How I implement IPM

Details of a holistic IPM strategy with low pesticide input in a European farm

My farm

Douglas Christie
Durie Farm
Leven, Fife, UK
KY8 5RF

PEDO-CLIMATIC CONTEXT

Sandy Loam soils (Grade 2 + 3.1 arable land - mainly free draining Darvel series)

Maritime climate, cool and wet (800mm annual rainfall average)

MAIN PESTS

Grass weeds – mainly Brome and Wild Oat

Yellow Rust/Septoria in Wheat & Rhynchosporium/Ramularia in Barley

AGRONOMICAL CONTEXT

Crop Rotation: Winter Wheat – Spring Barley – Break Crop (Bean, Pea, Linseed, Oat or cereal/legume intercrops)

No-Till Regenerative system

340ha arable area

SOCIO-ENVIRONMENTAL CONTEXT

Additional 200 ha in pasture for Organic beef herd

Quality Assurances – Scottish Quality Cereals and Red Tractor

OBJECTIVES AND MOTIVATIONS OF THE FARMER

Limiting inputs of PPP's to minimum to reduce financial risk with holistic approach to IPM.

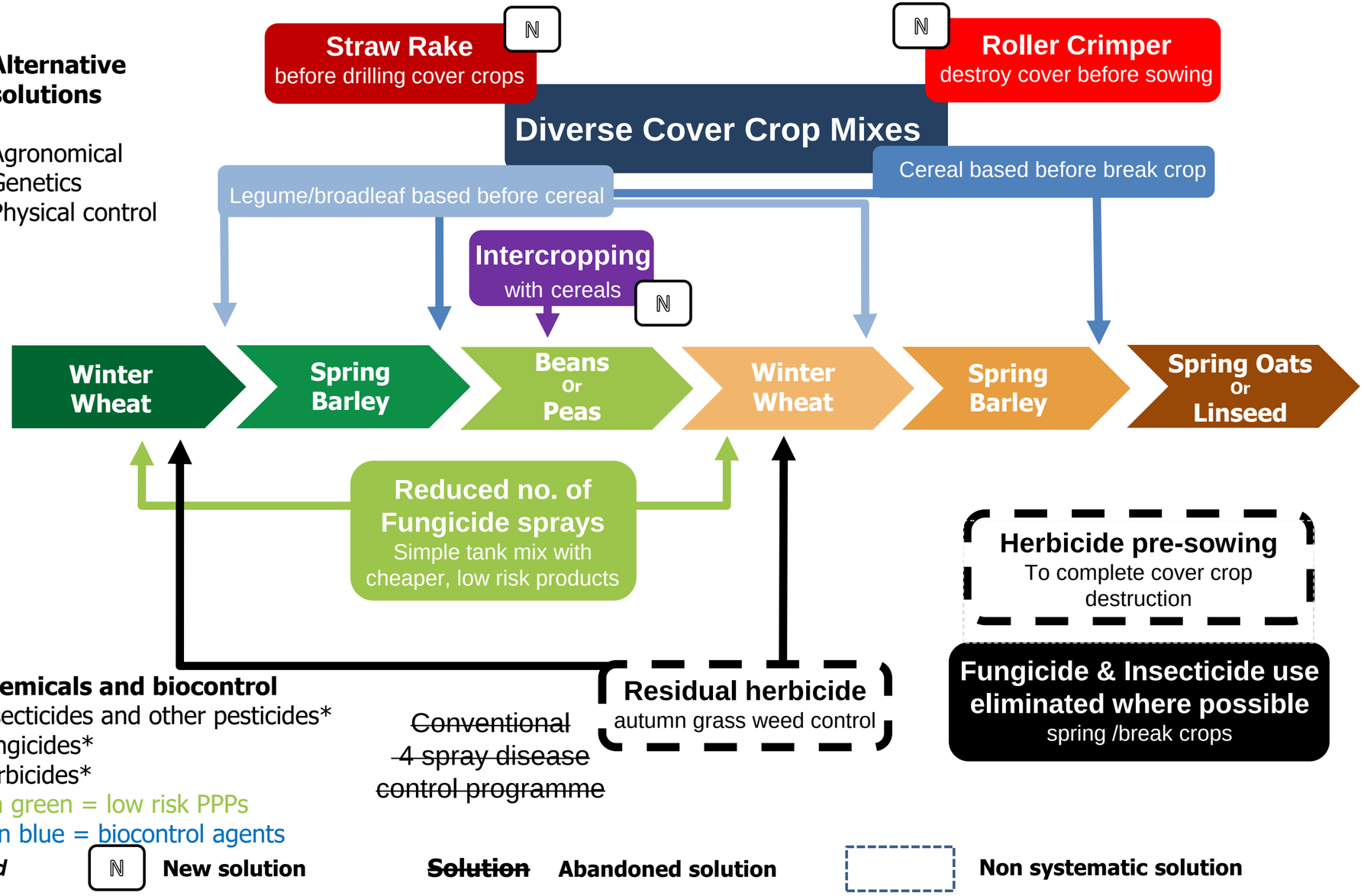
Focus on soil health:

- crop establishment by No-Till drill to reduce soil disturbance at depth
- cover crops included for living roots in overwintered stubbles

My strategy

Alternative solutions

Agronomical
Genetics
Physical control



Chemicals and biocontrol
Insecticides and other pesticides*
Fungicides*
Herbicides*
*In green = low risk PPPs
* In blue = biocontrol agents

Legend
N **New solution**
~~**Solution**~~ **Abandoned solution**
Non systematic solution

Key measures

Increased diversity of species in the rotation to improve weed, pest and disease suppression, including cover crops. Whilst the farm is managed in a 3yr rotation, alternating break crop is flexible to provide resilience within the system and acts to extend rotation to 6yrs. Intercrop cereal/ legumes adds further diversity following a regenerative approach

Straw rake before cover crop stimulates grass weed seeds to establish within cover crop.
Roller crimper destruction of cover crop also kills weed seeds/slugs and prepares for next crop sowing

My results

Evolution trend on the farm

Pests control

Very good	Medium	To improve
Yellow rust, powdery mildew, rhynchosporium	Septoria Broadleaf weed Slugs	Grass weeds

Evolution of use of pesticides

Very good	Medium	To improve
Fungicides Insecticides Low Risk PPP's	Herbicides	

Sustainability indicators

Very good	Medium	To improve
↗↗ • Establishment of cover crops	= • Equipment usage time	= • Gross margin
↗↗ • Diversity of species in rotation	↗ • Workload	↗↗ • Complexity"of the system
↘↘ • Use of synthetic fertilisers	↗ • Distribution of work over the year	↗ • Level of overall satisfaction of the farmer and his entourage
↘↘ • Pesticides costs	= • Actual mechanization load	= • Use of fossil energy
↘ • Use of dangerous or toxic products for the user	↘ • Energy costs	= • Use of sustainable energy
↘ • Standardized operating expenses	↗ • Use of conservation biological control [landscaping]	

Key conclusions

Moving away from ploughing means less work and energy used for establishment but this has been replaced by other operations to make the no-till + cover cropping successful

Grass weed burden remains the main issue in system – double straw raking to target brome before sowing cover crop has helped

Climate restricts potential to eliminate PPP use completely but targeted use gives significant reductions in input cost for both spring and winter crops

Diverse rotation with several species reduce disease and pest build up; inclusion of legumes reduces overall fertiliser use

Green cover, less soil disturbance and fewer fungicides help build a healthier soil rhizosphere with higher soil organic matter leading to healthier crops

Legend

In green = positive trend
In red = negative trend
In black = comparable

= Comparable

↗ Increase

↘ Decrease

↗↗ Significant increase

↘↘ Significant decrease

Environmental indicators
Social indicators
Economical indicators

Our feedbacks

> Moving to a regenerative system is a mindset change, and once I'd made a start I realised that there was much more to it than just saving money. The soils are becoming a great deal more resilient and this means that they have the ability to procure wider environmental benefits such as clean water; becoming more drought and flood tolerant due to higher water infiltration rates and water holding capacity; a better ability to hold soil nutrients, reducing soil erosion through higher soil aggregate stability, locking carbon into the soil and creating a platform in which to help biodiversity.

Farmer : Douglas Christie (UK)

MAIN OBJECTIVE OF THE FARMER

Limit inputs of PPP's to minimum to reduce financial risk with holistic approach to IPM. Improve soil health through no-till crop establishment and grow cover crops for living roots over winter. Work with nature rather than against it.

ADVANTAGES OF THE SYSTEM

Greater diversity in rotation has led to reduced pest and disease pressures. Fungicides often do not need applied to spring crops and only after flag leaf in wheat. Legumes and intercrops reduce expensive fertiliser input costs with N fixation. Improvement in soil health, higher organic matter and more microbial mass through use of a whole system approach

LIMITS

Grass weed burden increase which often comes with a yield hit, requiring additional work to control and adding complexity to the system. Wet, mild climate means PPP's use cannot be eliminated fully as crimping alone not effective for cover crop destruction and disease epidemics often occur during critical periods.

> The holistic approach taken within the regenerative arable rotation is paying dividends on several levels. Whilst there are some challenges in terms of grass weeds, with the tools available, some strategic planning and a little effort, these can be overcome. Increased diversity in plant species and green cover has helped to increase organic matter in these sandy soils which can be prone to nutrient leaching. Feeding the soil and extending crop rotation has allowed reductions in inputs, both in fertiliser and PPP's, whilst retaining the option where necessary is sensible to protect crop yield and quality as food production is the primary aim.

Hub Coach : Andrew Christie (UK)

Opportunities to develop in the future

Expanding use of intercrops and companion planting for N fixation, reduced disease/pest pressure and add species diversity in-crop

Experiment and adapt cover crop mixtures for combinations easier to destroy before sowing

Work on limiting grass weed burden below economic optimums and consider further cultural controls such as hand rogueing once at manageable levels

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 101000339