Herbicide Definitions Relevant to Forestry

SITUATION TERM	FIELD OF USE	DEFINITION	NOTES
FOREST	FORESTRY	Groups of trees being grown in their final positions, eg after planting out from a forest nursery, or from natural regeneration, colonisation or coppicing. Covers all woodland grown for whatever objective, including commercial timber production, amenity and recreation, conservation and landscaping, ancient traditional coppice and farm forestry. This includes restocking of established woodlands and new planting on both improved and unimproved land.	This is a very broad definition covering all land types and tree species. It covers farm woodlands,plantations of broadleaves or conifers and semi-natural woodlands established by any method. It also includes the management of vegetation within forests not directly related to establishing trees, such as the management of tracks and ridesides and areas used for public recreation. It includes Christmas trees although these are currently covered by separate long-term off label arrangements allowing the use of any approved product, with certain restrictions. Any specific exclusion period for the public will appear on the label. Small groups or individual trees in parkland or roadside verges fall under AMENITY use, whereas larger groups of trees on roadsides or in community forests fall under the FOREST definition. Between these two cases there will be some overlap. It is the responsibility of the users to ensure that, in deciding which category is applicable, the safety of humans and the environment is safeguarded when choosing and applying pesticide products.
FARM FORESTRY	FORESTRY	Groups of trees established on arable land or improved grassland including those planted for short rotation coppicing.	All new planting on arable or improved grassland as defined in WGS 111 is classed as farm woodland or FARM FORESTRY, which is a subset of the FOREST category. Some pesticides normally used on arable crops are needed in the establishment phase of farm woodlands and these products may gain approval in this situation.New hedges planted as boundaries around arable fields are also included.
FOREST NURSERY	HORTICULTURAL	Areas where young trees are raised outside for subsequent forest planting.	Areas where young trees are grown, for subsequent transplanting to forest and amenity plantings. Crucially, wildlife and the public have restricted access.
AMENITY VEGETATION	AGRICULTURAL/ HORTICULTURAL	Areas of semi-natural or planted herbaceous plants, trees and shrubs. If only one type is allowed this will be specified eg amenity vegetation - trees and shrubs	Can include small grassy area mixed with other vegetation, semi-natural areas not intended for grazing such as heathland and planted areas such as rose beds and tree and shrub plantings.Individual or small groups of trees in parkland or on roadsides will be covered. There is some overlap with the FOREST situation in the latter two cases - see earlier. The label should be checked to see if application in rooting zones of trees and shrubs is safe.
ORNAMENTAL PLANT PRODUCTION	HORTICULTURAL	This includes all ornamental plants that are grown for sale or are produced for replanting into their final growing position.	Forest nurseries are included if the label recommends treatment of relevant individual tree species or a separate approval may be granted for FOREST NURSERIES alone.
LAND NOT INTENDED TO BEAR VEGETATION	INDUSTRIAL/ HORTICULTURAL	Soil or man-made surfaces where it is intended that no or minimal vegetation will be grown for several years. It does NOT include the land between rows of crops.	Covers bare soil, but also that covered by hardcore, gravel and tarmac. Thus this situation may be relevant to weed control on forest roads or around buildings.
MANAGED AMENITY TURF	HORTICULTURAL	Frequently mown, intensively-managed turf.	Parks, sports fields, golf courses, etc. Of little or no relevance to forestry.
AMENITY GRASSLAND	AGRICULTURAL/ HORTICULTURAL	Semi-natural or planted grassland with the minimal management.	Railway/road embankments and grassland nature reserves, not intended for grazing. Open space within forests is likely to be covered by the FOREST situation.
GREEN COVER ON LAND TEMPORARILY REMOVED FROM PRODUCTION	AGRICULTURAL/ HORTICULTURAL	This includes fields covered by grass and herbaceous natural regeneration or by a planted green cover crop which will not be consumed by humans or livestock. These fields will be growing harvested crops in other years.	For example set-aside land. Not applicable to forestry - if trees are planted on set-aside it becomes a FOREST or FARM FORESTRY situation.
USE IN OR NEAR WATER		Includes drainage channels, streams, rivers, ponds, lakes, reservoirs, canals and dry ditches.	Also covered is the control of vegetation growing on the banks, or areas immediately adjacent to such water bodies but not the control of vegetation growing on nearby cropped or amenity land.

