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Spring 2001

ENGINE TORQUE SENSING
How it improves tractor performance

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Inset Photo: JD 3000 Series telescopic

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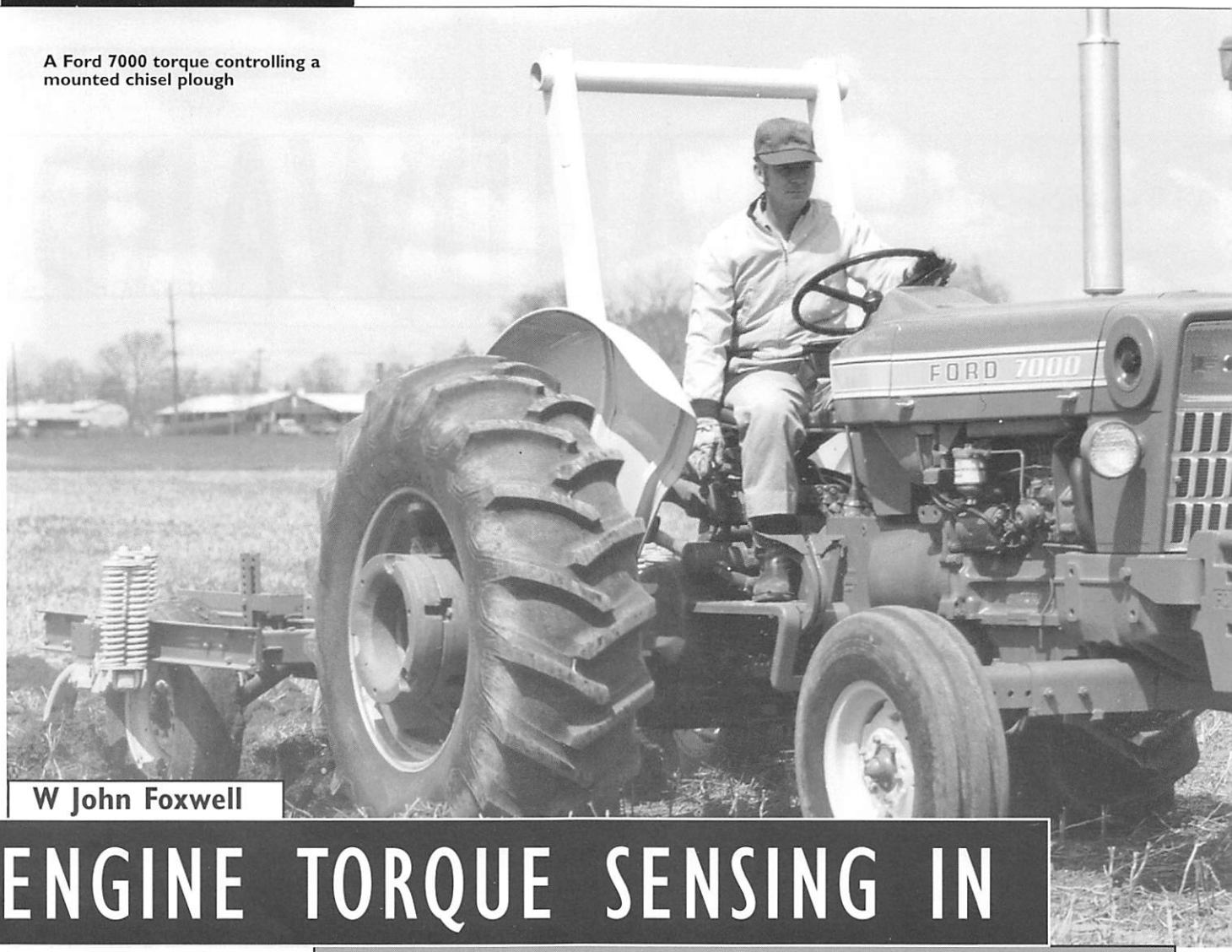


A Ford 7000 torque controlling a mounted chisel plough

W John Foxwell

ENGINE TORQUE SENSING IN FARM TRACTORS

How it improves performance

Abstract

The background of implement control is discussed from Ferguson's early attempts to the latest torque sensing patents. The benefit of torque sensing over the linkage sensing of mounted implements is clearly detailed, as are the benefits of applying torque sensing to the control of trailed implements. As torque sensing gives the tractor its own inbuilt dynamometer, torque sensing has other benefits such as diagnostic testing to detect hidden engine problems. It could also be useful in determining the transmission efficiency of tractors undergoing the OECD tests if the drawbar tests on the track were superseded by dynamometer tests measuring the actual axle power. Characteristic performance curves based on axle power with suggestions for predicting the performance on various soils are also included.

Background to implement control

Seventy-five years ago in Ireland, far sighted Harry Ferguson experimented with implements mounted to the rear of a Fordson tractor (Fig. 1) in order to eliminate their depth wheels and transfer the implement weight to the driving wheels of the tractor, so enabling the tractor to be lighter and more manoeuvrable than tractors pulling trailing implements.

In a provisional patent application dated February 12, 1925 entitled Apparatus for Coupling Agricultural Implements to Tractors and Automatically Regulating the Depth of Cut in Work, he wrote in one approach that: 'The torque reaction of the tractor may be utilised for controlling the depth of cut of the implement and, as this reaction is dependent on the draught of the implement, it is immediately rectified and the normal depth of cut constantly maintained'. He suggested that this might be achieved by using the worm

pinion in the rear axle of the tractor. Quoting again from the application, he states: 'The worm is capable of endwise movement and an extension thereof is arranged in contact with an arm of a bell-crank lever pivoted on the tractor and used for suspending the implement from the tractor through suitable linkage. Thus, the load or end thrust on the worm is proportioned to the draught of the implement and any variation in the draught will produce a corresponding variation in the load, or end thrust, with the result that the extension of the worm in contact with the ball-crank lever will pivot the same either upwards or downwards, as the case might be, to raise or lower the depth of cut of the implement according to whether the depth of cut of the implement is to be reduced or increased'.

In the amended complete specification of the patent, however, he did not mention torque sensing again, and he eventually developed the three-point hitch, as we know it today, with top link sensing of implement draught. In 1938, he sold the idea to Henry Ford and, between them, the 9N Ford Ferguson tractor was introduced in 1939. It was an immediate success, being small and light; and when equipped with the new rubber tyres, very manoeuvrable, very safe and easy to drive. As the implements were mounted at the rear, in ideal soil conditions, weight was transferred to the rear wheels from both the plough and the front axle by an amount approximately equal to the amount of weight transferred when the implement is in the transport position (Fig. 2a), up to almost twice that of the implement's weight (Figs 2b & 2c). This was reduced in harder soils and when the line of pull became parallel to the ground no weight was transferred. Later as Ferguson's patents expired other manufacturers adopted the three-point hitch.

Other influences

In the late nineteen fifties, two other events in the US influenced tractor design, namely, the development of the maize header on the combine harvester and the chemical control of weeds. These two factors eliminated the need for the narrow tricycle rowcrop tractors that were standard in the 'corn belt', but below 40 kW in power, because of the single front wheels. Wide front axles replaced the tricycle front axles and the size and power of the tractors rapidly increased together with the use of the three point hitch of which there were three categories in size. To handle the longer and heavier implements which did not work well with the top link sensing, lower link 'draft control' was invented. The lines of pull of these heavier mounted implements passed to the rear of the ball ends of the lower links, causing tension rather than compression loads in the top link.

Some long multi-furrow ploughs were semi-mounted on the tractor and attached only to the two lower links. The three-point hitch has a self correcting built-in feature which keeps the corrections small when hard ground is tilled. When the lower links alone were used, it needed an additional manual control

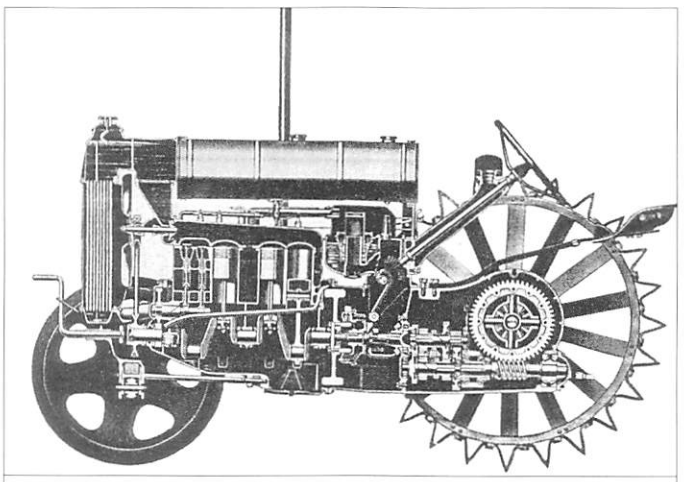
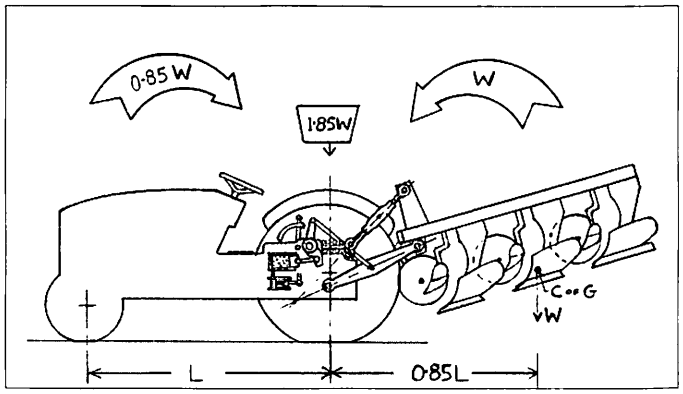


Fig. 1. The integral construction of the 1917 Fordson model was a factor in making it the first tractor to be mass produced; the initial 5000 were shipped to Britain in 1917; in 1919, production was shifted to Cork in Ireland and in 1932, to Dagenham; note the worm drive in the rear axle. [Source: British patent no. 253,566 dated February 12, 1925 by Harry Ferguson].

BIO NOTE

Mr John Foxwell's technical education was obtained at the Merchant Venturers Technical College in Bristol and the SEETC in Barking, Essex. He won a Ford scholarship in 1936 graduating top student in 1939. During the war he worked on the designs of military trucks and personnel carriers before being transferred to design implements for the new E27N tractor in 1944. He progressed to Executive Engineer - Tractors in 1955 and influenced the design of the Fordson Major and Dexta tractors. Transferred to the U.S. in 1962, he became Chief Engineer Ford Tractor Operations (Worldwide) in 1964 and was responsible for the 2000, 3000, 4000, 5000, 7000, 8000 and 9000 range of tractors. In 1975 he retired to form his own consulting company. Now fully retired he keeps up to date with tractor affairs. He is a 40 year Fellow of the IAgrE and a 55 year Fellow of the IMechE as well as being a member of the SAE. He keeps fit by playing golf twice a week in Michigan and in Florida in the winter.



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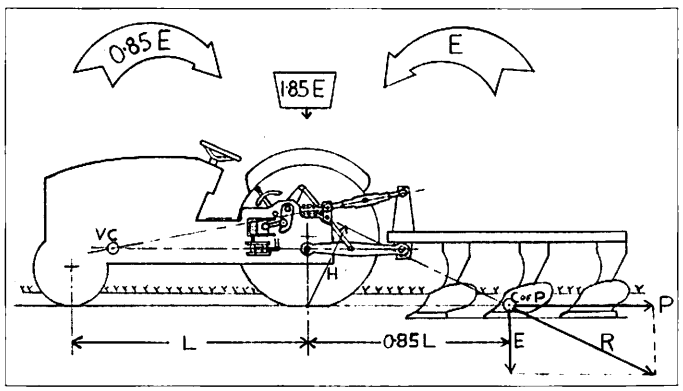

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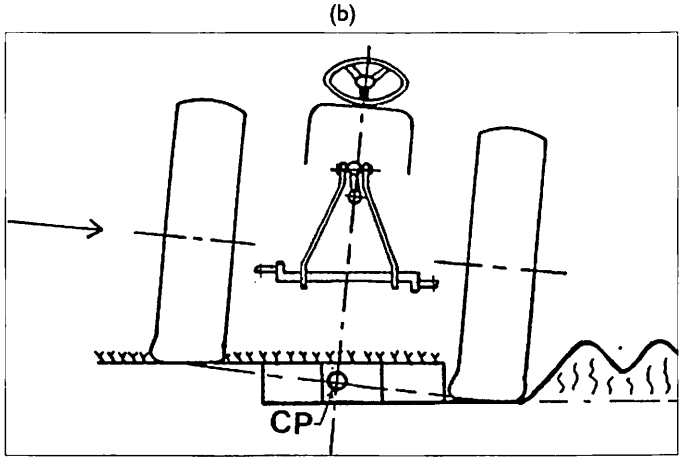


(c)

Fig. 2. (a) This shows a tractor similar to the 9N with the Ferguson three-point hitch carrying a three furrow mounted plough in the transport position; the weight transfer from the front axle is obtained by taking movements about the rear axle, where W is the weight of the plough in kg, L is the wheelbase in cm; C of G is the centre of gravity of the plough. Weight in kg added to the rear axle is 0.85W + W = 1.85W.

(b) The same implement as in Fig. 2a, at its working depth in the soil; the drawbar pull is P in kN; the excess downward load of the implement is E in kg and is the suction of the shares in the soil as the implement is pulled forward plus some of the weight of the implement; R is the resultant force in kN along the line of pull; H is the moment arm in cm of the line of pull about the contact point of the rear tyre with the soil; the centre of pressure (C of P) is approximately the same distance from the rear axle as the C of G of the plough. The weight transfer to the rear wheels is 0.85E + E = 1.85E
In soft soil, E is approximately equal to W; in hard soil or with worn shares E < W in varying degrees until it becomes zero when the implement will not go any deeper.

(c) The rear view of Fig. 2b, showing where the centre of pressure of the implement acts relative to the centre line of the tractor; Fig. 2b, is a view in the direction of the arrow.

which the operator could factor in to minimise the large corrections which occur in hard ground.

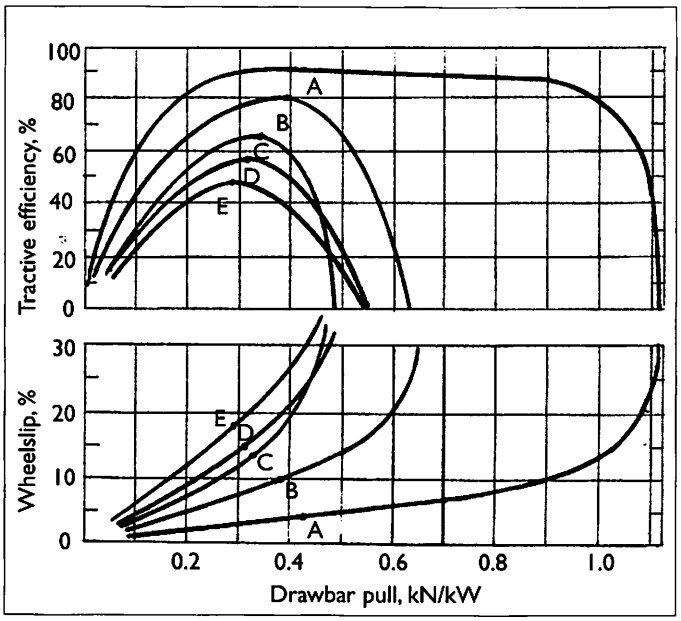
A further factor that facilitated the increase in tractor size and power was the improvement in the hydraulic systems applied to the control of pull type equipment which could not be mounted on the three point hitch. Higher operating pressures, coupled with the standardisation of remote hydraulic cylinders and improved breakaway hose couplers enabled one operator to hitch and operate extremely large and heavy pieces of equipment.

Predicting performance

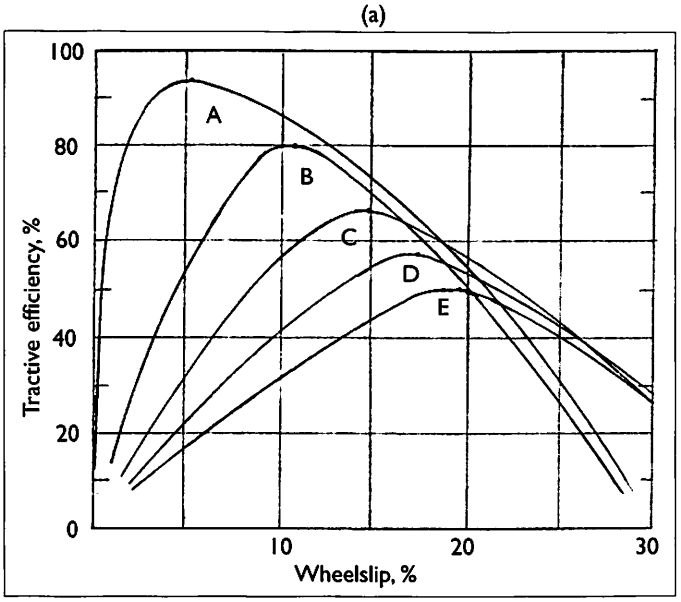
The behaviour of a tractor and implement in the field is mysterious to many engineers but it need not be so. The characteristic performance curves for two wheel drive (2WD) tractors are shown in Figs 3a & 3b. These curves cannot be put together from the current tests conducted by the Organisation for European Co-operation and Development (OECD) because the axle power is not given. One has to go back to the late nineteen fifties and study the reports of the British Standard tests where a few tractors were tested on various soils as well as on a hard tarmacadam test track. If the axle power of the tractor is known, one can determine from the graphs and tables, the traction efficiency, the drawbar pull, the wheelslip, the weight on each axle and the towing draught for each surface condition, providing the tractor is equipped with tyres which can support the loads on the axles at the normal operating pressures (from the manufacturers tables, not shown). It can be seen from the graphs that, for maximum tractive efficiency, the wheelslip on the different soils varies from about 10% to 17%. As the wheelslip approaches 25%, only a small increase in drawbar pull will induce complete wheelspin, particularly on the harder surfaces. A further useful chart (Fig. 3c) also shows the effect of tractor speed on soil ploughing resistance.

Three point hitch sensing problems

While the adoption of the three point hitch with linkage control of an implement was a monumental step forward, linkage control of an implement has one very great disadvantage, namely, that it maintains the same selected draught of the implement at all times. This works well when the soil is uniform throughout a field but it can cause problems when the soil resistance or surface conditions vary as they do quite frequently. For instance, when going from a firmer soil to a softer one, the unit resistance of the soil is reduced and an implement will go deeper to achieve the same draught as before. At the same time, the rolling resistance of the tractor is increased considerably and adds to the load on the tractor. The increased wheelslip also wastes more power. There is now a situation where the tractor is called upon to work much harder than it did on the firmer soil, resulting in either engine stall or wheel spin or both. Sometimes this happens so fast that the operator is powerless to prevent either situation. This means that to maintain forward motion, the implement's depth of cut must be set shallower on the firmer parts of the field. This also applies to undulating fields where the extra power to climb an incline can also cause engine stall. Harry Ferguson knew these problems existed with his small tractors. In demonstrations on land which was not uniform, his operators



(a)



(b)

Curve	*Surface*	*Static weight, kg/kW*	*Towing draught., N/kW*
A	Tarmacadam	120	25
B	Grassland – damp	111	65
C	Stubble on moist med. loam	111	92
D	Cultivated moist med. loam	111	157
E	Soft and sandy	111	188

Surface	*Weight on axles,%*		*Tyre pressure, kPa*	*Drawbar height, mm*
	Front	*Rear*		
Tarmacadam	26	74	110	381
Soils	28	72	82	355

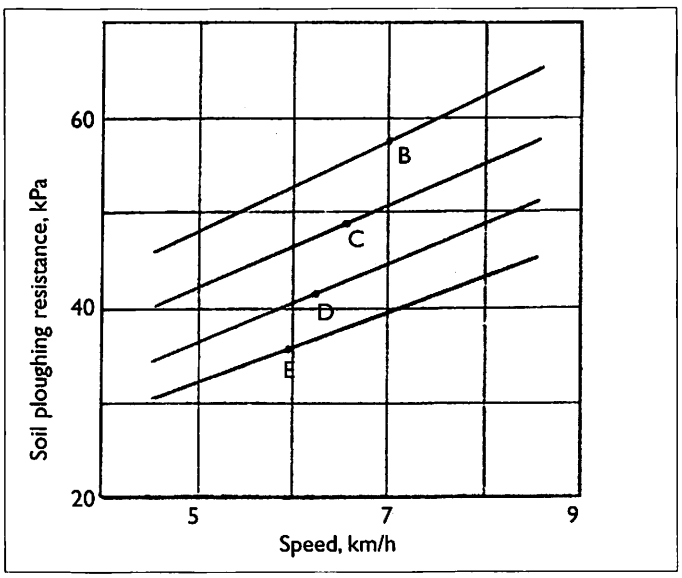
sometimes wore long white coats with only their left hands on the steering wheels, to demonstrate how easy the tractors were to steer. Meanwhile, their right hands were in the right pockets of the coats but actually operating through the coat slits and onto the manual control lever unseen to the spectators. The driver could raise the implement momentarily to put more weight on the rear wheels if a slippage problem was encountered or raise the implement slightly when ascending an incline.

