WEEDS OF PASTURES, WOODLANDS AND RANGELANDS - A REVIEW

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Summary. The interactions between weeds, pastures and livestock are described. The importance of pasture value in assessing weed effects and the central role of the farm manager in weed control programmes are highlighted. A continuing emphasis on prevention of weed problems and the use of fire and herbicide application techniques are discussed. The broad relevance of biological/ecological studies of weeds is demonstrated. The need for more economic appraisals of problems, the use of indigenous organisms for biological control and the relevance of plant spread and genetic studies are seen as major issues in pasture weed research into the 1980's.

INTRODUCTION

The interactions between weeds, pasture species and livestock are complex (Figure 1) and individual experiments of necessity only examine parts of this system but should still be seen in this context. In relation to this overall system we can consider three main groups of experiments:

1. Effects *of* weeds
   (a) on other vegetation
   (b) on livestock and produce
2. Effects *on* weeds
   (a) of other vegetation
   (b) of livestock
   (c) of man
3. Biology/ecology of weeds.

Results of studies in this group in particular can have relevance to studies in the other groups.

EFFECTS OF WEEDS

A weed of pasture (woodland or rangeland) is a species whose presence results in a reduced economic output of a specific system (Wells 1974). Most research into weed control assumes that control is economically worthwhile or at least that the weed has an adverse economic effect, yet there are few production orientated estimates of the impact of weeds in pasture. There are some good reasons for this since many weeds provide fodder and some pasture plants have undesirable (weedy) characteristics. Furthermore, when the economic consequences of weeds occur via competition with pasture, an assessment of these consequences involves a calculation of the monetary value of a unit of pasture. This value varies seasonally because of changes in supply and demand for both pasture and the animal product.

