WILDFARMED

REGENERATIVE STANDARDS

V2: HARVEST 2024

INTRODUCTION BY ANDY CATO

It's incredibly energising to be part of a community of such diverse and inspiring farmers. There is so much being learnt all the time. Together with our research trials with partners such as Rothamsted and Innovative Farmers, and the steady stream of findings from like-minded growers around the world, it represents a huge wealth of information.

Improvement will be endless, which is what, for me, makes this kind of farming so fascinating, but it's safe to say that we know enough today to grow our staple crops in a way which combines nutrition, building soil health and restoring ecosystems. There's an urgent need to get on with it.

It was thanks to Dr Christine Jones that what began as a pasture cropping project was reframed into a farming system based on plant diversity. The inter-row mower* continues to progress, with several Wildfarmed growers pushing forward new uses and improvements to manage all kinds of infield diversity, both perennial and annual. But most WF growers are managing diverse cropping systems without specialist equipment, and these updated standards aim to underline that this way of farming is accessible to all.

Thanks to the work done over the last three years in artisan bakeries up and down the country, we have been able to begin telling the story of soil health to an ever-wider audience. The support of this artisan community is what has created our farming community and allowed us to find solutions to the logistical challenges involved in creating a new kind of field-to-plate supply chain. As this collective work has begun to resonate, I and others from the Wildfarmed team have been able to spend a lot of time in fields with the procurement departments of high street retailers, explaining the power of their budgets to drive change, and rather than separating procurement and sustainability budgets, using a portion of these budgets to pay a little more for ingredients will allow farmers to restore ecosystems within their supply chain.

A question that always comes up in these meetings, particularly since the war in Ukraine, is food security i.e., can we transition to agroecological farming at scale without having to depend on additional grain imports to compensate for reduced yields? We ran a comparison between an example rotation under Wildfarmed standards and a conventional system. The answer was that with only the minimum reduction of grain fed meat required by the National Food Strategy. Yes, we can match calorific output, and that's just *calories* - before even considering the nutritional quality of food grown by biology based farming systems, the huge cost savings to society from health to pollution, the future resilience that only healthy soil can give us, or indeed the mental health

of farmers freed from the wild swings of input and commodity prices. The comparison revealed other upsides too - the inclusion of more bi-cropped pulses, for example, could help provide both human plant protein and reduce the annual 2.5 million tonnes of imported soya, less than ¼ of which is from 'non-deforestation' sources. The full workings can be seen in the appendix.

Answering this 'food security' question ignores the fact that, in my opinion, the question itself needs to be challenged because it assumes, against the evidence, that continuing with 'business as usual' is a viable option. The comparison of the two systems also ignores the pressing issues of, for example, food waste, access to land or the myriad problems with our food distribution system.

But ignoring these wider issues is intentional. Edd, George, and I set up Wildfarmed because of a belief that we are running out of ecological road; that it's time to act, concentrating on where we can be most effective, despite all the other things that need attention. Otherwise, we risk falling into a mindset which says, "I can't solve everything, so I'll solve nothing". We decided to focus on staple crops and on building a farming community that can supply both artisans and high street outlets because, as Wendell Berry puts it "unless conservation is built into everyday economic reality, it will be a series of rear-guard actions on a dying earth."

Success isn't just about building a farming community that's properly supported, a traceable supply chain, or, for example, the infrastructure to deal with bi and poly cropping. All of this is a huge project, but all of it will falter without consumer education. If the majority of people don't realise that there's a problem and that, with their awareness and help, we can fix it, we're on a road to nowhere. This is why a large section of the Wildfarmed team has spent countless hours thinking about how to democratise the message to a largely urban population that food is their greatest point of agency in the biodiversity, environmental and health crises with which we're confronted.

Progress here brings everything back around full circle again. Because informed consumers can only act if food produced in a way that deals with these issues is available to them locally, at a price they can afford.

My hope is that these standards will allow us to continue to build a Wildfarmed community capable of making that happen.

THANKS TO EVERYONE IN THE WILDFARMED COMMUNITY FOR THEIR FEEDBACK AND SUPPORT ON WHICH THESE UPDATED STANDARDS ARE BASED.

FOR THEIR TIME, ADVICE OR CONTRIBUTIONS TO THIS DOCUMENT, THANKS TO...

