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SOIL2CROP

SOIL AND CROP MANAGEMENT ISSUES

Dear levy payer,

One of the recommendations of the government's policy commission on the 'Future of Farming and Food', published in January 2002 — more commonly known as the 'Curry Report' — was the establishment of an Applied Research Forum (ARF) made up of levy boards and government to improve the co-ordination of applied farming and food research.

ARF is now in its second successful year. A key part of ARF was the establishment of a group to look specifically at knowledge transfer issues: issues that span the remit of the seven levy boards from horticulture to combinable crops, sugar beet to potatoes, and dairy to meat production.

Soil quality and management is a priority area for all growers and producers, and will become increasingly so with the introduction of DEFRA's cross-compliance soil protection and maintenance measures in 2005.

In recognition of this and to highlight some of the main issues raised by growers during HGCA's recently completed 'soil2crop' initiative, HGCA and British Potato Council (BPC) are jointly funding this 'pull out and keep' publication tackling many of the issues relevant to both arable and potato growers: compaction, erosion, soil types, cultivation methods and much more besides.

The 'soil2crop' initiative was HGCA's first focused effort at addressing and linking issues on practical soil management, exploring appropriate cultivations for different soil types and the impact of these practices on subsequent agronomy decisions.

'soil2crop' was all about helping growers improve profitability and certainly hit home with over 1,500 growers attending the 23 UK-wide meetings held in the year in which the initiative ran, 98% of whom recording that the information delivered would directly help their businesses.

On behalf of both HGCA and the BPC we hope you will find the information within this publication thought provoking and useful as a reference document.

Yours sincerely,

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A Crops supplement produced on behalf of the HGCA and BPC

The wet August is expected to have cost UK arable farmers up to £100m in lost crop value, drying costs and yield. No-one yet has put a figure on the cost of the damage to soils and the impact on next year's crops, but it is likely to be considerable. Soil management has never been more topical; it is in the environmental spotlight and is a key component of cross-compliance.

That is why the HGCA and BPC have joined forces to bring you this 8-page supplement. It draws together the most pressing soil issues that have been raised by you, the growers, at the many demonstrations and soil2crop events carried out this year.

A costly harvest legacy

COMPACTION

THE legacy of this year's soggy harvest on soils will be felt for years to come. Could it have been avoided? "Needs must — if the crops are ready and there is no sign of the land drying then some growers would have had to combine as best they could this year," admits Dr Vic Jordan, chief executive of the UK Soil Management Initiative (SMI).

Compaction problems will be widespread as a result, he predicts. "Working in wet field conditions, either to harvest or to prepare land for planting, is the main cause of compaction. Some compaction problems will be more deep-rooted than others, but damage in both instances will have to be repaired as soon as possible to avoid repercussions in following crops."

The earliest opportunity to start repairing even the lightest compacted soils with subsoiling will be the spring — just prior to planting spring crops when soils dry out. But heavier soil types are unlikely to be dry enough at subsoiling depths and they will have to wait until next summer.

Now, however, is the ideal time to take stock of the damage. Dr Jordan's advice is to walk around the farm with a spade or sharp stick. "Shove it into the ground. If you meet resistance at spade depth, then you should take a closer look."

Take remedial action where a pan or area of undue firmness is found. If the compaction is shallow then water can sit on the surface because it cannot get through to the subsoil where there might not be a problem. Establish a crop wherever possible because this will help dry out the soil and increase the chance of being able to subsoil effectively next year.

The impact of compaction on crop performance is two-fold, he warns. In wet years, crops are likely to suffer from water logging because the soil cannot drain efficiently. In dry years, they may suffer drought stress, as roots are unable to access moisture from deeper in the soil profile. Light soils are just as likely to have pans

A spade is the best tool to detect compaction

Drainage bonus with no plough

Compaction was the trigger to switch to non-inversion tillage on Stewart Vernon's Coatsay Moor farm in County Durham, but the experience was initially disastrous. He is on the HGCA R & D advisory committee and knowledge transfer group and host of two soil2crop events.