Farm forestry situation.

USING ADDITIVES with FORESTRY herbicides

BY IAN WILLOUGHBY, SILVICULTURIST, FORESTRY COMMISSION RESEARCH DIVISION

Additives are chemicals which are mixed with herbicides to enhance their effect on target weed species. They can be subdivided as in Fig 1.

Surfactants

Surfactants (surface active agents) contain lipophilic (oil loving) and hydrophilic (water loving) groups within the same molecule. When added to a herbicide they reduce the surface tension of droplets which tends to spread the herbicide better onto a leaf surface (see Fig 2).

Surface active parts of ionic molecules retain a positive (cationic) or negative (anionic) charge and can react chemically with herbicides and might, in theory, reduce efficacy. Cationic surfactants may be preferentially attracted to plant leaves.

Non-ionic surfactants are not electrolytes, do not form ions and therefore do not react with herbicides they are mixed with.

Most herbicides already contain a surfactant. Adding surfactants in small quantities may give some of the following benefits to some herbicide applications.

1. Smaller droplets - they are spread more evenly leading to improved efficacy.
2. Improved wetting of leaves - herbicides are absorbed over a larger area, leading to more rapid uptake.
3. Improved spread of droplets on leaves - droplets are less likely to fall off the leaf.
4. Reduced evaporation rate - herbicides remain in liquid form for longer, increasing the potential for absorption.
5. Dissolving of waxes - when surfactants dry, they have relatively higher concentration and may dissolve leaf wax so aiding penetration and spray retention.
6. Improved translocation - movement may be improved within the plant.

Generally speaking, using surfactants at higher concentrations than recommended, **will not** lead to further increases in efficiency.

Additives can be mixed with herbicides to enhance their activity in a number of different ways. A large variety of additives are approved, but relatively few are recommended by herbicide manufacturers, or have been the subject of evaluation by the Forestry Commission.

Adjuvants

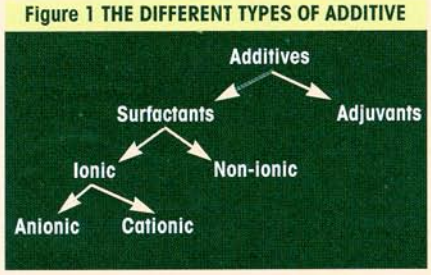
Adjuvants contain surfactants and oil, which increase the herbicidal effects of the product which they are added to. They are often used with water insoluble herbicides. They can also help to give a more even deposition when using very low volume applicators such as CDA (controlled droplet applicator) sprayer.

Other additives include ammonium sulphate, which increases leaf permeability, drift reducers and chemicals which stick products to leaves with a latex-type material.

Additives, like herbicides, must be approved for use by the Pesticides Safety Directorate. The UK Pesticides Guide 1996 (Whitehead 1996) gives a full list of all approved additives. Some additives have been subject to recent Forestry Commission testing and many are specifically recommended on product labels. These are summarised in the next section.

The relative benefits of other additives that practitioners may wish to use should be determined by liaison directly with the manufacturers and possibly through small-scale field trials.

Figure 1 THE DIFFERENT TYPES OF ADDITIVE



Recommended additives for forestry herbicides

The following additives are recommended for use with forestry approved herbicides. These are based on recent trials or herbicide label recommendations. Due to the wide range of available additives, few have been tested by the Forestry Commission. Practitioners should make their own judgement as to the relative benefits of any additive they may be interested in using, through liaison directly with the manufacturers, through small-

scale user trials.

Unless otherwise stated, all additives will reduce crop tolerance and should not be used when overall sprays are made. Additives may also increase the hazard classification of any herbicide they are mixed with - refer to the additive label.

Conclusion

The two main effects of additives are:

- to improve efficacy, and
- to improve the speed of uptake.