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Mike Harrington

Nicole Masters

Sam Phillips

Soilmentor: Abby Rose, Annie Landless, Eliza Jenkins

Thomasina Miers

Tim Parton

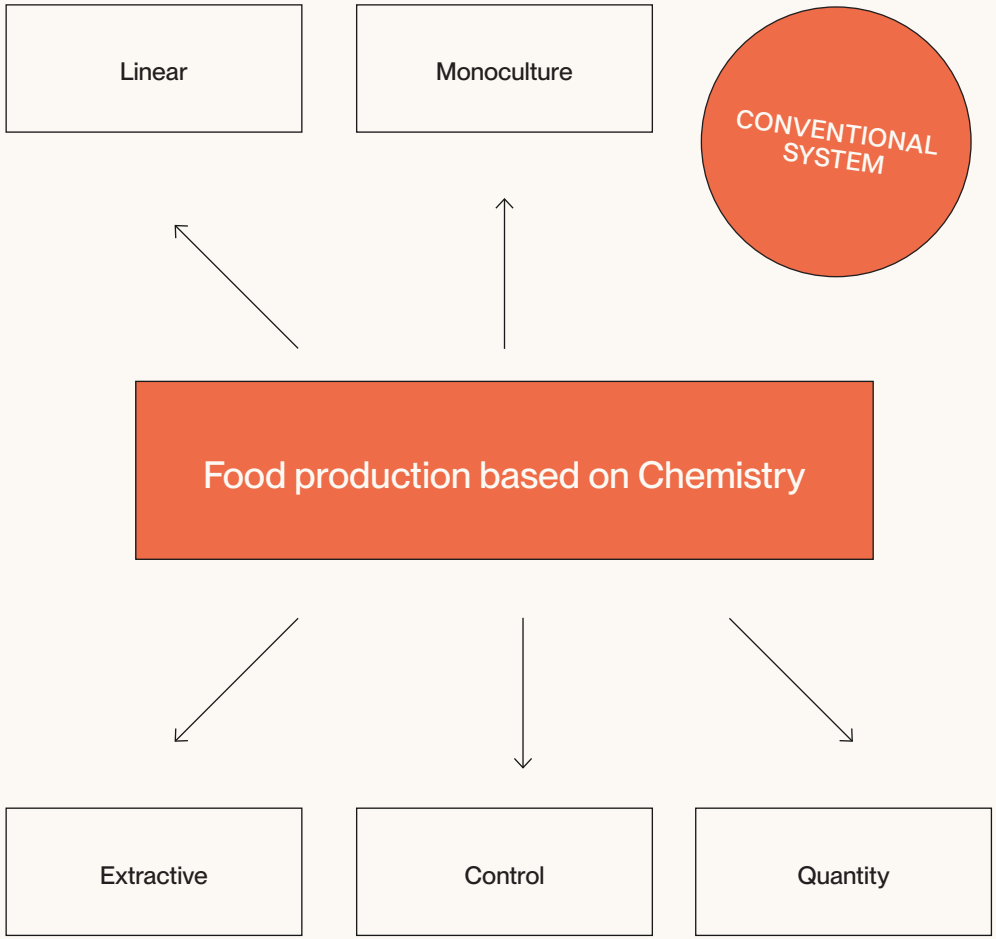
Tim Williams

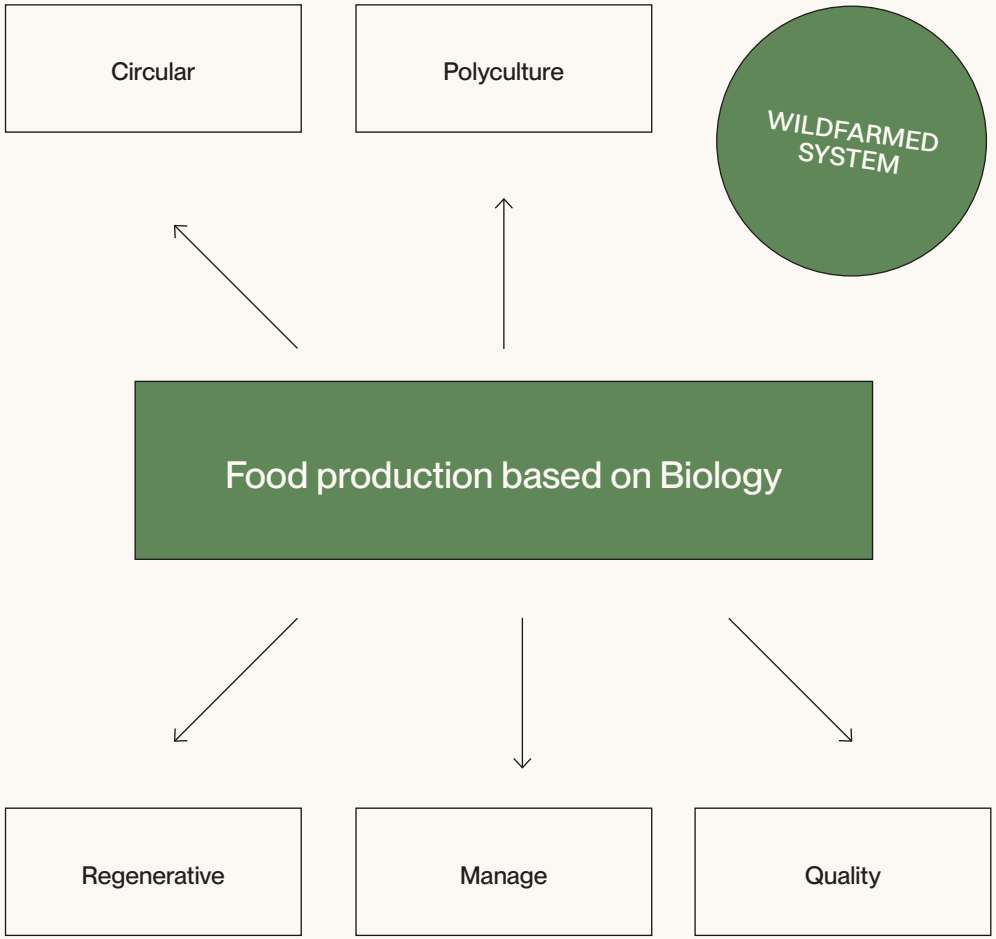
Tom Fairfax

THE STANDARDS

GEORGE GREED, FORTESCUE FARM

> “I didn’t hear the question but the answer is diversity.”
>
> — Anon


Linear
Monoculture
CONVENTIONAL SYSTEM
Food production based on Chemistry
Extractive
Control
Quantity


Circular
Polyculture
WILDFARMED SYSTEM
Food production based on Biology
Regenerative
Manage
Quality

A Wildfarmed collaboration is a transition to soil focused farming with the benefit of agronomic, community and financial support. Wildfarmed work on an annual grain contract within a three year agreement.

There is no obligation to sign up for three years at the outset, but engaging in a multi-year rotation with Wildfarmed gives the time needed to see a biology based system begin to develop.

STANDARDS

- **CASH CROPS SOWN WITH EITHER PULSES OR ANNUAL/PERENNIAL COMPANIONS**
- **MINIMISE BARE SOIL: OVERWINTER COVER CROPS AHEAD OF SPRING DRILLING**
- **NUTRITION BASED ON NEED: PLANT SAP ANALYSIS LEAF TESTING & 80KG NITROGEN (N) / HA MAX**
- **NO INSECTICIDES, FUNGICIDES OR HERBICIDES**
- **INTEGRATE LIVESTOCK INTO THE CROPPING SYSTEM AT LEAST ONCE IN A THREE YEAR ROTATION**

OFFERING

- **SIMPLE CONTRACT TERMS & PREMIUM PRICES**
- **PRODUCE OF AREA CONTRACT - NO PUNITIVE RULES**
- **GENEROUS MILLING SPECIFICATION**
- **AGRONOMY, CSS & GRANT ADVICE**
- **FREE SOILMENTOR ACCOUNT - A TOOLKIT FOR OBSERVATION BASED FARMING**
- **COMMUNITY & PEER-TO-PEER**
- **KNOWLEDGE SHARING + EVENTS**
- **BI/POLYCROPS PURCHASED WHOLE**

“The first rule for turning soil health around is to keep the soil covered, preferably with living plants, all year round. Point two is to maximise diversity in both cover crops and cash crops; include as many different functional groups as possible.

Diversity above ground will correlate with diversity below ground. Third, minimise the use of synthetic fertilisers, fungicides, insecticides, and herbicides. It’s a no-brainer that something designed to kill things is going to do just that.”

— Dr Christine Jones

COLLEYMORE FARM, SUMMER 2022

THE COMMUNITY

Embracing a new way of farming requires courage to go against the grain. This is why the collective support of a community is so important. Wildfarmed growers are a community of farmers, from Cornwall to Cumbria, with decades of combined experience and dedicated to profitable farming systems that are healthy for soil, plants and people.

In DEFRA's 'Farmer Opinion Tracker' from April 2022, food security, lack of positivity for the future, rising production costs and lack of certainty leading to mental health and wellbeing issues were cited as some of the biggest concerns facing farmers today.

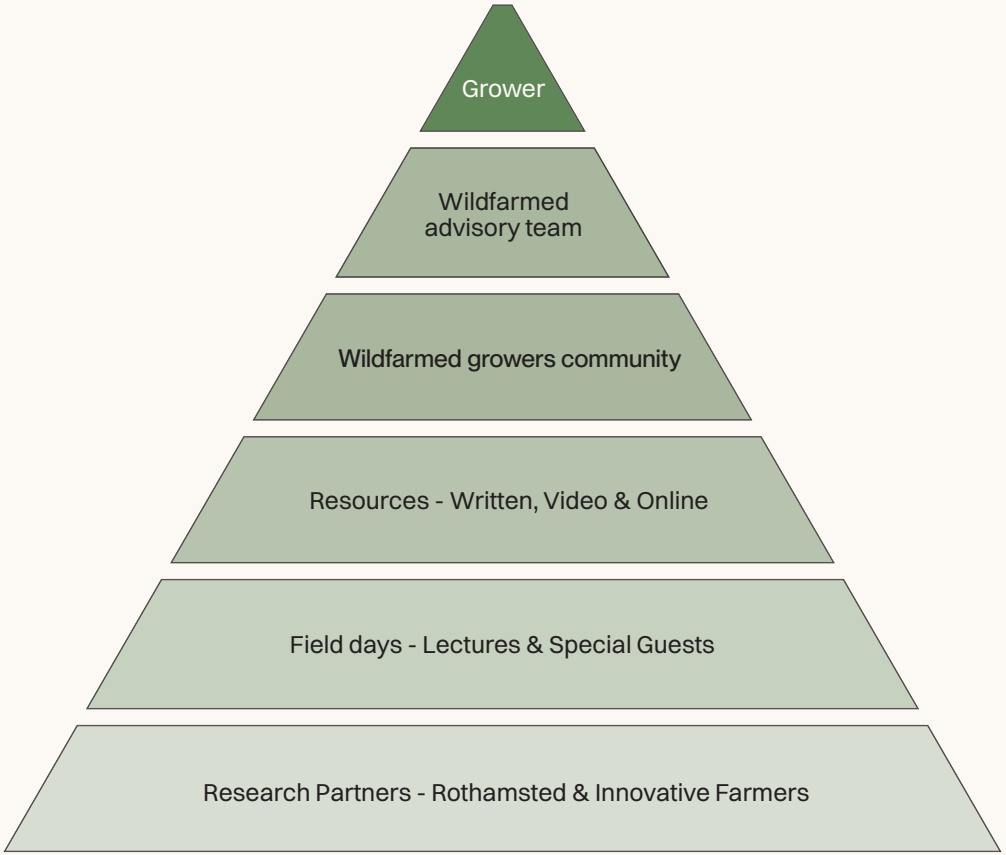
Our hope is that community support, together with:

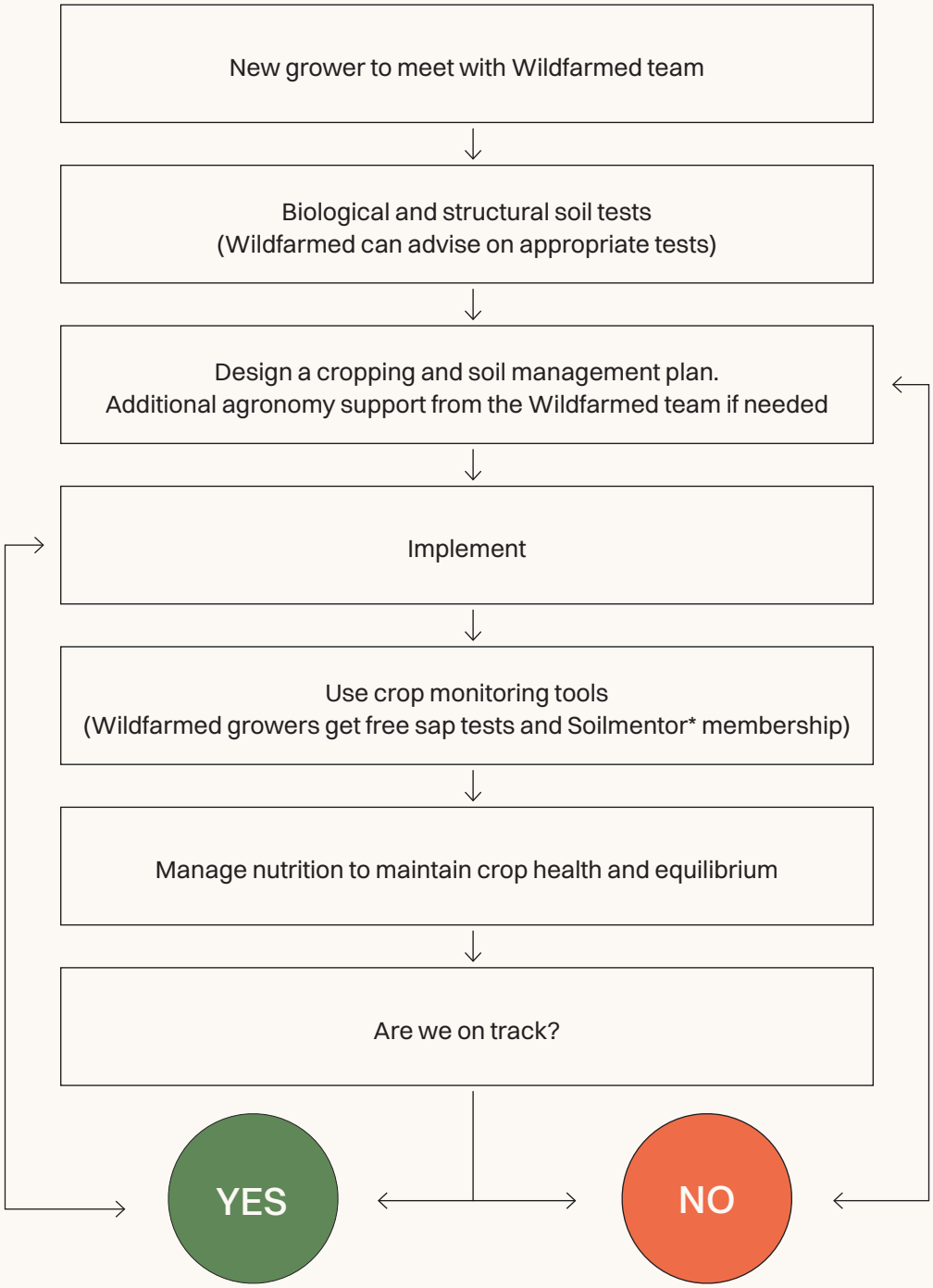
- Price stability
- Reduced inputs to minimise annual upfront risk
- Observation based farming (based on biology rather than chemistry) to restore a sense of control

Can all help to address these issues.

Wildfarmed growers benefit from many layers of advice, knowledge exchange, research and community support.

SUPPORTING TRANSITIONING FARMERS





*All of our farmers growing over 20ha get a free Soilmentor account

SAM PHILLIPS TESTING HIS BRIX WITH HIS PORTABLE REFRACTOMETER

MESSAGE ON THE WF GROWERS WHATSAPP GROUP, MAY 2022

“Having never grown an arable crop without pesticide & fungicide before, this crop is blowing my mind.”

— Ian Metson, Wildfarmed Grower

THE DETAIL

COLLEYMORE FARM, SUMMER 2022

SIMPLE CONTRACT TERMS & PREMIUM PRICING

For farming to be sustainable it has to be profitable. As it currently stands, at Wildfarmed we are rewarding farmers for soil and environmental improvements through a fairly blunt instrument - paying more for the crops.

In future, we aim to move to a collaborative model which balances average costs of production versus an average sale price of the flour. We are working on additional revenue streams for our growers through environmental payments, and have helped many of our farmers with successful AONB (FIPL) and Water Company grant applications.

A Wildfarmed contract is an annual produce of area contract.

- Wildfarmed growers can either fix a price for the following harvest, or opt for a % premium above the market price at harvest.
- We work to different specs to conventional mills and have less stringent protein and hagberg requirements.

ORGANIC & NON ORGANIC FARMERS

Organically certified growers are already meeting many of the Wildfarmed standards. A Wildfarmed partnership works in the same way for organic and non-organic growers alike, and there is much to learn from working with both types of growers in one community.

AGRONOMY & AGRICULTURAL SUPPORT

Wildfarmed supports all growers to design a rotation within the standards with the aid of previous case studies, agronomy advice if required and the collective experience of the grower community. Resources and research are available on a dedicated grower area on the Wildfarmed website.

SOILMENTOR

The Soilmentor app, provided free of charge to all our growers (>20ha), comprises a simple set of in-field soil monitoring tests to help you observe long term improvements in your soil and biodiversity.

