groundwater and will alter the way many farms and businesses work.

Since 31 March 1999, anybody disposing of listed substances (*e.g.* sheep dip, pesticides, heavy metals and ammonia) onto, or into, land must have authorisation from the Environment Agency unless they have already registered. During the three-month registration period the Agency has sent out over 90,000 application forms. "We have had a massive amount of interest in the regulations," Environment Agency Groundwater Implementation Manager, Bob Pailor said, "and we have received hundreds of applications daily. However, we are concerned that there are still some people who might let the deadline pass without registering.

Some regions in England and Wales depend heavily on groundwater for public supply. Groundwater is present in all rocks and provides up to 80% of public water supplies in some lowland areas and around 35% of the nation's drinking water supply.

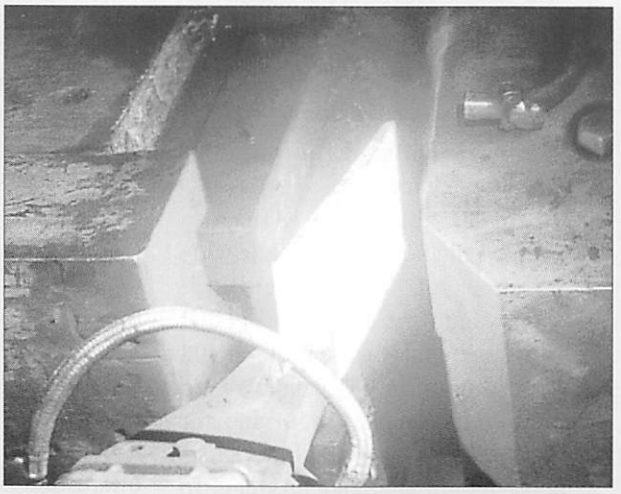
A wide range of businesses are affected by the changes, from farming and horticulture to forestry and local authorities, as well as any business not already covered by other pollution controls. To ensure the message has reached the necessary people, the Environment Agency has been in close consultation with national associations, as well as direct mailing 65,000 farmers and growers with information on the changes.

The Environment Agency's web site, www.environment-agency.gov.uk, contains extensive information on the State of the Environment in England and Wales, and includes the latest bathing water results and river water quality monitoring data.

New heat treatment methods give shares 25% longer life

Kverneland has launched a brand new range of heat treated earth wearing parts that offer life expectancy increases of up to 25%.

In 1993, a revolutionary new induction heat treatment process was introduced to make the company's plough points last longer, but without increasing the incidence of stress fractures. Hot on the heels of this development, Kverneland metallurgists immediately began work on applying this new technique to shares. The test for the engineers was how to increase the resilience of the shares to wear, without the risk of cracking. Now, six years, and more than one million pounds of investment later, the breakthrough has been achieved. The secret behind this successful development is the way the process hardens the wearing regions far beyond any previous level, whilst at the same time leaving, the area around the bolt holes comparatively flexible, to resist stress fractures.



Part of the heat treatment process producing shares at the Kverneland Klepp factory in Norway.

Under field test conditions, these new shares have consistently lasted 20 - 25% longer than imitation parts from non-genuine suppliers. More efficient factory production processes have also enabled considerable price reductions to be applied to many earth wearing plough parts, providing, a double bonus in these difficult times.

Increasing numbers of farmers are recognising the value of purchasing genuine replacement spare parts. Thicker steel parts from alternative suppliers may initially look appealing, but the quality of steel used in manufacture is frequently inferior, and tends to wear more quickly. As this happens, the plough can become unbalanced, as many of the imposed forces act against the natural line of draught, hampering penetration and making the plough harder to pull.

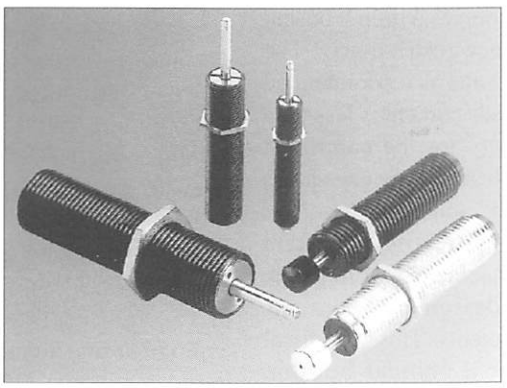
Kverneland's move to larger warehousing facilities at Haydock has meant that many parts, including these new earth wearing parts, are now held in the UK. Dealers nationwide already hold extensive stocks of this new metal, at the much reduced prices.

It will now cost 29.2% less to re-metal a 5 furrow Kverneland reversible plough, based on the replacement of points, mouldboards, shares, landsides and skimmers. On top of this substantial saving, users will also benefit from up to 25% longer life from these parts.