Trailed implements

Trailed implements with fixed depths of cut behave a little differently. When the ground varies from hard to soft, the decrease in the draught and the increase in the rolling resistance tend to balance each other, maintaining a more uniform load on the tractor. When operating in undulating fields, the extra power required by the tractor and implement to ascend the incline can sometimes stall the engine or at least slow it down considerably.

Tractor torque sensing

The foregoing symptoms can be overcome by factoring into the sensing system both the rolling resistance as well as the draught load of the implements. Torque sensing can achieve this because it does not differentiate between the loads caused by the draught of the implement or the rolling resistance of the tractor and, when ascending gradients, it will raise the implement to maintain forward progress. If Ferguson could have made the worm work, linkage 'draft control' would never have been heard of. A mounted implement controlled by a torque sensing system which is monitoring both draught and rolling resistance will maintain a more even depth of cut as the soil resistance varies. When going from hard to soft soils, the increase in rolling resistance (Fig. 3a) coupled with the decrease in draught in the softer soil (Fig. 3c) in many cases will offset each other and maintain the same depth of cut. The converse occurs when going on to a harder soil from a softer one. Therefore, the depth of cut



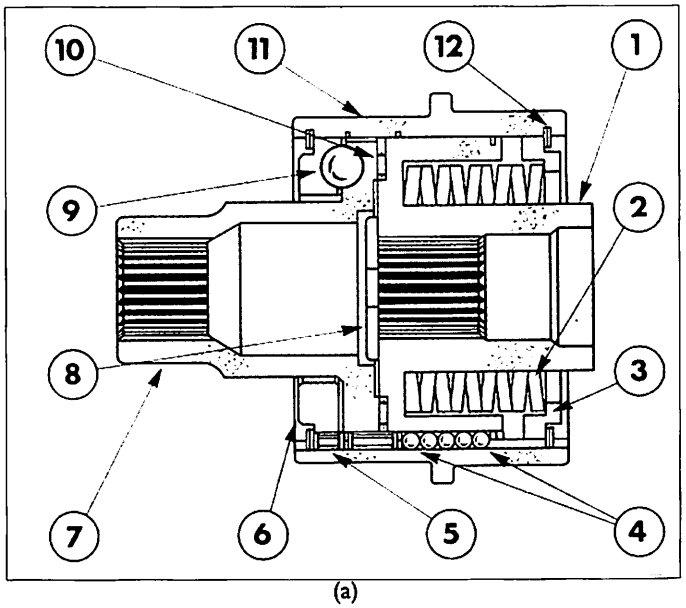
(c)

Fig. 3. Characteristic performance curves for 2WD tractors using the tabulated data.

(a) Charts showing the relationships between drawbar pull, wheelslip and tractive efficiency; points are at maximum efficiency on five surfaces: A, tarmacadam; B, grassland (damp); C, stubble on medium loam (moist); D, cultivated medium loam (moist); and E, soft and sandy.

(b) Chart showing the relationship between tractive efficiency and wheelslip for two wheel drive tractors; points on curves A, B, C, D and E are at maximum efficiency. [Source: N.I.A.E. Tractor Test Report number R. 59026 dated 29 June 1959].

(c) Chart showing approximately the variation of soil ploughing resistance with speed; points B, C, D, and E correspond to the points on Figs 3a and 3b.



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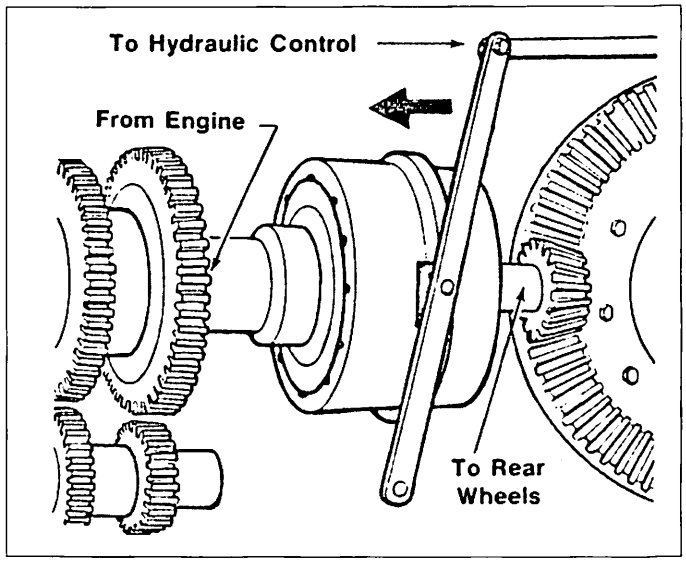

(b)

Fig. 4. (a) Cross section through the torque sensor: (1) output hub; (2) disc springs; (3) disc spring retainer; (4) ballbearings in splines, permitting sliding between 1 and 11; (5) override stop pin; (6) ball thrust plate; (7) input hub; (8) returning washer when unit is bolted to rear axle bevel pinion; (9) ball bearings - 10 in number; (10) roller thrust bearing; (11) outer hub which moves to the left under load; (12) retainer.
(b) The McKeon torque sensor positioned on the input shaft of the rear axle bevel pinion and driven by the transmission output shaft. [Source: U.S. patent no. 3,575,241 dated April 20, 1971].

varies much less than with a linkage control system and a less powerful tractor can do the work of a larger one. The tractive efficiency varies less, less fuel is used, air pollution is less and both initial and operating costs are smaller.

Torque sensing of rear mounted tillage implements does not differentiate between close coupled or large and heavy implements, the angle of the line of pull does not affect it in any way. It can control heavy, reversible, multi-furrow ploughs with ease. It can control tillage implements mounted on the front hitch, with suitable valving, as well as trailed equipment if they have special remote cylinders to raise or lower them into and out of work. Torque sensing can work with all types of tractors, small and large, including two wheel drive, front wheel assist, four wheel drive, crawler and bi-directional tractors. It can automatically change gears in a powershift transmission, making it useful for adjusting the forward speed of a tractor operating a PTO driven forage harvester. When the density of the crop reaches a predetermined figure, forward speed is reduced to prevent the crop from jamming up the cutter mechanism.

So why is torque sensing not in vogue on today's tractors except in one application with limited use of its capabilities? Most torque sensors take up a lot of lateral space which is not available in modern drivelines and neither is it easy to accomplish by mechanical means only.

The first tractor with torque sensing

The Ford 7000 tractor (Title photo) was introduced with a mechanical torque transducer in 1971 (Fig. 4). It was conceived by Chuck McKeon who was both a farmer and an engineer; and it was mounted in the space between the transmission and the rear axle. As it did not change the housings in any way, it was very cost effective. It was immersed in oil and used 10 ball bearings engaging spring loaded ramps and was connected to the control valve by a simple lever mechanism. It was also interchangeable with the top link sensing system carried over from the less powerful Ford 5000 model to work with landscaping blades. A simple lever engaged one system or the other, even on the move.

Test results of the McKeon sensor

The three charts (Fig. 5) show just how effective the McKeon torque sensing system was compared to the top link system. They depict two test runs in the same field, minutes apart, on the same tractor with the same four furrow plough running in adjacent furrows in a typical stubble field. Each run was of 18 seconds duration over a distance of 33 m. The surface was flat but with depressions and ridges left over from prior harvesting.

Perhaps the most dramatic comparison of the two systems is the one comparing the variation in engine speed. There was a maximum variation of 440 rev/min for the top link system and 225 rev/min for the torque control system but, more importantly, the average variation was much less with torque sensing. At the same time, the number of hydraulic pump corrections varied from 194 per minute for the top link system and only 85 per minute for the torque sensor system, with the time that the system was pressurised varying from 42% to 28%, respectively. The amount of vertical movement of the ball ends of the rear of the lower links, relative to the tractor, was a maximum of 12.2 cm for the top link system, 9.6 cm for the torque sensing system and the average variation with the torque sensor was much less.

All these improvements add up to: less variation in the depth of cut of the implement; significantly less wear and tear on the engine, the driveline, the hydraulic pump, control valve and linkage, and the three-point hitch ball joints; less tyre flex; and less fuel used.

The first tractor to automatically control the depth of cut of trailed implements

The Ford 7000 torque system also performed very well with trailed chisel ploughs which had their depth wheels controlled by a modified ASAE standard (Fig. 6) remote

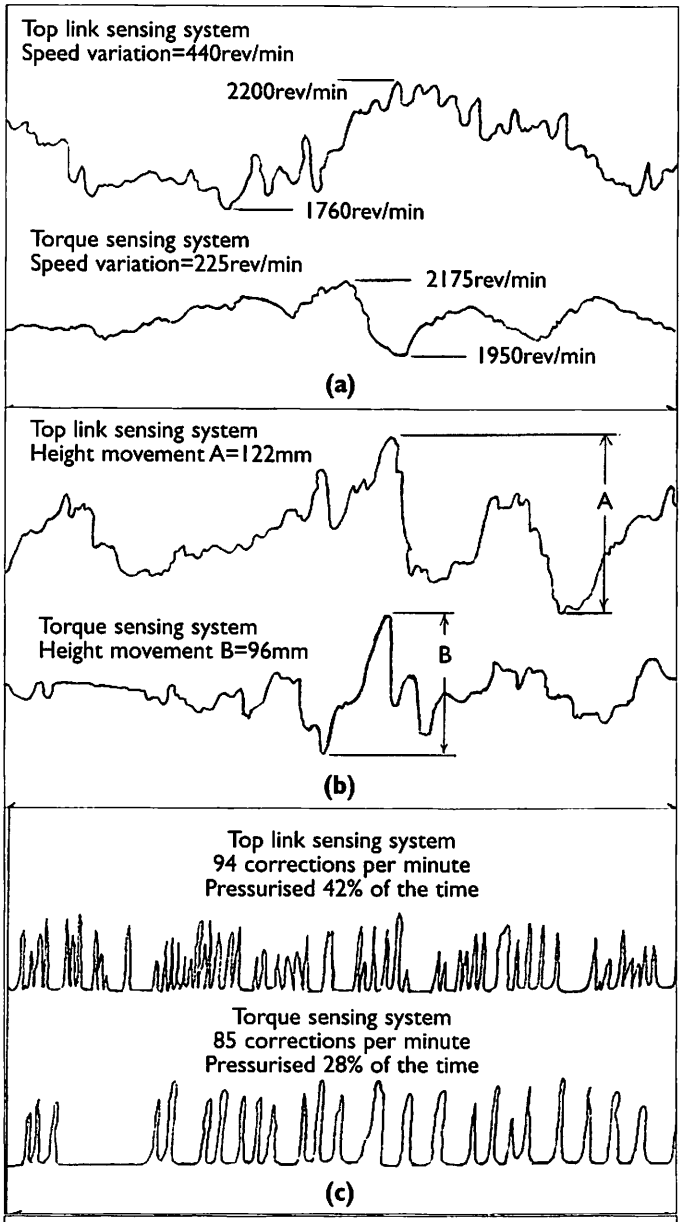

Fig. 5. Comparison between a top link sensing system and a torque sensing system for a Ford 5000 tractor with a four furrow, mounted plough: (a) engine speed; (b) lower link vertical end movement relative to the tractor; and (c) hydraulic pump pressure corrections

cylinder. This was connected in series with the main hydraulic lift cylinder so that they moved in unison, giving a feedback to the remote cylinder to cut off the severe upward corrections in hard ground. In comparative test demonstrations in undulating fields between implements with fixed depth control and those under the influence of the torque sensor on the same tractor, switched from one system to the other, the tractor would maintain progress on inclines with the torque sensor but suffered engine stall with the fixed depth control. The torque controlled implement could be set deeper in the flat parts of the field than the one with the fixed depth of cut. In the same way as a car loses speed on a hill if the power is not increased, the tractor needs more power for lifting itself and the implement up an incline, as well as maintaining forward progress, pulling the implement and overcoming rolling resistance.

For instance the vertical distance climbed up a 10% incline is a rise of 1 unit for every 10 units travelled along the slope. A 5% slope is 1 in 20. The extra pull needed to propel a 75 kW tractor with a mass of 111 kg/kW and a 900 kg trailed implement up a slope of 3% from the characteristic charts is:

$$(75 \times 111 + 900) \times g \times 0.03 = 2.71 \text{ kN}$$

where g is the acceleration due to gravity. From the charts, this adds to the draught of 24.6 kN at maximum efficiency on level stubble land, an increase of 11% which would cause many tractors to stall and, in the case of tractors with high torque back-up, the engine to slow down the forward speed by 11% depending how suddenly the incline is encountered. With a torque sensing system, the depth of cut would be decreased by 11% and progress would be maintained. Figure 7 shows an electronically controlled remote cylinder that could be adapted for agricultural use with trailed implements.

Although the McKeon torque sensor performed well and reliably for several years, it had to be abandoned when the drive for the front wheel assist (FWA) axles was positioned in front of it so that it absorbed the not inconsiderable torque wind-up between the front and rear axles, rendering the sensing capability useless.

In reviewing the Nebraska and British Standard OECD tests of the first Ford 7000 tractor in each country, it is incredible that there is not one mention, in either report, that the tractor had a new and revolutionary method of controlling the depth of work of both mounted and trailed implements. These are reports that are supposed to help the farmer in choosing a tractor!!!

Where should a torque sensor be located to be of most use?

The questions to be asked are:

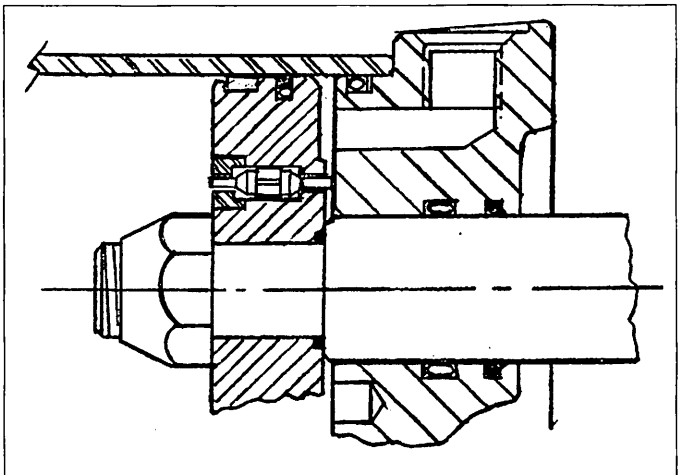

Fig. 6. Modification of the ASAE hydraulic remote cylinder to work in series with the Ford 7000 tractor hydraulic lift cylinder; fluid from the tractor hydraulic pump is directed to the remote cylinder to lift the trailed implement; as the cylinder extends, the fluid in the piston rod side is directed to the main tractor lift cylinder which moves linkage to shut off the tractor control valve when the stroke is completed; to ensure that the cylinders are in phase, a poppet valve in the piston of the remote cylinder contacts the end cap and is pushed off its seat to allow the fluid to go to the main cylinder and ensures that it reaches the end of its stroke to shut off the tractor control valve; the cylinder can be used normally by rotating the piston 180° so that the poppet valve lines up with a hole drilled in the end cap preventing it from being unseated.

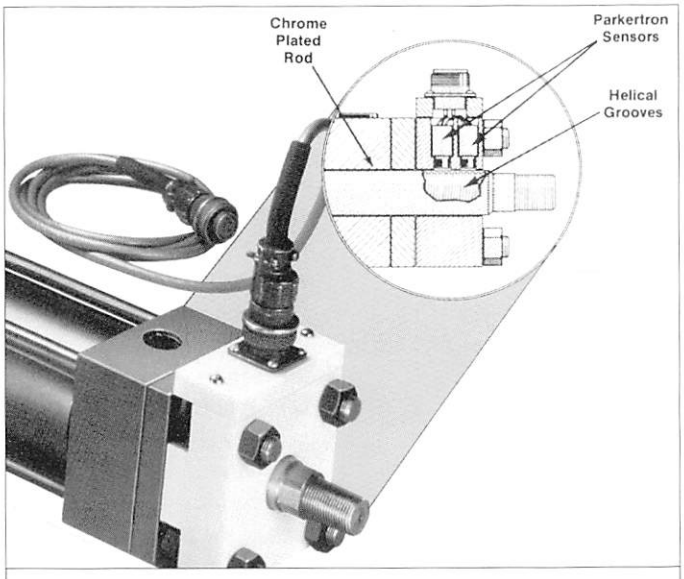

Fig. 7. An industrial electronically controlled 'smart' cylinder which might be adapted to the lower cost ASAE cylinder for agricultural use; the piston rod has shallow helical grooves machined along its circumference and then chrome plated over and ground to size; a Hall-effect, non-contacting sensor looks through the non-magnetic chrome to sense the grooves in the magnetic piston rod, sending digital pulses to the on-board computer to read out displacement. [Source: Parker Hannifin sales brochure no. 1165 dated December, 1982].

how can a torque transducer be incorporated into a tractor's driveline without having to make major changes and increasing tooling costs; and where can it be located so as not to incur parasitic loads, as in the case of the McKeon design, and to also control the PTO shaft, work with all types of transmissions of any size and configuration such as articulated 4WD machines as well as combine harvesters and, for that matter, automobiles and trucks?

The locations that meets all these criteria is at the engine flywheel, or between the engine and transmission, interfacing with non-contacting electronic position sensors which are now available, having been proved cost effective and reliable in automobile applications. Two recent patents have used the flywheel location for a torque sensor. They are the Foxwell patent and the Bulgrien (New Holland) patent which was introduced in the New Holland 'TM' series tractors in 1999 to change automatically the gears in the 18 by 6 powershift transmission (Fig. 8). This device adapts to the movement between the driving and driven members of the vibration damper at their outer circumferences. The interaction with a Hall-effect position sensor is fed into an onboard computer to provide out the torque of the engine. When combined with speed sensors at the flywheel and output shafts, output signals for the engine brake power and approximate output torque of the transmission in each gear ratio can be used to automatically shift the transmission up and down as the torque in the rear axle decreases or increases. The coil springs are six in number, four lighter ones, and two heavier ones which are set back an amount equal to half the deflection of the lighter ones. The device works very well but has some limitations. It can only operate powershift transmissions, up to 1000 Nm of torque, which have their own disconnect clutches. It cannot work with manual

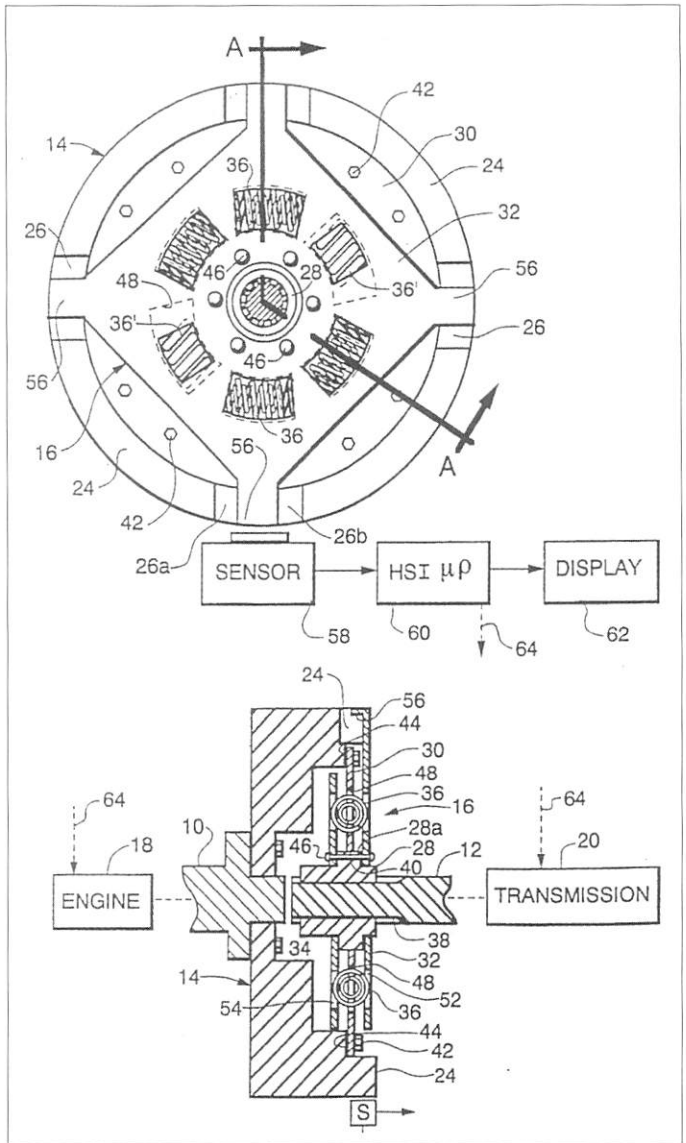

Fig. 8. Two views of the New Holland flywheel mounted torque sensor; the engine flywheel (14) drives the power shift transmission input shaft (38) via the driving disc (48), springs (36) and (36') and the driven discs (54) and (56); the disc (48) rotates a limited distance with the discs (54) and (56); four projections on the driven disc (56) operate in the gaps (26), (26a) and (26b) cut in the front face of the flywheel (14) and interact with a Hall-effect position sensor (58) which feeds into the on-board computer (60) and to the display (62) to read out the torque of the engine; this is explained in detail in the patent USA no 5,596,153. [Source: U.S. patent no. 5,596,153 dated Jan. 21, 1997].

transmissions using a manual clutch, and the springs are subject to being forced outwards due to centrifugal force. This effect could cause wear and tear and increase their hysteresis. The end loading between the springs and the discs is also high and could wear in time and affect the accuracy of the readings. The patent has not been adapted to control the hydraulic system, perhaps because it cannot be adapted to all transmissions in the 'TM' model line. It is claimed to change gears as smooth by as an automatic transmission in a car.