Thus a unit of pasture in a prime lamb enterprise at Orange has a

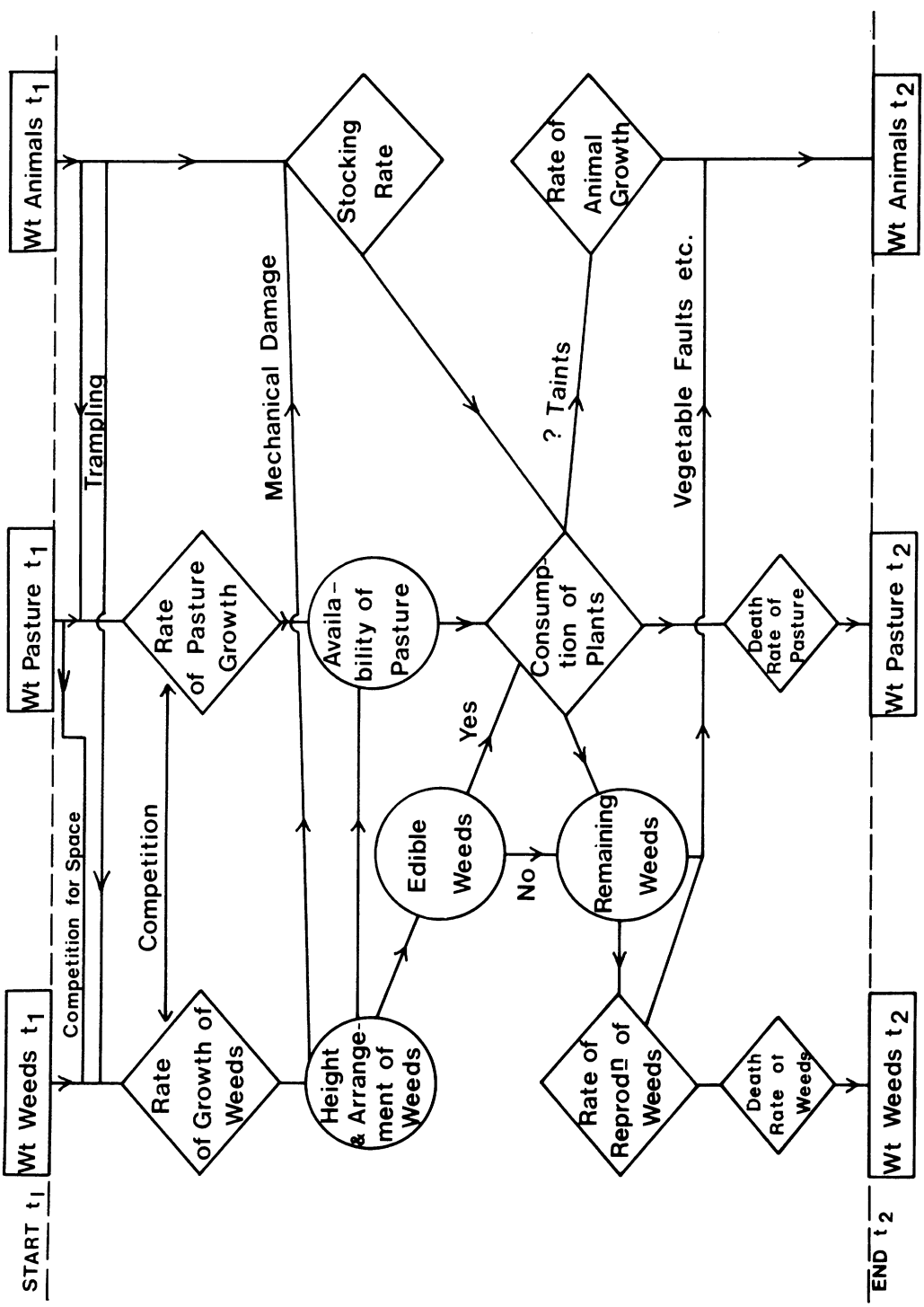

Figure 1. Interactions between weeds, pasture and livestock (after Auld *et al.* 1979).

higher value in winter than in spring (Figure 2), so the effect of weed competition in winter is more serious than the same degree of competition in spring. In addition the full impact of weeds cannot be measured solely by their current effects since competition now will effect pasture production later.

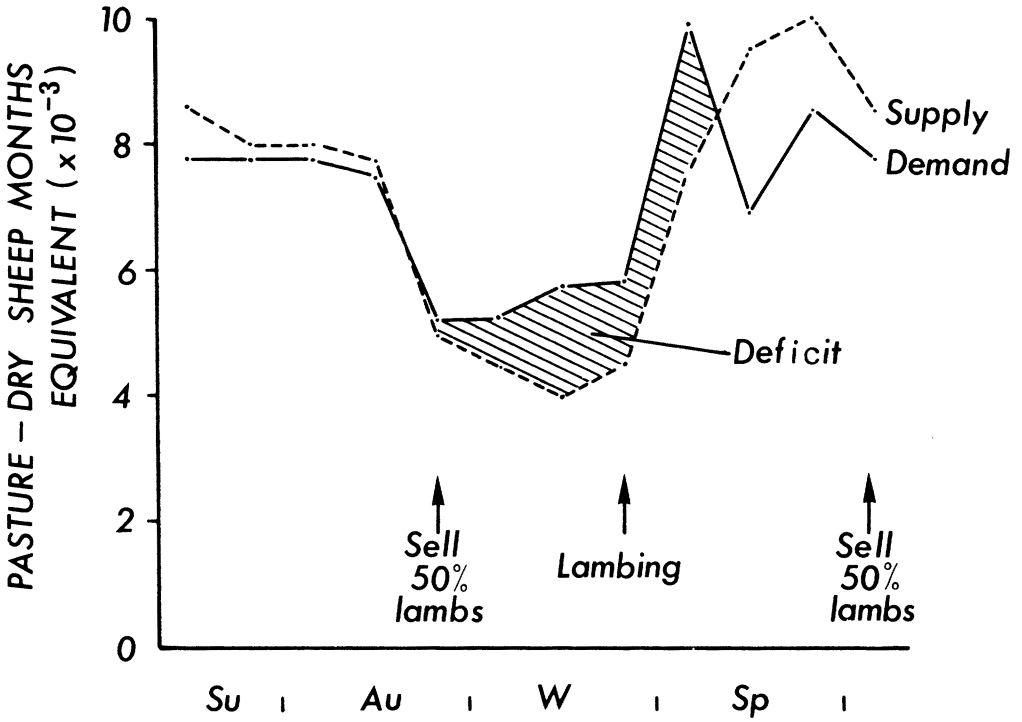

Figure 2. Pasture supply and demand for a prime lamb enterprise at Orange N.S.W. (after Auld *et al.* 1979). Note how a change in lambing time affects the system.