WHOLE CROP COLLECTION

A major barrier for many farmers who want to engage in bi-cropping is not having sorting equipment on site or nearby. Wildfarmed has committed to collecting the whole crop at harvest and will also take care of the onward sale of the legume. The cost of sorting the bi-crop will be deducted from the price paid for the legume.

SAP TESTS TO MONITOR PLANT HEALTH

Sap Tests are a way to monitor and manage the health of your growing crops. They build up a picture of system health and areas that need attention. Wildfarmed provides three tests to each grower as part of the 'Nutrition Based on Need' approach. Brix readings are also encouraged as a quick and easy indicator of plant health. See appendix slides for more Brix, sap and Soilmentor info.

WORKSHOPS & EVENTS

The Wildfarmed community includes some of the most pioneering farmers in the country, both organic and non-organic. On-farm events, workshops and online gatherings help us all keep learning.

VARIETIES RESEARCH

Wildfarmed uses blends of crop varieties that are suited to low input, biology based systems.

We supply blends of suitable varieties in terms of disease resistance, vigour and height. If growers have their own farm saved varieties which are suited to their environment then that's an option too.

STEWARDSHIP & SFI

The Wildfarmed standards have been developed to coexist within the Countryside Stewardship Schemes (CSS) and Sustainable Farming Incentive (SFI). For example, Countryside Stewardship options such as combining low input cereals (AB14) with legume leys (GS4), or SFI companion cropping and farming without insecticide options can all provide additional financial rewards. We can advise growers on which of these will fit best with their system.

RESEARCH & KNOWLEDGE SHARING

Some of the trials currently underway include:

- The impact on soil microbes of tillage versus low dose & buffered glyphosate to terminate a cover crop and establish a wheat crop - with Rothamsted Microbiology team
- Non-chemical methods to control blackgrass in winter and spring cereals - with Innovative Farmers
- Soil and biodiversity outcomes monitoring - with Soil Association Exchange and Pilio
- Trialling fungal seed coating, carbon capture fertilisers, and continual R&D into the mechanical interrow mower with members of the Wildfarmed community. Results from all such trials will feed into the online resources available to Wildfarmed growers and we welcome ideas and participation from our grower community.

CASH CROPS SOWN WITH EITHER PULSES OR ANNUAL/ PERENNIAL COMPANIONS SUCH AS CLOVER

Wildfarmed crops are grown with companion plants, or as bi or poly-crops. Wildfarmed can deal with post harvest separation or make arrangements with growers who have their own separation equipment.

Diverse mixtures of plant families combining different functional traits drive soil health, biodiversity and help in weed suppression both physically and by moving the soil conditions away from those which favour arable weeds. This is nothing new. Indigenous farming systems were based around polycultures such as the "3 sisters" - Maize, Bean and Squash. Several studies, of which some are in the appendix, have shown that combinations of crops show better disease resistance and often give a greater yield than monoculture control plots.

"I have no doubt that your approach of polycropping can only be beneficial. I have data that a greater diversity of plant inputs supports a greater functional diversity and so resilient soil communities."

— Andy Neal, Soil Microbiology research, Rothamsted

MINIMISE BARE SOIL: OVERWINTER COVER CROPS AHEAD OF SPRING DRILLING

Cover crops are planted where there is no overwinter cash crop. When the soil microbiome isn't being fed by photosynthesis, soil health is depleted. Living roots are key. Protect your microbes.

"It is clear that diversity aboveground is directly linked to diversity belowground, and diversity belowground is linked to the health and carbon storage capability of the soil as well as pest and disease resistance of any plants communing with that soil – there's no doubt that these outcomes are of real significance for any farmer."

— Vidacycle

NUTRITION BASED ON NEED: PLANT SAP ANALYSIS LEAF TESTING AND 80KG NITROGEN (N) / HA MAX

This is matching the correct amount of nutrients to the plant's requirements. Three free sap tests are provided per season to help growers understand plant needs. We encourage growers to test regularly and build up a picture of nutrient availability across the season. In conjunction with soil tests, this means a nutritional program can be targeted and focused on plant health.

Optimising soil health means optimising photosynthesis

Our aim is to build fully functional soils, capable of providing all the nutrition our crops need. But in transitioning soils, with poor biology, plants are often unable to access what is required for healthy and vigorous growth. Maintaining the nutritional equilibrium of the plant through targeted nutrient applications minimises disease, maximises food for the soil microbiome and speeds the creation of soil aggregates that improve future nutrient availability and water retention.

Sap tests are a valuable tool to help match the correct amount of nutrients to the plant's requirements. In conjunction with soil tests and observation, this means a nutritional program can be targeted and focused on plant health.

Nitrogen (N)

A cropping plan is designed to optimise N fixation from legumes and cover crops. Including legumes within cereal crops is not only another source of N but creates habitat for pollinating insects. Greater incorporation into mainstream arable production would have hugely beneficial effects on biodiversity. When required, N fertiliser may be used to a maximum of 80kg N / Ha. 40kg may be applied as granular, the rest as foliar. (See appendix for further information on nitrogen).

"The nutritional integrity of a crop determines its capacity for photosynthesis and carbon sequestration. Photosynthetic activity can vary as much as 3-4x based on a plant's nutritional status... Plant photosynthesis is the engine that drives the generation (and regeneration) of soil health, not the other way around"

— John Kempf, founder of Advancing Eco Agriculture (AEA), and leading thinker in regenerative agriculture

Split doses & testing = efficiency + environmental protection

Under standard fertilisation practices, an average of only 51% of the fertiliser nitrogen applied to cereal crops was recovered by plants. P-fertiliser use efficiencies are around 10-15%.

Granular v foliar

Foliar N applications can be 95% efficient, so where possible these should be used. Sometimes there may be a need for granular nitrogen during the critical early spring growth stages, where fields are N deficient and where foliar applications are unable to meet the needs of the plant. Similarly with Phosphorus and Potassium (P&K), foliars alone may not be able to provide all that's required in the early stages of soil recovery. It is recommended to buffer N applications with a carbon source, both to improve efficiency and prevent soil carbon losses. Sources of carbon include molasses, humic & fulvic acids, seaweed/kelp extracts, amino acids, fish hydrolysates.

Phosphorus and Potassium (P&K)

With a good cycling soil and cover crops, levels of available P and K can be increased in the upper soil levels without any inputs at all. Initially however, in soils with poor biology, few earthworms, anaerobic or tight, and poor rooting can mean little to nothing is available. Soil and leaf tests can identify any deficiencies that need correcting.

NO INSECTICIDES, FUNGICIDES OR HERBICIDES

A Wildfarmed contract doesn't allow for the use of fungicide, insecticide or herbicide to the growing crop.

Plant health begins with soil health, and increasing soil biology through living roots and plant diversity are our best protection against disease. There are many examples of growers successfully managing crops without fungicides and insecticides (including all of those in our community!). In terms of herbicide, the debate between glyphosate and tillage continues, but underlying that debate is an assumption that glyphosate is safe when used in smaller doses. Evidence here is lacking, and we are running research on this. For more information on glyphosate, please see the appendix.

No herbicides inevitably means some tillage. But occasional tillage in a biologically rich system is not a barrier to improving soils. And we know that non-diverse, biologically poor no-till are not enough to transform soils. Building soils requires a systems approach. See the appendix for some studies on tillage and soil health, including the Rodale Report comparing 40 years of no-till versus tillage.

"In systems, which have much more diverse carbon inputs going into the soil, microbial biomass is significantly higher than in the conventional system, leading to higher soil organic matter over time."