Contact: **Richard Riley, Parts Product Manager, Kverneland UK Ltd, Haydock Lane Industrial Estate, Haydock Lane, St Helens, Merseyside, WAI I 9UU. Tel; (01942) 272 777**

High-speed shock absorption through SKF

A new range of high specification absorbers is able to operate at working temperatures between -40 to 180°C. This is due to a design specification that combines the use of a silicon-based oil that will not degrade, with a patented throttling system and recoil cylinder. The Perret range of shock absorbers, now available from SKF Engineering Products of Luton, has been specifically developed to provide a controlled deceleration at the end of a stroke involving a very short distance of cushioning or short intervals of time. Ideal applications would demand high operating speeds and minimised cycle delay.



The rate of deceleration can be specified within the same design as linear or progressive damping or special damping curves to suit specific applications such as to protect fragile loads.

The innovative oil-throttling zone, which can alter the damping curve to suit the application, is achieved through the patented system that modifies the profile of the compression chamber. This principle limits local heating of the silicon oil and extends operating life.

A further patented innovation in the recoil accumulator ensures that the rod returns rapidly to its initial position through a pressure exchange between the oil and a gas. This development dispenses with the use of resin-based compensation foams, found in many shock absorber designs and does not suffer fatigue, even at elevated operating temperatures.

Each shock absorber can operate with frequencies up to 4 Hz and accommodate impact speeds ranging from 0.3 to 4 m/sec. Depending on the model, between 15 and 300 joules per impact can be tolerated.

One further advantage of the Perret design is the 15degree, angle of incidence that can be accommodated between the centre line of the cylinder and the direction of motion of the load to be controlled. Most systems can only tolerate a maximum of five degrees.

Contact: **SKF Engineering Products Limited, Sundon Park Road, Luton, Bedfordshire LU3 3BL. Tel: 01582 490049**

New portable cumulus weather station - operational in five minutes, whatever the location

ELE's new portable Cumulus automatic weather station can be erected and fully operational within five minutes of arriving at each monitoring site. Ideal for both short and long term weather monitoring, the portable Cumulus is supplied fully pre-configured to operator requirements, allowing even first time users of the system to achieve professional results, quickly and easily, whatever the location.

The portable Cumulus incorporates a series of high quality meteorological sensors for monitoring wind speed and direction, air temperature, humidity, rainfall, solar radiation, soil temperature and barometric pressure.

To ensure that the system provides the optimal flexibility for each application and location, the portable Cumulus stands on an adjustable tripod. This can be set up at a height of either 2 or 3 metres in accordance with operator requirements. The simplicity of the tripod system renders the Cumulus extremely quick to erect and, therefore, ideal for short term monitoring. At the same time, the aluminium construction of the frame ensures that the system is rugged and durable and adaptable to long term monitoring, should analysis be required over an extended period.

Readings taken by the sensors are stored on a data logger, which can be configured to take readings at intervals of between 1 second and 24 hours, or to begin taking readings after a parameter exceeds a pre-set figure. The maximum, minimum, average and running totals for each sensor can be calculated and stored, with the memory having an overall capacity for 60,000 readings.

Cumulus is easy to operate using an integral, Windows-based software package, which allows the user to control the data logger and process recorded data. Information stored in the logger can be easily downloaded using a portable or fixed computer with an RS232 cable. For longer term monitoring applications, the system can also be interrogated remotely via telephone (landline) or GSM (cell phone) modems.

Cumulus is powered using a choice of batteries, a solar charging unit or even mains power. For additional flexibility, the choice of sensors supplied can be tailored to meet user requirements.

Contact: **ELE International Ltd, Eastman Way, Hemel Hempstead, Hertfordshire, HP2 7HB.** Tel: **+44 1442 218355.**

Heat treatment tank for contaminated vegetable washing effluent

A specialised heat treatment installation has been recently designed and installed by Haith Industrial Ltd to handle potentially contaminated effluent from the vegetable washing systems at NBM Ltd, Chatteris plant. The equipment complies with the recommendations from the plant health and seeds inspectorate division of MAFF. This specifies that dirty water can be treated on site by heating to 70°C and held at that temperature for a minimum of 30 minutes. This minimises the risk by rendering harmless the causal agents of known infections. The disposal of waste from the commercial processing of imported raw vegetables (which includes washing, packing and grading) must be disposed of to approved MAFF sites. The vegetables include potatoes, beets, carrots, celery, celeriac, leeks, turnips and swedes and the recommendations follow recent concerns over potato brown rot and beet rhizomania being spread onto agricultural land.