"In the first year, I just tried establishing 2ha of wheat with non-inversion tillage. Yields fell by 25% and crops were patchy," recalls Mr Vernon.

Undeterred, he persevered with developing a suitable system on his heavy clay soils. "There are limited opportunities to work these soils. They go from being wet and soggy one minute, to resembling concrete the next. We can have trouble creating seedbeds."

Having always ploughed and pressed, followed by a Simba drill, Mr Vernon was keen to save time and money on crop establishment. Without a blackgrass problem, ploughing was proving difficult to justify.

The digging of test holes in the soil2crop demonstration revealed the compaction problem and persuaded him to buy a subsoiler. In the second year, he subsoiled and used non-inversion tillage to establish his oilseed rape crop, and yields were very good.

"I also worked the land straight after the combine, which I'd been anxious about before," he comments. "With ploughing, we never dared work the land too far ahead."

Mr Vernon immediately noticed that soil drainage was much improved in the non-inversion tillage section. "We were waiting for the ploughed land to dry out instead."

That trend has continued throughout the year, and the ground has gone on drying out well. For this season, land coming out of oilseed rape will be chisel ploughed, with a press being run across it immediately prior to drilling.

Don't let it leach away

as heavy soils; some of the best yield responses to subsoiling have come from lighter soils.

"Compaction is also a problem for earthworms," notes Dr Jordan. "It restricts their ability to move through the soil profile, not only limiting the 'channels' that aid soil aeration but also reducing the amount of organic matter they can move from the surface into the top soil."

Field mapping has a role to play in spotting problem areas, he suggests. "In dry years, the bad areas show up clearly. Where you know take-all is not responsible, the culprit is bound to be localised compaction."

Subsoiling is the main solution. "But it must be done properly. If it just skims the top of the compacted layer, rather than penetrating and breaking it, the problem will remain."

Get the spade out and check the depth of any panning before you start subsoiling, recommends Dr Jordan. "You need to set the tine a couple of inches below the compacted zone to get a good shatter and the soil must not be plastic. If you can roll the soil in to a bendy worm subsoiling is ineffective. Continue checking during and after the operation too."

Subsoiling is an expensive operation. "The problem is that you don't always see a response in the first year. Costing it over two or three years helps to justify the expense. And don't do it unless it is needed."

Avoid further compaction this season by —

- Using low ground pressure tyres
- Sticking to well-defined traffic ways in fields
- Avoiding working the soil intensively if soils remain wet
- Do the minimum amount of cultivation to get a seedbed
- Direct drill or broadcast seed and incorporate where possible

EROSION

SOIL erosion is now seen as the most important environmental problem of modern agriculture because the impact is much more wide-ranging than simply lost soil.

Soil eroded by water can end up on roads, in streams and reservoirs. That in itself causes problems with traffic and housing, but also for fish, where soil sediments cover gravel beds affecting spawning and hatching. And if pesticides are attached to those soil particles pollution issues can result too. For farmers, erosion means nutrient losses and lower crop yields.

The main cause of erosion is bare soil during wet seasons. Excessive tillage, as well as cultivations when soil moisture is low, also helps to destroy the soil structure and make soils increasing susceptible to erosion.

According to DEFRA guidelines, reducing the risk of erosion depends on a number of factors:

1. Soil type, structure and condition — sandy, silty and low organic matter soils are most vulnerable to water erosion; sandy and peaty soils are prone to wind erosion.

2. Crop cover — bare soil in winter encourages water movement across soil surfaces, so make use of cover crops.

3. Slope — erosion can occur on any slope

4. Compaction — where rain can't filtrate, erosion is more likely to occur.

5. Cultivations — excessive cultivations create the greatest risk.

6. Seedbed — fine tilth and level seedbeds encourage capping.

7. Cropping — root crops, maize and vegetables pose the greatest risk.

8. Straw disposal — surface and incorporated crop residues will help to add soil stability and aid infiltration.

9. Field contours — long, unbroken slopes can encourage run-off; make use of hedges, grassland, woodland and buffer strips to halt the movement of water and soil.

