

Managing Set-aside and Fallows for Crop Protection

SUMMARY

- **Set-aside and fallow breaks can present opportunities for weed management.**
- **Disease pressures may change following a set-aside break.**
- **Pest numbers can build up in set-aside but so can their natural enemies.**
- **This technical note indicates how such breaks can be used to improve crop protection throughout the rotation.**

Introduction

Set-aside has been a feature of modern rotations for many years. With the advent of new approaches for support following CAP reforms in 2005, the value of crops is much more closely related to world market prices. On occasion a set-aside or fallow break may present a more cost-effective option than sowing a crop.

Both set-aside and fallows present opportunities for long-term weed and volunteer crop management. The management of weeds and volunteer crops have major implications for pests and diseases, as can management of crop residues and the timing of husbandry practices.

This technical note examines how set-aside and fallow breaks are best used to improve crop protection throughout the rotation.

Weed Control

Set-aside and fallow breaks are most useful for management of grass weeds, perennial weeds and volunteer crops which may contaminate other crops in the rotation. Both grass weeds and volunteer crops may be carriers or hosts to pests and diseases of other crops in the rotation.

Grass Weeds

Grass weed seeds have limited dormancy, so readily emerge when conditions are suitable. When going into a fallow break after a crop, lightly disturb the soil surface; for example, by harrowing. This will encourage weed grass seed to germinate in the autumn, or possibly early spring. The grasses should be treated with glyphosate in the spring before setting seed. This approach is particularly effective for rough meadow-grass, brome grasses, black-grass and Italian rye-grass. Wild-oats, which persist for longer in the seedbank and can emerge from some depth over a long period in autumn and spring, are less affected by the approach. However, it may encourage emergence in wild-oats that have shed in the previous crop, which after control will reduce the potential build-up in the seedbank.

To enhance the effectiveness of such a break, use reduced tillage after the fallow break so as to keep remaining grass weed seed at depth for at least another season. Many grass weed seeds do not survive for longer than two or three years in the seedbank, so keeping them buried for that long has a significant effect.

Volunteer Crops

Volunteer cereals behave similarly to grass weeds and can be tackled in the same way.

Recently shed oilseed rape should be left on the soil surface, where it will germinate and is readily controlled. If you wish to harrow to encourage grass weed emergence, wait for ten days after rain after the oilseed rape harvest to allow the shed rape seed to germinate first. If the oilseed rape seed is buried, it can persist for up to nine years in the seedbank, and fallows make little difference.

Volunteer linseed, beans and other annual crops usually emerge readily in fallows and can be controlled with glyphosate.

Set-aside and fallows are very important for the management of volunteer or groundkeeper potatoes. Treat the plants once they start to flower in the early summer with a full dose of glyphosate for best effect. However, where there is a concern about early blight from volunteers affecting neighbouring crops, treat newly emerged plants with paraquat + diquat, then treat the re-growth with glyphosate at flowering or after.

Perennial Weeds

Set-aside and fallows present an excellent opportunity to control perennial weeds. For perennial grasses, such as common couch-grass and rushes, glyphosate is the most effective treatment. This is also true for many broad-leaved plants, although higher doses are usually

required. The best timing is when flowering has started, but before any seed set.

However, some perennial broad-leaved weeds are relatively resistant to glyphosate and a combination of treatments may be needed. Rosebay willowherb and hoary willowherb are examples where treatments such as metsulfuron-methyl +2, 4-D or triclopyr may be more effective. Horse-tails (*Equisetum species*) are most effectively treated with glufosinate-ammonium in the late spring, although MCPA will kill the tops. However, long-term control also has to consider drainage improvements.

Where a green cover is to be maintained, treatments based on a metsulfuron-methyl can be effective for docks and creeping thistle. Where grass cover has been established triclopyr + clopyralid for example can be used for nettles, docks and thistles and MCPA or 2,4-D for thistles. Where clover is required to be maintained, products based on amidosulfuron and thifensulfuron-methyl are effective on docks and have some effect on thistles and nettles, MCPA+ MCPB has some effect on thistles. The use of wiper applicators is very effective on tall growing weeds; use glyphosate in most cases at the start of flowering of the weed.