Processors and packers are to be monitored to ensure they are making adequate provisions for the safe and efficient handling and disposal of all trade effluent. This includes solid and slurry waste, which must go to approved land-fill sites.

Dirty water also to be similarly disposed of through approved drainage, sewage and watercourses within 'consent to discharge' licence restrictions. The treatment of dirty water is recommended even where the solids content is less than 30 ppm, particularly for the control of potato brown rot when treating vegetables from known 'at risk' sources.

The Haith heat treatment system incorporates an insulated holding tank with a capacity designed to suit the application requirements. This cylindrical unit incorporates a conical bottom, enclosed lid and motor driven mixer operating within the unit.

A natural gas/propane energy source is used as the most economical form of heating, but other energy sources could be accommodated. A serpentile heat exchanger is employed to utilise any available residual heat from incinerators or other peripheral equipment for maximum efficiency.

The cycle time for fill, warm-up, final heat treatment and discharge can be designed to suit the operating requirements of individual sites. A wide range of parameters can be accommodated, including effluent volumes and input temperatures, together with warm-up cycle times and treated water discharge arrangements

The equipment has been designed to handle multiple washing lines with maximum flexibility. Both dump discharges at the end of washing processes, plus cyclical discharges from the base of washers can be treated to maintain the water quality. The plant is equipped with the necessary high and low level effluent controls for fully automatic fill, heating and discharge operations. Holding sumps are also equipped with mechanical mixers to prevent settlement.

Contact: **Haith Industrial Ltd, Lawn Road, Carlton-in-Lindrick, Worksop, Nottinghamshire S81 9LB. Tel: 01909 730836.**

New professional earth borer from Hemming & Wood

The new 'two-man' operated TR1 581 R professional earth borer has been launched in the UK by the Italian manufacturer EFCO's new partner and British distributor, Hemming & Wood. Complementing the existing TR1 540 earth borer, which requires one operator, it is the latest addition to the EFCO range of agricultural and construction equipment and features a new reverse gear.

The TR1 581 R develops a high power output of 4.0 kW, via its 2-stroke 80.6 cm^3 EMAK engine, which has an idling speed of 2,400 rpm, with a maximum speed - at no load - of 12,000 rpm. The reinforced tubular frame also allows operation even in the most arduous of conditions.

Integral safety features include specially designed handgrips, which prevent the operators from coming into accidental contact with the engine and auger, and which fold away for easy transit. An automatic safety cut-out stops the engine, if the operator releases the handgrip. Both the safety cut-out and the throttle lever are positioned for easy operation from the handgrip.

The hand grips fold to occupy less space during transportation, and the gearbox has a convenient lever allowing the operator to rapidly change gear between forward, neutral and reverse. This means that the auger can be extracted from the ground with ease.

Other convenient features include a quick-fit tool attachment, which simplifies auger fitting and replacement, and a WALBRO diaphragm Mod. WJ 55 carburettor, enabling the machine to be used in all working positions.

The auger sizes available include 25 cm, 30 cm, 35 cm, 40 cm, 45 cm and 50 cm diameters, plus an extension piece to increase hole depth.

Leica introduces new GPS-based machine guidance system

Leica GPS has announced the introduction of a new satellite-based machine guidance system that permits a bulldozer operator to control the vehicle and blade with a high degree of precision without the need for survey stakes.

Leica's new Dozer 2000 system uses signals from the US Global Positioning System (GPS) to determine the position of the vehicle with centimeter-level accuracy in real time. Position data from a vehicle-mounted Leica GPS receiver is fed to an Autocad-based engineering software package running on a rugged touch-screen computer in the vehicle's cab. The computer clearly displays the vehicle's position and movement in relation to a predetermined design surface and guides the operator with graphic instructions for left/right steering and cut and fill values.

The Dozer 2000 system includes a differential base station and multiple vehicular receivers used in conjunction with rover equipment mounted on construction or inspection vehicles. The base station, which consists of a Leica MC1000 GPS receiver and radio transmitter, is established at a known position at the site. It measures errors in the satellite signals and transmits satellite correction data through a wireless link to the GPS receivers on the vehicles. Each vehicle is fitted with a Leica MC1000 GPS receiver, a radio receiver for the satellite correction data, a rugged touch-screen computer and Leica's Dozer 2000 software.

"Dozer 2000 is designed to assist the operator by providing real-time navigation information and easy-to-follow instructions for steering and blade control in the cab," stated Rod Eckels, business director for OEM GPS systems. "The system uses intuitive graphic displays to show cut and fill values between actual position and design surface. The operator can select cross-section and forward/backward views, plus other useful displays."

The new Leica system is suitable for a wide range of earth moving and construction projects, including land reclamation, mining, road construction, dams, airports, golf courses and other construction projects in which dirt has to be moved to a predetermined design shape. In addition to earth moving machines, the Leica GPS system can be mounted on inspection vehicles to collect data for verifying the actual grade and elevation of the site.