On the other hand, the Foxwell torque sensor (Fig. 9) which is adapted from a two-piece flywheel and can be used to work with any type of transmission, is suitable for any

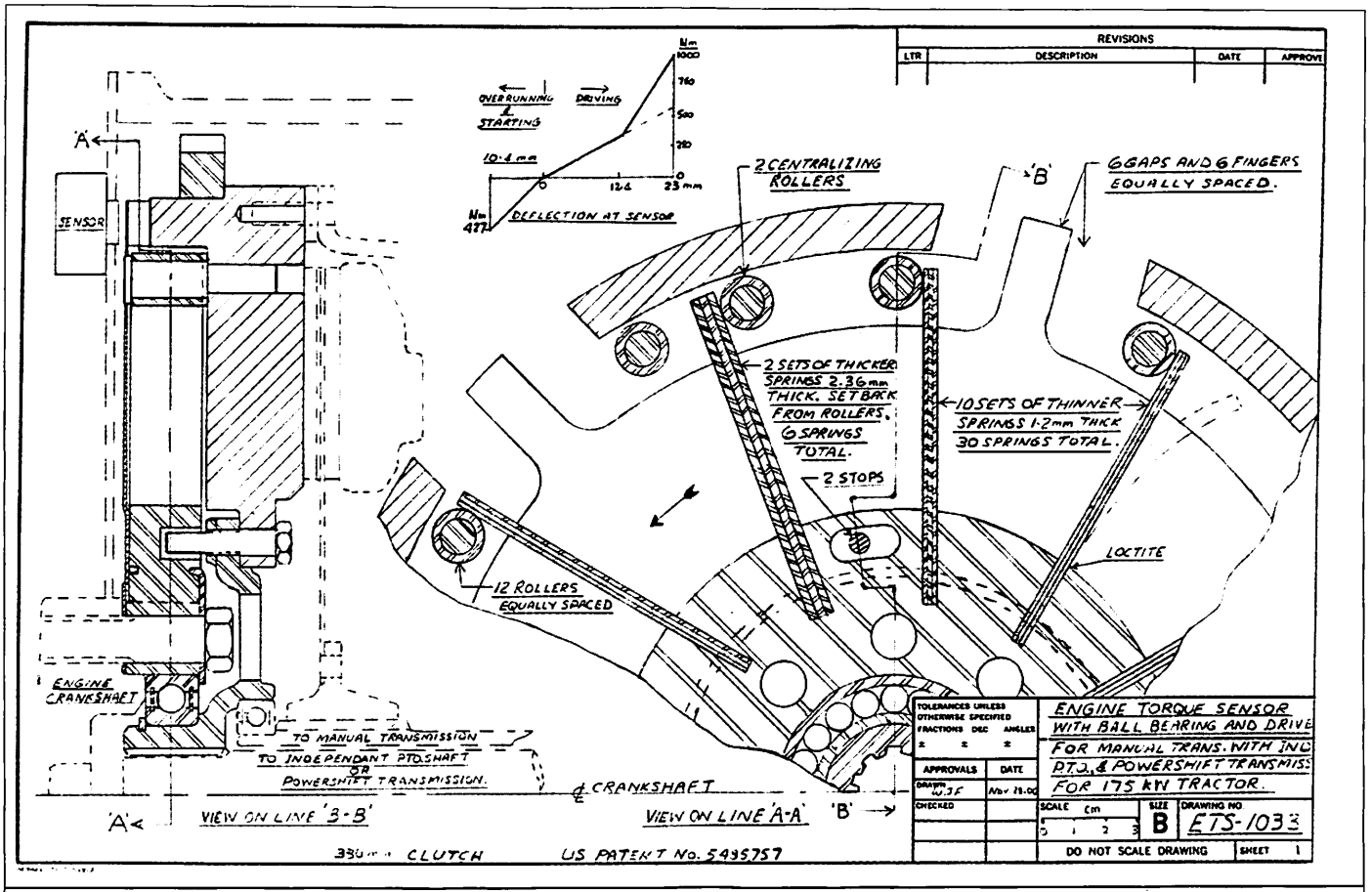

Fig. 9. One version of the Foxwell torque sensor suitable for large tractors up to 175 kW, and for scaling down to suit any size of engine and type of transmission; a driving hub is bolted to the engine flywheel and contains 12 sets of rectangular leaf springs which transmit power to the driven member, the two hubs being connected by ball bearings which permit limited relative movement between them under the deflection of the springs; in the embodiment shown, an engine drive disc with six radial fingers intermesh with six gaps cut in the front face of the driven member and interface with a Hall-effect position sensor which interacts with the on-board computer to measure engine torque; the initial shock load on the starter motor is cushioned because the engine is turned via the two sets of thicker springs. [Source: U.S. patent no. 5,485,757 dated Jan. 23, 1996].

implement attachment system (three point linkage or drawbar), and can also control an independent PTO drive used with some manual transmissions. It uses batches of thin rectangular cantilevered leaf springs fixed at their inner ends to make them immune to the effect of centrifugal force. The springs take up very little lateral space and can be varied in number and thickness to work with engines over a wide power range. In one version the first driving member, which contains the springs, is bolted to the crankshaft and the second driven member is mounted to a ball bearing the outer race of which is mounted in the driving member so that both members can revolve a limited amount relative to each other as the torque of the engine deflects the springs. A Hall-effect position sensor scans the movement and sends the information to the on-board computer to read out torque. Speed sensors at the flywheel and output shaft of the transmission read out horsepower and torque at both locations.

Torque sensing as a diagnostic tool

The power that an engine develops on a dynamometer is not the same as the power it develops when installed in a tractor because the cooling systems, air intake systems, exhaust systems, etc., are completely different from each other. Up to now, it has not been possible to know precisely the actual engine brake power available. However, flywheel mounted torque sensors will enable the brake power to be accurately determined on the test bed and in the field. Therefore, the tractor will have its own built in dynamometer at all times and it can be used by the dealer as a diagnostic tool to monitor engine performance. By connecting a portable computer to it over a period of time and taking it back to the dealership for connection with a higher powered computer to analyse the signature pulses of each cylinder, any problems would be detected and remedial action taken before catastrophe of failure. One automotive engine manufacturer during the cold testing of its V8 engines drives the engine via a torque transducer and has uncovered over two dozen specific problems for correction before shipping the engines to the vehicle assembly plants. A torque sensor in a tractor could duplicate this in the field.

The indicated power of an engine can be obtained by monitoring the fuel flow with the new electronic control fuel systems. This is satisfactory as long as the engine remains healthy. Just because fuel is going into an engine, it does not mean that the fuel is being used efficiently. If an injector fouls up, or a ring sticks, these malfunctions cannot be diagnosed because the indicated power is unchanged from that of a healthy engine.

Making the tractor tests more useful to the farmer

If tractors were equipped with flywheel mounted torque

sensors, it would be especially beneficial during the OECD tests to compare the brake power with the PTO power; and if each test station was equipped with dynamometers capable of measuring the power at each driven wheel, the efficiency of the drive trains could be recorded in the tests. Some multi-geared transmissions and hydraulic pumps are very inefficient at the rated speed of the tractor and these power wasting units would be uncovered. These transmissions and pumps noticeably increase in efficiency when run at lower speeds which inflate the lugging ability figures noted in the OECD and Nebraska tests.

Actually if these dynamometer efficiency and durability tests could be carried out, there would be no need to run the drawbar tests on concrete or tarmacadam, which are labour intensive, except to check the comfort, drive by noise, general handling, etc. They would be replaced with a series of graphs similar to those in the paper but based on axle power and brought up-to-date with field tests on different hard to soft soils for each of the basic tractor drive configuration i.e. 2WD, FWA, single tyres, duals, triples, 4WD fixed, 4WD articulated and crawlers with metal and rubber tracks. Probably only one typical tractor in each group needs to be tested. Once these are established, they would probably last for another forty years which is how long the present method of drawbar testing has lasted. It would also allow the Nebraska tests to be carried out all year round.

At the same time, the drawbar pulls of various modern tillage implements would be standardised so they could be matched with the tractors as would typical weight transfer figures for mounted implements on various soils. There might be different lists for a particular country or area.

Currently, the farmer for whom the tests are supposed to provide information in selecting and using tractors, is unable to determine from them how they will perform in his fields. With the standardised graphs printed out for the tractor under test and with the assurance that it does develop its advertised power he should easily, with or without a personal computer, determine exactly how to set up the tractor for maximum efficiency in his own fields and with his own implements. Further, manufacturers would have a standard method to rate their tractors and their implements. They could also play a large part in securing the data by working closely with the test stations in formulating the standards for the graphs and charts. The annual worldwide fuel savings would be substantial as would be the reduction in pollution.

Conclusions

In summary, a flywheel located torque sensor:

- provides the tractor with its own built-in dynamometer capable of reading out the power and torque of the engine at all times, when monitored along with engine speed sensors;
- provides a diagnostic tool for detecting hidden problems with engine output;
- provides a feedback into the engine's management system for better control;
- saves the costs of the top or lower link sensing components;
- controls the depth of cut of mounted and semi-mounted implements more accurately and more closely maintains the ground speed of the tractor than is possible with either top link or lower link sensing, especially when the ground conditions vary and when climbing gradients because the sensor monitors the implement draught load and the rolling resistance as well as the extra power required to climb a gradient;
- handles both close coupled and long or heavy mounted implements, such as one way reversible ploughs because the angle of the line of pull has no affect on the torque sensor's performance;
- operates both front mounted and reverse operated implements on the three-point hitch and controls their depth of cut;
- controls and maintains the tractor's progress in the field when operating trailed implements on marginal and rolling terrain;
- provides the tractive efficiency by comparing the axle power with the drawbar power, if combined with a load sensing pin in the tractor drawbar and a ground speed 'radar' device, thereby allowing the driver to operate the tractor at peak efficiency, by using an instrument panel display;
- signals the gearshift sequence of a powershift transmission it can automatically upshift or downshift the transmission to suit the soil conditions either in conjunction with or without depth control of a tillage implement;
- senses the torque on a PTO shaft connected to a forage harvester and signals the gearshift sequence of a powershift transmission to suit the density of the crop and prevent jamming the cutting mechanism;
- significantly reduces wear and tear on the tractor by reducing the range of engine speed variations in the field;
- reduces initial shock on the starter motor (using the Foxwell design), because the engine is turned via the torque sensing springs;
- works with all configurations of tractors, small and large, from 2WD, FWA, 4WD, 4WD (articulated), crawlers with metal and rubber tracks and bi-directional tractors as well as many industrial earthmoving tractors;
- allows the power of the tractor to be checked during homologation and regulatory checks;
- reduces the pollution emitted by the tractor engine;
- improves fuel economy;
- reduces the need for extremely high torque back-up engines, saving cost and protecting the transmissions which have to absorb the high torques;
- works with torque converter transmissions used in earthmoving tractors with front or rear blades;
- enables the axle power to be accurately determined and shows up inefficient transmissions, by replacing test tracks with axle drive dynanometers for official test purposes;
- facilitates the presentation of a set of standard curves for different types of soils with certain implements, by providing accurate assessment of the axle power available, so making the Organisation for Economic Co-operation and Development (OECD) test reports easier to understand;
- eliminates the need for track testing and so enables the Nebraska tractor tests to be carried out year round.

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DLG approval for Accord Monopill precision drill

Kverneland's mechanical sugar beet drill, the Accord Monopill SE, has achieved exceptional practical results during a recent field test by German agricultural institute DLG. In doing so, the Accord precision drill has achieved DLG approval for sowing commercial beet seeds into a conventionally prepared seedbed.

Testing the drill's operational ability in a 176 ha field found that the Monopill's percentage of misses are low, at 1.4%, while doubles were virtually non-existent at 0.4% - the latter earning the drill full marks during the evaluation test. In addition, plant emergence was considered very good at 88%, while precision placement of seeds was found to be within a tolerance of +/- 20 mm.

From an operator's point of view, the DLG found the drill to be easy to operate - filling and emptying of individual seed hoppers was said to be easy, as was the operation of the drill monitor, the setting of planting distances and the control and sequencing of tramlining.

The DLG's report also found that planting depth and parallelogram clod deflector position were easy to adjust, while switching between work and transport positions was said to be easy to execute and took about five minutes to achieve.

At speeds of up to 8 km/h, the Monopill's seed placement in each row was found to be very accurate, and the level of emergence was said to be very good - both areas in which the Monopill was awarded a maximum score.

Kverneland's Accord range of precision beet drills also includes the Optima - a pneumatic precision drill designed as a modular machine. Such a construction enables growers to choose from a range of working widths from 3 m up to 9.3 m, and with a maximum of 18 rows.

CONTACT

George Randles, sales director, Kverneland (UK) Ltd. Tel: 01744 853200. Fax: 01993-853400

E-commerce will account for over half of the global agrochemical trade by 2005

The e-commerce revolution has hit the $30 billion global agrochemical industry. Agrochemical manufacturers are purchasing raw materials through Internet based Electronic Trading Exchanges (ETEs). Farmers are buying inputs on-line and are benefitting from Internet-based information providers. Distributors and dealers are also using Internet based ETEs to revolutionise the agrochemical distribution network.

'E-commerce has started to have an impact at every level of the agrochemical industry, from the purchasing of raw materials to the retail sale of the branded product' says Philip Jarvis, author of a new Agrow report, E-commerce: Opportunities for the Global Agrochemical Industry. 'Moreover, we estimate that within five years e-commerce will account for more than half of global agrochemical trade - equivalent to $15 billion of goods traded via electronic channels'.

The US is leading the way in Internet based e-commerce, and US farmers have now had the opportunity to purchase agrochemicals on-line for one full growing season. The report estimates that 10-15% of the crop protection products used during the 1999-2000 season moved through e-commerce channels at some point on their route down the distribution chain, and that this figure is expected to reach 50% by 2005. XSAg.com is the leading US based e-business catering to the agrochemical distribution network. XSAg.com operates as an Electronic Trading Exchange, allowing buyers and sellers of agrochemical products to trade anonymously. Anonymous on-line trading has enabled horizontal movement of products between distributors and between dealers, a channel not economically viable through traditional business practices. The first UK based e-business facilitating trade in agrochemical products, is globalfarmers.com

The report explains how the development of Internet trading of chemical raw materials and intermediates has been led by the diversified chemical industry. CheMatch.com and ChemConnect.com, the two leading chemical industry ETEs, have provided chemical companies and agrochemical manufacturers with the opportunity to undertake spot purchases and chemical contract auctions on-line. AgroConnect.com hosts the first ETE specifically facilitating trade in agrochemical intermediates and active ingredients. Based in Singapore, AgroConnect.com provides Chinese and Indian agrochemical manufacturers with an ideal opportunity to enter the global agrochemical market. AgroConnect.com also facilitates trade in branded crop protection products presenting agrochemical distributors around the world with the opportunity to move excess branded stock.

Farmers are also benefitting from the e-commerce revolution as e-businesses supplying crop protection products to the agricultural industry offer both 'content and commerce'. Loss leader information services are used to attract potential customers to the profit generating 'commerce' aspects of the site. Loss leaders usually include news reports, weather forecasts and market information. The e-commerce facilities offered to farmers include interactive business models such as on-line auctions and Electronic Trading Exchanges, and more traditional on-line brochure type business models. These e-commerce facilities provide farmers with the opportunity to purchase inputs, including agrochemicals, and to sell produce and livestock through Internet based farmer markets.

The report concludes that, through every level of the agrochemical industry, from the manufacturer to the distributor to the end-user, e-commerce is already being used to reduce transaction costs and increase competitive advantage. Within five years e-commerce will grow from being seen as an alternative to traditional business practices, to become the accepted method of business within the

AWARDS

Innovation at Smithfield

The Farm Energy Centre (FEC) unveiled some of the most up-to-date energy efficient technology at Smithfield 2000.

Innovations included storage and control equipment for bulbs, an electric irrigation pump station, a milk pump speed control and a new range of agricultural fans.

Through its Trade Membership Award Scheme, the FEC encourages members to submit new products and installations in energy innovation. There are two categories of award - project installation and product. An award ceremony took place at Smithfield 2000 and the winning technology was highlighted throughout the show.

'The FEC is delighted to receive support from the Institution of Agricultural Engineers (IAgrE) to help encourage development within the industry. Energy efficiency is a key issue in the future of farming and it's essential that manufacturers are aware of what the industry needs and for farmers and growers to know what is available,' says FEC's manager, Andrew Kneeshaw. 'We (encouraged) farmers and growers to visit our stand, discuss energy issues and find out about the latest technology to help with energy efficiency,' adds Mr Kneeshaw.

Mr Chris Whetnall, Chief Executive of the Institution of Agricultural Engineers, said: 'The IAgrE is pleased to continue its support of FEC's initiatives in working together with manufacturers and installers to improve energy efficiencies. With reduced margins across our industry, the need to reduce costs is of paramount importance. It will, as ever, be agricultural engineers such as those working with FEC and the award winners, who will be the innovators improving returns to the producers.'

The winners

Project Installation: Octagon Products - tulip stores

A design of storage and control equipment for tulip bulb stores at Spalding. The project incorporates the coordination of several engineering principles - heating, cooling, dehumidification and fresh air integration - through a single controller. This equipment allows the monitoring of motors, provides improved control for temperature manipulation and reduces man-hours.

A menu-based controller offers a number of options for case of operation. There is great potential for energy efficient storage through an effective and accurate control system.

- Consistent environmental condition ensuring crop quality
- Enhances disease control
- Improved conditions for retardation
- Reduction of man hours per year
- Ease of operation
- Potential for energy efficiency

Contact: John Madigan, Octagon Products, 3 Brindley Close, Drayton Fields Business Park, Daventry, Northants, NN11 5RP. Tel: 01327 677100.

Product: Fabdec Ltd - Veri-Kool milk pump speed control

Veri-Kool can be installed to work in conjunction with any make of plate cooler and bulk tank to further reduce the temperature of the milk before it enters the cooling vessel. Test sites in both the UK and Northern Ireland have proved that savings, of up to 30% reduction in cooling costs can be achieved. Reduction of milk temperature prior to entering the bulk tank cuts down on compressor run time, which reduces electricity costs.

- Increased plate cooler efficiency
- Helps maximise efficiency of bulk tanks
- Reduces running costs by cutting down compressor run time
- Can be installed to work in conjunction with any make of plate cooler and bulk tank
- Proven savings of up to 30% in cooling costs

Contact: Brian Colley, Fabdec Ltd, Grange Road, Ellesmere, Shropshire, SY12 9DG. Tel: 01691 627200

The runners-up

Project Installation: Caprari Pumps (UK) Ltd - electrical irrigation pump station

A design including two 262 kW Caprari electric irrigation pump stations to extract water from 1 by 120 million gallon reservoirs at Elveden Farms, Norfolk. Due to a large variance in water demand, operational efficiency is a key factor. Two fixed speed pumps and one variable speed pump provide control and balance the system. Two output submersible pumps supply water directly to the suction manifolds at each station and use automatic speed control to ensure correct suction pressure.

Unico Flux vector drives and software jointly developed with Powerflow Services ensure the optimum number of pumps operate in response to the wide range of demand, ensuring maximum efficiency.

- Energy reduction by using electronic control/ drive system
- Reduced on-site installation time - packaged unit
- Easy integration with existing systems
- Energy saving potential
- Ease of operation - menu driven controller allows easy inputs of pressure set points and priming/start procedure
- Free standing

Contact: Peter Billing, Caprari Pumps (UK) Ltd, Caprari House, Bakewell Road, Orton Southgate, Peterborough, Cambs, PE2 6XU. Tel: 01733 371605.

(continued)

Product: Soler & Palau - new range of agricultural fans
ensure good air circulation in stock sheds with low noise emissions and energy efficient operation. Good heat dissipation through cost aluminium impeller hub and rot proof plastic blades and wall plates.

- Improved levels of air movement and energy efficiency
- Specially manufactured motor to ensure minimum energy use
- Low noise motors insulated to IP 65/ class F standard
- Aluminium hubs for long term durabilty and heat dissipation
- Rot-proof glass filled nylon blade
- Rated for single phase operation - 3 phase optional
- Designed for operation in ambients up to 70¡

Contact: Graham Mooney, Soler & Palau Ltd, 19-23 Betts Avenue, Martlesham Heath, Ipswich, IP5 7RH. Tel: 01473 626277.

MORE INFORMATION

Contact Pete Smith on the Trade Membership Award Scheme at the Farm Energy Centre on 024 7669 6512 or email peter@farmenergy.com

AWARDS

Helmut Claas Foundation announce first UK Awards

The Helmut Claas Foundation has announced that the first United Kingdom winners for an award are Andre Paul, a BEng Honours Agricultural Engineering Student at Cranfield University (Silsoe), and Alan Haycocks, who is a BSc Honours Agricultural Engineering student at Harper Adams College.

The Helmut Claas Foundation was created last year to help promote science and research in agriculture, by granting awards to engineering students for first rate projects, research studies or other publications in the agricultural engineering field.

Two awards are made in both Germany and the United Kingdom. The first prize is a grant of 200 Euros (approx. £120) per month for two years, and the second prize is a grant of 200 Euros per month for one year.