Set-aside and fallows can be used to help manage, in particular:

Black-grass	Volunteer cereals and other annual crops
Bromes	Volunteer potatoes
Rye-grasses	Perennial weeds
Meadow-grasses	

Note that special attention should be paid to weeds listed in the Weeds Act 1959: ragwort, docks and thistles

Set-aside Rules in 2006

Details of set-aside management rules can be found in the Arable Area Payments Scheme (AAPS) Section D(2): Management of Set-aside Land : <http://www.scotland.gov.uk/library3/agri/aaps-08.asp>. This may change in future years.

Key points (paraphrased) include:

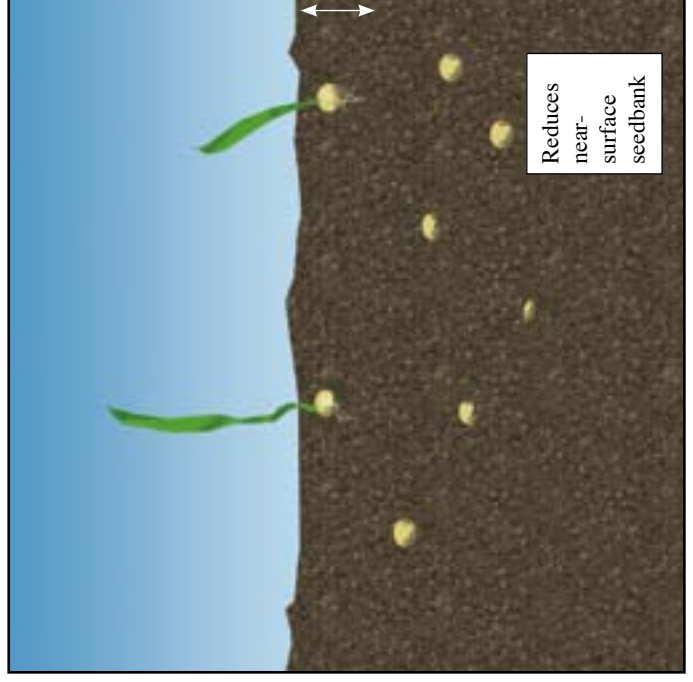
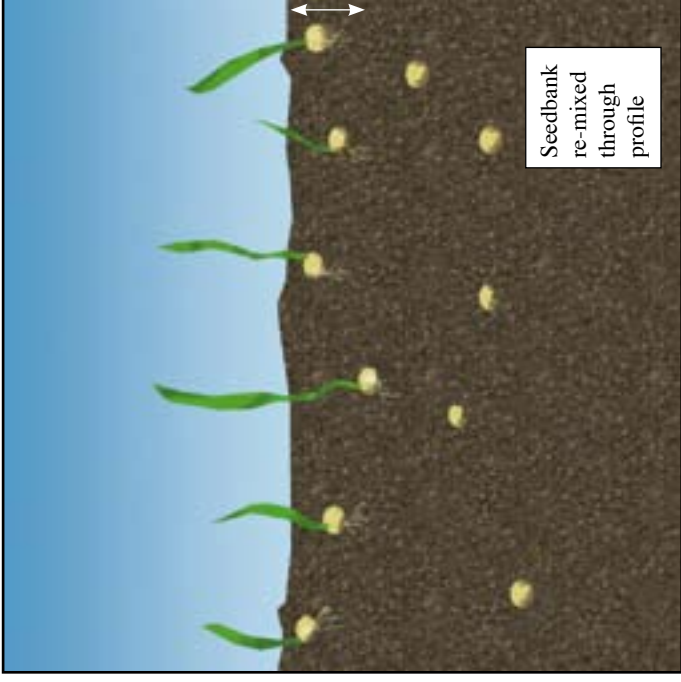
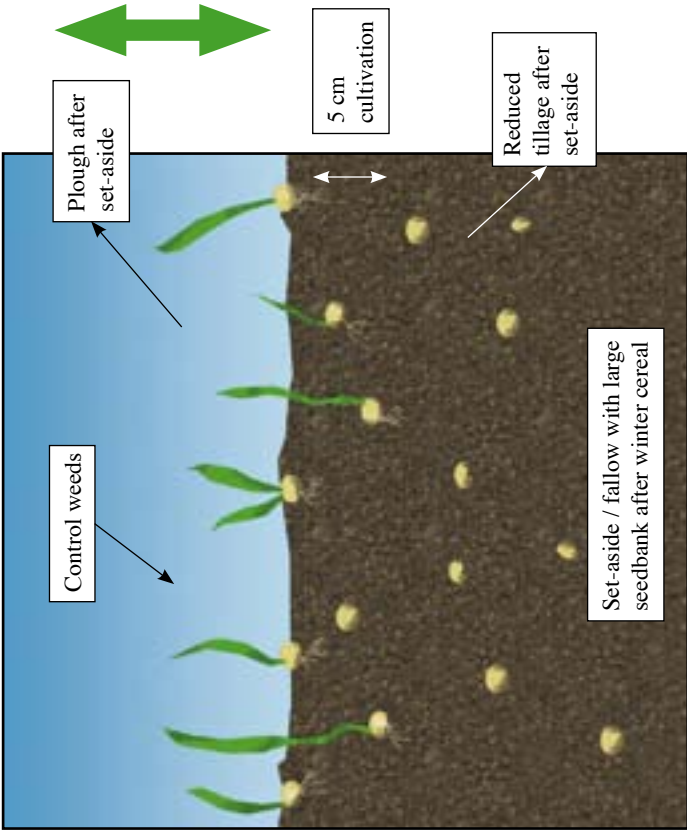
Green cover must be in place by 15 January.