Initial beta tests have been very successful, according to Eckels, who stated that operators have given the system a very enthusiastic reception.

Based in Torrance, California, the GPS Business Area of Leica Geosystems, Inc., designs, manufactures and markets professional products using the Global Positioning System (GPS) for a broad range of survey, mapping, navigation, positioning, machine control and other applications.

The Leica Geosystems Group, with worldwide headquarters in Heerbrugg, Switzerland, has a more than 100-year heritage as one of the leading instrument and system innovators in surveying, industrial measurement and navigation. Leica is a worldwide registered trademark that stands for quality and service.

Contact: **Leica Geosystems Inc. GPS, 23868 Hawthorne Boulevard, Torrance, California 90505, USA. Tel: +310-791-5300.**

Amazone Magna rides on air

Amazone has introduced a new air suspension system for the UG Magna range of trailed sprayers, which is one of the largest trailed sprayers on the market and will be demonstrated at Sprays and Sprayers.

The air suspension system is similar to that used on lorry axles and, through the use of a fulcrum linkage and air bag, is designed to increase transport speed and provide improved boom stability in the field.

The geometry of the fulcrum linkage system is such that the suspension system automatically compensates for the amount of liquid (and therefore weight) in the Magna's 4,750 litre capacity tank. This ensures that it provides optimum ride characteristics regardless of tank levels.

Ground clearance of the UG Magna remains unaffected by the suspension system, which needs to be fitted to a tractor with an air braking system. Where fitted, the air suspension system allows the Magna to be trailed at speeds of up to 50 km/h on the road.

In standard format the UG Magna is equipped with 24 m Amazone Super 'S' booms, which fold down to just 2.4 m for transport. Alternatively boom widths of between 15 m and 28 m are also available. The Magna has a 320 litre clean water tank, induction bowl with Power-injector rinsing and a full electronic control system.

In standard form, the Amazone UG Magna retails at £30,250, whilst the UG Magna with the new air suspension system is available at £33,895.

Contact: **Amazone Ltd, Rowse, Pillaton, Saltash, Cornwall PLI2 6QU. Tel: 01579 352800**

New rear mounted mowers from John Deere

High productivity and a top quality cut are offered by two new rear mounted mower conditioners that were launched by John Deere at Kemira Grassland '99.

Designed primarily as a farmer's machine, the models 324 and 328 are fully mounted belt driven mowers with cutting widths of 2.4 and 2.8 m, producing easily adjustable swath widths from 1.1 to 1.6 m and 1.3 to 2 m respectively.

The main mower body is attached to the tractor three-point linkage, with the cutting and conditioning unit pivoting around a central shaft mounted on a hanging arm attached to the main body. A new hydro pneumatic suspension system provides adjustable flotation for more precise following of ground contours.

There is a choice of six or seven cutting discs, depending on model, with easy access to disc bearings and front removal of knives for maintenance. The cutter-bar is bolted to the frame for greater reliability, and there are detachable skid shoes on both sides, with optional high skids for stony conditions.

The conditioning system employs the same free swinging, retractable V-shaped steel tines as was featured on the existing 1350 and 1360 trailed models. The conditioning hood can be adjusted quickly and easily, through six positions using a single lever and the removable two-speed rotor is situated 46 cm behind and 35 cm above the mower bed. This means the grass stems are cut before being conditioned, to avoid soil contamination, and there is a smoother, more efficient flow of grass through the machine.

The mowers feature 540 rpm pto drive, a hydraulic breakaway system and rear position transport light as standard. The cutting and conditioning unit folds directly back behind the tractor to give a transport width of less than 2.5 m.

Prices of the new John Deere 324 and 328 rear mounted mower conditioners are £8500 and £9500 respectively, excluding VAT. They are available in limited quantities for 1999, with full production expected for the 2000 season.

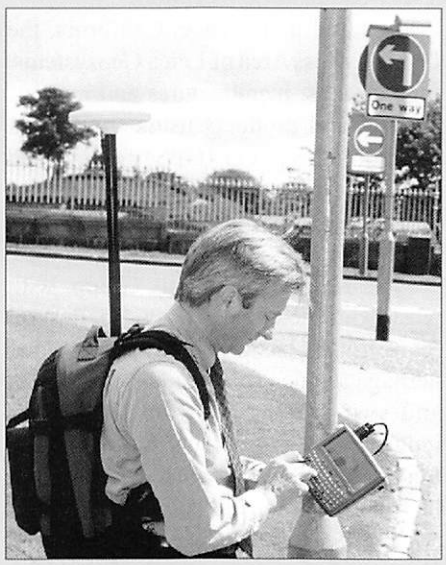
Contact: **John Deere Limited, Langar, Nottingham, NG13 9HT. Tel: 01949 860491**

PocketGIS™: only 'one way' for field data

Positioning Resources are pleased to announce further developments in PocketGIS, the innovative field data capture software.