10. Field drainage — good drainage prevents the surface accumulation of water

Dr Vic Jordan believes that more science is needed to help combat erosion. "Soil quality is largely governed by organic matter content. This in turn is dynamic and responds to changes in soil management."

"Total losses from ploughed land can be five times higher than from unploughed land."

Falling soil organic matter affects soil structure and stability. It may also make the soil more vulnerable to erosion, he warns. "Leaching of nutrients and pesticides into surface and ground water is a further consequence. "Again, soil organic matter helps. It binds nutrients and pesticides."

Residue and trash incorporation can make a big difference, adds Dr Jordan. "If you have potatoes in the rotation, it's important not to disturb the soil excessively once you've harvested. Use the trash to provide a soil cover and think about drilling a green cover crop."

Better practice is the way forwards, he concludes. "That may mean a change in cropping, or it could be greater use of residue and trash incorporation."

Excessive tillage makes soil susceptible to erosion

Tips to minimise erosion

Crop or trash cover – avoid bare ground in winter
Capping and compaction – these will promote soil run-off, containing nutrients and pesticides
Cultivations – don't create very fine seedbeds which can cap and slake after heavy rainfall
Soil organic matter – helps keep stable soil structure which is less likely to be broken down by raindrops
Bunded or tied ridges – help prevent soil movement in potato crops on slopes but can interact with harvesting operations

Choosing the right rat

FERTILISER REQUIREMENTS

SHOULD you vary the rate of fertiliser according to your cultivation system? Only in genuine direct drilling situations, says ADAS's principal research scientist Peter Dampney. "Every situation should be treated individually, but cereals grown in reduced cultivation systems are likely to benefit from early spring nitrogen."

"That's because there is no mineralisation of soil nitrogen in the autumn because of the lack of soil disturbance. So N requirements tend to be higher."

But there are more significant factors on which to base nitrogen decisions, adds Dr Dampney. "Previous cropping, soil nitrogen supply and rainfall have a much greater effect than cultivations."

Where straw has been incorporated, it will absorb some of the available nitrogen in the soil, he explains. "If it's a big quantity of straw, you can sometimes see colour effects in the crop.

"Don't be tempted to apply autumn nitrogen if this happens. There's no economic benefit."

If straw has been baled and removed, there will be a need to address potash levels. "A 10t grain crop loses double the amount of potash than it does phosphate. So that should be accounted for in the farm's fertiliser strategy."

Potatoes

NITROGEN requirements are being over-estimated by more than 90kg/ha in some situations, according to BPC funded trials at Cambridge University Farm to investigate the reliability of two methods used in RB209.

The two methods are based on soil type and previous cropping (the Field Assessment method) or by measurement of soil mineral nitrogen in the spring (the SNS Analysis method).

"While applying too much nitrogen did not necessarily reduce yield, it did result in delayed skin set, reduced tuber dry matter concentration and, in the last year of trials, a reduction in tuber populations," explains Dr Marc Allison of Cambridge University Farm.

He points out that neither method predicted the large season to season variation in crop nitrogen requirement. "Season has a big influence, and our understanding of this is not complete yet.

"We do know, from cultivation experiments, that factors such as soil texture, temperature and moisture content have an influence on nitrogen mineralisation, especially during the critical phase when the canopy is expanding rapidly."

Cultivation work also showed that the rate of nitrogen mineralisation could be double in ploughed and ridged soils, when compared to uncultivated soils, he notes. "We know that ploughing releases large amounts of nitrogen, and that this varies according to when the ploughing takes place.

"And there's evidence to suggest that the potential of the crop is determined within six weeks of emergence," continues Dr Allison. "This is, in part, dictated by the amount of available nitrogen in the soil, but it's also influenced by factors such as compaction which affect root and canopy function."