Andre Paul, who is from Guyana, won the first prize for his work on the application of 'precision farming' technology for estimating sugar cane yield and sucrose content in the field. Andre Paul worked for the Guyana Sugar Corporation prior to arriving at Silsoe and the judges noted that the project was imaginative, potentially extremely valuable to the industry and brought together several advanced technologies.

The second prize was awarded to Alan Haycocks for his project at Harper Adams on computer modelling of the loads induced by a tractor three-point linkage.

The assessors considered that both these projects were in different ways both excellent and well deserving of recognition by the Helmut Claas Foundation.

Andre Paul receives his Claas Foundation award from Helmut Claas (centre), Chairman of the Claas Group Supervisory Board, with (from left to right) his project supervisor Dr Peter Crossley, and the UK judges Brian Finney CBE, Professor Brian Witney and Dr Dan Mitchell.

Alan Haycock, awarded second prize.

AWARDS

Young Woman Engineer of the Year Award

Samantha Hubbard, who works for Shotton Paper Company plc in Flintshire, was presented with her prestigious national Award in January at a special ceremony held in London at the RSA (Royal Society for the encouragement of Arts, Manufactures and Commerce). The 27-year-old engineer received a cheque for £1,000, a silver rose bowl and a certificate from Lord Sainsbury of Turville; Parliamentary Under Secretary of State for Science and Innovation.

Runner-up and winner of the WISE/IBM prize (WISE - Women into Science and Engineering) was Monika Sud, 23, from Reading, Berkshire. Monika, a full-time mechanical engineering student and part-time Piping Designer with Foster Wheeler Energy Ltd based in Reading, received a cheque for £600 donated by WISE/IBM and a certificate.

A Prize for Special Merit was also awarded to 29-year-old Karen Phillips, a Chief Petty Officer Weapon Engineering Artificer at HMS Collingwood in Fareham, Hampshire. Karen received a cheque for £300 and a certificate.

Winner of the 2000 Mary George Memorial Prize (offered to younger entrants who, whilst academically eligible, have yet to gain the experience and responsibility required for the main Award) was Nicola Bradford, 22, a Core Team Member Lean Manufacturing at BAE SYSTEMS Marine in Scotstoun, Glasgow. Nicola received a cheque for £500, a silver salver and a certificate.

Jointly sponsored by the Institution of Incorporated Engineers (IIE) and the Caroline Haslett Memorial Trust (CHMT) this year's Award, once again, attracted a substantial number of high calibre contenders with a wide range of knowledge and experience in electronic, electrical and mechanical engineering. The IIE and CHMT have great pleasure in congratulating the four prizewinners on their achievements.

HEALTH & SAFETY

Company directors must be more accountable on health and safety

Today the Health and Safety Commission (HSC) launched a public consultation on its draft code on health and safety responsibilities for company directors and Board members of public sector organisations.

The code aims to help directors to ensure that health and safety risks arising from their organisations' activities are properly managed and that adequate measures are taken to protect both employees and members of the public.

The draft code makes clear that Boards need to:

- accept joint responsibility and leadership for their organisations' health and safety performance, providing a clear health and safety policy, and explaining how it intends to deliver its health and safety objectives;
- appoint one Board member to champion health and safety issues;
- ensure that individual members of the Board recognise their personal liabilities and responsibilities under health and safety law;
- make sure that all Board decisions reflect the organisation's health and safety policy, especially when making investment decisions on new equipment, premises and products, and by doing business with companies who themselves have sound health and safety policies and practices;
- consult staff fully - via trade union representatives, where appropriate - on all health and safety issues, as required by health and safety law;
- keep informed about - and on top of - all health and safety issues affecting the organisation and its performance.

HSC Chair Bill Callaghan said: 'Many employers take their health and safety responsibilities seriously, but there are still too many who don't. Directors must be accountable for their organisations' health and safety performance: this should be a core requirement of business activity, not an inconvenient 'add-on'. Health and safety performance is just as important as financial performance. Quite simply, those who cannot manage health and safety, cannot manage.

Under current law, individual directors and managers can be prosecuted if their actions - or lack of them - lead to work-related deaths, illness or injury. The code seeks to ensure that everyone at Board level recognise and acts on this responsibility.'

Mr Callaghan added: 'Ignorance is no excuse. I want to see all firms taking their health and safety responsibilities seriously - and this means at boardroom level. I would also like to see organisations publishing their health and safety record in their annual report and I will be taking steps to ask Britain's major enterprises to ensure that they do so.'

'The cornerstone of good health and safety is effective partnership between management, employees and unions. The code makes clear that directors must ensure that staff are consulted on all health and safety issues affecting the company.'

Mr Callaghan concluded: 'The British economy loses £18 billion a year through workplace health and safety failures, while the cost in terms of human suffering cannot be measured. Directors have a heavy responsibility towards both their staff and members of the public, not to mention the taxpayer who often picks up the bill for negligent performance.'

SCHOLARSHIPS

JCB Scholarships will boost the flow of Harper Adams Engineering Graduates

JCB, one of the best known names in British engineering, is investing £750,000 over the next four years in a joint venture with Harper Adams University College to boost the flow of engineering graduates.

The collaboration will promote engineering as an attractive option for students entering higher education and will help scholars cope with the increasing burden of tuition and living expenses.

Prof Wynne Jones, Principal of Harper Adams University College, is delighted with the joint venture.

'This is a tremendous initiative by JCB. It sends a strong signal to school leavers that there is a real demand for high quality engineers and that Harper Adams is the appropriate place for their education. The scholarship scheme will help the industry attract the best possible people and is a significant investment by JCB in the future of technological design and development.'

Paul Pritchard, Head of Training and Development, JCB, sees the scholarship scheme as an essential initiative in the drive to attract good students into engineering.

'JCB has built a reputation for innovation and quality engineering in the construction and agricultural markets and we are committed to building on that. Our future growth plans, within a competitive world marketplace, demand that we continue to employ and develop high-calibre individuals. Our initiative with Harper Adams University College should ensure that, together, we can encourage more students to enter the exciting world of engineering and thus nurture top class professionals for the future.'

The JCB Engineering Scholarships package will include:

- A scholarship of £2,000 a year for each student
- Employment at JCB during vacation periods
- Employment at JCB during the sandwich year

JCB will sponsor an intake of up to 12 students a year on four-year engineering courses at Harper Adams. While primarily directed at students entering Harper Adams new Off-Road Vehicle Design Degree, applicants will also be considered for other courses including:

- Agricultural Engineering
- Agricultural Engineering with Marketing and Management
- Engineering Design and Development

Selection of students will be carried out in conjunction with Harper Adams normal procedures. However, students applying for the scholarships will be invited to spend time at JCB headquarters for further assessment to determine their attitude, skills and abilities for a career within the company.

On graduation, JCB Scholars can expect to enter employment with the company. For those who have performed particularly well in their studies, the opportunity will be available to apply for a JCB Gap Year - a posting to one or more of the firm's overseas bases. The first JCB Scholars will enter Harper Adams in October 2001.

CONTACT

Geoffrey Wakeham, Engineering Course Manager, Harper Adams University College, Newport, Shropshire TF10 8NB. Tel: 01952 820280.

ENVIRONMENT

Access to environmental solutions at the fingertips of British business

Funding by the Government's Joint Environmental Markets Unit (JEMU) has now given UK business managers access to environmental solutions offered by companies from around the globe. Access to this network of over 8,000 Consultancies and Equipment Suppliers is through the Greentie website (www.etsu.com/greentie) or via a CD-Rom.

Originally created by the international community to assist businesses in developing countries to achieve sustainable growth and development by providing easy access to suppliers of environmental products and services, it quickly became apparent that businesses in the developed world lacked the same basic information. Responding to this need, JEMU were at the forefront of a drive to make the fully searchable Greentie database available on the intemet to give UK business access to suppliers of services covering:

- Air Pollution and Control
- Contaminated Land
- Marine Pollution
- Recovery and Recycling
- Energy Efficient and Renewable Energy Technologies
- Waste Management
- Waste and Waste Water Treatment

For more details of the Greentie Database or, if you are a supplier of environmental products or services, to register your company on the database free of charge, please go direct to the Greentie Website: www.etsu.com/greentie or

CONTACT

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WOODLANDS

Community forest regeneration work advances

The latest Annual Monitoring Report of the Community Forest Programme, which has been presented to the Department of Environment, Transport and the Regions, records another year of achievements for this, the UK's largest, environmental regeneration initiative.

In the year 1999-2000, England's twelve Community Forests created new woodland and revitalised old woods across an area equivalent to 19 times the size of London's Hyde Park, and also opened up access to other woodland and open areas equivalent in size to 512 Old Trafford (Manchester) cricket grounds. This work has been carried out in and around major cities and towns.

The 12 Community Forests are now established and delivering real benefits for the local and regional environment and economy. The Programme demonstrates how the combination of a strategic vision, an integrated approach to area based planning, and partnerships between the public, private and voluntary sectors, can deliver real benefits close to where people live.

New woodland planting of 1200 hectares brings the total to over 11% of the long term, 30-50 year target. Over 1400 hectares of existing woodland were brought into management for the first time, with the result that 93% of existing woodlands within Community Forests are now under some form of structured, sustainable management. Over 1300 hectares of woodlands were opened up for public recreation and access, providing real opportunities for local people to benefit directly.

Community Forests are, however, more than just about trees. They are about a wide range of other land types and land uses. For instance, significant progress continues to be made opening up non-woodland areas for access and recreation particularly on the urban fringe where there is a demand for informal recreation, community involvement and nature conservation. Work is also underway transforming closed landfill sites and reclaiming the land for forest related uses.

Achievements for 1999/2000

- Nearly 1200 ha of new woodland were planted, bringing the total planted since 1991 to 7419 ha.
- Over 1400 ha of existing woodland were brought into management for the first time, with the result that 93% of established woodland within the Community Forests is now under some form of structured management regime.
- Over 1300 ha of woodland were opened up for recreation and access. Since 1991, 11413 ha have been made available for public access.
- Nearly 750 km of linear routes were restored, upgraded or created. In total, there are now over 5750 km of routes in good condition.
- Just under 875 ha of non-woodland habitat were created or brought into good management.
- Over 170 km of hedgerow were planted or brought into management.
- Over 260 ha of derelict land were reclaimed for forest-related uses.
- Nearly £7 million was received in the form of sponsorship, donations, support in-kind and landfill tax.
- Nearly £18 million was secured from non-forestry sources such as the National Lottery.

PEOPLE

Management changes at John Deere

Deere & Company has announced that Alec McKee will be taking up a new position as vice president, worldwide marketing in the company's agricultural division, based in the USA at Lenexa, near Kansas City.

He is being replaced at John Deere Limited by Clay Sherrill, who is currently sales branch manager of the Minneapolis branch in the USA. The appointments are effective from 1 st February 2001.

'I have had 28 very happy years working for John Deere Limited, the last eight as managing director,' said Alec McKee. 'A major part of my new responsibility will be to ensure that we have the right products to meet our ever changing customer needs, and to provide increased customer and market development support on a global scale.'

After gaining an NDA from Harper Adams Agricultural College in 1967 and an NDAgrE from Writtle College of Agriculture in 1968, Alec McKee worked for four years with a John Deere distributor in Zambia.

He joined John Deere Limited in 1972 as a trainee territory manager, becoming a territory manager in 1973, business management adviser in 1974, credit manager in 1975 and commercial manager in 1979. He was subsequently appointed general sales manager in 1991, and became managing director of John Deere Limited in February 1993. Alec is a past president of the Agricultural Engineers Association.

Clay Sherrill is a graduate of Wofford College and gained an MBA from Georgia State University before joining Deere & Company in 1977. He held a variety of marketing roles in different North American sales branches before becoming Minneapolis sales branch manager in 1998.

'I am looking forward to learning about the business in the UK and Ireland, and to settling my family here in the next few months,' said Clay Sherrill, who is married with two children. 'Europe is more advanced in some ways than the USA, particularly with regard to more intensive use of machinery and the highly competitive nature of the marketplace - it promises to be an exciting challenge.'

Training success for Ag Tech apprentices

From left to right: Brooksby Melton College machinery lecturer Richard Trevarthen; Ag Tech student David Price of Palmers Agricultural; Brooksby Melton College machinery lecturer Phil Spencer; Ag Tech student Michael Strange from Masons of Chudleigh; and John Deere Ltd manager, customer support Peter Leech. Both students are displaying their recently awarded City & Guilds Medal of Excellence, the only two given to agricultural engineers in the latest of these annual national awards.

Technicians graduating through the John Deere Ag Tech programme will now have the best overall qualifications of any agricultural engineering apprenticeship.

These include the BAGMA/City & Guilds of London Institute 4024 Agricultural/Groundcare Service Engineers NVQ Level 2 & 3 Certificates and the John Deere Ag Tech Certificate.

Successful completion of the fourth year of the programme will also now qualify technicians for Associate Membership of the Institution of Agricultural Engineers, and registration as Eng Tech with The Engineering Council, provided free by John Deere.

'Only by setting an example of professional excellence within the company can we expect our dealer and John Deere trained personnel to receive the professional recognition that they deserve,' says Peter Leech, John Deere Ltd's manager, customer support.

The roll call of successful Ag Tech graduates who have gone on to achieve prestigious national awards reflects the quality of the training they receive. Latest recipient of a City & Guilds Medal of Excellence for the NVQ Level 2 training programme is David Price of Palmers Agricultural in Maidstone, while Michael Strange from Masons of Chudleigh won a Medal of Excellence for Level 3, the first time a John Deere Ag Tech student has achieved this level.

Over half a million candidates complete a City & Guilds qualification each year, and only 205 medals were most recently awarded, with David Price and Michael Strange the only two agricultural engineers to win national Medals of Excellence.

Medals of Excellence at Level 2 have also been awarded previously to Carl Pitelen of Ben Burgess & Co, Norwich (1997) and James Paterson of Lawrence (Farm Equipment) in Berkshire (1996).

The John Deere Ag Tech programme, run by machinery lecturers Richard Trevarthen and Phil Spencer of Brooksby Melton College and funded by Leicestershire TEC, first started in 1992 and won a National Training Award at the end of 1997.

It offers three years of 'on-the-job' training with block release at Brooksby Melton College, which also includes regular attendance at the John Deere training centre at Langar. A fourth year of special training leads to the John Deere Ag Tech Diploma.

The programme continues to attract young agricultural apprentice engineers from John Deere dealerships across the country. A total of 90 have now qualified since the programme began, and another 56 are currently undergoing training.

CONTACT

Peter Leech, John Deere Ltd, Langar, Nottingham NG13 9HT. Tel: 01949 860491. Fax: 01949 860490.

SAFETY

Research justifies lap straps on tractors

Twenty-seven tractor drivers have died in the last ten years as a result of ejection from the cab in an overturn. New research conducted for the Health and Safety Executive (HSE) by the Transport Research Laboratory, and announced at the Royal Smithfield Show, suggests lap straps for tractor drivers would have prevented this total.

The research used computer modelling to compare injuries suffered by drivers when using a lap strap or not. Tests were based on a modern tractor and cab and were validated against real life overturns of the same specification tractor using a crash test dummy to establish the forces involved. Typical overturning scenarios taken from real life accidents were used in the tests.

Results showed greater head, neck and spinal injury forces for unrestrained drivers. Only one force, spinal axial tension (lower back) was higher for drivers using lap belts.

Greg Bungay, Head of Agriculture and Wood Sector said: 'The research clearly supports the HSE view that fatalities and serious injuries would be reduced by the widespread use of lap belts by tractor drivers. The extent of injuries is greatly reduced and the likelihood of being ejected from the cab and subsequently crushed, reduced to a minimum.

'It was also interesting to learn that the unrestrained driver was often thrown against the cab door facing backwards. The computer modelling showed this was due to a combination of a strong sideways impact force, a slight forward momentum and an unexpected twisting action on the driver's body. The result is the full body weight of the driver is flung against the cab door, which helps explain how the cab door is so easily burst open during overturning accidents.

'There is no doubt that lives would be saved and injuries reduced if farmers fitted lap belts to tractors and drivers wore them when working on slopes, silage clamps or wherever there is a risk of overturning.'

HSE investigated tractor overturns show it does not take steep slopes to turn a machine over. Ground conditions and attached equipment are often the main factors. Half of all investigated tractors turnovers occur on slopes of 10 degrees or less.

- Most tractor seats have mounting points for lap belts even if they are not fitted as standard. Lap seat kits can be purchased relatively cheaply.
- Full seat belts can only be fitted under the direction of the manufacturers. This is because the framework of the cab cannot legally be welded or drilled.
- Seat restraints must not be fitted to a machine without roll over protection, otherwise the operator will almost certainly be crushed in an overturn.
- Improved lap belt design has overcome initial objections that they were too restrictive and prevented drivers turning to watch machinery.
- HSE is currently running an Agriculture Workplace Transport campaign to reduce transport related deaths which are the highest cause of fatalities in the industry.

Contact: HSE Agriculture Information Sheet No 37 Operator seat restraints for mobile equipment in agriculture and forestry, gives more information and advice. It is available free from HSE Books. Tel: 01787 881165.

INFORMATION

Copies of the Research Paper CRR no 310 'The effectiveness of lap straps as seat restraints on tractors in the event of overturning' ISBN 0 7176 1909 5 price £20, are available from HSE Books, PO Box 1999, Sudbury, Suffolk, CO10 2WA. Tel: 01787 881165. Fax: 01787 313995. Priced publications are also available from all good bookshops.

REGISTRATIONS

UK tractor registrations - company share 1999

The data analysed are tractor units registered for road use under the Department of Transport body code 'agricultural tractor'. Almost all tractors sold into agriculture are registered. However, it should be noted that small tractors (e.g. below 30 kW) are sold in various markets and not all are registered.

1999

Manufacturer	*Units*	*% of Total*
John Deere	2,958	25.5
New Holland	2,329	20.0
Case *	2,296	19.8
AGCO **	1,589	13.7
Renault	506	4.4
Valtra	394	3.4
JCB	289	2.5
Others	1,260	10.8
Total	11,621	100.0

* Case includes Steyr
** AGCO includes Massey Ferguson and Fendt

Data includes compact tractors (30 kW or under) and agricultural tractors (over 30 kW). Data released after one year delay. Source: A.E.A.

Quarterly SPRING 2001

MEMBERSHIP MATTERS

THE NEWSLETTER OF THE INSTITUTION OF AGRICULTURAL ENGINEERS

AGRICULTURE ENGINEERING - PAST, PRESENT AND WHERE TO NEXT?

The conference was organised by the Northern Ireland Branch of the Institution of Agricultural Engineering to celebrate not only a millennium year but also the 21st anniversary of their "full branch status".

The event was held at the prestigious Kings Hall Conference Centre, Balmoral, Belfast on the afternoon of 24 February 2000 and attracted around 70 farmers, contractors and machinery dealers.

The title said it all. The aim of the conference was to review the developments in agricultural engineering in the past century (including reference to the contribution made by Northern Ireland) and then to look at what is happening now and where it goes from here.

The Branch Chairman Hugh McIlvenna welcomed everyone and in particular the conference speakers. Session chairman Terrence Chambers introduced the first speaker, Mr Derek Shaw, who looked at the global changes in agriculture and the food industry with his presentation "Food for Thought". Mr Shaw is Director of Shaw"s Farms Ltd in Ireland and Australia and chairman of a number of food and farming organisations. He was certainly well qualified to look at the "Global" food situation and by using some now infamous quotes, he illustrated that progress required the need for lateral vision and change. In a Northern Ireland context he showed how agricultural outputs are steadily dropping while in the manufacturing sector there is generally a steady increase in output. In the "New Consumer Society" priorities were changing. We now lived in a "global village" with the emphasis on lifestyle - not class, service - not goods. Mr Shaw introduced the expression "Time Poverty" where time consuming activities such as shopping, cooking and cleaning are getting pushed out as supermarkets, fast food, recipe meals, internet shopping etc.

The Chairman of the Northern Ireland Branch, Mr Hugh McIlvenna at the vintage tractor display outside the conference venue.

provide the solutions. Thanks to the excellent slides, facts and statistics galore were used effectively to illustrate his thoughts on the issues that would determine the future in agriculture and the food industry not only in NI but also on the world market.

The next speaker was Bill Martin, who looked at some developments in agricultural machinery with a focus on Plough, Sow, Reap and Mow. Mr Martin is the former Head of Agricultural Engineering at Greenmount College and well known locally as an historian with a particular knowledge of Harry Ferguson. On this

occasion he started at "grass roots" agricultural engineering with a unique look at plough developments from animal powered wooden implements through steam ploughs and gyrotillers to the Ferguson tractor/plough phenomenon. He continued to follow the cycle through seeders, mowers and harvesters, all illustrated with excellent slides.

Before the mid afternoon tea break, Terrence Chambers chaired a discussion with Cyril Johnston, founder of Cyril Johnston Farm Machinery Ltd and John Cleland, former machinery sales manager with Kennedy"s of Ballymena. This was a fascinating and humorous journey through the lives of two men who had collectively been involved in the farm machinery business in NI for over 100 years.

Chairman Bertie Hunter then introduced Dr Mike Kelly, Head of Farm Building Design at The Scottish Agricultural Colleges. Dr Kelly gave his views on the developments in farm buildings with particular reference to what was happening at SAC. He emphasised how the current economic climate in farming had impacted on low cost housing. He explained the complex interaction between social, structural and climatic conditions and cited a number of specific examples of how better design and layout could optimise these and minimise costs. He finished by concluding "The agricultural industry will need to cope with an ever increasing rate of change so the industry must be highly receptive to change."