Cover must be cut short between 15 July and 15 August and cuttings must be left on the ground. Alternatively cover must be destroyed by 31 August unless multi-year set-aside.

Do not use non-selective herbicides before 15 April unless replacing green cover.

Do not control weeds by cultivation before 1 July. No cultivation allowed between 1 May and 1 July (there are exceptions in details).

Where Weeds Act 1959 species are present (ragwort, docks., thistles), use herbicides for control where possible from 1 May to 15 July; derogation for cutting can be requested. Selective herbicides are preferred.



Controlling grass weeds in set-aside/ fallows helps in long-term management. Reduced tillage after set-aside will reduce the buried seedbank further, but unless surviving seeds near the surface are controlled, the grass seed population will grow rapidly in reduced tillage systems. Ploughing after set-aside brings up the buried seedbank but even a year under set-aside/ fallow will have reduced the seedbank. Keeping the seedbank buried for 2-3 years under set-aside/fallow will have a very significant impact. So rotational set-aside/ fallows and rotational ploughing can be used as tools in grass weed management. Most grass weeds emerge within 5-8cm of surface; wild-oats are an exception.

DISEASE CONTROL

The green bridge

Disease carry over in set-aside is dependent upon the type and amount of crop volunteers from previous crops. Volunteer cereals can harbour diseases which survive the winter via the 'green bridge effect'. The green bridge encourages fungi which require a living cereal plant to survive from one cropping season to another; for example, powdery mildew and yellow rust.

Other diseases, which survive on trash and volunteers present in set-aside, include the barley diseases rhynchosporium and net blotch. The spores of the fungi responsible for these diseases spread by wind or rain splash from the previous crop onto volunteers in set-aside. Further dispersal can then take place from these volunteers onto newly emerging crops. Effective control of volunteers will therefore have an impact on disease survival.

Cereal root and stem diseases

Some root and stem diseases may survive in set-aside in the stubble. Two key examples are the root disease take-all and the stem base disease common eyespot.

Common eyespot is a disease of wheat and barley. It attacks the stems, causing eyespot lesions, which affect water and nutrient uptake. They also lead to a weakening of the stem, which can lead to a greater risk of lodging. The disease infects stems in the autumn and spring, but symptoms may not be obvious until the summer when lodged crops or white heads may appear.

In a wheat/set-aside/wheat rotation, the cereal stubbles from the first wheat crop will harbour common eyespot. This means that the wheat crop following the set-aside will be at a higher risk of common eyespot than a true first wheat crop. When using the SAC eyespot risk forecast, it is best to assume these crops have the same risk of eyespot as a second wheat as opposed to a first wheat crop.

The cereal root disease take-all is a greater risk to second wheat crops. It is rarely a major problem in first wheat crops. The wheat/set-aside/wheat rotation will not provide a complete break from take-all. Take-all will be present on cereal and grass weed volunteers in the set-aside. The risk of take-all in the following wheat crop is therefore likely to be higher than the risk posed in a first wheat crop.

Where the crop rotation has been in continuous wheat, take-all decline can develop. This is a situation where the take-all is in balance with antagonistic fungi in the soil. Not cropping with a cereal usually breaks the cycle. The impact of set-aside on take-all in this situation may depend upon the level of grass and cereal volunteers. If they are numerous, it may have little impact on the take-all decline. If there are few volunteers in the set-aside, take-all levels in the following cereal crop may be higher than seen previously. In this situation, using a seed treatment, which provides some reduction in take-all, would be a sensible precaution. Examples of seed treatments include Latitude and Jockey.