Fully released on *Windows CE* and operable on a range of Handheld, Palm Size and Pro PCs including the ruggedised Husky FEX21 for field applications - PocketGIS now has enhanced modules for both GPS and Laser Rangefinder.

The GPS interface will now accept RTK as well as RTCM inputs. OmniSTAR DGPS systems may be specified for real-time location tracking and data capture, assuring a high degree of accuracy and integrity, even when used globally.



Laser Rangefinders can be directly connected to PocketGIS to provide users with a comprehensive set of functions including traverse and side-shot modes. Combined with GPS or stand-alone, these Eye-Safe Laser Rangefinders can be used to determine offsets.

These options add increased functionality and allow the development of third party customised solutions. This makes PocketGIS the cost-effective solution as well as the ideal platform for mobile GIS field data capture applications.

Contact: **Positioning Resources Ltd, 64 Commerce Street, Aberdeen, AB11 5FP. Tel: 01224 581502.**

Triple Press scoops Gold Medal in RASE Machinery Awards

New equipment relating to just about every sector of the industry from potato storage cooling systems, a range of new tractors, electronic cattle feeders to a chemical storage shed all feature in the latest RASE Machinery Awards, sponsored by Lloyds TSB.

A new approach to the furrow press, which can also be used as a light roll or a landpacker has won the 1999 Gold Medal from the RASE Machinery Award Scheme. The company has also made history in being the first firm to collect the Gold Medal in successive years.

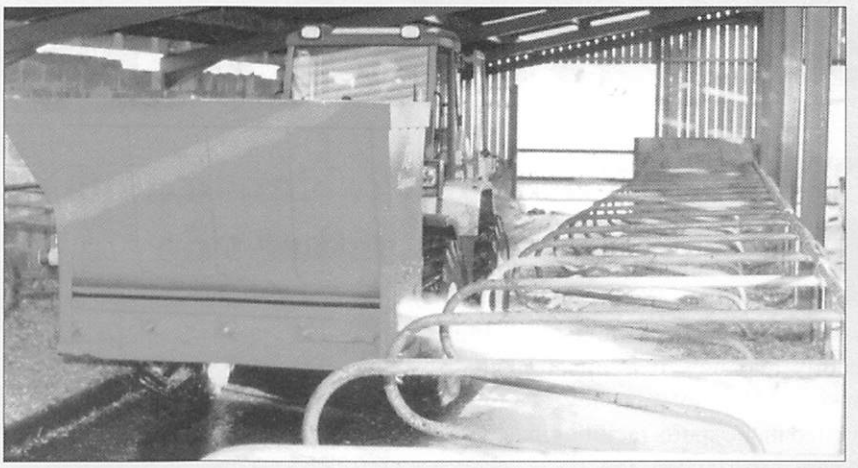
The Knight Triple Press, from **Knight Farm Machinery,** Oakham, Rutland, scooped the Gold Medal because it incorporates a new concept in press wheel construction and overall implement design which makes it a versatile and efficient cultivation tool for the large scale arable farmer. Both judges and users were impressed by its flexibility and its crucial role in the general strategy of reducing the number of passes over the land and achieving economy in cultivations.

The winner of a Silver Medal and the Lloyds TSB Award, introduced in 1998 for equipment which has special economic significance for British farming, is the Sapphire and Emerald range of electronic cattle feeders from *E Collinson and Co Ltd* of Preston. The feeders provide 24 hour access to accurately metered and controlled concentrate feed, and also extensive management information through a unique electronic ear-tag identification. Judges saw user evidence of higher milk yields, more efficient use of concentrates, better control of milk quality and improved herd health.

An ambient and refrigerated cooling system for potato stores won a Silver Medal and the special *Grower* Award, presented to equipment of special value to the horticultural industry. This award for 1999 is unusual in that each installation from *Farm Electronics Ltd*, Grantham, Lincs, is individually designed, commissioned and installed. The results achieved in these stores were excellent, satisfying the requirements of major processing and retail buyers.

Other awards went to equipment for shepherding, cattle bedding and feeding, vegetables, combinable crops, golf course drainage, haylage for horses and general farm use. In all, one Gold Medal, ten Silver Medals and two Awards of Merit were made in the 1999 awards.

AG Dispenser



RASE Silver Medal in 1999, and 'Certificate of Merit' Prince Philip Award EDFE in 1998.