— Rodale Institute - Farming systems trial 40 year report

INTEGRATE LIVESTOCK INTO THE CROPPING SYSTEM AT LEAST ONCE IN A THREE YEAR ROTATION

The grazing of over wintered cereals or cover crops to recycle nutrients is an important contribution to soil biology. Wildfarmed ask all growers to try this at least once during their initial three year rotation. For farmers without livestock, Wildfarmed can help to find local flying herds if required.

There are many testimonials to the importance of well managed livestock in biology based farming systems, some examples of which are in the appendix.

AUDITS

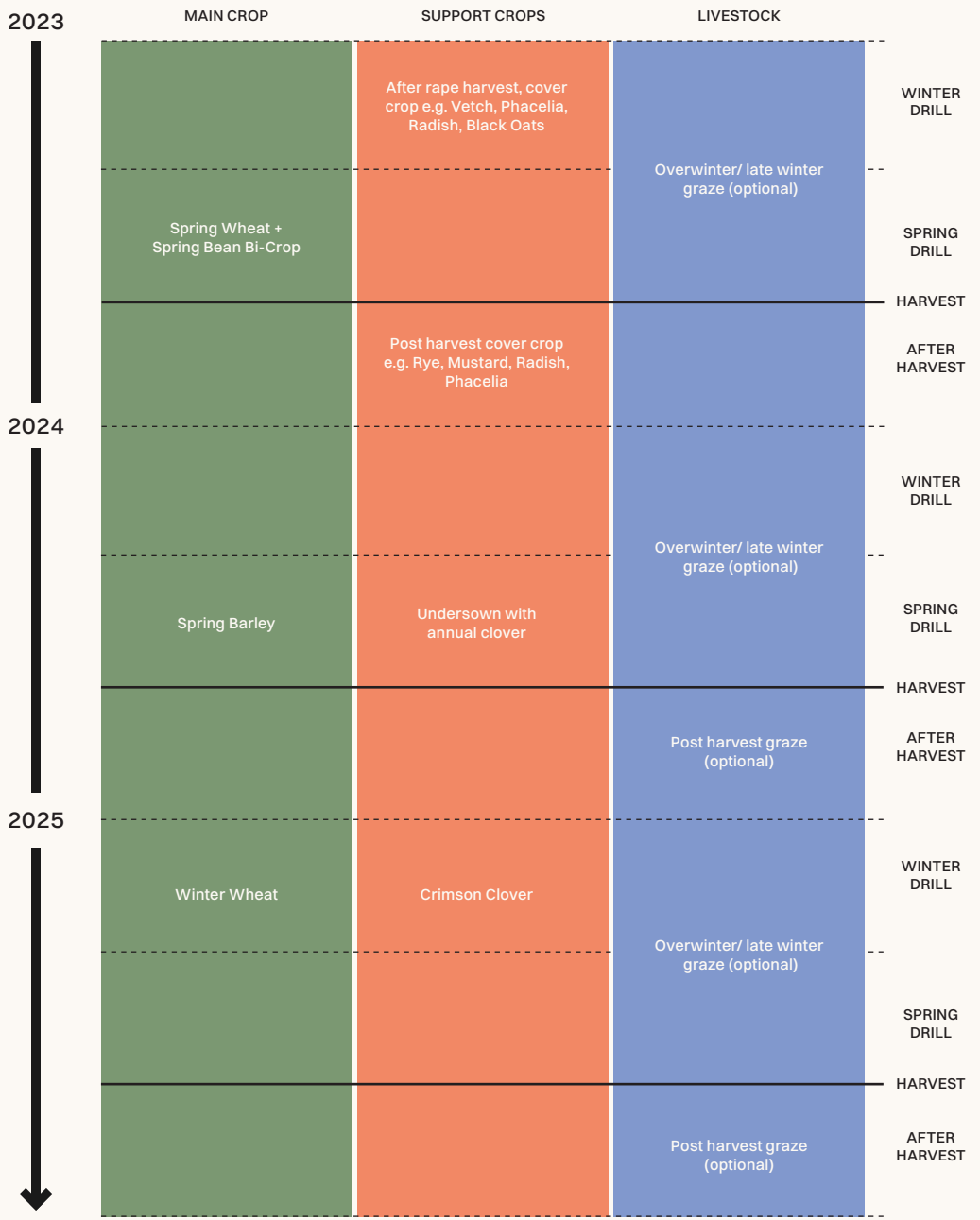
The Wildfarmed standards are subject to a third party audit by Control Union. They will ensure no insecticides, fungicides or herbicides have been applied and that management, area and yield are coherent. The auditing process has been designed to be based as much as possible on grain and leaf sampling. Growers will only be asked for paperwork which they are already required to keep such as SAP tests and nutritional applications.

ANDY'S FARM IN FRANCE

This is an example rotation using standard equipment on a conventional farm beginning a Wildfarmed rotation after rape with spring wheat & beans.

This example assumes all crops are being sold to Wildfarmed. This doesn't have to be the case. So long as the standards are respected, a Wildfarmed rotation can include any kind of crop alongside the ones being grown for us.

Example three year rotation for a conventional farm coming into a Wildfarmed programme



EXAMPLE CONVENTIONAL FARM - 40 HECTARE BLOCK

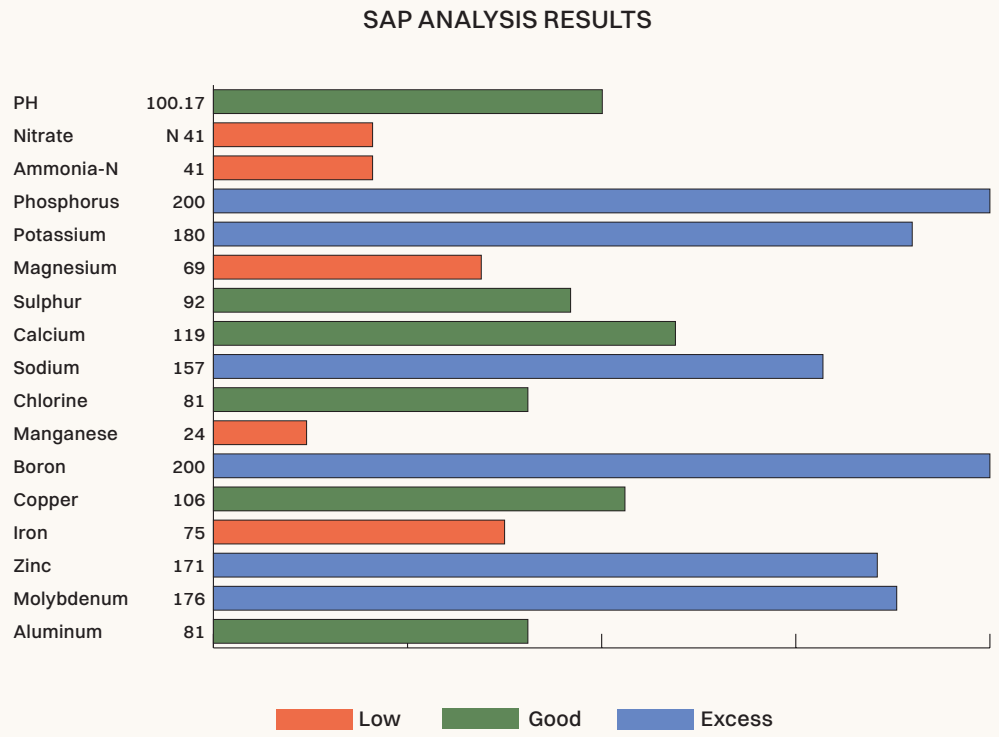
THE APPENDIX

SAP ANALYSIS RESULTS

Plant sap analysis shows real-time plant mineral levels.