In spite of these difficulties there have recently been some noteworthy attempts to quantify the effects of weeds in pasture and benefits from control by Neilsen and Cronin (1977) and Vere and Campbell (1979). In this Conference we have a paper by Tudor *et al.* which deals with meat taints from parthenium weed (*Parthenium hysterophorus*). This is one of the few instances where tainted meat has actually been submitted to a tasting panel rather than the subject of an anecdotal report. A practical outcome of this work was to demonstrate that tainting could be reduced by removing sheep from parthenium weed infested pasture for at least 14 days prior to slaughter.

EFFECTS ON WEEDS

Conference papers in this section discuss the effects on weeds of man.

The importance of 'the man' or 'the manager' in weed control must be emphasised since he is the driving force in a farm system. He does not see weed control as an isolated activity but one which must compete with several other activities on the farm. A key feature of his activities is his ability to revise and adjust plans with time (Figure 3). A good manager will not glibly follow a predetermined recipe for weed control but will adapt principles established by research to his farm system. Thus in weed control, research establishing principles is a key activity.

Rangelands and woodlands. A simple principle often neglected in contemporary research is that prevention is better than cure. Pressland takes up this point in relation to woody weeds in Australian rangelands and emphasises the need for stock management to prevent the problem. He also makes the point that managerial control may be more successful when weeds are already under some form of stress (although this may not be true for chemical control) a point made recently by Harris (1980) in relation to biological control.

In this context Condon and Alchin report the need for containment of Noogoora burr (*Xanthium pungens*) in rangeland.

One method of control in rangeland is the use of herbicides. Alchin reports that hexazinone may have potential for woody weed population control in rangelands as it was able to kill over 75% of three species treated. Although this is likely to be of most use in the control of small invading populations, the economics of its use on a broader scale should be evaluated along with assessments of its effects on useful species.

Fire is a weed control tool in rangelands which is coming under increasing scrutiny. Early explorers observed that fire was used by aborigines for hunting and (perhaps unwittingly) to maintain disclimax grassland, but only in the last ten years has a concerted research effort been directed towards studying the effects of fires in Australian rangeland. Robertson and Walker describe the use of fire to control three shrub species in *Eucalyptus populnea* woodland. One of the problems with the use of fire is the requirement for sufficient ground fuel to carry the fire and maintain temperature sufficiently high to kill undesirable species. Robertson and Walker emphasise the use of follow-up burns and the inability of native pasture to provide the necessary fuel. Fire has also been suggested for Noogoora burr control in rangeland areas by Condon and Alchin.

Pastures. Chemical control of blackberry (*Rubus fruticosus*) is the subject of a paper by Toth *et al.* and a paper in another session by Irvine. These papers indicate that there are a number of useful alternatives to 2,4,5-T for blackberry control. The use of controlled droplet application is sure to have relevance in rough terrain in which blackberries are so often found. However there is always a high degree of variability in effect either with time of application or site with any method of chemical control of blackberries. One wonders whether there might not be a genetic basis for this.

Serrated tussock (*Nassella trichotoma*) has remained a serious weed in the tablelands of New South Wales and is still spreading. The methods of control have been well established by Campbell (1974) but anything that can be done to reduce the cost of control is worthwhile. In this session Campbell describes how the cost of control can be significantly reduced by halving the herbicide rate.