Bernard Rice is the Head of Agricultural Engineering at Oak Park Research Centre, Carlow and he presented an Irish perspective on "The future of Farm Mechanisation." Aided by an excellent slide presentation, Mr Rice looked first of all at the social and economic pressures for change. Looking at the trends over the past few years, he predicted what would happen in the next 15 years in dairy farms, dry-stock farms and arable farms. He touched on GPS and yield mapping but felt that in Ireland there will always be problems with wet crops, work interruptions and small fields. In general, land use would see little change but there would be a big change in the farm structure with fewer units, fewer machines and more contracting of work with large specialised equipment.

The final speaker was Professor Dick Godwin who spoke on "Future Advances in Agricultural Engineering." Professor Godwin, a Past President of the Institution of Agricultural Engineers, has vast knowledge and experience gained from his work at the Silsoe College wing of Cranfield University and he did not disappoint in giving comprehensive coverage of the subject in his own inimitable style. With excellent visual aid slides, he started by looking at cultivation and establishment costs and systems. "Work the top few inches with skill rather than the whole profile with horsepower" was his message. He predicted that the future would see an ever-increasing use of electronics. Professor Godwin dealt in detail with the further developments in "Precision farming", advances in tractor ergonomic design and improved tractor/implement efficiency with built in diagnostic and servicing facility.

The conference was a great success thanks to the quality of the speakers and their presentations. Credit also to the ambitious and hard working committee and in particular branch secretary John Mawhinney who attended to all the details relating to the speakers and their slide presentations. Thanks also to the many sponsors who helped make it possible and to members of the Northern Ireland Vintage Association for providing tractors for the static tractor display.

Harry Barr

LONG SERVICES CERTIFICATES

50 years

Name	*Grade*	*Date of Anniversary*
John Shewring	IEng FIAgrE	23 Jan 2001
Keith Edgar Morgan	CEng FIAgrE	1 Feb 2001
Randolph William Ladbrooke	IEng FIAgrE	20 Feb 2001

35 years

Anthony Arthur William Chestney	CEng MIAgrE	13 Jan 2001
Robert Tunstall Lindsay	IEng MIAgrE	13 Jan 2001
Ananda Rajasinghe Molligoda	EngTech MIAgrE	13 Jan 2001
David Fleetwood Ellam	FIAgrE	13 Jan 2001
Edward Stewart Escourt Southcombe	CEng FIAgrE	13 Jan 2001
David Llewellyn Bebb	FIAgrE	13 Jan 2001
Peter William Carpenter	MIAgrE	13 Jan 2001
James William Mason	EngTech MIAgrE	13 Jan 2001
Brian Terence Webb	IEng MIAgrE	13 Jan 2001

25 years

Keith David Broomer	EngTech MIAgrE	5 Jan 2001
John Vashon Tyrwhitt Wheeler	CEng FIAgrE	8 Jan 2001
John Gwyn Bumby	MIAgrE	5 Feb 2001
David John Mattey	EngTech MIAgrE	15 Feb 2001
David John White	CEng FIAgrE	1 Mar 2001
William Waddilove	IEng MIAgrE	2 Mar 2001
Brian Frank Fraser-Smith	CIAgrE	6 Mar 2001
Stephen Allen Clark	IEng MIAgrE	6 Mar 2001
Robert Lockhart	MIAgrE	25 Mar 2001
John Frederick Scott	IEng MIAgrE	25 Mar 2001

LETTER TO THE EDITOR

Dear Sir,

Thank you for publishing my piece about tractors and for extending to me the opportunity of debate with some true professionals in Ag Eng.

Having written a short explanation of the main concepts which have caused HST Developments Ltd., (Trantor) to try to change the world of tractor design (in addition to originating JCB Ltd's work on the Fastrac and helping them to appreciate the significance of all-round suspension from 1982-1984), I was thrilled to be reminded of the paper, published in October 1970 in Agricultural Engineer, by Alan R. Reece entitled, 'The Shape of The Farm Tractor' which was but one of the many interesting topics to be enlightened by the then Reader (?) in the Ag Eng Department of Newcastle University.

Reading Alan Reece's paper again recently and properly for the first time (!) and later asking my secretary to type it (for e-mail transmission to some overseas friends) I wondered if our tiny company's work at all measured up to this most significant of papers written so long ago?

The Trantor (farmer James Anderson, Tony Milroy MSc Silsoe and co-founders) team had been invited to NIAE Silsoe and to Newcastle in the early 1970's after we had built some 20 prototypes. I think we passed the Reece 'paper test' of having a new concept but the ag-detail side left lots to be desired. At Silsoe they made us plough and James Anderson (a Scottish farmer) did well (with strakes) but why on earth did these Silsoe Ag people want us to plough? Simple really, they could then see how poor the transport-first tractor was, compared to those wondrous ploughers! In the first decade of transport-first tractor development, these 2 days were the most discouraging of events which, we learned later, were par for the course, for innovators. The lunch and tea menu of humble pie was, however, a little excessive!

How different it was at Newcastle. The department assembled and gave our two speakers a most enjoyable ride for they teased and joked and generally understood that the Trantor team were reasonably intelligent people trying to change the world of tractors - without any success! Our view, 'suspension is significant for off road and on-field!!' was not contested but our 3 point linkage was totally unacceptable!

For those Ag Engineers who really enjoy their work and appreciate the benefits of a British education and who care about the future of Ag Eng education and training in UK (if only as a means of helping the developing world) we should perhaps consider what made Newcastle Ag Eng in-part so progressive and NIAE (as it was) so bureaucratic and narrow-minded? Whilst Alan Reece's paper of 1970 reflects much of what is excellent about the Ag Eng profession, the massive wastage of R and D funds (e.g. spent by NIAE on the farm transport vehicle) is a good example of how not to invest for the future of industry. Modern policy makers concerned with our industrial future have to be supportive of invention, innovation and entrepreneurship (the lifeblood of our future) and they have to be able to find it by visiting small firms who are backing a hunch without too clear an idea where its leading - except that it's forwards!

Alan Reece's paper was not only far-sighted but his statement, 'There are powerful conservative forces at work discouraging the attempt to radically advance tractor design!' contains more than a modicum of wisdom!!

Yours sincerely,

Graham Edwards

INSTITUTION MEMBERSHIP CHANGES

Admissions

Associate Member
R G Copland (Orkney)
D J Dobson (Lancashire)
M M Hay (Renfrewshire)
P D Lawson (Lincolnshire)
P E May (North Lincolnshire)
C A Moulis (Lincolnshire)
J R Speir (Nottinghamshire)
M A Strange (South Devon)
J D Walton (North Yorkshire)

Associate
D M Carless (Gloucestershire)
B J Freeman (Essex)
S J Hunt (Essex)
C Jones (Shropshire)

Transfers

Member
R J Brindle (Staffordshire)
R W Causer (New Zealand)
A Goodall (West Yorkshire)

Associate Member
S S M Davies (Shropshire)
L K Jordan (Ireland)
D Sayer (North Yorkshire)

Deaths

C L Fox (Lincoln)
M S Gill (London)
J A Hellier (Essex)
D G L Monnington (Sussex)

Engineering Council

Registrations

CEng
R W Langley (Essex)
E J Ratcliffe (Staffordshire)

EngTech
J Cowie (Fife)

NEWS OF MEMBERS

In response to the request, in the News of Members column in the last issue of Landwards, for members to contact me with their news, I have had a very interesting letter from **John Coleman**. John has been a member of the Institution for 51 years. Although supposedly retired 20 years ago, he is still working harder than ever, and he says "why not - I am only 80 years old". John was President of the Agricultural Engineers Association in 1978 and chaired the Smithfield Show Joint Committee in the same year. Having sold and withdrawn from the chairmanship of Coleman International in 1981, he started John E Coleman Associates, a consultancy advising on marketing of agricultural mechanisation and finding outlets for farmer inventors.

John is now very busy for a Dutch company who manufacture agricultural drain cleaning equipment. There is a steady market in the UK where maintaining subterranean drains by low pressure jetting is accepted as an urgent necessity. He is also involved in a Dutch innovative weeder which has a front mounted patented steering control system. John is able to advise client companies on setting up distributors and organising demonstrations.

Thank you John for this information, and we hope that you will continue to enjoy working.

Martin Peters made his first trip to Australia for his work experience year in 1994, whilst he was an undergraduate student at Silsoe College. He says that he immediately fell in love with the country (lifestyle, culture, climate and people) and returned a further 4 times on vacation. Two years ago, he and his wife decided to apply for residency visas which would allow them to stay in Australia indefinitely. After a long wait they were notified that their application had been successful and started preparing themselves for the move. Having both given up their jobs in the UK and not having anything particular lined up, they decided to take an extended holiday and travel overland to Australia. They are now settled in Australia and are in the process of setting up their own company offering the Magnascan system of non-invasive soil mapping to farmers and amenity turf users. Martin jointly developed the Magnascan system for his former employer in the UK, ASE Solutech Ltd of Biggleswade, Bedfordshire. Martin's company is also a distributor for the American farm management software package "Farmworks".

M Mutema is at present doing a PhD in soil science in the Department of Agriculture and Food Science at Reading University.

Congratulations to **Seamus D Murphy**, who graduated with a Doctorate of Engineering from Cranfield University, Silsoe in July 2000. The doctorate was sponsored by Silsoe Research Institute and the Engineering and Physics Science Research Council. The title of the doctorate is "spray transport from a moving boom" which is a study of the combined effects of agricultural sprayer boom design and sprayer nozzles on spray drift.

In December 2000 Seamus left Silsoe Research Institute and joined Oxford Lasers as a Sales Engineer, within the Imaging Division. The Imaging Division specialise in the combined application of lasers and high speed imaging to develop solutions for customers. They provide products within the areas of high speed imaging, PIV velocity measurement, particle/drop sizing and flame penetration imaging. Applications for Oxford Lasers products range from Agricultural (droplet/particle analysis), Automotive (combustion processes and injector performance), Welding processes (visualisation of arc) and Aerospace (aero engines and blade breaks). As Sales Engineer, he is responsible for liaison between customers and the Imaging Division, and the development of system solutions to suit customer requirements.

Congratulations to **Philip Amos** who completed his MSc in Environmental Engineering at Newcastle University in September 1999, graduating with distinction, and was also awarded the Severn Trent Prize for best Environmental Engineering Student. He has since taken a break year to travel in New Zealand and South America, arriving in Chile ten days after Pinochet's return home, and then travelling overland through Bolivia to Peru. Philip had an eventful journey through Bolivia. Roads were blockaded in protest at rising water and fuel prices and poor living conditions. As a result, road transport was impossible so he decided to fly to the capital La Paz, with the commercial branch of the Bolivian Air Force. However, the plane sped off the end of the runway, and suffering from shock, he and fellow passengers stumbled out of the plane and waited next to the wreckage while jet fuel poured out of the engines and the crew checked off their baggage tickets. The airline office staff assured them that the plane would be repaired in time for the afternoon flight, but he decided that he would try to catch a bus to La Paz and then head off to Peru.

Philip arrived back in the UK at the beginning of June and immediately went out to Pakistan as a member of the Anglo New Zealand Hindu Raj Climbing Expedition. Their four man expedition was funded by the Sports Council and the Mount Everest Foundation, which was approved by a committee of well known climbers including Sir Chris Bonnington. The team visited an unexplored valley in the North West Frontier Province, close to the Afghanistan border, and made the first ascent of a previously unclimbed 6000 m peak. They had hoped to climb more of the surrounding peaks but were hampered by unseasonably bad weather which kept them rain bound at base camp for a week where they played endless games of cricket with the local goatherder.

Since returning home Philip has taken up a position as an Environmental Engineer in the Edinburgh office of Cuthbertson Maunsell Limited. His work is primarily focused on design, restoration and environmental management of landfill sites in Scotland, although the company also has ongoing work in Antigua and Vietnam.

Tony Chestney

Write to Tony with your news!
His address is:
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Bedford
MK40 4BY

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BUSINESS

Time is running out for 27% of the Agri-Machinery Industry

Over a quarter of all UK agri-machinery companies will not see out 2001 in their present shape, according to Plimsoll Publishing. Identified in their new First Edition 2001, Plimsoll Portfolio Analysis, they are predicting in 2001 these losers will disappear, be taken over or be forced to change to stay in the market.

The analysis, which included 772 companies in total, predicts that the Winners and the Chancers, who are capturing market and profits with a combined sales growth average of over 14.6% are pushing the Losers out of the market. As they try to maintain sales and profit targets, acquisition activity could intensify in 2001.

The First Edition 2001, describes four types of company strategy. The Winners have low borrowings (debt) as a percentage of sales and have high sales growth. The Chancers have high borrowings and high sales growth. The Sleepers have low borrowings and low sales growth. The Losers have high borrowings and are growing below average.

For these 151 Losers, time is running out. Their level of debt is high at 25.6% of sales on average. A more sensible average would have been about 11%. These companies have lost market share and sales growth average for the latest period is showing an average decline of 12.7%. Their margins are slim at 0.6% on average and almost 40% of them are loss making. They have borrowed to stay in the market, but how long can this strategy be maintained?

The publication contains the most up-to-date analysis of 772 UK agri-machinery companies covering their latest four years of trading. Presented in a one-page per company format, setting into context the strengths and weaknesses of each company couldn't be simpler. In addition, it is a great tool for searching acquisition prospects.

CONTACT

To order a copy of the First Edition 2001 Plimsoll Portfolio Analysis: Agri-Machinery for 305, please call Jennifer Ovington on 01642 257800. Or for a full version of this particular research visit www.plimsoll.co.uk. Readers of this publication can obtain a 5% discount by mentioning this article upon ordering.

TAKEOVER

CNH sells UK Tractor Plant to Landini

CNH Global has reached an agreement for the sale of its tractor manufacturing plant in Doncaster, England, to Landini S.p.A. The sale, which is in accordance with the European Commission's approval of the business merger of New Holland and Case Corporation in 1999, is subject to final approval by the European Commission.

In addition to the manufacturing facility, the agreement includes design, and manufacturing rights to the C, CX and MX-C tractor lines, as well as commercial rights in the European Economic Area (EEA). It also includes sale of the McCormick brand name to Landini. Landini intends to sell these tractors under the McCormick brand. The C, CX and MX-C tractors will continue to be produced at the Doncaster plant to be sold by Case IH outside the EEA under a supply agreement that CNH negotiated with Landini.

Through a manufacturing agreement with CNH, Landini will produce for Case IH the MX Maxxum middle power range tractors in the Doncaster plant, and in the Case IH brand, for Case IH dealers traditionally supplied from Doncaster. CNH will continue to produce MX Maxxum tractors for distribution in other markets around the world. More details about this agreement will be provided following approval by the European Commission.

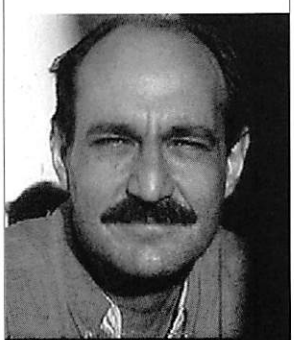
With strong global brands, CNH is a leader in the agricultural equipment, construction equipment and financial services industries and had combined 1999 revenues of approximately $11 billion.

CNH sells its products in 160 markets through a network of more than 10,000 dealers and distributors. CNH products are sold under the following brands: Case, Case IH, Fermec, Fiatallis, Fiat-Hitachi, Link-Belt (earth-moving equipment), New Holland, New Holland Construction, O&K and Steyr.

Packaging fresh mangoes for export

Federico Hahn

MANGO DESTONER



BIO NOTE

Dr Federico Hahn is a Technological Assessor at CIAD, Apartado Postal 32-A, Culiacan, Sinaloa 80129, Mexico, and is involved in the development of machines for processing food and of sensors for food quality.
E-mail:
bandido@cln.megared.net.mx

Introduction

Mango is an exotic fruit grown in tropical countries. Mexico was the first exporter of fresh mangoes, in the world. It is now the second largest producer, just behind India, selling over three times more than the Philippines. Although most of the fruit is exported fresh, huge quantities are lost due to its short shelf life.

Processed mango products have an increased shelf life and so add economic value to the commodity. Cost and quality competitive mango products are being sought and several processing plants are being installed in the country. The main processed products obtained from mango are:

- dehydrated mango;
- pure mango;
- mango nectar.

Fruit drying is one of the oldest methods for storing food and can be used as an alternative to frozen and canned products. Fruit drying is simple and easy, and several dehydration techniques are available. Many products are dried under natural atmospheric conditions, but using furnaces to control temperature, moisture and airflow variables increases its efficiency. It is difficult to distinguish between natural and high quality dried fruits. The characteristics of the dehydrated product include:

- the same nutritional components as the fresh product;
- the provision of a sterilised product;
- a reduction in size to half the volume; and
- a reduction in weight to one quarter of the fresh product weight.

The world global

competence is intense and for dried mango the world market is controlled by the Asian countries, mainly Thailand, the Philippines and India. In Mexico, dried mango is becoming a popular product and more than ten dehydration plants are now established.

To increase efficiency in production, further development of more accurate and automated processes is required.

misalignment of several fruits caused many stones to be cut (Fig. 1). To reduce this occurrence, an automatic mango sizer was elaborated and used a laser scanner (Hahn, 1998).

Mango processing is increasing day by day and automation is required, especially when no manual labour is available. For pulp and juice, a pulper is used to separate the fruit pulp from the stone and the peel. The pulper is a mill, which rotates

Fig. 1. Mango cut through the stone

Existing mango destoning machine

In an earlier system, using gravity, mangoes fell through vertical tubes directed over disk blades, which then destoned the fruit. The mangoes firstly had to be manually sorted by size to enable the fruits to fall through the correspondingly sized tube. Size differences and misalignment of several fruits caused many stones to be cut (Fig. 1). To reduce this occurrence, an automatic mango sizer was elaborated and used a laser scanner (Hahn, 1998).

Mango processing is increasing day by day and automation is required, especially when no manual labour is available. For pulp and juice, a pulper is used to separate the fruit pulp from the stone and the peel. The pulper is a mill, which rotates at 600 rpm, pressing the product against a stainless steel screen. The pulp that crosses the screen is pumped to other equipment for thermal treatment and further processing according to the final product desired. Mango for canning and dehydration requires the pulp to be obtained from the mango cheeks without losing the product consistency.

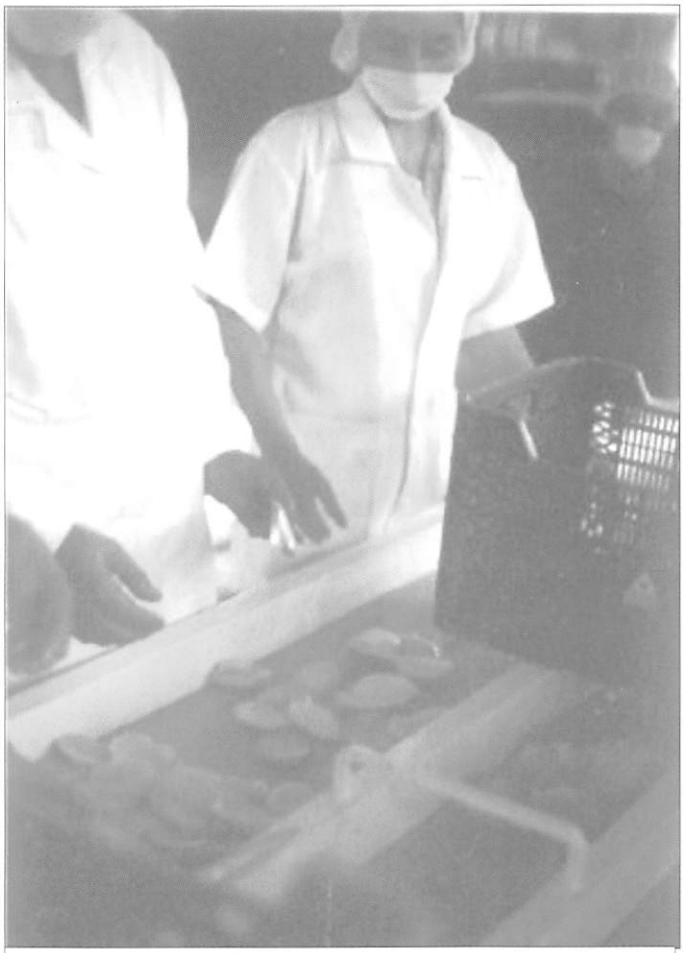


Fig.2. Manual cutting and destoning

Table 1. Percentages of pulp, stone and peel for different varieties on mango fruits

Cultivar	*Weight, g*	*Pulp, %*	*Peel, %*	*Seed, %*
Edward	473.4	76.1	17.2	6.7
Haden	297.2	69.5	21.2	9.4
Manila	209.3	65.9	20.3	13.8
Tommy Atkins	374.5	76.2	14.1	9.7
Kent	486.0	74.9	14.7	10.4
Keitt	433.8	74.2	15.3	10.5

Peeling and stone extraction are the most expensive processes during mango dehydration due to the intensive manual labour required. During mango drying, 20 tonnes of mangoes have to be peeled and destoned to produce one tonne of dried fruit. Half of the fresh mango weight accounts for the peel and stone, but varies with the variety (Table 1). The remaining pulp consists of 80% of water, which is removed during the drying process.

