Pest control

Reducing pesticide use on farms, as required by the European Commission, is a significant challenge, which can only be met through more diverse crop rotations and a greater focus on integrated pest management (IPM) strategies.

As part of the recently published Farm to Fork Strategy, the European Commission has committed to take action to reduce by 50 % the use and risk of chemical pesticides by 2030. Frequently used in a generic sense, pesticide is an over-arching term that, as defined by EU legislation, encompasses fungicides, herbicides, bactericides, insecticides, plant growth regulators, molluscicides, and other plant protection products (PPPs).

The most recent usage surveys completed by the Department of Agriculture, Food and the Marine calculate that 1,058,461 kg of active substance* were applied to arable crops in 2016 (DAFM, 2016) with an estimated 516,189 kg applied to grassland and fodder crops in 2017 (DAFM, 2016). In the case of arable systems and the 120 active substances used, this represented a 7.2 % decrease on 2012 figures, while for grassland and fodder this was a 13 % decrease (for 82 active substances) relative to the previous survey in 2013. On grassland systems herbicide usage dominates, representing ~96 % of the total weight of pesticides used. In contrast, 31 % of pesticides used on arable systems were herbicides, with fungicides taking up 46 %, followed by growth regulators (18 %) and insecticides (2 %).

Due to a deficit of both durable resistance within existing varieties and robust integrated pest management (IPM) strategies, farmers have become reliant on pesticides to control pests, pathogens, and weeds within their crops in order to maintain profitability. However, no farmer wants to spray; it takes time and money, and users must be registered and fully trained to minimise potential risks to health and safety, and the environment. In the case of pesticide-intensive crops such as potatoes, where up to 12 sprays per season are typically required to offset the potential losses of late blight disease, annual expenditure on potato disease control is typically ~€5 million to offset disease within the national crop.

An over-reliance on pesticide use presents further challenges with regard to the ability of a pest to overcome a pesticide's mode of action. Irrespective of whether the host is a plant/animal, the more the same chemical is used the greater the chance the target pest will negate the efficacy of the active substance.

Depending on the biology of the targeted pest this can have a dramatic effect. For example, in the case of septoria blotch disease (STB) of wheat, septoria strains now exist in Ireland with resistance to strobilurin and SDHI fungicide classes, as well as tolerance to several azole chemistries. Combined with the loss of chlorothalonil fungicide in 2020 due to legislative constraints, there are now a diminishing number of effective pesticides available to control STB in wheat, therefore undermining the future sustainability of an important crop in tillage rotations.

Drivers for change

The drive within the EU to limit pesticide use did not begin with the publication of Farm to Fork. For over 20 years, various legislative directives and regulations have focused on heightened water quality requirements to limit pesticide levels in drinking water, redesign of pesticide approval procedures to a hazard-based versus the previous risk-based assessment, and promoting the sustainable use of pesticides across member states via a greater reliance on IPM practices. In its simplest form IPM is the use of multiple approaches/agents, be they physical, biological, chemical or cultural, to diminish pest damage, while maintaining the economic sustainability of the cropping system. At a practical level, IPM does not preclude the use of PPPs, but rather triggers their use only as a last resort. Hence, the decision to spray is made only once all other options have proven ineffective.

In 2019, Teagasc partnered with 38 EU academic and public entities in a new European Research Alliance to develop novel research and experimentation strategies to achieve the goal of reducing pesticide usage across the EU.

Next steps

Based on current crop management systems, a blanket reduction of 50 % in PPP usage will significantly increase economic risk for farmers, making the cultivation of several crops impractical, and thereby further increasing Ireland's dependency on imported substitutes. However, the key to mitigating any risk is diversification. With IPM a cornerstone of the Farm to Fork strategy, diversification will mean expanded and more diverse rotations, with additional break crops between cereals in addition to adopting alternative cultivation techniques, to give more opportunities within the rotation to minimise pest damage. Expanding arable margins to promote beneficial organisms and minimise grassweed populations will be important, as will increased vigilance on behalf of the grower to survey their crops and identify pest incidence at an early stage. To inform decision making, enhanced disease surveillance will be key. At a basic level, this simply starts with the farmer devoting more time to walking crops. In time, assistance from the use of in-field biosensors, image-based plant disease detection, and landscape surveillance networks linked with rapid diagnostic platforms will add additional depth to surveillance strategies.

Choosing the most appropriate variety is central to effective IPM, but that is based on the assumption that material with durable resistance is available. When it is, the impact is significant, as we have seen with the use of genes conferring late blight resistance in potatoes. Combined with weather modelling and disease surveillance we demonstrated how genetic resistance to late blight in potatoes can reduce the environmental impact by >80 % and reduce sprays from 12 to two per season (Kessel *et al.*, 2018) clearly demonstrating that improved crop genetics can actually exceed the required 50 % mandated cut in PPP use as per Farm to Fork.

In 2019, Teagasc partnered with 38 EU academic and public entities in a new European Research Alliance to develop research and experimentation strategies to achieve the goal of reducing pesticide usage across the EU. The Alliance is currently designing a programme of research focused on testing, piloting and demonstrating systemic innovations in support of the Farm to Fork Strategy. While the integration of multiple tools, technologies and practices can deliver crop management systems with the potential to achieve a 50 % cut in pesticide usage, it is important to note that this is on the assumption that in time the positive impact novel technologies can play in achieving this ambitious goal is fully realised.

*Active substances are the essential ingredients in a pesticide that enable the product to do its job. The pesticide is the final product placed on the market. Apart from active substances, a pesticide usually contains other ingredients to increase its efficacy and better protect the plant on which it is applied. For more information, see https://ec.europa.eu/assets/sante/food/plants/pesticides/lop/index.html.

References and further reading

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