Oilseed rape diseases

If industrial oilseed rape is sown in set-aside, the risk of disease will be similar to those of having a crop of winter oilseed rape, including light leaf spot, phoma leaf spot and sclerotinia.

Oilseed rape volunteers and brassica weeds in set-aside can increase

levels of clubroot, if it is present in the field. Clubroot is a soil borne fungus which attacks brassicas and disease levels increase in the soils where oilseed rape or other brassica crops are grown in short rotations. Where clubroot levels are high, it usually takes over ten years of non-brassica crops to reduce the levels, and a single years break from a brassica crop will have little impact on the disease.

Ergot

Grasses and grass weeds are a potential host for the cereal disease ergot. Where grasses are allowed to flower and set seed, the risk from ergot is likely to be higher to neighbouring wheat crops and to following cereal crops than in a set-aside field where grasses and cereal volunteers have been controlled prior to flowering.

PEST CONTROL

Will pests increase in set-aside?

Some pests have the capacity to build up their populations in set-aside, depending on whether the set-aside is short-term, long-term or restricted to the field margins. However, the flip side of this is that the predators and parasites of pests will also increase, especially where set-aside is long-term.

- Slugs tend to increase in set-aside and could pose a problem in subsequent cereal and oilseed rape crops.
- Rabbits take advantage of the extra cover afforded by set-aside and pose a threat to following crops.
- Plant-parasitic nematode populations build up in set-aside.
- A reservoir of barley yellow dwarf virus (BYDV) may persist in set-aside.
- Wheat bulb fly, frit fly, leatherjackets, aphids and bionids may build up over time in set-aside depending on the type of cover and plants present.

Set-aside has been shown to increase populations of beneficial invertebrates such as spiders, carabid beetles, hoverflies, and aphid parasitoids depending on the plant species and cover in the set-aside.

The key to preventing pest problems arising in crops sown after set-aside is managing the green bridge.

The green bridge

Just as the green bridge can have an impact on the carry over of diseases, several pests may take advantage of the volunteers and grasses that may be prevalent in set-aside.

There is potential for a reservoir of barley yellow dwarf virus (BYDV) to persist in grasses and cereal volunteers in set-aside, with aphids picking up the virus and carrying it over into subsequent cereal crops. Wheat bulb fly can utilise wheat and barley volunteers as hosts, as well as couch grass to allow a local build up in numbers.

Tackling the green bridge can reduce the threat from many pests that have built up during the set-aside period.

By far the best option is to desiccate the set-aside stubble with a herbicide, plough in 7-10 days later, and leave for a further 2 weeks before sowing. Alternatively, the stubble can simply be ploughed in and sowing of the next crop delayed for 4 weeks.

The benefits to be gained from this are that aphids that may be carrying BYDV will be controlled, preventing them simply walking onto the

emerging crop and transmitting the virus. Aphids can still fly into the crop though, so an aphicide either as a seed treatment or a spray may still be necessary.

Other potential pests such as frit fly, leatherjackets and slugs can be managed as well to some extent in this way, although it is recommended that set-aside stubble be sampled or monitored for these pests to determine whether they are likely to be a problem in any following crops.

Wheat bulb fly is a potential problem as it lays its eggs in bare soil from July through to the end of September. Consequently tackling the green bridge as outlined above can make fields attractive to wheat bulb fly for egg laying. Several options exist for minimising the threat from wheat bulb fly after set-aside, and by far the simplest one is to not grow winter wheat or spring barley after coming out of set-aside. Alternatively, soil sampling for wheat bulb fly eggs before soil cultivation in early September will allow an estimate of egg numbers to be obtained, and a decision can then be made on whether a seed treatment needs to be applied to winter wheat for minimising wheat bulb fly damage.

Free-living nematodes

The build up of plant-parasitic nematodes in set-aside can have an impact on subsequent crops. By far the most concern is to growers who will grow potatoes in the rotation, as Trichodorid nematodes are vectors for tobacco rattle virus, which causes 'spraing' in potato tubers.

The virus can persist in a variety of weeds, so set-aside can act as a reservoir for the virus and the nematodes can acquire and transmit the virus from/to these plants. Free-living nematodes can also cause direct-feeding damage to crops such as cereals, potatoes, carrots and other vegetables.