Mangoes are cut with knives extracting the stones. The remaining mango cheeks contain the pulp that is extracted with a tablespoon (Fig.2). A very skilful worker cuts 500 kg of mangoes per day, which corresponds to 1500-2000mangoes depending on their size. Therefore 40 skilful workers are required to cut the 20 tonnes of mangoes, so that a further 40 workers can peel them. With the actual wages, the fruit cost and labour cost are similar. PROCTOR dehydrators can produce more than ten tonnes

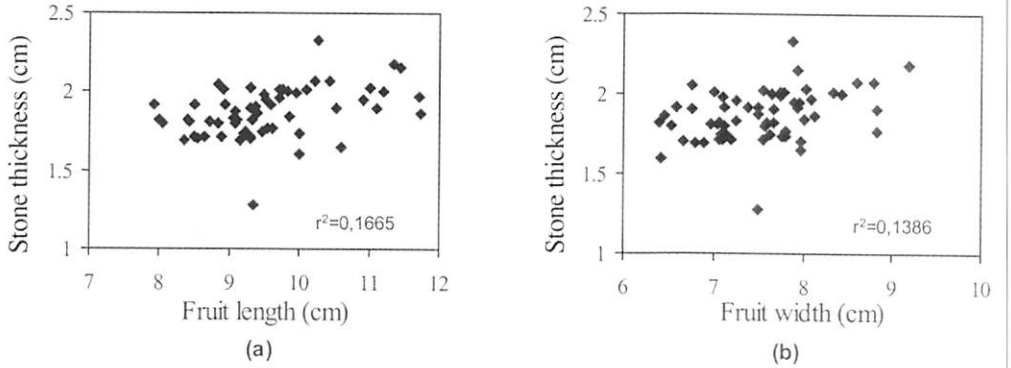


Fig. 3. Stone size depending on fruit (a) length; and (b) width

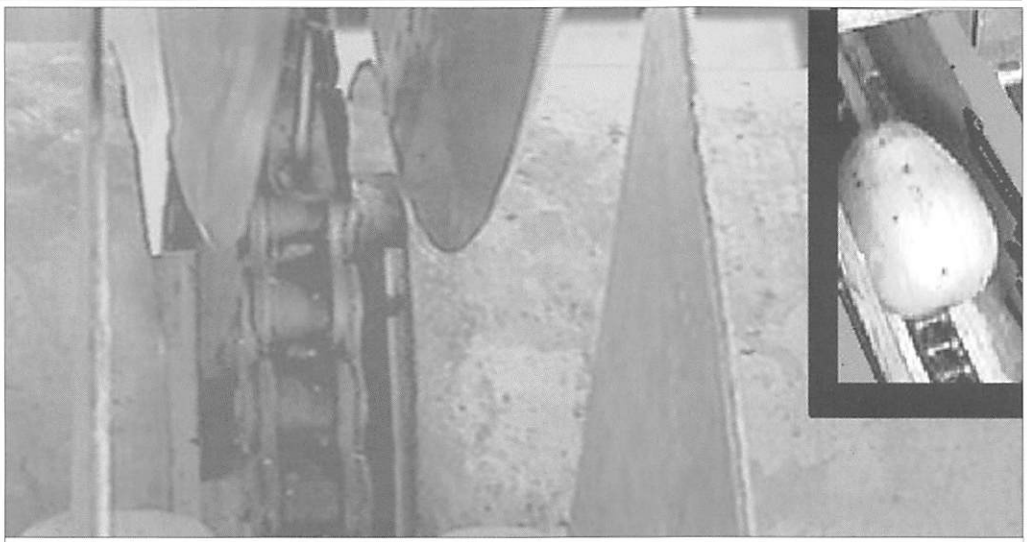


Fig. 4. Chain-nail positioning system with pressing sheets and mango pictorial

of dry fruit per day, so more workers would be required.

Fully automated destoning process

A machine that can destone mangoes automatically is required. This needs to be capable of:

- fruit sizing;
- fruit orientation;
- fruit cutting;
- cheek positioning.

Fruit sizing

Fruit sizing is required to avoid changing the distance between blades. Otherwise the pulp cheeks will not be cut properly. Several techniques can be used such as laser sizing (Hahn, 1998) or mechanical sorting. The size-sorted product is introduced to the mango destoner, where the seed size establishes the fixed blades spacing. In a previous study the mango width was studied using 'Kent' mangoes; the stone size does not increase dramatically with size (Fig. 3). If the space between the blades is small and a big mango is introduced the stone will be cut. If the spacing is big and the mango small, the pulp cheeks obtained will be small remaining most of the pulp around the seed. So the maximum pulp is obtained with an efficient fruit sizing system. With three sizes, the probability of cutting stone is reduced to 7% and the quantity of pulp obtained on the cheeks increased. With four sizes the system becomes more efficient, and less than 5% of the fruit are cut by the seed.

Fruit orientation

Mango is not a completely spherical product and it has to be oriented properly so that the stone travels parallel towards the cutting blades (Fig.4). If the fruit is not oriented properly, the seed will be cut. At the moment that the fruit touches the blades, it tends to roll so it was necessary to look for a fruit holding mechanism. A chain with stainless steel nails was used to fix the mango as it travels towards the cutting edge at a speed of 2 rpm. The nails prevent the product rolling and the quantity of mango that could be cut is dependent on the speed at which the worker inserts the fruit.

The worker takes the previously sorted fruit and inserts it onto the nailed chain. Two stainless steel sheets are used to orient the fruit. Each sheet is spring loaded at on one end to exert pressure and eject the fruit. If the same force is exerted on both ends, the mango is centred to the middle of the cutting blades.

Fruit cutting

Two stainless steel circular blades are moved by a 0.75 kW electric motor turning at 1750 rpm. With the 0.75 kW electric motor drive, the blades are brought to a complete halt if they encounter a seed. The blades and the travelling chain rotate in opposite directions pulling the mango towards the cutting edge, reducing mango rotation. The high force required for cutting the peel cause this rotation, which is avoided with the chain-nails. When the fruit is overripe it will turn before being cut. The distance between both disk blades is adjusted according to the fruit size.

Cheek distribution

The cheeks cut by the destoner have to be delivered to the peeling band, which transports them to the peeling machine. Once the cheek is cut (Fig. 5) it falls by gravity towards the band maintaining always the peel towards the stainless steel sheet. Different angles were tested to avoid cheek bouncing and it was found that 30 degrees was the proper inclination. The mango cheek is properly oriented in 98% of the cases at the peeling band.

When a stone is cut, the mango has to be removed automatically. The motor current is sensed and when it reaches a given threshold a solenoid is activated separating the cheek. In an experiment carried out with 1000 mangoes it was noted that after manual sizing, 93% of the

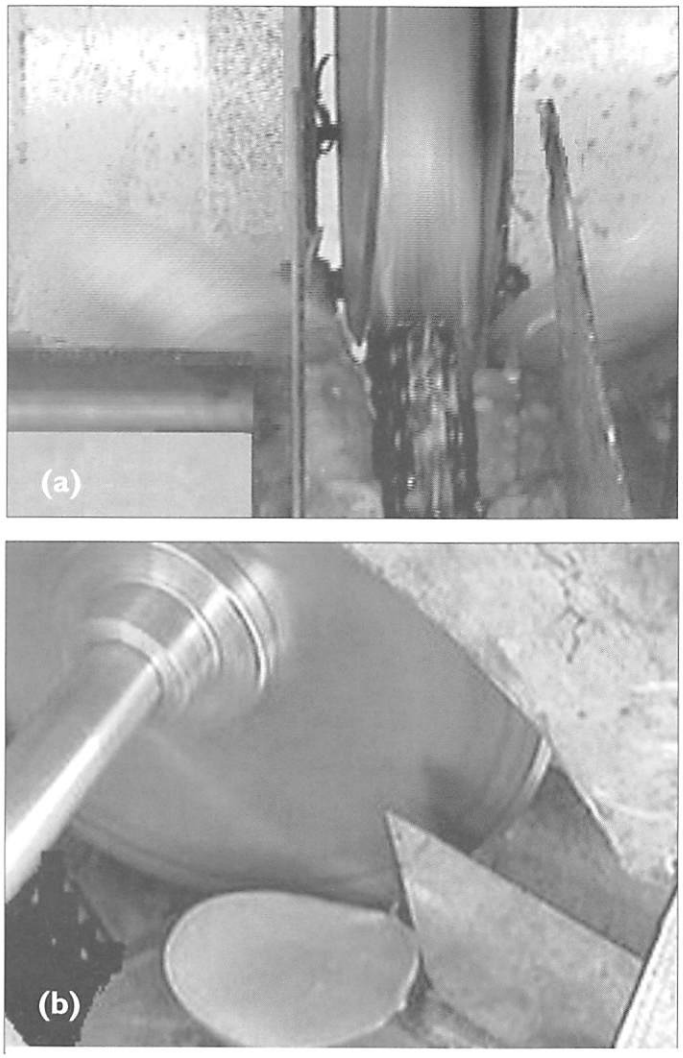


Fig.5. (a) Mango cheeks being cut from the stone passing between the two discs; and (b) position of one cheek after the cutting operation is complete

fruits were properly cut, with less than 10% of the pulp remaining on the stone. With four parallel pair of blades, 20 tonnes of mango could be cut in one working day of 8 hours. Higher speeds could be achieved but it could be harmful for the workers.

Work is now being done to completely automate the machine, both to avoid workers having to insert the fruit and to eliminate overripe, fermented fruit. The affected fruit must be removed to prevent the final juice product being tainted, and it is possible to sense overripe fruit by its colour.

Reference

Hahn F (1998). Automatic mango cutter. ASAE Paper No. 983119

Commercial Members

Bomford Turner Ltd
Salford Priors, Evesham
Worcestershire WR11 5SW

Douglas Bomford Trust
16 The Oaks
Silsoe
Bedford
MK45 4EL

Farm Energy Centre
NAC
Stoneleigh
Kenilworth
Warwickshire
CV8 2LS

John Deere Ltd
Harby Road
Langar
Nottinghamshire
NG13 9HT

White Horse Contractors Ltd
Lodge Hill
Abingdon
Oxfordshire
OX14 2JD

Academic Members

Cranfield University
Silsoe
Bedford
MK45 4DT

Harper Adams University College
Newport
Shropshire
TF10 8NB

Lackham College
Lacock
Chippenham
Wiltshire
SN15 2NY

Sparsholt College
Sparsholt
Winchester
Hampshire
SO21 2NF

Built to last: Honeywell introduces new corrosion-resistant pressure reducing valve

Honeywell's corrosion-resistant D15P pressure reducing valve now features an epoxy powder coating that protects valve components, so ensuring long-term, reliable operation in underground chambers. The epoxy powder coating is applied inside and outside the valve body to provide a high degree of protection against corrosion. The powder coating is physiologically safe and non-toxic. Other new features include an increased outlet pressure range of 1.5 to 8.0 bar and a position indicator on the spring bonnet to provide easier setting.

Built to a reliable and well-proven design, the Honeywell D15P is designed for use in potable water supply systems and is used in municipal, industrial and commercial water networks. It is WRc approved for use with potable water and all materials in contact with the water are KTW approved. It also carries full WRAS approval.

Honeywell D15P pressure reducing valves minimise water consumption and repair costs by protecting water installations against damage from excessive pressure in the water supply. By reducing the operating pressure and maintaining it at a constant level, the Honeywell D15P also minimises flow noise in the installation. They can be used in multi-dwelling buildings as well as industrial and commercial premises. The set output pressure is held constant across a wide inlet pressure fluctuation.

Honeywell supplies the D15P in sizes from 50 mm to 200 mm (DN 50 to DN 200) and with a maximum inlet pressure rating of 16.0 bar.

Contact: Honeywell Control Systems Ltd, Honeywell House, Arlington Business Park, Bracknell, Berkshire RG12 1EB. Tel: 01344 656000. Fax: 01344 656240. email: uk.infocentre@honeywell.com Web: www.honeywell.com/uk

INCREASING PRODUCTIVITY AND IMPROVING LIVELIHOODS IN SEMI-ARID AREAS

Jim Ellis-Jones, Vurayai Zvarevashe, Steve Twomlow and Kelly Stevenson

Research-development linkages, a case study from southeast Zimbabwe

Background

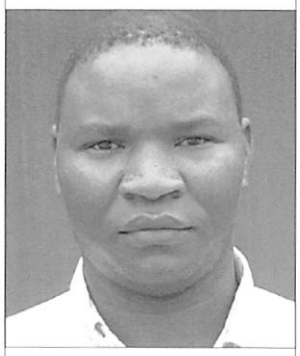
A small dam and community resources management project in Masvingo, southeast Zimbabwe, assists local communities to improve their livelihoods through the rehabilitation and protection of small dams, development of small-scale irrigation and conservation of the physical catchment of the dams. Each dam has three types of catchment:

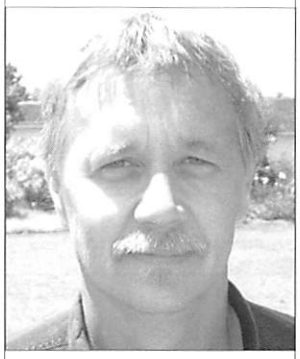
- a micro-catchment, being the area immediately surrounding each dam, which is presently being fenced as a protective measure;
- a geographical catchment, being the physical area from which run-off water is collected in the dam; and
- a social catchment, being the area from which the different user groups is drawn and who utilise the resources of the dam within the geographical area of the catchment and can comprise a number of different villages each with its own traditional leadership.

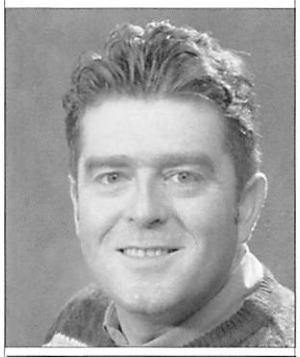
CARE is concerned with all three catchments but in the first instance is seeking to facilitate the establishment of measures to reduce the amount of siltation going into the dam through appropriate production and conservation methods in the micro and geographical catchments to control erosion.

The project aims to improve household livelihood security through increased production incomes. As such, it has a number of interdependent components:

- assisting community organisation and management;
- promoting community awareness of environmental issues;
- rehabilitation and protection of damworks and







BIO NOTE

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catchment areas (typically 200-5000 ha);
- development of household irrigation systems (typically 1-3 ha in extent);
- improving dryland farming practices and farmer-led research trials;

Marketing garden produce

Particular attention is being given to the benefits that can accrue to the poorest households in the community

To ensure sustainability after CARE's facilitating role has been completed it is essential that the ability of the local community and institutions to maintain the dam and irrigation maintenance is strengthened. Key to this are the improvement of dryland farming and conservation of common property resources in the catchment to reduce siltation and increase dam life. Without these the income generating effect of irrigation is likely to be short-lived and benefits to the poorest illusive. This paper addresses the role of natural resources in peoples' livelihoods and work undertaken to achieve sustainable catchment management

Purpose of research and approaches taken

The work undertaken is interdisciplinary, technically relatively straightforward, but institutionally and socially complex in that a number a number of organisations internal and external to the community are involved. The approach has been designed to:

- reinforce the development objectives of the project through promoting long-term infrastructure maintenance and ongoing testing of technology options by the local community;
- provide opportunity for researchers to address community needs in a participatory and iterative way; and
- empower local people to take the initiative, set the priorities, participate in the management, evaluation and use the research results.

A key concern of the project is to reduce the levels of siltation in the dams to ensure the sustainability of irrigation and other dam benefits. This means improving conservation in the catchment areas. The project is therefore promoting several initiatives.

- The use of improved soil and water conservation (SWC) through participatory catchment planning, development and dissemination of appropriate technologies in each catchment area.
- The adoption of a range of tillage and water conservation measures through farmers' experimentation with innovative between and in-field SWC methods. These include the testing of various crop establishment techniques (Riches et al., 1998), such as rip-planting and seed priming and use of water harvesting techniques for fruit orchards. In addition, improving the maintenance and the use of draught animal equipment (Koza et al., 1999), and the introduction of innovative low cost implements are ongoing aims.
- The introduction of drought tolerant crops by linking farmers with the International Maize and Wheat Centre (CIMMYT) in Mexico and commercial companies for testing drought resistant crop varieties. This in turn has led to these organisations being more aware of the criteria farmers take into account when selecting new varieties.

Knowing more about household assets and understanding how people derive their livelihoods is important in ensuring that the poorest also benefit. The integration of these research activities within a development project is providing the basis for improving linkages between the community, extension personnel, and researchers. It has led to greater appreciation of the problems faced by farmers and the role that research should play in improving livelihoods of the poorest households within a rural community

Results and discussion

Understanding how peoples secure their livelihoods

A detailed socio-economic survey (Ellis-Jones, 1999) identified a low level of assets, low incomes (less than US$ 1 per day), low productivity and the importance of watered gardens as a an income source, particularly for the poorest. Participatory wealth ranking exercises (CARE, 1999) identified four categories of household based on livestock and implement ownership, use of crop inputs, yields achieved, as well as type of homestead, education level of head of household and sources of income. This categorisation was used to classify beneficiaries using livestock and implement ownership as the main indicators of the four household resource groups (Table 1).

Poorer households are more likely to be female headed, have a younger head with a smaller household, fewer people living away from home, receive lower cash incomes, own fewer livestock, own fewer implements, cultivate smaller arable areas, achieve lower yields, spend less on crop inputs and have less access to watered gardens. Overall the main sources of income are local wages, dryland crops, remittances,

Table 1. Summary statistics showing the mean for each Resource Group (RG)

	RG1 Well resourced (n=166)	*RG2 Average resourced (n=281)*	*RG3 Poorly resourced (n=192)*	*RG4 Very poorly resourced (n=111)*
Households, % of total	22	38	25	15
Male Head of Household (HoH), % of total	85	81	79	74
Predominant age group of HoH, y	Over 55	Over 55	46-55	46-55
Average household size, no. of people	11.8	9.7	9.1	6.3
No. of livestock owned				
Cattle	9.9	3.2	0.3	0
Donkeys	2.0	1.1	0	0
Goats	7.2	4.6	4.1	0
Implements owned	Full range	Plough	Plough	None
Access to watered gardens, % of total	92	92	90	81
Arable area cropped, ha	2.9	2.4	2.1	1.7
Total maize harvested, kg	1250	520	390	255
Average cash expenditure on crop inputs, US$	42	26	17	12
Average income from crop sales, US$	51	21	11	3

n, sample number

Table 2. Average annual incomes for male and female headed households in each resource group (RG) 1998 (US $/year)

Income source	*Average annual income in each resource category (RG), US$/y*									
	RG1 Well resourced		*RG2 Average resourced*		*RG3 Poorly resourced*		*RG4 Very poorly resourced*		*ALL groups*	
	Male 19%	*Female 3%*	*Male 30%*	*Female 7%*	*Male 20%*	*Female 5%*	*Male 11%*	*Female 4%*	*Male 81%*	*Female 19%*
Dryland	48	42	23	11	9	7	4	1	23	13
Irrigated gardens	10	6	7	7	7	8	5	3	7	7
Livestock	54	5	12	8	2	1	0	0	18	4
Wages	42	4	53	9	44	2	36	2	46	6
Remittances	22	8	19	15	18	8	13	5	19	10
Pensions	23	13	4	8	1	7	0	0	7	7
Total	**201**	**78**	**118**	**57**	**82**	**34**	**59**	**12**	**120**	**46**

livestock, pensions, and irrigated gardens, but there are major differences between households. (Table 2).

In all resource groups (RGs), women headed households earned much lower incomes. Only in the well-resourced group (RG1) was dryland farming and livestock the main source of income. Local wages and remittances were important for men and women in the averaged resourced group (RG2), poorly resourced group (RG3) and the very poorly resourced group (RG4); with dryland crops being important for men and irrigated crops for women, in these three groups.

The order of importance does vary between groups and even though income derived from agriculture is important, local wages and remittances are proportionately higher in poorer households. Loss of income from remittances or wages is likely to have higher impact on the poorer categories. Within an average household of eight requiring approximately one tonne of maize per year to be self sufficient, only RG1s (22%) do not need to purchase additional maize. Other RGs (78%) need additional maize through donation, working for others, barter or purchase. The potential for increasing not only incomes, but also nutrition and health, is large.

Sedimentation studies

Sedimentation in dams is a natural and inevitable process and advice on the sizing of dams to avoid excessive sedimentation has been available since the late 1980s (Kabell, 1984). It is controlled by three factors:

- the sediment load delivered from the catchment;
- the proportion of annual run-off that is stored; and
- the proportion of incoming sediment that is trapped.

Estimates based on these parameters can be used to indicate the time in years before the initial storage capacity is reduced to a specified percentage of the original capacity (Lawrence, 1999). Such predictions are dependent on characterization of the catchment and the impact of conservation. Relief, soil type and drainage, vegetation type and condition, surface water storage, population density and existing and past land use can influence erosion catchment risk. Long term and seasonal differences in the amount, timing, intensity and duration of rainfall will effect soil loss and sedimentation. There can be time lags of 10-20 years between the introduction of

Table 3. Ranking of problems in the catchment using pairwise ranking.