The important message for growers is that there are opportunities to reduce the amount of nitrogen applied to all types of potato crops, he stresses."This will reduce costs, and may well increase yields and quality. That has to be good news."

New work shows growers should cut back on N

His advice:

- 40-50kg N/ha total on short season salad crops (and possibly seed) even when grown on relatively infertile soils.
- 150kg N/ha is sufficient for many full season processing crops

"On average, using the Field Assessment method overestimated nitrogen requirement by 91kg N/ha, while the SNS Analysis method recommended 56kg N/ha too much."

Dr Allison warns that the SNS Analysis method may perform much worse than his trials suggest in practice. "The soil samples were taken from a small area in our experiments, which reduced variation considerably.

"Furthermore, the timing of the sampling in relation to the sequence and timing of cultivations had a big effect on the amount of soil mineral nitrogen measured, and consequently the amount of fertiliser recommended."

He is confident that there will be improvements in predicting the nitrogen requirements of potato crops. "Reliable diagnostic tests which predict canopy persistence and the requirement of supplementary nitrogen are a real possibility."

Influence of green manure

HGCA-funded research on the influence of a green manure in wheat rotations under different cultivation systems has shown no yield benefit.

White mustard grown as a green manure between the harvest and drilling of consecutive winter wheat crops had no effect on wheat yields, which may have been due to an interaction with crop establishment. In addition, cultivation system had no influence.

The extra trash burden involved, slug pressure and the effects of the white mustard on crop establishment are thought to be the reasons. More efficient utilisation of green manure was expected in the non-inversion systems, due to their ability to produce higher levels of microbial activity in the upper soil layers.

Future work will focus on any benefits of a green manure grown in a set-aside break, to compare it with a shorter season catch crop.

"BPC are currently keeping an open mind. Green manures have been promising but variable for soil borne disease control in BPC funded trials. If nothing else, reducing the bare soil issue ahead of the potato crop could help with erosion control."

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Spud tactics

Matching nitrogen fertiliser rates to varieties has helped Cornwall potato grower Alex Stephens to raise yields and quality but reduce fertiliser costs.

He changed fertiliser tactics on the 40ha (100 acres) of potatoes grown for local processing markets at Boconnoc Estate, Lostwithiel three years ago following the results of BPC-funded research.

"With the old RB209 booklet, the advice was to treat earlies, second earlies and maincrop differently," he recalls. "But there was no consideration given to different varieties within these groups."

The launch of the updated RB209 explained the effect that determinancy can have on fertiliser requirement and helped him make significant changes.

"We grow a lot of Estima, which is a very determinate variety. It needs high amounts of nitrogen, around 240kg/ha, although the final amount depends on factors such as soil type and previous cropping.

"That's in stark contrast to an indeterminate variety, such as Cara, which has an optimum requirement of 60kg/ha. We cut right back on the amount of nitrogen we were giving King Edward too," continues Mr Stephens.

The result of this was an immediate yield increase. "The crop did over 20t/acre without any irrigation. By reducing nitrogen, tuber initiation started earlier and the final crop quality was better. Before, the nitrogen was producing too much vegetative growth.

"We are fine-tuning fertiliser rates all the time."

Trash tactics: an even spread is best

Starters orders

ESTABLISHMENT

GETTING crops off to a good start sets the scene for future success.

The key is to create seedbed conditions where the seed is surrounded by a fine, firm tilth and under which roots can develop well. It should be non-compacted but well consolidated with no clods. Well-formed seedbeds also allow residual herbicides to work well, which is important for the control of difficult grass weeds such as blackgrass and brome.

Minimal cultivations seem to present the biggest challenge to growers and HGCA-funded research projects have helped to answer questions on the following:

Trash

Poorly distributed straw and chaff is the most common cause of failure with reduced cultivations.