It provides the opportunity to determine the required nutrients before a deficiency manifests as a disease or weakness.

Wildfarmed growers receive a set of three free sap tests for use prior to nutrient applications. Agronomic advice is on hand if help interpreting results is needed.



SOILMENTOR

Soilmentor supports farmers and growers to learn what healthy soils and flourishing biodiversity look like, helping farmers and growers to understand changes above and below ground and to make informed management decisions.

The Soilmentor app has the ability to easily record results from a series of simple in-field soil tests, as well as general observations and photos. This data can be measured against regenerative benchmarks, visualised to spot trends, compared with other soils & against results from previous years.

Find out more about the soil tests and hear from farmers already using it at soils.vidacycle.com.

All of our farmers growing over 20ha get a free Soilmentor account.

SOILMENTOR: BRIX TESTING

Brix (%) is a measure of the light refracting through dissolved solids & sugars. It is measured using a pocket refractometer, and is a useful and quick indication of the health of your plants.

If your weeds have a higher brix than your crops, this indicates your soil needs some support. If the weeds have a lower brix than your crops, your crops will outcompete the weeds in time.

Brix scores fluctuate throughout the day, generally peaking in the afternoon before dropping at night. Brix scores will also vary due to stress or dehydration, so this is a metric you can continue to record regularly throughout the year, to keep a good record of how things are changing.

The ‘fuzziness’ of the line you read through the refractometer is an indicator of how nutrient dense the sample is – a sharp line can indicate calcium deficiency for example. A low brix reading indicates your plant is vulnerable to pest attack, and has high nitrate levels (which works against nutrient density & complexity).

You can record your brix scores in the Soilmentor app.

BRIX STANDARDS (% SUCROSE FOR A NUMBER OF CROPS)

	POOR	AVERAGE	GOOD	EXCELLENT
Alfalfa	4	8	16	22
Grains	6	10	14	18
Field Peas	4	6	10	12

ARTIFICIAL NITROGEN AND SOIL HEALTH: BACKGROUND

In the 19th century, the US and UK supported rapidly increasing populations through the import of nitrogen-rich guano from Caribbean and Pacific Islands. Panic set in as these reserves began to run dry until synthetic nitrogen from the Haber-Bosch process enabled a historic increase in productivity. However, this nitrogen bonanza has come at a huge cost in terms of soil health, water quality and the ecosystem consequences of the pesticides that excessive nitrogen required.

For these reasons, nitrogen has so far not been used by Wildfarmed growers and this would be the first time that it is included under the "nutrition based on need" approach. This is based on a greater understanding of the available science around N and on the experiences of growers in transitioning soils around the world. The conclusion is that a management system using small, targeted amounts of N can be a useful tool in combining soil restoration, food security and economic viability for farmers.

When does artificial nitrogen go from being a positive contribution to plant vigour and system viability to having a negative impact on nitrogen fixing soil communities and plant health? How does applying N in multiple small doses based on plant need and as determined by sap tests affect soil communities and is there a difference in the response of soil communities between applications of foliar and granular N? Whilst there are innumerable research papers on the use of different volumes of nitrogen (see the references page for some examples) the answers to some of these specific questions don't seem to be known. At Wildfarmed, we have engaged Andy Neal at Rothamsted, and John Crawford at the University of Glasgow to work with our growers to answer these questions.

In the meantime, we need guidelines for N applications that maintain the viability of recovering systems, speeds soil restoration through increased root exudates, whilst avoiding the negatives of excess.

Existing knowledge seems to coalesce around split doses, up to a maximum of 80 kg/Ha N, and based on the needs of the plant.

WHY 80KG AND WHY SMALL DOSES?

1. A key concern when using artificial N is maintaining natural nitrogen fixing communities. Trials of maize grown after vetch cover crops showed that these communities continued to function under 80kg N applications, with greater yields after vetch + 78 kg/Ha N than after a ryegrass cover crop + 240kg/Ha N.[2]

2. Chen et al[3] were able to double maize yields in China whilst completely eliminating excess nitrogen by applying it in five split doses, with testing guiding their application rates. (Currently, 50% of wheat nitrogen is leached).

3. We have examples of farmers in biologically active soils getting 10T wheat yields on 50-80 kg of nitrogen whilst still building functionality in their soils (Tim Parton).

Our maximum N use of 80 kg will come with a requirement to deliver this in doses of no more than 40 kg. Buffering N applications with a carbon source, such as humates, can improve efficiency and soil outcomes. See references for some examples.

"Humates.... significantly altered soil microbial diversity and function [and] increased N retention."[3]

Wildfarmed cropping systems are designed to optimise the role of pulses, cover crops and companion legumes to fix nitrogen. This makes sense both financially and in terms of restoring a functioning soil. ▶

NITROGEN: SOURCES

Sources of nitrogen are often debated in black and white terms but the reality is more nuanced. For example, nutrient flows between conventional and organic farming are substantial.

Denmark, a country where organic farming is twice the EU average, has decided to set a maximum of 70 kg of nitrogen per hectare per year that can be sourced by organic growers from conventionally farmed manure, which itself is largely derived from artificial N. 70 kg/Ha is close to the total amount of N we are proposing under the new Wildfarmed standards.

Furthermore, there are many innovative forms of nitrogen coming onto the market, using carbon capture to stabilise ammonium from existing sources or the use of amino acids, and other natural compounds to greatly increase the efficiency of foliar applied nitrogen and reduce the amount required.

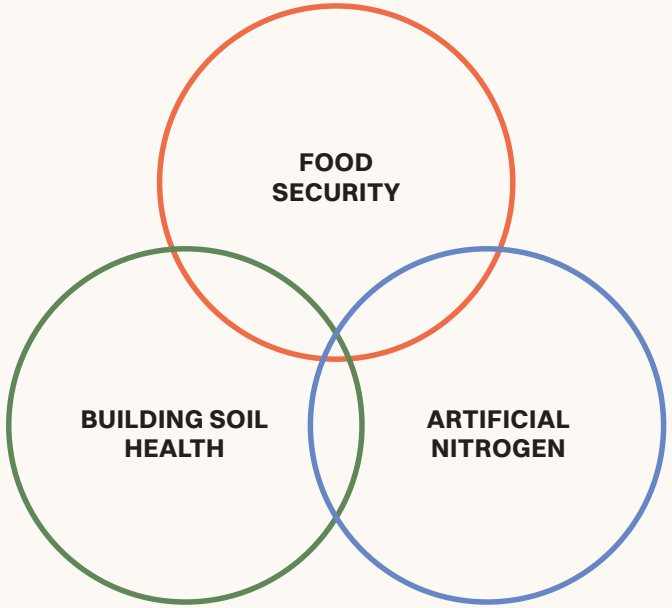
WILDFARMED NITROGEN PROCESS

1. In Spring, use a preferred process to estimate soil available N (based on testing / estimation of existing sources of N, including autumn applied manures*, fertility building legume cover crops, previous cropping, etc).

2. If the results suggest likely deficiencies at the beginning of the critical growth stages, an application of up to 40kg N is allowed.

3. Once the plant reaches growth stage 25, use a SAP Test to ascertain the need for any further applications, up to a maximum of 80kg N. N from any source is permitted. Local and national regulations relating to fertiliser use must be adhered to.