	Problem	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*Score*	*Priority*
A	Gullies	A	A	A	A	A	A	A	7	**1**
B	Stream bank cultivation,		B	B	E	F	B	B	4	**3=**
C	Arable lands too close to waterways			C	C	F	C	C	4	**3=**
D	Cropping without contours,				D	F	D	D	3	**5=**
E	Tree cutting,					F	E	E	3	**5=**
F	Overgrazing close to the dam						F	F	6	**2**
G	Erosion caused by cattle tracks							H	0	**8**
H	Brickmaking								1	**7**

Table 4. Structures constructed and performance (21 catchments)

Structure	*Total number*	*Number in each performance category*					
		Worked well	*Washed away*	*Under cut*	*Side cut*	*Fully silted*	*Desilted*
Masonry weirs	43	36	0	4	4	4	0
Stone check dams	76	64	0	0	9	9	0
Brush wood check dams	27	18	9	0	0	0	0
Gullies filled with stones	66	46	26	0	0	26	0
Gullies filled with bush	9	0	0	0	0	0	0
Diversion banks	32	32	0	0	0	0	0
Dead Level contours	24	22	12	0	0	0	0
Fanya juus	9	9	0	0	0	1	0
Infiltration pits	29	26	0	0	3	6	12
Total	**315**	**253**	**47**	**4**	**16**	**46**	**12**
	100%	*80%*	*15%*	*1%*	*5%*	*15%*	*4%*

effective conservation and significant reduction in sediment yields, especially on larger catchments. Research is ongoing to see if these characteristics can be used to describe historical sediment patterns (Zirebwa & Twomlow, 1999). Sediment traps can provide an initial reduction in siltation, but can become ineffective after 1-2 years.

Most households indicate a need for conservation in arable, grazing and woodland/hill areas, with grazing areas considered the biggest problem. However, recent research in Zimbabwe points to the extreme difficulty of implementing management systems for common property resources (for example Campbell et al., 2000, Frost & Madondo, 1999). This is especially so for woodlands but less so for water (Lovell, 2000). In other countries a slightly more optimistic voice is raised (Farrington et al.,, 1999). A process of participatory catchment planning has been initiated with local communities to pioneer a way forward in Zimbabwe, as regular desilting of dams is uneconomic.

Participatory catchment planning and soil conservation

Participatory planning is being undertaken with local community members and institutions (dam, irrigation and conservation/agronomy committees established in each catchment, traditional leaders as well as representatives from local government). Typically it involves:

- a series of workgroups mapping details and changes taking place in the catchment, establishing the main natural resources activities in the catchment, identifying the institutions who effect or can provide assistance in use of the catchment;
- a transect walk by participants through the catchment noting both positive and negative aspects, obtaining the views of men and women, younger and older people;
- identifying and prioritising problems and suggesting solutions; and
- detailing an action plan and agreeing whom is going to be responsible for following up.

An example of a ranking exercise (Table 3), following a transect walk, shows greatest concern about gullies, over-grazing close to the dam and streambank cultivation.

For each problem, the cause is then identified, possible solutions discussed and an action plan agreed upon. Conservation or agronomy committees appointed by the community are the custodians of the plan and monitor the activities taking place.

Different structures have been promoted and an average of have been installed 15 in each of the 21 catchments surveyed (Table 4). Participatory surveys have shown that while most (80%) have worked well, there have been problems with washing away (particularly in stone filled gullies and dead level contours), under or side cutting (masonry weirs) and siltation. Diversion banks were considered problem free and where infiltration pits have been constructed, a number have been desilted.

There are concerns about the ability, willingness or feasibility of the community to maintain structures, which are either washed away or require desilting. Experimentation with vegetative barriers (vetiver and napier), proven in higher rainfall environments are highly rated by the communities (being easy to maintain with potential to provide grazing), are being increased.

Run-off orchards

The establishment of fruit trees in areas close to people's homesteads using rainwater-harvesting techniques was initiated through inter-farmer visits to view the success of rainwater harvesting (run-off) orchards established by farmers in other areas. This formed an important part of the initial agronomy and conservation programme in order to establish immediate returns to conservation activities. It provided opportunity for farmers to control run-off and observe sedimentation facilitating the identification of problems within catchments. Training was provided by farmers in the layout of the orchards for maximising water harvesting using A frames, digging planting pits and using compost material. Emphasis was given to providing the skills so that visiting farmers would themselves become trainers of

Table 5. Farmer ranking of treatments against their criteria

Criteria	*Score*		
	Harrow, hoe and plant	*Rip and plant*	*Hoe and plant*
Ease of operation after an average rainy season	2	3	2
Ability to conserve moisture	2	3	1
Suitability for different soil types (clay/sand)	2/2	3/1	1/3
Weed growth after planting	-3	-1	2
Draught power requirements	-1	-3	2
Timeliness of operations	1	3	2
Labour required	-1	-3	2
Best germination	2	3	1
Best yield	3	2	1
Total	**9 (+14–5)**	**10 (+17-7)**	**4 (+10-6)**
Rank	2	1	3

(1=low, 2=medium, 3=high, with negative figures indicating disadvantages)

other farmers when they returned home.

Initially, some 7000 trees were supplied to farmers albeit at a subsidised cost, with each farmer being supplied with 5 trees. A considerable number of other households sourced and purchased trees independently. Notwithstanding the demand for seedlings far exceeded the supply and many holes dug for the trees remain unplanted. Experience has shown that all resource categories have benefited in both receiving trees, planting and maintaining them. Over 70% of farmers report that all their trees were alive, one year after planting. Others lost up to 75% of their trees due to lack of fencing and livestock damage.

The promotion of run-off orchards is continuing in all dam areas with successful farmers being further encouraged to act as trainers. Local individual and small community nurseries are being promoted through training and credit with a small charge being charged for tree seedlings. Non-governmental Organisations (NGOs) are not competing with small individual or community nurseries in providing trees for run-off orchards.

Improving crop establishment

An example of an evaluation undertaken by farmers compares harrowing then planting by hoe, direct-planting by hoe, and rip planting all after winter ploughing. Farmers criteria were identified through brainstorming and each treatment ranked according to these criteria (Table 5)

Overall the Rip-plant technique was regarded as being the best and further trials are being carried out by farmers on a wider scale using low cost ripper attachments that can be fitted to the plough beam

Other farmers have experimented with priming maize seed through overnight soaking and planting the next day. Results for participatory trials indicate earlier germination, better crop stands and improved crop growth with less competition from weeds. Problems with handling the seed and rotting if left too long between soaking and planting were identified.

Participatory crop variety trials

An example is the evaluation of a number of commercially available maize varieties (R201, CG 4141, CG 3631, P 3435 and CG 4585). Farmers developed their own evaluation criteria and then carried out a matrix ranking exercise (Table 6).

The maize variety P3435 was considered marginally better than CG4141, with the others having worse qualities. Farmers regarded 'R201 as having AIDS'.

Conclusions

The close interrelationship between research and development provides opportunity for local households and communities to take the lead in prioritising their requirements, participating in the design, implementation, evaluation and use of results. Additional benefits have included institutional strengthening, enhanced environmental awareness, gaining in confidence, ability to resolve conflicts and above all development of farmers own abilities to experiment and not just accept research messages which may or may not be

Table 6. Ranking of farmer criteria on maize varieties

Criteria	*Score*				
	Maize variety				
	R201	*CG 4141*	*CG 3631*	*P3435*	*CG 4585*
Drought resistance	2	2	2	3	1
Cobs covered by leaves	2	1	2	3	2
Synchronisation	1	2	3	3	2
Cob size	1	2	2	3	1
Lines of seed	2	3	2	3	2
Taste	3	3	1	1	2
Time to germination	3	3	2	1	2
Seed size	3	3	2	3	2
Weevil resistance	1	2	2	3	2
Time to maturity	3	3	2	1	2
Overall health	1	2	2	3	1
Resistance to disease	1	33	3	3	3
Yield	1	3	2	3	2
Total	**24**	**32**	**26**	**33**	**24**
Rank	*4=*	*2*	*3*	*1*	*4=*

1=low, 2=medium, 3=high

applicable to local situations.

It has helped research and extension staff to focus their work on farmers' priorities and use farmers' evaluation criteria in the evaluation process.-

Acknowledgements

We would like to acknowledge the support from the Department for International Development, for the work being undertaken. We also thank Angela Crampton for her helpful advice on the draft paper.

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The Society of Operations Engineers appoints its first patron

At its Foundation Luncheon today in London, the Society of Operations Engineers, Britain's newest professional engineering institution, announced Lord Haskel a Labour life peer, as its first patron.

Acknowledging his appointment, Lord Haskel stated, 'I welcome the coming together of road transport engineers and plant engineers to create The Society of Operations Engineers. This demonstrates a forward thinking approach to the development of engineering in Britain. As such, I am pleased to have an opportunity to contribute to this aim to which we are all committed'.

Lord Haskel is no stranger to the world of engineering, having had a long and successful career in business. He has been a Life Peer for seven years and has held front bench posts in opposition and in government and is currently a member of the House of Lords Select Committee on Science and Technology. With a strong and continuing practical interest (Dod's Parliamentary Companion lists his special interests as 'trade and industry, science and technology'), he is well placed to advise and assist the Society as it embarks on its declared task of promoting the significance of operations engineering to business and society as a whole.

David Cox, as president of the Society of Operations Engineers, warmly welcomed Lord Haskel's appointment commenting, 'Our Society has a significant role to play for engineers and technicians in all areas of operations engineering management and technology, as well as the development of UK engineering in general. With his depth and breadth of experience, Lord Haskel's support and interest will be invaluable in helping the Society establish itself as a key organisation'.

HYDRAULICS

Linde's HPR-02 pumps offer greater swept volumes, lower cost and help overcome noise

The critical feature of the new HPR-02 Variable Pump Series from Linde Hydraulics is the unique 21 degree swash angle, which enables much greater swept volumes to be achieved than on normal 18 degree swash angle pumps, all without sacrificing quality or service life.

The radical design of the HPR-02 embraces a whole new concept that sees prices below those of earlier series by between 5% and 20%, dependent on final specification. This has been achieved by considerable investment in dedicated machine tools and improved manufacturing techniques which also give higher volumetric and mechanical efficiencies.

Designed for open loop applications, the new pumps result from an innovative rethink of the basic in-line axial piston, swash plate rotating group. Traditional design swash plate pumps incorporate a ball on the piston end which locates into a socket on the slipper pad. By placing the ball end on the slipper pad instead in can now go inside the piston which reduces overall unit length. This new arrangement enables the critical increase from 18 degrees to 21 degrees for the swash angle, a change which is entirely responsible for the twin benefits of increased swept volumes and higher power density.

Further underlining the cost saving approach was the decision to deploy common rotating groups in both the pumps and motors plus the use of common parts in units of differing capacity.

The new wHisPeRing-02 derivatives of the standard HPR-02 series have been specially developed for systems where lower noise levels are particularly important. Noise in static industrial systems, marine applications and mobile vehicles can be caused by many factors, not all of which are hydraulic. Where airborne noise is partly produced by a hydraulic installation, it will have a pump at its origin.

Airborne noise can also be radiated by structures and can be excited by a prime mover such as an hydraulic pump, an electric motor or perhaps a diesel engine to such an extent that it is audibly intrusive. When this happens there is an increasing number of mandatory Health & Safety considerations to be taken into account.

To address these issues, Linde development engineers set out to analyse and reduce the exciting frequencies and their amplitude generated by hydraulic pumps. Detailed analysis of the pressure ripples within the -02 series HPR pump range enabled Linde engineers to significantly reduce the amplitude of the pressure ripples over a wide range of input speeds and operating system pressures. Typically, sound level reductions of 2 to 4 dB(A) have been achieved by reducing pressure pulsations from 38.7 bar to 11.3 bar.

The new units are available in 55, 75, 105, 135, and 210 cm^3/rev displacement and, while rated at 420 bar, are suitable for a maximum 500 bar. The Linde LINTRONIC OCA (Open Current Amplifier) digital controller is specifically designed for use with Linde's HPR-02 series of power regulated, open circuit pumps which, in addition to either electric motor or diesel engine power limiting, incorporates a secondary feature that provides for direct control of pump delivery, down to zero flow, at pressure.

Tony Clements, Sales & Marketing Manger of Linde Hydraulics pointed out: 'The rotating groups used in the HPR-02 series have been operational for six years in other series, so the engineering and technology are well proven. The design objectives were all realised which has resulted in an extremely compact unit with a high power density, improved efficiency, very low noise characteristics and at the same time, lower prices'.

MORE INFORMATION

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New variable chamber balers offer progressive density

With the emphasis on continually improving bale quality and machine performance, Vicon has introduced two new variable chamber round balers for use in grass and straw.

Designated the RV1601 and RV1901, the new balers replace the previous RV157 and RV187 models. Bale diameters extend from 0.6 m up to 1.6 m and 1.9 m respectively for the RV1601 and RV1901, representing an increase in the maximum bale size of 10 cm compared with previous RV models. And, like their predecessors, the new balers can be specified with Vicon's Opticut crop chopping system and a combination of net and twine tying or net wrap only.

Key to the success of the new RV models is the development of a progressive density bale formation system for improved bale structure, and a new pre-chamber design that provides easy bale starting, regardless of the crop conditions.

'Progressive density is applied through the RV baler's belt tensioning arm,' explains Vicon's technical manager Tim Baker. 'As the bale grows within the chamber, the belt tensioning arm is subjected to steadily increasing resistance from a hydraulic cylinder and a spring tensioner. So as the bale diameter grows, so too does the bale's density.'

'The result is a very firm bale with a moderate core - not too soft, or too hard,' says Mr Baker. 'And with a tougher outer shell, straw bales will be more tolerant to poor weather conditions, while silage bales will maintain their shape for improved stacking and easier rehandling.'

The process of starting a bale has been refined on the new RV models by switching to a single set of belts running throughout the baler. This has allowed the installation of two driven bale rollers above and behind the crop intake as part of a new design of prechamber, in which the bale can start rolling immediately.

'These subtle design changes to the bale chamber mean immediate bale starting in any crop, in any condition,' adds Mr Baker. 'You can drive straight into any swath at working speeds, which means baler output is never compromised.'

Both RV models now use five wide-section belts instead of six belts used on the previous machines. Fewer belts have the effect of reducing crop losses and offering a more positive bale rotation.

'The wider belts now cover 90% of the bale, compared to 81% coverage with the older balers. This means more belt area now grips each bale providing even more positive bale rotation,' says Mr Baker. 'Also, there's less opportunity for crop loss between each belt.'

Vicon has revolutionised the application of net wrap with its new variable chamber balers. The firm is the first to eliminate the need for feed rollers to apply wrap to the bale. 'When the bale tying process is activated, a steel plate presses net wrap against the belts to feed wrap on to the bale,' says Mr Baker. 'It is a simple process that now removes the possibility of net wrap becoming tangled in rollers that were previously used to apply net wrap.'

Both models are equipped with a 2.1 m pickup, to which can be added an integral feed rotor or Opticut crop chopping system.

'A 2.1 m wide pickup means the RV1601 and RV1901 models can easily handle heavy swaths produced by high capacity combines and mower conditioners,' says Mr Baker. 'With the new pre-chamber design, there is no restriction in getting crop into the baler and this contributes to high in-field performance.'

But for heavy, wet silage crops or lumpy, matted swaths, operators can take advantage of Vicon's integral rotor technology by opting for a high capacity feed rotor taken from the firm's latest fixed chamber baler range. The rotor carries large diameter augers which, combined with tines arranged in a helix pattern, improves the way dense, wet grass or heavy, tangled straw is cleared from the pickup.

A further option for the latest RV balers is Opticut - Vicon's crop chopping system that uses 14 stationary knives working against a chopping rotor. When selected, Opticut ensures that 100% of the crop is cut as it enters the baler and the hydraulically adjustable knives can be fully in work, fully retracted or set in an intermediate position.

In-cab controls extend to Vicon's Autoform system which allows the operator to make adjustments to the baler from the comfort and safety of the cab. Using Autoform, the operator can select net or twine tying and adjust the quantity of net or twine applied. The system also indicates the position of the Opticut knives when fitted and displays the required location of the tractor in relation to the width of the swath to ensure even falling of the bale chamber.

Autoform's additional sophistication allows fine tuning of the progressive density system to suit the gentler process of hay making. It includes the ability to set the bale diameter being produced and also, when equipped with the optional soft core kit, allows the operator to determine the diameter and density of the bale's core and outer layers.

Prices start at £19,235 for the RV1601 and £20,720 for the larger RV1901.

MORE INFORMATION

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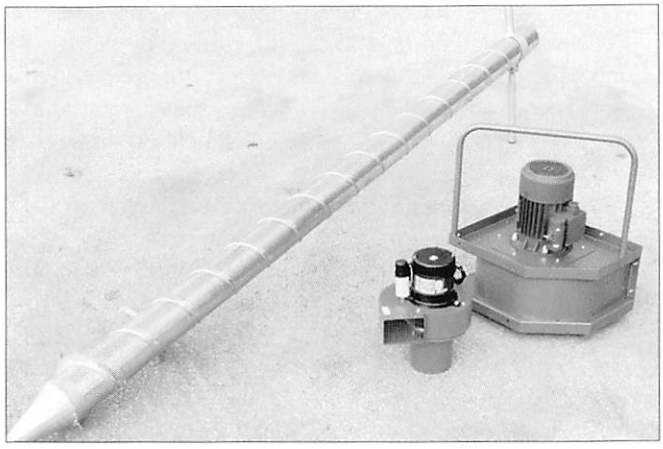
GRAIN STORAGE

Spalding hot spot grain Airspears

Hot grain deteriorates in quality very quickly. Cool grain will keep safely for longer, with less chance of pest infestation, vital with today's low grain prices. Unventilated grain in the store may appear to be doing well, but there is a very high risk of it heating up without warning.

Spaldings grain spears are 100 mm in diameter and 2.1 m overall with a 0.9 m perforated section. They feature sharp steel points with 21/flights that can easily be screwed into the toughest grain hot spot using a unique specially designed handle. Two Airspears are available, one designed for cereals and one for oilseed rape. One spear will cool approximately 30 tonnes of grain with the recommended spacing between each spear of 3 m.



A choice of fans are available with airflow from 0.2 m^3/s (recommended for rape)to 0.1 m^3s (recommended for cereals) that suck hot air out of the grain. When one area of the grain is cool, the spear can easily be screwed out and moved to the next hot spot keeping grain at optimum quality levels.

The new range also includes a digital temperature gauge and probe to identify hotspots in the grain store allowing action to be taken.

Spaldings airsprears can be used in conjunction with existing underfloor drying systems allowing hot spots to be dealt with in the event of a blocked duct or vent.

MORE INFORMATION

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FENCING

On the right track with Vulcan stockfence

New Vulcan high tensile stockfence from leading fencing manufacturer Tinsley Wire has been chosen as stockproof trackside fencing in Devon and Cornwall.

Ray Green, fencing contracts manager for GW Railtrack said: 'Vulcan proved to be highly effective as a barrier to prevent animals and people straying onto dangerous track areas. It is a cost-effective alternative to line wire and concrete posts which we had used previously. The new fence also offers greater stockproofing properties for the farmer and ourselves and a fence line that can be erected faster and more efficiently to increase trackside safety.'

Vulcan high tensile stockfence from Tinsley Wire being erected for Great Western Railways

60,000 metres of Vulcan HT8/80/15 stockfence will be erected over the next year, with four lines of Vulcan barbed wire above it for additional height and security, creating an 1.2 m high barrier.

Marketing manager Paul Frost said: 'This is one of the first major applications of Vulcan, which was launched recently at the Royal Smithfield Show. Contractors and farmers alike are recognising its unique properties which make it the most user-friendly and easy to erect stockfence on the market.'

Vulcan stockfence is manufactured from Vanadium-enhanced high tensile wire. This allows the fence to be strained without stretching and gives a much higher resistance to impact than traditional fences. It is a premium quality product, manufactured in Sheffield and is designed to offer high performance and low maintenance.

Vulcan barbed wire is one of the strongest barbed wires available. It will not break or unravel when strained and will hold its tension throughout the lifetime of the fence without sagging.

The complete Vulcan range will include Vulcan High Tensile Stockfence, High Tensile Green Rylock Vulcan and Vulcan High Tensile Barbed Wire in 200 m rolls and 25 kg exact weight coils.

Stoll Robust F loaders from Lynx

Lynx Engineering has introduced the new premium quality Stoll Robust F range of tractor loaders. Manufactured in Germany, the loaders are produced in nine main sizes and are suitable for tractors from 30 to 128 kW. Key features include high strength slim profile loader arms and class leading load cycle.

The loaders are offered in two basic forms, HD and HDPM. Both types have double acting lift rams, the HDPM featuring mechanical parallel lift. Automatic attachment coupling is also standard.

To speed fitting and removal, the loaders are supplied with flat face colour coded hydraulic hose connectors. The Stoll Hydro-Fix single point docking system is also available, and uses an over-centre clamp to rapidly connect and release the hoses even when they are under pressure.

As standard, the Stoll Auto-Lock system locks attachments to the carriage as they are fitted. As an alternative, Hydro-Lock can be fitted to enable attachments to be released without the operator having to leave the cab.

A loader suspension system, Comfort-Drive can also be specified. This uses a gas accumulator to cushion shock loads from the loader to the tractor. Comfort-Drive is recommended for use on loaders fitted to tractors that will be used over rough ground or at high transport speeds.

Stoll has recently modified its loader manufacturing system and reduced production costs. This has combined with the favourable exchange rate of the pound to make premium quality Stoll loaders more affordable. This also applies to the comprehensive range of Stoll loader attachments.