There is not much that can be done to limit the build up of nematodes. Research is ongoing into the growing of green manures that can be ploughed in to have an effect on nematodes and other soil organisms, but no firm recommendations can be given at this early stage.

It is recommended that soil samples be taken to assess nematode populations after set-aside has been ploughed, so that advice on whether nematicides need to be applied to crops such as potatoes and carrots can be given. In other crops, the only option is to sow in good seed beds to give them a chance to grow away from any feeding damage. Rolling of cereals before GS30 can help.

Slugs

Slugs will enjoy and exploit the constant supply of food and shelter afforded by set-aside over the winter months. However, their predators, such as carabid beetles, will also build up their numbers in set-aside, so there will be a certain level of natural control of slugs by the beetle larvae and adults. Monitoring of slugs prior to ploughing in the set-aside is recommended so that the risk of slug problems in the following crop can be gauged.

Authors:

Ken Davies

Weed and Vegetation Specialist
SAC
Pentland Building
Bush Estate
Penicuik
EH26 0PH
Phone 0131 535 3306
eMail ken.davies@sac.co.uk

Simon Oxley

Senior Researcher (Plant Pathology)
SAC
Kings Buildings
West Mains Road
Edinburgh
EH9 3JG
Phone 0131 535 4094
Fax 0131 535 4144
simon.oxley@sac.ac.uk

Andy Evans

Researcher (Entomology/Nematology)
SAC
Kings Buildings
West Mains Road
Edinburgh
EH9 3JG
Phone 0131 535 4093
Fax 0131 535 4144
andy.evans@sac.ac.uk

Summary table

Problem	Issues in managing problem	Advice to control problem	Impact on weeds	Impact on diseases
Grass weeds e.g. meadow grasses, bromes, black-grass, Italian rye-grass	Limited dormancy & readily emerge when conditions are correct.	Lightly disturb soil in autumn going into fallow break. Treat with glyphosate in spring before seed sets.	Reduced tillage after fallow will keep grass weed seeds at depth for another season. Most grass seeds only survive for 2-3 years.	Grass weeds can harbour ergot. Controlling weeds helps reduce the disease.
Wild oats	Persist longer in seedbank	Advice for grass weeds will have limited effect	Action still worthwhile as for grass weeds to reduce seedbank.	Limited impact on oat disease carry over.
Volunteer cereals	Limited dormancy & readily emerge when conditions are correct.	Lightly disturb soil in autumn going into fallow break. Treat with glyphosate in spring before seed sets.	Reduced tillage after fallow will keep volunteer cereal seeds at depth for another season. Most cereal seeds survive for 2-3 years.	Controlling volunteer cereals cuts the green bridge so preventing major foliar and stem base cereal diseases from over-wintering.
Volunteer oilseed rape	Many seeds on surface after harvest	Leave on surface in fallow.	If buried soon after harvest, seeds can survive 9 years.	Controlling oilseed rape reduces carry-over of clubroot.
Volunteer potatoes	Set-aside provides an opportunity for control.	Use glyphosate when flowering has started.	Not 100% effective, but there will be a major reduction.	Controlling volunteer potatoes can reduce blight spread.
Perennial weeds e.g. Couch grass, rushes	Set-side provides an opportunity for control.	Use glyphosate when flowering has started but before seeds have set.	Opportunity to control perennial weeds.	Controlling couch grass can help reduce take-all and ergot.
Perennial weeds resistant to glyphosate e.g. willow herbs, horsetail	Set-side provides an opportunity for control.	Combinations of herbicide treatments are required.	Opportunity to control perennial weeds resistant to glyphosate.	Little impact except controlling brassica weeds will reduce clubroot carry over.
Slugs	Trash will encourage slugs, but predators will also increase.	Monitor slug populations before sowing following crop.	Slugs may selectively feed on weeds.	Little impact.
Wheat bulb fly	Bare soil July – September encourages flies to lay eggs.	Anticipate higher risk in following cereal crop where weeds have been controlled	Volunteer cereals may be attacked by wheat bulb fly.	Little impact.
Free-living nematodes	Parasitic nematodes persist in weeds.	Anticipate a build up where host plants are present.	Little impact.	Little impact.
BYDV	Volunteer cereals can harbour disease.	Control volunteers to reduce risk.	Presence of volunteer cereals will increase aphid populations.	Controlling volunteer cereals will reduce other foliar and stem-based cereal diseases.