

## Inter-Row Cultivation and Arable Black-Grass Control

### **The potential for inter-row cultivation to contribute to the control of black-grass (*Alopecurus myosuroides*) in arable production systems**

The effective management of all crop pests is vital to developing and maintaining efficient food production systems. Of all pests, it is weeds that pose the greatest global threat to food production, and their control is the centre of my PhD project, writes [Will Smith](#), PhD Student and Research Agronomist (Weed Management) at NIAB. This project has been kindly supported by the [Felix Cobbold Trust](#) and the [Chadacre Agricultural Trust](#).



Fig.1: Will Smith, NIAB

In the UK, the most dominant weed is *Alopecurus myosuroides*, commonly known as black-grass. It has come to be nearly ubiquitous in arable fields as a result of autumn dominated cropping systems and the development of herbicide resistance.

Currently, the use of herbicides is the primary method of in-crop weed control. These have historically proved to be highly effective against the target weeds. However as a result of the aforementioned herbicide resistance the reliability of these chemicals has waned. Unlike for insect pests and diseases, a poor year of weed control will have a significant legacy, rather than just reduce crop yield in the primary year of infestation. Therefore, aiming to maximise control in every year is often the target. For black-grass the level of reduction of seed production to reduce future populations is estimated to be over 97% in rotations dominated by autumn sown crops.

Concurrent to the reduction in herbicide effectiveness due to resistance there has been a shift in consumer behaviour and political will. This has resulted in a focus to increase registration standards and a reduction in the pesticide inputs used in crop production. This has contributed to less effective chemical control now being possible. Therefore, alternative approaches must be sought to ensure effective weed control remains accessible.



*Fig.2: Inter-Row vs Intra-Row*

My project has worked from the framework that weed control can be organised by the crop arrangement so that the techniques used between the rows (inter-row) are different to those used over the crop row (intra-row) (*Figure 2*). The options for control in the inter-row space, where crop safety is no longer a requirement, are expanding with electric, light or laser weeders being developed, however inter-row cultivators are already widely available, and represent the most immediate possibility. Working with Garford Farm Machinery to build a machine suitable for plot scale work, I developed a multi-year trial series that would develop a robust data-set on the efficacy of inter-row cultivation, and provide a launchpad for economic and life-cycle analysis. (*Figure 3*)



*Fig. 3: Inter-Row Hoe working in the Field*

As I now enter the write-up stage, the results are looking really positive. One of the challenges of mechanical weed control in the UK is that the typical climate leaves soils close to field-capacity late into the spring, risking poor cultivation and re-rooting of weed species. Despite this, inter-row cultivation consistently delivered over 25% additional control when combined with an autumn herbicide programme. The economics appear to stack up, as this additional control is likely to be available at £20/ha, which can rival even the newest herbicides for cost-effectiveness.

There is one major challenge associated with this technology and that is the uplift in labour required. Inter-row cultivation is likely to require over four times the labour (in hours) compared to using a sprayer, and whilst this economically possible, it should be questioned whether this labour time exists, even if contractors are used.

Herbicides, particularly the residual types, can be variable in performance due to conditions around application, so it is expected that inter-row cultivation may only be practiced in those scenarios where chemical control was not as high as expected, or where there is an absence of appropriate herbicides, for example in winter beans or more novel crops, such as chickpeas. The initial life-cycle analysis indicates that this reactive approach, to fill the efficacy gap, would contribute enough control to prevent growth in black-grass populations in the short-term, however would not be effective enough to be used in isolation in the long-term.