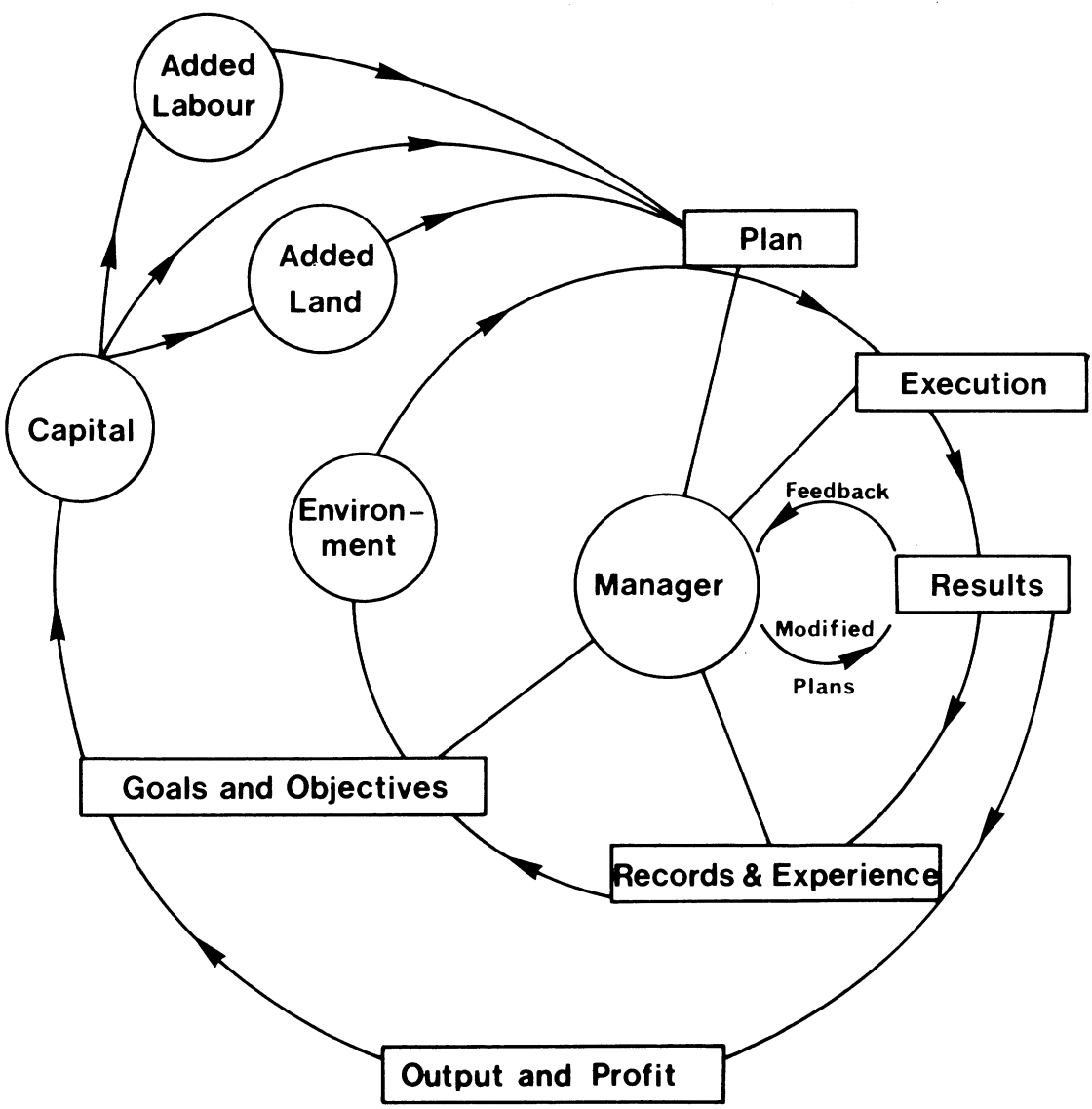

Figure 3. Generalized farm management cycle (from Auld *et al.* 1979).

BIOLOGY/ECOLOGY OF WEEDS

This last category of experiments may superficially appear to lack practical value. For instance, over the last ten years there has been a considerable amount of work on plant demography which is concerned with births and deaths of plants - a seemingly academic exercise. However results from such studies can often have a direct bearing on weed control which a manager can put to good use.

In a recent study of the population ecology of charlock (*Sinapis arvensis*), Edwards (1980) showed that the viable buried seed population would return to its original level if herbicide application was missed for only one year in eleven - a very useful piece of cautionary information for a manager.

The paper by Harvey on germination of prickly acacia (*Acacia nilotica* ssp. *indica*) following ingestion by sheep and cattle helps to explain the spread of the species, indicates the possibility of control by grazing and indicates that further spread could be reduced. The containment of spreading species is mentioned in papers by Condon and Alchin, and Tothill and Berry. It is an area of great relevance to noxious plant policy as prevention of spread is the motive force behind government intervention in weed control (Menz and Auld 1977).

INTO THE 80's

Effects of weeds. More stringent economic appraisals of weed effects and benefits from control will be required to obtain research funds. This area is not well represented at this conference.

Control by fire. The use of fire in rangelands is an important area which will come under increasing study in the 80's as will the use of better techniques of herbicide application - both areas are represented at this conference.

Biological control. Although there have been suggestions of the use of indigenous organisms for biological control in an inundative approach - this has not happened - perhaps it will in the 80's.

Biology/Ecology. The interest in studies of spread and containment of weeds will continue both at Orange, following up recent work (Auld and Coote 1980 and 1981; Menz *et al.* 1980), and C.S.I.R.O., Canberra. Genetic studies of our weed species such as those of Burdon *et al.* (1980) will continue to play a vital role.

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