For some, an extra pass either to spread the straw on the surface prior to incorporation or to help with further breakdown after initial incorporation, may be required.

Raking trash after harvest to create a more uniform layer can often improve establishment, and sometimes yield. Leaving a longer stubble slightly reduces the amount of loose trash, and may also prove helpful. Deeper minimal tillage has not shown consistent improvements in establishment or yield.

Stale seedbeds

Stale seedbeds are most effective when combined with some delay in drilling. They are a good method of weed control in all cultivation systems, but essential to prevent a build-up of grass weeds with reduced cultivation. For most weed species, establishing a stale seedbed immediately after harvest is best.

To get the maximum benefit, delay cultivation by one month if wild oats, blackgrass and cereal volunteers predominate, to allow seed to germinate. To remove volunteer oilseed rape, early cultivation at 2-5cm, is needed.

Weed germination will be maximised by consolidation after cultivation. Make sure all of the weeds emerged are removed by the use of a non-selective spray. This should be done no more than 2-3 days before drilling in the case of grasses, and no less than 2-3 weeks with volunteer oilseed rape.

Reduce soil disturbance at drilling, if the seedbed is good enough, to limit any further flushes of weeds.

Weed control

Ploughing has been shown to reduce grass weed populations by up to 80%, by burying weed seeds. However, it can also bring up seeds from the seed-bank in the soil.

Rotational ploughing can be a useful part of a grass weed control strategy. To work well, it must leave the seed buried at a known depth. For large seeded grass species, ploughing depth should exceed 12cm, going down to a maximum of 17cm. Timing should be adjusted according to species, to allow seed to ripen rather than creating enforced dormancy.

Where crops and weeds are at similar development stages, pressure is immediately applied on the post-emergence herbicides. Using a pre-emergence product on targeted fields can remove some of this pressure and avoid the need for additional treatments.

Slugs

Slugs are a potential concern in min till regimes, especially if the seedbed is loose or cloddy and the seed is shallow drilled. Wetter soils are more prone to problems.

A good straw chop, good spread of chaff, a well-structured seedbed, consolidation of the stale seedbed and removal of green material prior to drilling are crucial to reduce risks. Drilling to a depth of 3cm will help (4-5cm with cloddy seedbeds), as the slugs have difficulty finding the seed.

Monitoring with baited traps will highlight if treatment with slug pellets is warranted, especially when combined with other risk factors. It should be done before cultivations take place, as these will disrupt slug activity.

Broadcasting pellets has been shown to be the best method. This should be done immediately after drilling, as any economic response occurs in the first month after drilling. Combined with the use of a consolidated seedbed, the results will be good.

Finding the right mix

ROTATIONS

FIFTY FIFTY wheat and oilseed rape might appear to be the most profitable rotation on paper, but is that rotation the most effective way of dealing with pest, disease and weed control — and maintaining soil structure and fertility?

Changes to a rotation need to be considered in the light of market demand and prices but the agronomic implications should be assessed too. Continuous winter wheat, for example, needs high nitrogen and pesticide use to achieve maximum yields. Placing wheat after a break crop might achieve the same end but at less cost.

Winter oilseed rape's competitive ability should not be underestimated; it can enable growers to reduce herbicide use in the rotation and seldom suffers from severe pest and disease problems. Winter oats and linseed are cheap to grow, but that doesn't mean they cannot be profitable.

The benefits and pitfalls of three different 6-course rotations:

Sequence A *(intensive cereals)*	**Sequence B** *(cereals/roots)*	**Sequence C** *(integrated)*
W.Wheat	Sugar Beet	W.OSR
W.Wheat	S.Wheat	W.Wheat
W.Barley	W.Barley	W.Oats/Linseed
W.OSR	Potatoes	W.Beans or Peas
W.Wheat	W.Wheat	W.Wheat
W.Wheat	W.Barley	W or S.Barley

Sequence A, with successive wheats and barley, has a higher risk of most soil and trash-borne diseases. Eyespot, fusarium and take-all are all potential issues. Disease inoculum from crop debris and volunteers gives increased infection opportunities for foliar disease. Successive wheats can allow a build-up of ground beetle and wheat blossom midge.