*Whilst natural fertility building (manures, or fertility building leys) are outside the 80kg limit, remember that the objective here is to maintain plant equilibrium. Balanced nutrition is the key to plant health in a Wildfarmed system that doesn't allow the use of fungicides and insecticides. Overloading the plant with nitrogen is likely to create pest and disease issues.



WHY NO GLYPHOSATE: BACKGROUND

In 2016, figures analysed by the Soil Association from government data revealed glyphosate use in UK farming had increased by 400% in 20 years. This trend has continued since. Safety concerns are well documented, and it may well be that bans come into force over the next few years. There are also increasing problems with resistant weeds.

"After forty years of chemical use we have ...created a place for what were once uncompetitive weeds by herbicide and heavy nitrogen practice. Along with tight rotations we create a cycle of weed seed production, which, once it becomes large, we find the plants begin to influence the soil in their favour."
— Mike Harrington, Agronomist

And there are questions around the impact of glyphosate residues not just on human health, but on crop health too.

"*Plant growth promoting rhizobacteria are negatively affected, while pathogenic bacteria and fungi are enhanced. Such shifts in microbial community composition have been implicated in enhanced susceptibility of plants to Fusarium*"
— Van Bruggen et al[5]

And yet, a lot of the studies around glyphosate toxicity draw on US and South American statistics from "roundup ready" corn and soya systems, where glyphosate doses are high and regularly repeated.

But many excellent UK farmers use glyphosate in a way which they might argue is fundamentally different to the high doses of this "roundup ready" system. Here, regen farmers will more likely use glyphosate once a year, at low doses, buffered with citric acid to optimise efficacy, and to kill a cover crop before planting a cash crop, with none applied to the harvestable crop itself.

Tilling soil also has consequences. Yet, the studies comparing the soil impact of glyphosate no-till and tillage, which generally come out in favour of glyphosate, are almost all in the context of monocultures (poor soil biology) and deep, inversion tillage (ploughing).

A 40 year study by the US Rodale Institute concludes that in biologically rich systems, well managed tillage is not only compatible with building soil health but can actually speed up that process.

A biologically rich cropping system (cover crops / polycrops etc) as opposed to the monoculture systems normally cited in till vs. no-till studies, is critically different, because the rich soil biology present will behave in fundamentally different ways when subject to disturbance. The Rodale report[6] follows the empirical evidence of generations of good organic farmers who have demonstrated that plant diversity and thoughtful tillage are fully compatible with improving soil health.

On the other hand, the rich biology of a plant diverse cropping system will also have an impact on the half-life of the toxins in glyphosate. Microbiologists tell us that the speed at which these toxins are broken down depends on the soil biology that's present, which in turn depends on the diversity of plants that are growing and for how much of the year the biology is being fed from a covering of plants.

Research needs to be done and this forms part of the trials we will undertake with the Rothamsted microbiology team, where they will look at:

1. The impact on soil microbes of tillage versus low dose & buffered glyphosate to terminate a cover crop and establish a wheat crop.
2. If any glyphosate is found in the grains of the wheat planted into the cover crop killed with glyphosate.

In the meantime, we do not allow the application of glyphosate or any other pesticide to the growing crop.

Ultimately, restoring soils to the right successional profile for the crops we are trying to grow, using plant diversity to fill ecological niches and integrating livestock can provide a path to herbicide free, soil focused farming.

WILDFARMED: A MAINSTREAM AND SCALABLE ALTERNATIVE

A question that often arises - can we produce enough food whilst farming in nature's image? The first part of the answer is that this question assumes the current system can continue to feed us whereas the evidence suggests it can't. It is widely recognised that the state of our soils, biodiversity and public health mean that continuing with an extractive agricultural model is not a viable option.

Furthermore, global hunger and food insecurity are frequently oversimplified as being primarily a problem of scarcity (not enough food) or a problem of distribution (not enough access to food) when in fact hunger and food insecurity result from a web of immensely complex and interconnected factors.

On paper, the world has enough calories to feed 10+ billion people but this doesn't hold up in reality when more than a third of the world's edible crops are fed to livestock. The UN warns that global meat and dairy consumption will double by weight between 2000-2050.[8] As of 2022, this prediction is on track.

Relying on further increases in yields to maintain the status quo is optimistic in a world where declining soil health is increasingly a limiting factor, and such a path can only increase the already huge externalised societal costs of an extractive food system.

It's far beyond the scope of these standards to address these global imbalances. Instead, let's focus on the UK and how a soil focused, biodiverse, Wildfarmed (or similar) system would compare to conventional production. To avoid paralysis through analysis, or the phenomenon of "I can't solve everything so I'll solve nothing", our focus is a model which can work within the current system of land and food distribution, for all of the many other issues there are to be solved within that.

System design is important. It has been said that fertility building cover crops increase the agricultural footprint by taking land out of production. i.e. that without synthetic fertilisers, farms need to grow additional legume rich cover crops to provide nitrogen, and these require extra land. This "shadow land footprint" of agricultural systems that don't use synthetic fertiliser has been argued to be more important than the yield gap.

The Wildfarmed standards combine fertility building and cropping at the same time. It is this feature, combined with plant-health focused nutrition (including limited and targeted amounts of nitrogen), that allows it to be an alternative model to conventional production, whilst restoring soils and ecosystems.

NUMBERS

The table on page 49 reflects that 40% of UK cereals, including 50% of the wheat harvest, is currently fed to animals.* The feed conversion rate used here is for beef. It would of course be different for both systems for poultry or other animals, but the purpose here is a like for like comparison.

We see that the calorific output of the Wildfarmed rotation is within 6% of the conventional model, whilst still assuming that 33% of Wildfarmed calories are fed to livestock. This correlates with a 30% reduction in meat consumption, in line with what the National Food Strategy[9] stipulates as a minimum to hit national carbon targets.

Because of the inclusion of pulses, the Wildfarmed system produces twice as much protein, so there is plenty of room to reduce livestock feed further and increase consumption of plant protein. A 10% reduction in animal feed would be enough for overall calorific output to equal the conventional system.

Increasing pulse production is important for other reasons too. In the UK we import 2.5 million tonnes of soya for animal feed, of which only 27% is covered by a 'deforestation free' standard. ▶

"70% of proteins fed to animals in the EU are imported and it is increasingly difficult to source GM-free varieties, so there is a strong case for growing more home grown proteins in the UK for both human and animal consumption." (Sustainable Food Trust)[9]

It's worth noting that yields under the Wildfarmed type model will increase as soil biology increases. We have assumed 6T winter wheat yields and yet there are already examples of biologically active soils producing 10T yields with minimal inputs. On the other hand, the conventional yield assumptions reflect averages which have plateaued for some time.

	Conventional	Wildfarmed
3 Year Rotation	YR 1: Winter Wheat YR 2: Spring Wheat YR 3: Barley	YR 1: Winter Wheat and Beans YR 2: Oats YR 3: Spring Wheat and Peas
Yields	Winter Wheat: 8.3T Spring Wheat: 7T Barley: 6.5T	Spring Wheat: 5T Winter Wheat: 6T Oat: 6T Peas: 1T Beans: 1.5T Beef from grazing*: 103kg
Example crop production per ha	21.8T cereals	17T cereals 2.5T pulse
Per HA Crop Caloric Output	74,911,608	63,821,693
Calories for direct human consumption	44,946,965	42,760,535
Calories used for animal consumption	29,964,643	21,061,159
Livestock Calories Produced	1,872,790	1,316,322
Protein Produced (kg)	224.4	492
Total Calories Produced for Human Consumption	46,819,755	44,076,857

*A 10% reduction in animal feed would be enough for overall calorific output to equal the conventional system. Assumes a beef feed conversion rate of 16kg grain for every 1kg of meat.