The AG Dispenser is a cow cubicle bedding device. It consists of a 2 m wide by 1.2 m high bucket mounted on a tractor or loader. It can be hydraulically tilted forward to scoop up the bedding material. The bottom of the bucket is a perforated steel plate, the design depending on the material being handled. Beneath the plate, a high speed reversible conveyor belt, hydraulically driven, discharges the bedding material to the direction and distance required. Contra-rotating augers in the bucket break up lumps and ensure a steady flow of material to the conveyor. The bucket is very substantial, and with no mechanical drives and no blower the machine is simple, of low power requirement, and virtually maintenance-free.

Judges found the dispenser working with sawdust, shavings, chopped straw and shredded paper. It worked well in every case, with the time required for bedding being reduced to one third or one quarter of the previous hand work. There was considerable economy in straw use with chopped rather than long straw, halving of the cost of sawdust with bulk rather than bagged supplies, and full appreciation by staff of the more pleasant working conditions that the dispenser provided.

Contact: **Andrew Garnett AIAgrE, Garnett Farms Engineering Ltd, Clay Bank Farm, Allostock, Knutsford, Cheshire WA16 9NE. Tel: 01565 722357.**

Modern sportsturf drainage - big advances in recent years

David Shelton

Today's professional sporting scene is one of high input and high output. For many years, the cost of players has been growing steadily and now it is apparent that considerably more money is being invested in the sports facilities than was the case 7 to 10 years ago.

Many of these events are televised at considerable cost. The TV companies want play to be guaranteed and are likely to seek compensation if postponements occur simply due to heavy rain. For this reason, it is commonplace to plan sportsturf drainage schemes capable of moving 25 mm of precipitation in an hour.

In this article, my remarks are confined to established sportsturf for although the majority of new natural turf sports facilities are constructed with drainage schemes, there is often a call for supplementary drainage within a short period of time. The problem with established grounds - be they football or rugby, golf or horse racing - is that the window when they are available for drainage operations is very small. Sometimes, it is a matter of days, for in the case of stadia music festivals and the like have to be catered for after the winter football season has concluded.

Hence new or additional drainage must cause minimum disruption, be undertaken quickly, keep damage to the playing surface to the minimum and be speedy to repair. It certainly should not be carried out in the wettest winter months, for damage to soil structure can often outweigh the benefits arising from the installation of a piped system.

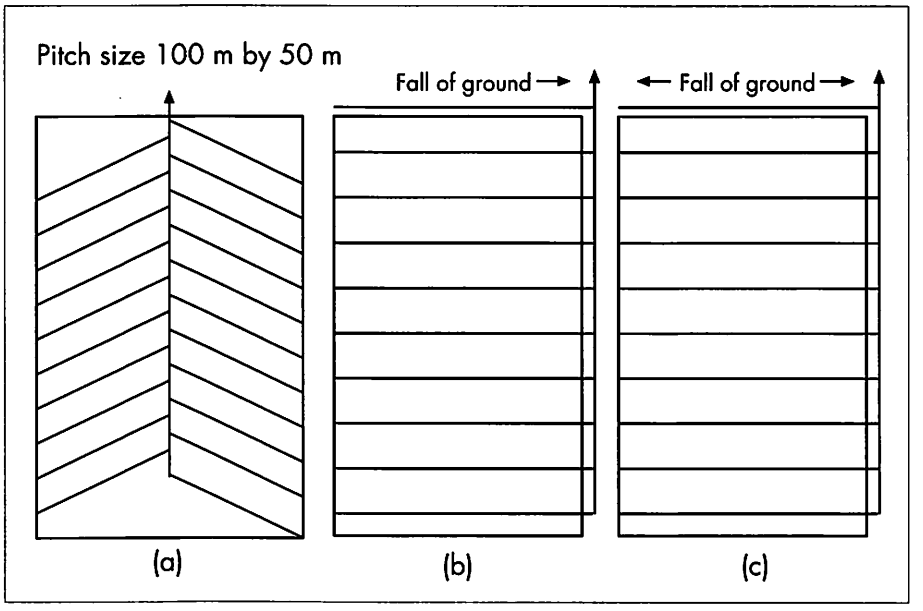


Fig 1 (a) Herringbone layout with main drain and 21 junctions down the centre of the pitch; (b) flag layout, with main drain and all junctions off the pitch to one side; and (c) crowned pitch layout, with main drains and all junctions off the pitch on both sides.