Sequence B has a lower disease risk. Barley crops may suffer from eyespot and fusarium, although these diseases are less damaging on barley. A potential pest problem is wheat bulb fly; one third of the crops are at risk and another third are potential egg laying sites. A good separation of peas and sugar beet should prevent the build-up of potato and beet cyst nematodes. Spring crops will help reduce slug numbers.

Sequence C is an integrated rotation, with the least pest and disease risk. Neither of the break crops is favoured for wheat bulb fly egg laying, but winter wheat after oilseed rape is at risk from slug damage. Winter oats and winter beans are both liable to attack by stem and bulb nematode, but by different races of the pest. Having spring crops in the rotation reduces the overall agrochemical requirement and provides a weed control opportunity. There's potential for nitrogen conservation, providing an autumn catch crop is sown.

Weed control

Grass weed control is a major challenge on some soils. Planning ahead is essential, as growers must employ rotations, herbicides, drilling dates and cultivations to maximum advantage.

- **Break crops**. Use the break crops to get good control. Excellent results with grass weeds can be achieved in oilseed rape and beans, for example.
- **Herbicides**. Different active ingredients should be employed across the rotation. This helps minimise the risk of herbicide resistance.
- **Drilling dates**. Delay drilling in some seasons and allow weeds to germinate prior to drilling. Maximise germination of weed seed in stubble by cultivation, then use a non-selective herbicide to remove weeds.
- **Rotational ploughing**. Using the plough on a rotational basis may be necessary. Where barren brome is a problem, the quality of ploughing is important.

Legumes have an important role to play in the development of systems that aim to conserve nitrogen, helping to reduce the demand for supplementary nitrogen across the whole rotation. They have the ability to collect and store nutrients and their crop residues add organic matter to the soil when incorporated.

However, in building soil fertility by nitrogen fixation, they can increase the amount present in the soil, which is at risk from leaching the following winter. On the other hand the roots of catch or cover crops scavenge the soil for nitrogen. When they are incorporated prior to spring sowing, that nitrogen is recycled.

Spring cereals provide a different set of genes to resist disease, which can not only limit the spread of disease but also enable less fungicide use.

Ergot – an increasing problem?

Are changes in farming systems responsible for the increasing problem of ergot contamination in wheat? Do flowering grasses in field margins act as a source of inoculum for the adjacent wheat crop?

Those are just two of the questions that the HGCA and a new LINK research project has set out to answer, although the final results won't be available until 2008.

The project will run for four years, and has a budget of £551,681. The role of field margins as a source of ergot inoculum will be assessed, together with the effects of herbicide resistance and subsequent weed control levels on ergot, the use of shorter rotations and the trend towards earlier drilling.

The aim of the project is to develop an integrated package of measures aimed at reducing the risk of ergot infection, while retaining the environmental benefits of grass margins.

Low risk grass species will be assessed, alongside margin management regimes which prevent ergot infection spreading to the crop. The resistance of wheat varieties to ergot will also be investigated, so that flowering characteristics which help to escape infection are understood. Contributors are NIAB, ADAS, Rothamsted Research and Velcourt.

Tillage & timeliness

Consider soil type and soil condition before switching to min till

Workdays

The weather and soil type together dictate how many days can be worked. The following table gives the average cultivation days available in the eastern counties (in brackets are those available in the 8th most difficult autumn in 10). They are based on an average rainfall of 600mm (24 in), so would also apply to much of the country.