FOOD SECURITY AND THE TRUE COST OF FOOD

In his National Food Strategy (NFS)[10] report, Henry Dimbleby presents four estimates of the externalised societal costs of our current food system – calculated by organisations from the NFU to the Sustainable Food Trust. Each organisation places different weight on different costs.

The average of their annual externalised costs is £68 billion, of which the component parts, averaged across the four studies, are detailed in the NFS report as follows:

- Health costs of production 7.5%
- Environmental costs of production 2%
- Natural capital (soils/ecosystems) degradation 11%

These three equate to 20.5% of the total = £12 billion

Just these external costs of production, averaged across the 17.2 million farm HA in the UK, equates to £697 / HA.

The report attributes a further 51% of externalised costs to healthcare linked to consumption of food from the current system. Some of that is in the processing, the addition of sugars, fats etc. Some of that is due to the toxic residues in the food and its lack of nutrient density. It's not clear how this divides up. But if we were to attribute 1/3 of food consumption healthcare costs to toxicity and lack of nutrient density, that's £11.5 billion.

Across the UK farmed area, that is another £766 per HA or £1,463 per HA in total.

In other words, the government would double its money if it were to give farmers £731/HA to grow in a way that doesn't create externalities.

Under the Wildfarmed standards, externalised societal costs would be close to zero, aside from the 9% of agricultural emissions that currently come from machinery and heating. Assuming this stays the same, this is 0.99% of UK GHG emissions.

Most fundamentally, under Wildfarmed (or similar) management, we will grow our food in partnership with nature rather than at war with it. We would restore biodiversity, water quality, flood protection and climate resilience. It is hard to put a price on this.

With the NHS in crisis, it is seldom mentioned that health begins with the quality of what we eat and the quality of what we eat depends on how we grow it. A study of year one Wildfarmed wheat samples, at the very beginning of the soil recovery curve, showed twice as many antioxidants as both control samples from neighbouring conventionally managed systems.

Reference: Future of Food Report

FARMING IN STRIPS

While most Wildfarmed growers aren't farming in strips, this system continues to evolve.

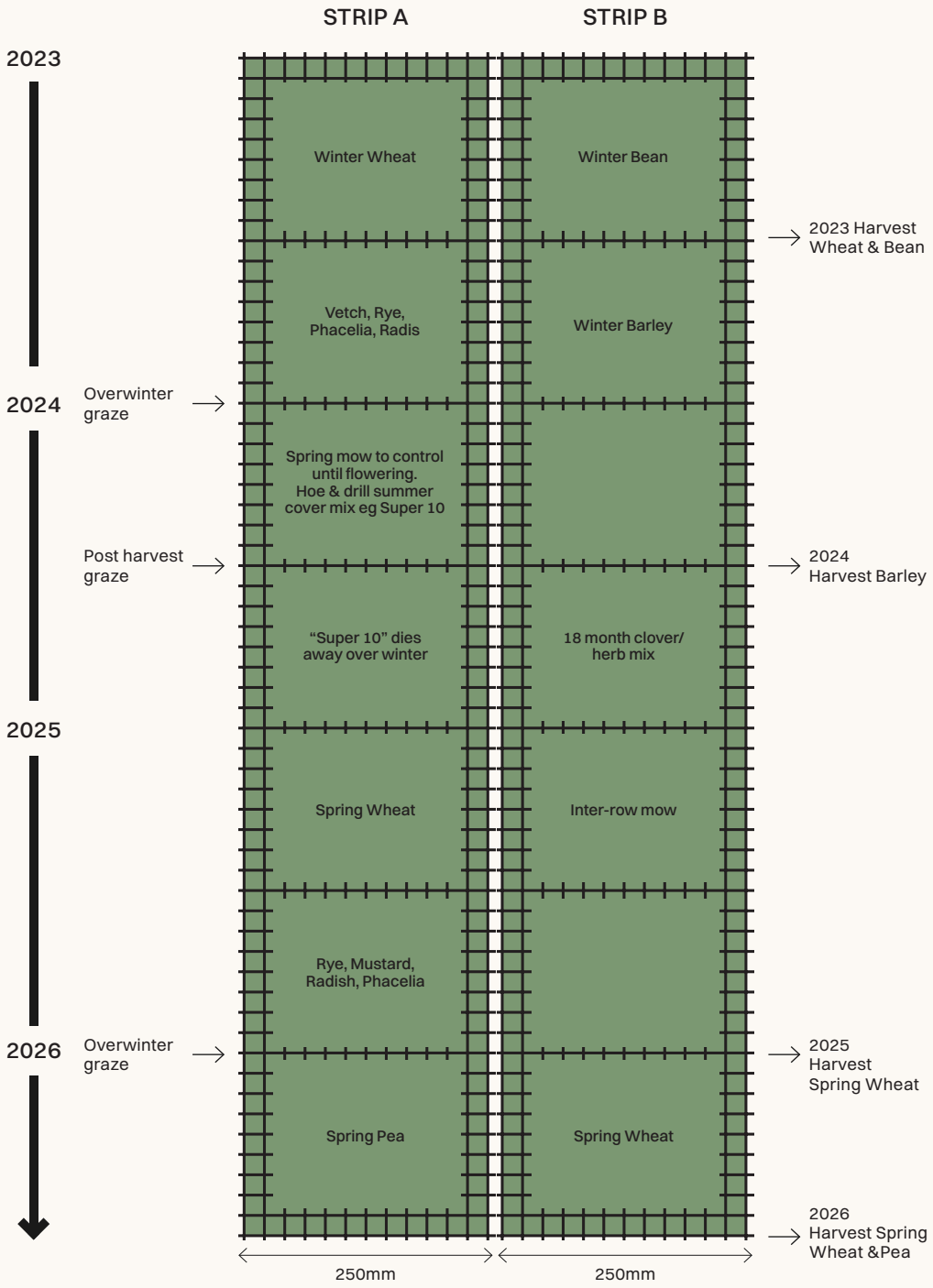
The idea of the strip layout is to be able to manage cover crops, annual or perennial companion crops in a way which means soil fertility is building at the same time as cropping is taking place. Bi crops such as wheat and beans are of course a version of this. The strip layout just opens up more possibilities.

Farming in strips doesn't have to involve a strip till. Strip tillage only becomes necessary if one of the strips is perennial. Wildfarmed can provide more information on how standard drills can be configured.

The inter-row mower allows management of the annual or perennial cover. These are currently bespoke machines. Wildfarmed can provide information on having one built. ▶

Example rotation in strips using inter-row mower and hoe: conventional farm after rape.

Not all crops grown need to be Wildfarmed. For example, the 50cm spacings are suited to growing rape with companions in the inter row (e.g. vetch, berseem, buckwheat) to control flea beetle which can then be managed with the mower.



THE 3M INTERROW MOWER AT WORK

COLLEYMORE FARM, SUMMER 2022

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Seaweed extracts also have a positive effect on brix. Seaweed extracts include mannitol, a natural sugar that chelates micronutrients and makes them more available to the plant. Seaweed extracts work synergistic with other organic biostimulants, so using a combination of additives is better than using any single additive alone.

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