Produced to the same exacting standards as the loaders, the attachments are supplied ready to fit, and are priced in line with units from third parties. As an example, a 1.50 m wide Silage Shear Grab suitable for a mid-range loader is £2,030 and an eight tine manure fork is £380.

Supplied complete with brackets and a single lever joystick control, an entry level HD8 loader for a tractor of up to 45 kW is priced from £1295. The Hydro-Fix single docking point hydraulics, Hydro-Lock attachment system and Comfort-Drive suspension system options add £236, £298 and £355 to all loader models, respectively. The new Lynx Stoll Robust F tractor loader has a heavy duty slim profile loader arm

MORE INFORMATION

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Smithfield presentation recognises sale of 1000th UK Lexion

The sale of the 1000th Claas Lexion combine in the UK has been recognised in a special presentation made at the Royal Smithfield Show by Helmut Claas, Chairman of the Claas Group Supervisory Board, to Richard Wingfield who bought the combine, a Lexion 480.

The combine is one of two Lexion 480s bought by Richard Wingfield for his Barrington Park Estate near Burford, Oxfordshire, which is managed by Colburn Phillips. The two combines replace two smaller Lexion 460s, and have been bought to increase combine capacity on the 2,225 ha estate, having taken on the management of a neighbouring 610 ha under a five year Farm Business Tenancy (FBT).

Total cropping across the combined area is 2,100 ha. Of this, some 200 ha has either full organic status, or is in conversion, growing winter wheat, winter barley, oats, pulses, sugar beet and potatoes. Of the conventionally farmed area, winter wheat accounts for 36% of the area in rotation with winter barley, oats, peas, spring beans and setaside.

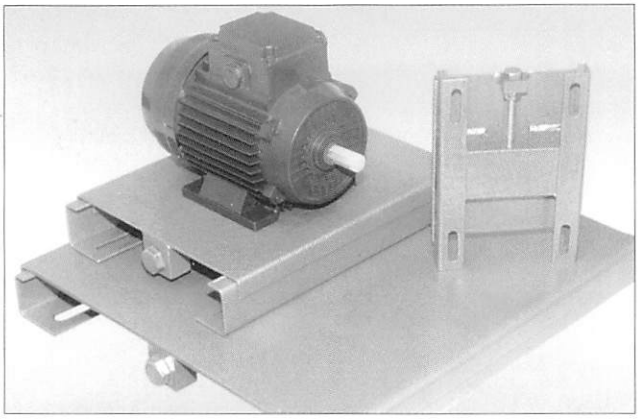
The two Lexion 480s have been specified with 7.5m Vario cutterbars and the Laser Pilot automatic steering system.

'To handle the increase in area, we did look at the option of buying a third Lexion 460, but we have every confidence that the two Lexion 480s will be capable to handle the acreage,' says arable manager Adrian Dolby. 'After a demonstration of the Lexion 480, we found the increase in capacity over the Lexion 460 was significant. It is at least one and a half times that of the Lexion 460, plus the straw chopper and spreader system is ideal for use within the minimal cultivations policy that we have adopted over the conventional area.'

MORE INFORMATION

Trevor Tyrrell, Claas UK Ltd, Saxham Business Park, Saxham, Bury St Edmunds, Suffolk IP28 6QZ.
Tel: 01284 763100

Adjustable mounts maintain production & process efficiency



Adjustable mounts for simplified installation of electric motors from 0.5 to 45 kW can be supplied by Challenge Power Transmission plc. These are high quality products, not to be confused with inferior models, which provide a high degree of linear movement to ensure the easy and effective tensioning of belt, pulley and chain drives to maximise the efficiency of power take-off points.

Although designed for use with electric motors, the mounts could also be used for the installation of any equipment where a simple single axis adjustment is required to achieve a final setting. They are ideal for use on OEM equipment as well as for retrofitting.

The mounts comprise rugged pressed steel assemblies with a sliding top plate which is adjusted with a hexagon headed threaded bolt. Motors are simply bolted to the top plate as a permanent fixture. The lower rails of the mount assembly incorporate slotted holes for fastening the complete unit into position on an appropriate surface.

The mounts are manufactured to close tolerances to ensure ease of top plate movement while preventing noise or vibration when the motor is operating. The take-off drive system is tensioned with a single screw adjustment without the need to stop the motor or slacken the motor fixing bolts.

Optimum drive mechanism alignment and tensioning can be continuously maintained with the minimum of effort, with no production or process time losses through unnecessary downtime.

A total of three motor mounts are available in the range. The smallest, which typically accommodates metric framed motors (ref 63 and 71), has a full fore and after adjustment of 80 mm. This increases to 100 mm for the middle sized mount, which can be fitted with motor frame sizes ref 80, both 90 and 100 S & L, 125 S & M, together with 132 S. The largest mount is suitable for frame sizes 132S, together with 160, 180 and 200 M & L as well as 225 S & M. This mount unit provides a top plate movement of 180 mm.

The mounts have a stove enamelled finish with zinc plated adjustment screws for corrosion protection and they weigh from 1.4 to 19 kg according to size.

MORE INFORMATION

Contact: Challenge Power Transmission PLC, Unit 4, Phoenix Road, Wednesfield, Wolverhampton, West Midlands WV11 3PX. Tel: 01902 86611. Fax: 01902 866117. email: uksales@challengept.com

Leica Geosystems has introduced a new, improved version of the successful Dozer 2000 GPS-based machine guidance system.

Among the major enhancements to the Dozer 2000 product are a new high-accuracy GPS sensor, robust flat-panel computer display, upgraded operating software, wireless data transfer and tilt sensor interface.

The Dozer 2000 is one of the first Leica products to take advantage of the high-precision MC500, a new dual-frequency GPS receiver, incorporating the highly acclaimed ClearTrak™ signal processing technology. ClearTrak™ provides unsurpassed signal reception, satellite tracking, multipath mitigation and jamming resistance. The MC500 provides outputs in Leica's proprietary data format as well as the CMR and RTCM formats, ensuring compatability with any Leica dual-frequency survey receivers as well as those of other manufacturers.

The Dozer 2000 now offers a new 150 mm colour flat-panel computer display that mounts inside the bulldozer's cab. The touch-screen display unit is designed specifically to withstand vibration, dust and temperature extremes. The unit's adjustable brightness control makes it suitable for night and daytime work.

Leica has released a new software version (V3.0) for the Dozer 2000 containing a number of improvements and enhancements. The changes will make it easier for machine operators to set up and carry out earth moving functions using simple on-screen graphic displays and icons.

Also new for 2001 are a wireless data transfer function, permitting design files to be sent from the office to the onboard computer through the existing radio network, and dual-axis tilt sensor interface permitting the operator to see the long section and cross section slope of the machine as it works.

'The enhancements now being released in the new version of Dozer 2000 reflect the operational experience gained in field applications during the last two years,' said Rod Eckels, business area manager for machine guidance at Lieca Geosystems. 'Dozer 2000 systems are now in service at numerous mining and construction sites in North America, with an excellent record for reliable performance in the field.'

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.

New MF Quadlink tractor suspension

The new tractor suspension system - MF QuadLink - provides all the advantages of a suspended front axle without the disadvantages associated with some other systems. Developed for four-wheel-drive Massey Ferguson 6200 and 8200 Series tractors from 79 to DIN kW, the MF Quadlink offers simple but effective operation. In particular, it gives the operator the choice of switching the system on or off. It operates vertically only, so does not produce any variation in lead ratio to increase tyre wear and the simple design has no more grease points than the standard MF front axle.

Enhanced operator comfort

The MF QuadLink axle is available on the four largest models in the MF 6200 Series (6260, 6270, 6280 and 6290) and the MF 8200 Series up to 139 DIN kW (8210, 8220, 8240, and 8250). Operators benefit from improved ride characteristics resulting from the reduction in shock loads and reduced fore and aft pitching.

A major benefit is the reduction in transport time resulting from the ability to operate safely at higher speeds on farm tracks and public roads. On tractors without suspension, operators often throttle back when travelling on tracks and roads both for comfort and to have greater control on uneven surfaces.

The MF QuadLink suspended front axle moves to compensate for variations in the terrain, absorbing the humps and hollows to give a smoother ride. As a result, faster transport speeds can be maintained comfortably and without compromising safety.

Higher output in the field

In the field, the smoother ride allows the operator to maintain a high work rate without any need to sacrifice speed for comfort. That translates into higher output through the working day. The smoother ride also reduces stress on the tractor's components, improving reliability and component life.

Greater productivity in fieldwork is also achieved because the suspension system keeps the wheels in full contact with the ground for a higher proportion of the time. This improves front wheel traction, giving higher work rates while reducing tyre wear and soil damage. It also gives more positive steering, even with heavy mounted implements.

Simple four link mechanism

Simple systems are often the best, and that is definitely the case with tractor suspension. The MF QuadLink design has just four moving links, a single hydraulic ram, hydraulic accumulators and an electronic control system.

When switched on, the automatic control system operates electronic hydraulic valves to pressurise the QuadLink suspension's accumulators. It always sets suspension height at the same level, regardless of the weight on the front of the tractor.

In operation, the four links allow the axle to oscillate by up to 15 degrees and the hydraulic ram and accumulators act as shock absorbers and springs to reduce shock loading and maintain an even ride with suspension travel of 90 mm.

The operator can use the tractor with the QuadLink system switched on for fully automatic operation, or switched off. Switching the system off has advantages in some circumstances, such as: in heavy draught work when maximum weight transfer to the rear wheels aids traction; when working with front linkage mounted implements when a uniform working depth or height is required; and when precise height control is needed with a front-end loader.

55 degree steering angle maintained

The high central pivot point of the QuadLink suspension system has no detrimental effect on the tractor's turning circle, allowing full use of the normal 55 degrees steering angle. As the suspension point is immediately above the axle, movement of the axle is in a vertical plane only, with no fore and aft movement as in some other systems.

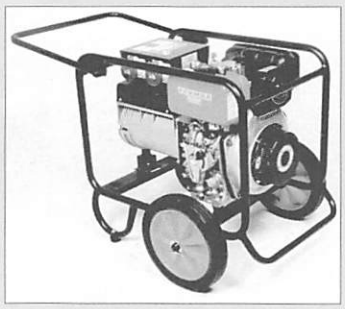
The tractor's wheelbase and lead ratio of the front wheels are always fixed, so the system causes no extra tyre scrub or wear.

Easy maintenance

The straightforward design and construction of the MF Quadlink system make it very reliable, with the low maintenance requirements. Like the standard front axle, the suspended axle has only four grease points, so routine maintenance can be completed in the same time.

GENERATOR

New Truecraft diesel powered generator



The new generator, say Spaldings, provides constant power for many applications around the farm wherever and whenever you need it. Diesel power gives the extra reliability, ruggedness and greater efficiency than petrol machines and has a fuel usage of only 1.5 l/h.

The new generator has a maximum output of 4.7 kVA which allows the machine to run equipment such as electric power tools, workshop floodlights and many other essential electrical appliances.

The machine is powered by an air cooled 4-stroke Yanmar 300 cc diesel engine and is fitted with two 16 A 240 V sockets, one 16 A and one 32 A 110 V socket for maximum versatility. Fully CE marked and backed by a full 12 month warranty. The generator can be ordered under product number 14695 and is priced at £1349.30

MORE INFORMATION

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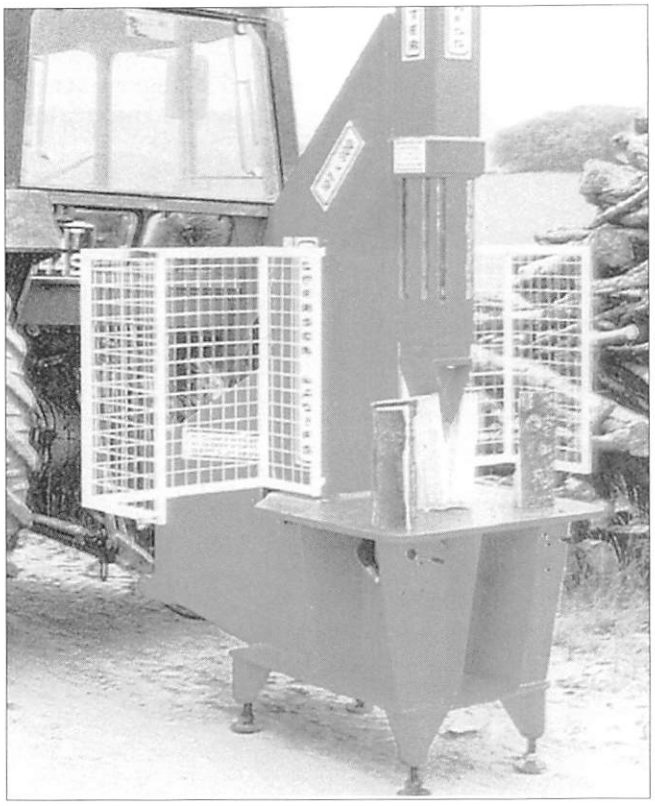
Web Site: wwwspaldings.co.uk

LOG SPLITTER

Alderson-Davies 10 t log splitter/agricultural press



This log splitter is probably the most serious log splitter on the market and compares well with lighter duty imported machines. It gives 10 tonnes of hydraulic muscle and can split any type of timber - oak, ash, beech, etc. up to 0.9 m diameter by 0.6 m long.

It is of an industrial robust construction with a large double acting hydraulic cylinder and gives optimum splitting action at a convenient work height for maximum daily work output and minimum operator fatigue. It is fitted with an easily removable hard steel wedge for long life. The wedge may be re-sharpened or replaced and copes with knots and nails without problem.

The machine may also be used as an hydraulic press for pressing in bearings or straightening tines etc. It has excellent control action with twin control levers and guarding for maximum safety. Various straightening tools are available. It takes only three minutes to convert from log splitter to hydraulic press.

The machine can be supplied to fit tractors with 3-point linkage, forklift trucks or wheeled loaders. This allows the machine to be used in any location without man handling into position. It can be supplied with adjustable feet or on wheels or castors if required.

The prototype was conceived, built and tested by Phil Alderson and Chris Davies of Craven Arms, and well proven for over 2 years. The production model was redesigned and built by Dudley Designs & Technical Services.

MORE INFORMATION

Contact: Maurice Arnold, Tel: (01384) 291139. Fax: (01384) 400944.

ATS weeder from Holland - speed and accuracy

The active tracking system (ATS) is an innovative mechanical weeder patented by the inventor Frank Mutsaers.

The patented control system is mounted in front of the tractor, to steer the machine along the rows. The tractor driver's task is simplified and accuracy made easy. In other words with the ATS, the operator anticipates the direction in which the hoes are moving and where they will be within a short time. With the patented steering system, the weeder moves independent of the tractor to the right and left. Guidance bars are mounted in front of the weeder, so all the operator has to do is to see that the bars are above the crop. Track discs are fitted to ensure that the weeder maintains a steady course.

The main features of the system, thoroughly tested in Holland, include speed, accuracy and simple operation.

The system is accurate within 5 mm. At the same time, a speed of 7 km/h is possible using 70 cm wide shares. The result is an increase of capacity of 2-3 times that of the traditional weeder. For instance in sugar beet, the 3 m attachment has a capacity of about 4 ha/h.

Following with a band sprayer shows an impressive reduction of chemical use, which will be welcomed by farmers practising biological methods. Urgency to reduce the use of herbicides, speedy and precise weeding was clearly the aim of the designers. The final design includes regulating depth whilst moving; adjustable hoe fixing; light weight, but robust; integrated levelling and so on.

Example price of 3 m wide weeder set for sugar beet is around £7,000. Homburg are in the process of appointing dealers in the UK.

MORE INFORMATION

Further information from Homburg in the UK, Salters House Sudbury, Suffolk. Tel : 01787 372233.

Popularity of all-electric AC band-sawmills

Wood-Mizer is enhancing its range of all-electric, AC band-sawmills, following the popularity with which they have been met throughout Europe since their 1999 launch.

The mills were originally developed to meet the needs of a majority of East European Wood-Mizer owners who operate in fixed, static locations in central and Eastern Europe - as well as the large minority who do so in Western Europe.

Such operators do not require the flexibility nor mobility which the majority of 25,000 Wood-Mizer diesel and petrol-driven portable bandsaws, with DC electric drives, provide worldwide. They are quieter and easier to maintain, yet still powerful. And the new versions are even safer, simpler, more serviceable, and easier and more comfortable to operate.

The new versions dispense with the clutch lever, simplifying the units' construction as well as making them both more rigid and easier to service. This also enhances operator comfort.

Safety is further improved by electromagnetic brakes within the main motor which stop both motor and blade in one second.

A new operating panel allows operation of all virtually all functions from the console: forward carriage; raising/lowering the blade; de-barking; and blade lubrication. Hydraulic functions are still operated from the hydraulics box.

Carriage feed, head up/down, log loading and debarking are all provided by 380 volt, 3-phase AC industrial motors.

The mills' simple, durable design suits them to around-the-clock, often harsh operating conditions.

They are also available in the same 'Super' and standard sawmill options, which involve different grades of cutting head speeds, carriage drives and log manoeuvrability power. The smallest model, the LT15, is now also available as an all-electric AC mill.

The optional debarker attachment removes bark and extends blade life and the 'LubeMizer' (also optional) blade lubricating system ensures that even woods with high sap content can be cut straight and true.

MORE INFORMATION

For further information, a video or a demonstration call Peter Burn, Wood-Mizer UK, High Oak Farm, Oswaldkirk, York YO62 5YF. Tel: 01 439 788030. Fax: 01439 788031.

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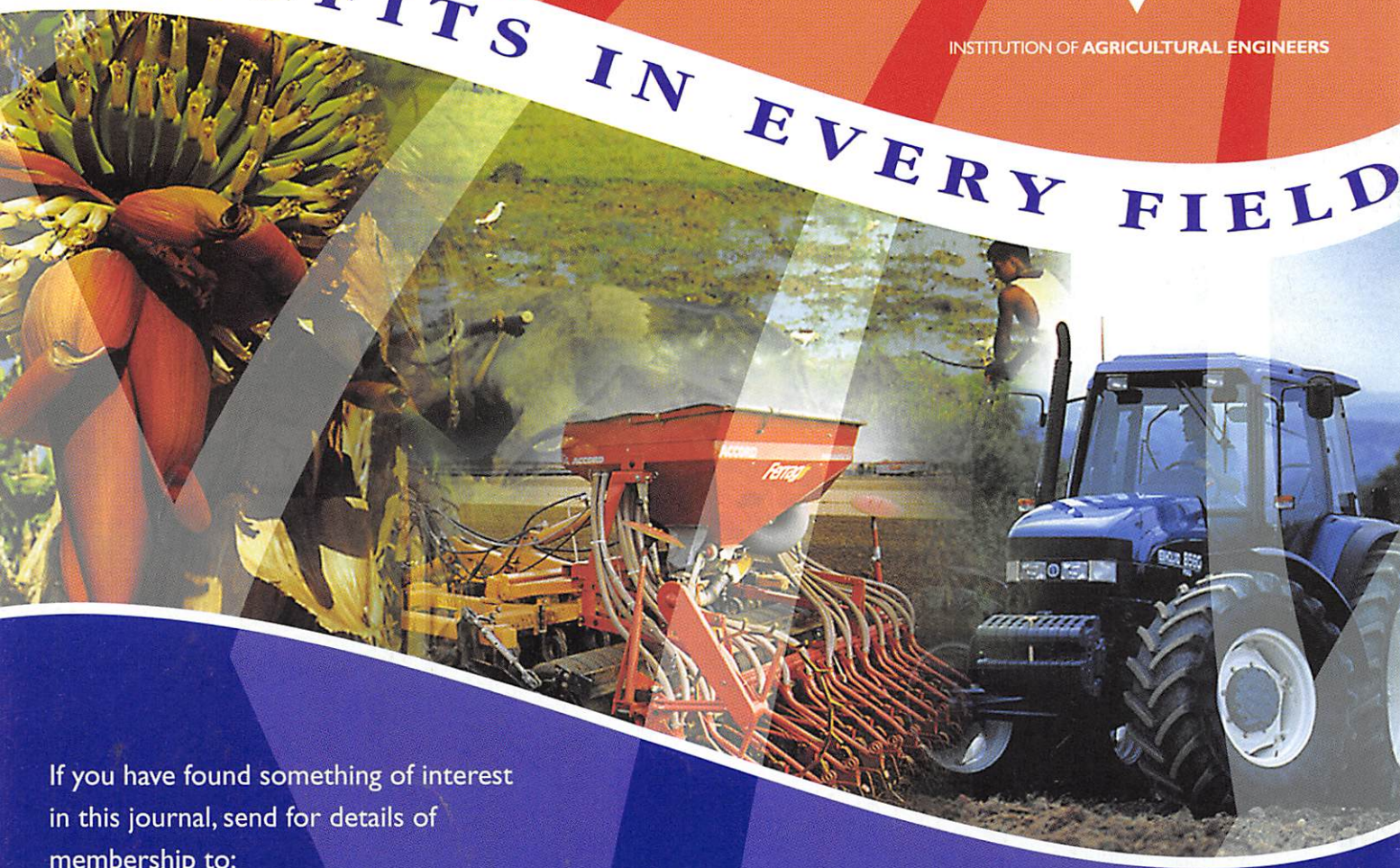

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