	Soil Type		
	Light	Medium	Heavy
August	30 (26)	30 (26)	28 (24)
September	28 (24)	28 (21)	23 (17)
October	25 (22)	24 (16)	17 (7)
November	20 (13)	17 (9)	5 (2)

Source: ADAS Meteorological Office

Costings for a plough-based system on sandy land

Combinable crops	**Cost /ha**	**Work Rate/ 8hrs day**
Combine 12 cut	£49	8ha
Drill	£19	16ha
Fertiliser spreading	£7.80	40 ha
Spraying	£8	50ha
Plough and press	£39	8ha
Subsoiler	£35	10ha
Cambridge roll	£9	

Root crops	**Cost /ha**	**Work Rate/ 8hr day**
Bedforming	£30	6ha
Stone separator	£130	3ha
Pot planting 2 row	£50	3ha
Pot harvester 2 row	£84	2ha
Sugar beet harvest (contractor)	£158	8ha
Irrigation 25mm/ha	£90	1.8ha
Fertiliser spreading	£7.80	30ha
Spraying	£8	30 ha

CULTIVATIONS AND SOILS

THE primary goal of cultivations is to bury weeds and trash, improve soil conditions to achieve easier planting and early seedling growth.

Plough-based tillage has long been the conventional practice. But in the drive to cut costs and labour reduced cultivation and conservation tillage, many of which have proven economic, ecological and environmental benefits have been adopted.

Cultivation machinery can be divided into four broad categories:

- Direct drill — acts on the surface, accurately placing seed at the required depth
- Reduced cultivation — soil disturbance is limited to 5-10cm depth
- Deep cultivation — non-inversion, but the soil is disturbed to a depth of 20cm
- Plough — reversible, mounted and semi-mounted types, 12-25cm depth.

These all have their advantages and disadvantages, most of which have been discussed over the years. Management capability is the key; approaches to improve soil management require greater levels of skill and knowledge.

Changing to reduced cultivations needs land which is free from subsoil structural damage and compaction. When these techniques are adopted correctly, land can be sown much more quickly. But timeliness and choice of implements are critical.

Potatoes are more difficult and systems are still under development. Most potato growing systems demand the formation of beds, involving substantial soil upheaval.

Effects of Soil Type

Heavy soils (sandy clay, clay, silty clay)

- Have a stable soil structure but a narrow window for optimum cultivation. Often too wet or too dry to work
- Well suited to shallow cultivation, but the first pass must be shallow enough to avoid bringing up large clods
- Cultivations should be kept to a minimum, to reduce moisture loss. Use a furrow press or roll after each cultivation to retain soil moisture

Medium soils (sandy clay loam, clay loam, silty clay loam)

- Have few limitations and are easy to cultivate
- Soil structure tends to be weak and damage will occur in wet conditions
- More susceptible to plough pans

Light soils (sandy loam, sandy silty loam, silty loam)

- Have an unstable structure, especially if low in organic matter content
- Limit cultivations to avoid creating a very fine seedbed, which may settle into a compacted state during heavy rain and result in surface ponding
- Ploughing may be needed to break up compaction, creating a vicious circle
- Where damage has occurred, consider importing large quantities of an organic material (but don't break NVZ rules on total organic matter loadings)

Very light soils (sand, loamy sand)

- Very weakly structured, can slump down over winter
- Leave cultivations until just before drilling
- Plough to loosen the top 20cm of soil
- Use appropriate consolidation to preserve moisture and reduce erosion

Savings to be made

COSTS

AUTUMN cultivations are the hub of combinable cropping, dictating the labour required and the number and size of tractors, says John Bailey of TAG Consulting Ltd.

"There are huge opportunities to save time and money by finding a workable alternative to the plough. There's a host of new and used machinery available, to suit all farm sizes and pockets," he says.

The resulting time savings can amount to weeks of work at a critical time of year, adds Mr Bailey.

He points out that labour and machinery costs account for two-thirds of fixed costs, and suggests benchmark figures for growers to consider.

Labour is often the most difficult area, he highlights. "The target figures include the farmer or manager's time doing manual work, as opposed to management at employee rates.

"Many 400-500ha farms are being successfully run by the owner, with one regular, but very able employee. Good quality labour is important in this situation."