The first benefit may result in better vegetation control and the opportunity to use lower herbicide dose rate. The second benefit reduces the risk of contact herbicides such as glyphosate being washed off by rainfall soon after application.

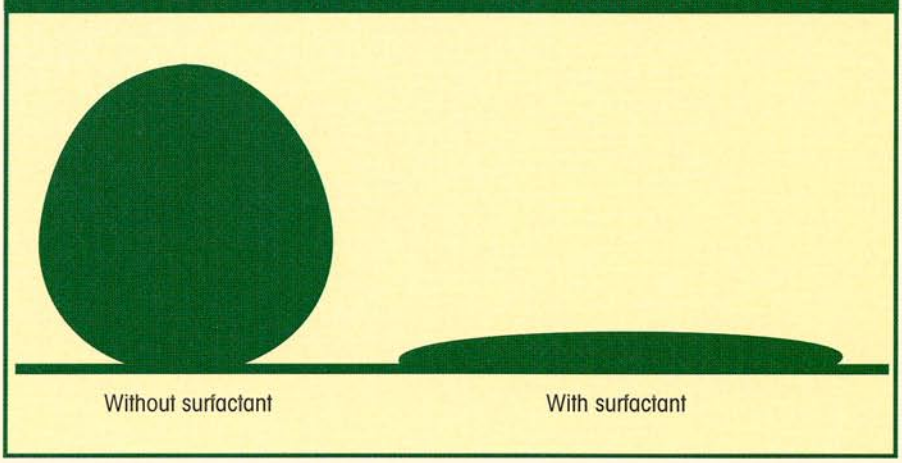
Additives are, therefore, primarily worth considering when particular problem weeds are present, or when rainfall is likely shortly after application. In either case crop tolerance will be reduced - overall sprays should not be made.

HERBICIDE ACTIVE INGREDIENT	TYPE OF APPROVAL	POTENTIAL ADDITIVE	MANUFACTURER	PRE-PLANT	DIRECTED	OVERALL	RATE	APPROX COST/LITRE	USES
Asulam	Full forestry label	Agral	Zeneca (tel 01428 656564)	✓	✗	✗	0.001%fsv	£7.00	For water-based solutions, where rainfall is expected within 24 hours. At least six hours rain-free is a minimum requirement.
		HT Non-toxic	Service Chemicals (01327 704444)	✓	✗	✗	0.001% fsv	£3.00	Note that any additive mixed with asulam increases potential enviornmental risk. Additives should never be used post-planting or with aerial applications.
Cycloxidim	Forestry off label	Actipron	Bayer plc (01284 763200)	✓	✓	✓	0.8%fsv	£2.50	**Essential** for all applications. Crop tolerance confirmed in recent Forestry Commission trials.
Fluazifup-p-butyl	Farm forestry label	Agral	Zeneca	✓	✓	✓	0.1%fsv	£7.00	**Essential** for all applications. Crop tolerance confirmed in recent Forestry Commission trials.
Glyphosate	Full forestry label	Mixture B	Service Chemicals	✓	✓	✗	2%fsv	£4.50.	Use if rainfall is expected within 12 hours of application and for all applications to rhododendron. Greater efficacy than other adjuvants confirmed in recent Forestry Commission trials.
Imazapyr	Full forestry label	Mixture B	Service Chemicals	✓	✗	✗	2%fsv	£4.50	Use for applications to rhododendron. Efficacy confirmed in recent Forestry Commission trials.

Notes: fsv - final spray volume
Table shows only those additives that are recommended by herbicide manufacturers or have proved to be beneficial in Forestry Commission tests. All additives will potentially increase the risk to the crop, environment and the operator.

ALWAYS READ THE ADDITIVE LABEL BEFORE USE

Figure 2 PROFILES OF LIQUID DROPLETS WITH AND WITHOUT SURFACTANT



Reference

Whitehead, R. ed. (1996). *The UK pesticide guide*. British Crop Protection Council, Bear Farm, Binfield, Bracknell, Berks, RG42 5QE (tel: 01734 342727).