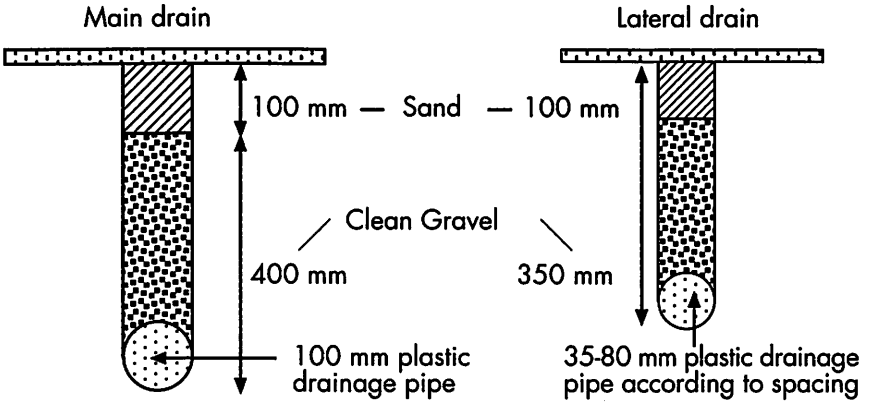


Fig 2 Trench cross sections for the main drain and laterals.

There are three distinct operations in installing this drainage:

- the installation of a network of piped drains often 5, 7 or 10 metres apart, backfilled with permeable fill almost to the surface;
- an intensive system of drainage channels, such as slit trench drainage and gravel band drainage, to lead water rapidly to the drainage pipes; and
- improvements to the drainage of the surface layer by the incorporation of coarse free-draining sand in the top 100 mm.

Optimum results are achieved only by carrying out all three operations.

David Shelton is Managing Partner of Sheltons Sportsturf Drainage Solutions. His company has specialised in the manufacture of sportsturf drainage equipment for the past 17 years, and this is now sold in 15 countries worldwide. In the UK, the company operates contracting and hire divisions also. David Shelton can be contacted on 01507 578288.

Material	*Rate, m/h*
Without geotextile membrane	
Lytag 12 mm	93.6
Lytag 6 mm	60.0
Gravel (medium)	10.5
With geotextile membrane	
Lytag 3 mm	21.4
Gravel (small)	0.6
Coarse sand	0.4
Washed Lytag sand	1.6

Tests conducted by Nottingham County Council Leisure Services, Sports & Landscape Development Unit

Table 1 Hydraulic conductivity

On football and rugby pitches, the herringbone layout of land drainage pipes is less popular than it was for it creates the most disturbance down the centre of the pitch. Layouts popular nowadays are shown in *Figure 1*.

The drainage pipes are a snug fit in the trenches, usually 500 to 650 mm deep *(Figure 2)*. These trenches are often cut with trenchers with high speed digging wheels as opposed to chains for their circular-saw-like action results in precise, neat trenches. The arisings are conveyed away into dumpers or trailers, and the pipes and permeable backfill may be placed simultaneously. The tractors onto which the trencher is hitched should be shod with wide, low ground pressure grassland tyres, as should the attendant equipment. Tyres working at the correct pressure are less damaging to fine turf than tracked vehicles.

Permeable backfilling material is usually gravel but man-made products such as Lytag - pulverised fuel ash - drain much more speedily (Table 1).

Until now it has been usual to top these piped runs with a free draining sand or sand/soil mix and then sow grass seed. Increasingly, immediate restoration is called for and strips of turf of the same composition as the 'pitch' may be placed and rolled to achieve this.

The aim of the secondary intensive system is to move excess soil water speedily to the piped drains. The most widely used technique in the 1980s was slit trench drainage 50 mm wide trenches, 250 to 300 mm deep, spaced 1, 2 or 3 metres apart at 90∞ to the pipes. These were backfilled with gravel and topped with sand. But major problems arise on sites of heavy clay. In dry weather these open-up, the permeable fill falls and topping-up once, twice or even three times may be necessary. All this lengthens the 'repair' period.

Shelton Gravel Band Drainage has become the preferred intensive system of the 1990s. Gravel bands, usually 20 to 25 mm wide, 250 mm deep, spaced 400 mm apart are installed using a trenchless system. The operation has to be carried out when the soil is moist and this prevents summer work unless irrigation is available. Disruption is minimal and use of the facility may be resumed immediately. Because of the close spacing of the bands, soil shrinkage is less of a problem and significant settlement in the bands rarely occurs.

As Shelton Gravel Band Drainage is a one-pass operation, it can be carried out in the wetter months with virtually no damage to the sward. Safety of players, especially in football and rugby, is of paramount importance. Angular shaped porous fill, such as crushed gravel, can cause grazing of the skin if player and gravel come into contact. Spherical products such as Lytag and Leca - lightweight expanded clay aggregate - are to be preferred in these circumstances.