Investing in new cultivations equipment is a big decision, recognises Mr Bailey. "Deciding what system suits a farm best means you have to consider a number of factors."

Peak autumn workload, soil type and average rainfall are good starting points. "Then you need to be aware of the merits of the various systems, and their flexibility to adapt to a wet autumn. Finally, the tractor power available is important."

System	Cost (£/ha)	Time (mins/ha)
Ploughing	90-125	100-250
Heavy Discing	70-90	60-70
Solo type	65-70	40-50
Carrier type/Horsch	50-70	30-60
Scratch & drill	30	30
Direct drill	25-50	15-30

Fixed Cost	Benchmark	Comment
Manual Labour	£60-90/ha	Depends on farm size and alternative enterprises.
Manual Labour	300ha/regular employee	Range of 200-500ha
Machinery Cost	£140-160/ha	Covers depreciation, repairs, fuel and others.
Tractor HP	0.75-1.0hp/ha	All tractors doing some cultivation work.
Tractor Hours	800+hours/annum	Aim for reasonable hourly costs.
Average Establishment Cost	£70/ha	Range of £30-100/ha
Combining Cost	£37-62/ha	Excludes carting, add £10/ha
Combining Hours	250-300 hours/harvest	
Machinery Re-Investment	£70/ha per annum	Net of trade-ins

Potatoes

The BPC Enterprise Benchmark Calculator is helping growers get to grips with their finances, but it's also highlighting a widespread problem with labour and machinery costs.

The calculator has been updated, with new fresh and seed sectors added to the original version for the processing sector. It is potato-specific and provides a cost per tonne, rather than looking at costs per acre.

"Most growers have a good handle on costs per acre, but the cost per tonne can be a real surprise," says Phil Bradshaw, supply chain manager with the BPC.

The cost per tonne for labour and machinery, for ware potatoes across all regions is:

Less than 40ha	£44
41-99ha	£37
100+ha	£32

sow2succeed

BUILDING on the successful soil2crop initiative, the HGCA is planning **sow2succeed**.

This will explore tailoring agronomy decisions from the day you drill. It puts those decisions in to a whole farm context with the help of risk management strategies.

A series of winter roadshows are planned:

7 Dec 2004 – Peterborough
8 Dec 2004 – Colchester
14 Dec 2004 – York
19 Jan 2005 – Gloucester
20 Jan 2005 – Hampshire
25 Jan 2005 – Kelso

Contact events@hgca.com for more information. These will be followed by a series of workshops and farm visits in the spring and summer next year. Contact Clare Kelly at the HGCA (clare.kelly@hgca.com) if you are interested in hosting a farm visit.

In addition to the publications below, HGCA has produced a range of Topic Sheets in the areas of soil assessment, cultivations, crop establishment, crop management, nutrition and agronomy.

Topic sheets and guides are free of charge to levy-payers and can be downloaded from **www.hgca.com** or email publications@hgca.com or telephone HGCA's Publications on 0207 5203920.

- *Wheat disease management — update 2004*
- *Soil management for sustainable profit: soil assessment for decision making, 2003*
- *Pest management in cereals and oilseeds – a guide, 2003*
- *Managing and preventing herbicide resistance in weeds – WRAG Guidelines, 2003*
- *Arable Cropping and the Environment – a guide, 2003*
- *Precision farming of cereals – practical guidelines and crop nutrition, 2002*
- *P&K fertiliser planning, 2000*

BPC has produced quick guides for calculating fertiliser rates. These are available at **www.potato.org.uk** or you can email publications@potato.org.uk or telephone 01865 782222.

- *How to implement RB209 nitrogen fertiliser recommendations on your farm – and save money*
- *How to implement RB209 P, K and Mg fertiliser recommendations on your farm – and save money*
- *Making the most of organic manures for optimum results and cost savings*

Interactive web-based fertiliser calculators are also available at **www.potato.org.uk/RB209**