Some improvement to the top 100 mm of the surface layer is important to get optimum performance from the drainage system. Top dressings are beneficial but markedly better results are achieved if this dressing is incorporated into the top 100 mm of the sward.

It usually falls to the groundstaff to complete the operation! Irrigation, overseeding, and fertiliser applications are all necessary to ensure the facilities are back into play quickly.

The latest sportsturf drainage techniques installed with the advanced equipment now available have transformed the sportsturf drainage operation and in so doing have significantly reduced cost.

The Royal Agricultural Society of England has awarded the Silver Medal to the single leg Shelton Gravel Band Drainer – equipment designed to install intensive drainage schemes on sports fields with minimum disruption to the playing surface. Here, David Skinns IEng MIAgrE who builds the machines at his factory at Woodhall Spa talks to David Shelton (right), Managing Partner of Sheltons Sportsturf Drainage Solutions.

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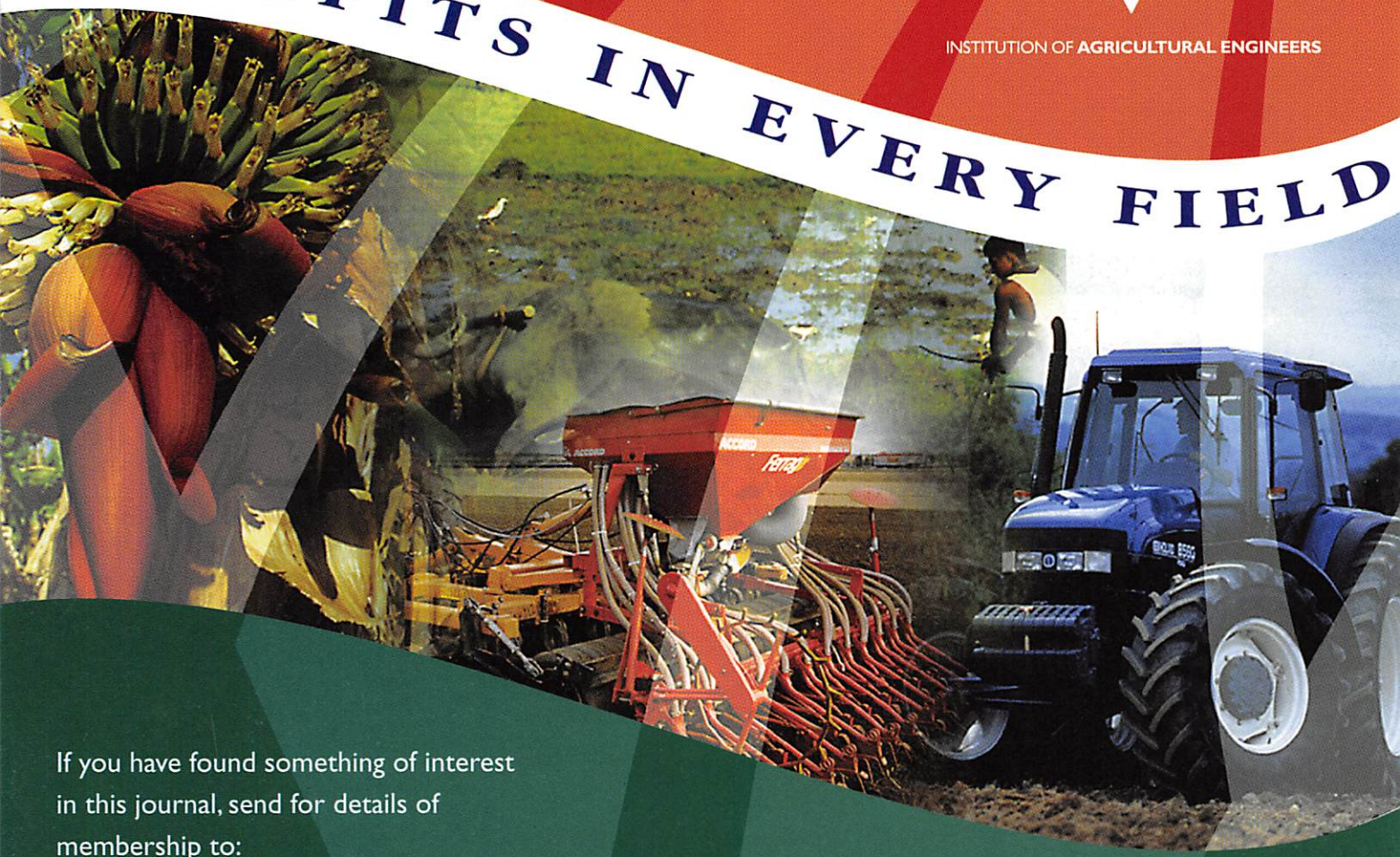

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