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Low input and organic heritage cereal production in South East England

LAMMAS FAYRE – Heritage grain, Flour and Pasta
 What lessons can be learned by organic farmers from the way in which medieval farmers cultivated cereals? John Letts has adapted and updated their practices to grow the same land race populations of 'heritage' cereals that were common in medieval England. Key elements are growing tall cereal genotypes in the same field, the absence of crop rotation, leaving crop residues on the field surface, and undersowing the winter wheat crops with white clover. Low yields (3.0 t/ha every year) are compensated by premium prices achieved.

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The farmer, John Letts, operates under the business name of "Heritage Harvest Ltd." and grows crops of wheat, rye and barley on rented fields in Oxfordshire and Buckinghamshire, England, and contracts growing to other growers throughout Southern England. Grain is stoneground and flour is marketed under the brand name "Lammas Fayre" and includes various 'historic blends': a "Neolithic blend" which aims to replicate what our ancestors were eating thousands of years ago; an Iron Age blend of emmer and spelt wheat; and a Medieval blend or "Maslin" mixture of wheat and rye. Further value is added by running training courses and pizza making days for schoolchildren in the summer.

The challenges of finding seeds for heritage grains

In order to cultivate these crops, the farmer had to find grains and conduct research to find which varieties would grow well in his location. His interest in medieval cereals first arose during his studies for a Masters degree in archaeobotany and from his research on thatching straw (published in 2000). He now grows a range of wheat species (*Triticum spelta* (spelt), *T. dicoccum* (emmer), *T. aestivum* (bread), *T. turgidum* (rivet)), together with *Secale cereale* (rye), *Hordeum vulgare* (two, four and six-rowed barley). Original seeds were obtained from gene banks and from his own collections. These have been bulked up from small plots – a process which can take several years. A major challenge is, however, that none of the seeds are of varieties appearing in National Lists and so trade in the seeds would be illegal.

The methods of cultivation

Wheat is grown using 'low input' organic methods including:

- No crop rotation – the cereal is grown every year in the same field.
- High genetic diversity – a range of species and varieties is grown in the same field. No attempt is made to prevent out-crossing although this is expected to low for wheat.
- No manure is applied.
- Crop residues are left on the surface after harvest.
- Seed is broadcast into the tall stubble of the previous crop, and the stubble is chopped to create a mulch which prevents bird damage and helps with germination and establishment. The crop is undersown with white clover when required to maintain a strong sward. The field is never cultivated.
- Limited hand-rogueing takes place but only for the most problematic weeds.
- Early sowing ensures strong root development before winter.

In contrast to medieval crop husbandry, he undersows his cereals with dwarf white clover. The use of tall, weed-suppressive medieval wheats, means that, in contrast to most organic farming systems, weed problems are not a serious issue except for creeping thistle (*Cirsium arvense*) and wild-oat (*Avena fatua* and *A. ludoviciana*).

In these ways, he argues that he avoids the need for either crop rotations or inter-row tillage or even ploughing for non-chemical weed control. He also avoids the need to include fertility building fallows or cover crops or manure (it being a stockless system). He must keep soil fertility low because the ancient cereals he grows will lodge in high fertile soil.

Bunt (covered smut) disease. Absence of bunt is essential for flour milling. It is a seed borne disease that is spread by spores on the outside of the grain and they are particularly trapped in the brush hairs at the top of the grains. The risk of disease transfer is minimised in three ways: (1) tight biosecurity on the farm – contaminated seed lots are not allowed on the farm; (2) a polishing machine which removes the

brush hairs (and any spores) before planting; and (3) all planted seed is treated with vinegar and mustard powder to prevent fungal spores from germinating.

Disease is not a problem in these fields, in spite of continuous cultivation, due to the high genetic diversity of the crop, low nitrogen growing conditions, a biologically active mulch of crop residue and clover on the surface of the field, high biodiversity within the field which reduces pests, a strong population of protective mycorrhiza and healthy growing conditions.

The main challenges

An apparent challenge is the low yield – 3.0 t/ha – which is 40% lower per hectare than that achieved by most organic farmers who practise fertility-building rotations and intensive weed control (by tillage). But the usual organic rotation produces a wheat crop only once in every 4-6 years, whereas the system used here produces a wheat crop every year – tripling the output of grain from the farm. The low yield is compensated by the crop's resilience and hardiness, due to the presence of very diverse cereals in the field.

Lack of small-scale grain production equipment. The farmer has purchased some small scale equipment from France and Germany, and refurbished old farm equipment (eg. a 19th century winnowing machine) from the UK, to process small (c. 1-5 ton) lots of grain by hand.

The system is profitable despite the low yield, not only because of low input costs, but also because of the high niche value of the grain, which will fetch prices of up to £900/t for heritage grain used in gin, whisky, beer and flour.

Soil fertility and avoidance of degradation. Undersowing obviates the need for a fertility-building rotation, and nitrogen levels rise naturally if only 3 tons of grain is removed from the agro-ecosystem every year. Old, tall varieties suppress weeds and nurture a biodiverse crop understory. Recently, he has also adopted a zero tillage regime in order to avoid damaging soil structure and soil organisms. The surface mulch prevents any erosion, increase soil moisture and retention and infiltration rates, and reduces use of fossil fuels.

Interestingly, the farm does not have any problems with slugs, perhaps because of a free-draining soil.

The method of harvesting

In order to harvest the cereals, the farm owns a combine harvester. The crop is harvested high on the stem to avoid weeds and beneficial insects. Crop residues are left to decompose on the soil surface, since

adopting a zero tillage system, seeds are broadcast into the mulch. No significant problems have developed, and the weed population is changing slowly towards short, perennial, 'pasture' type weeds rather than arable weeds such as charlock (which are more prevalent when soil is tilled).

The way forward

Formation of a heritage grain cooperative is being considered to avoid problems of legislation which prevent selling or distributing seeds directly to other farmers. 'Seed user agreements' (i.e. rental contracts) allow grain to be grown by other farmers on contract to supply millers, bakers and distillers. One of the primary challenges in this system is the cost and labour of creating the populations of 'heritage' grains and bulking them up to field level. This takes many years, and a return on investment is made only on the sale of grain or flour to consumers.

More detailed research on aspects of soil fertility and weed competition would help to substantiate the scientific basis of the production system. The farmer is currently writing a summary of his methods.

In conjunction with the above the farmer also uses the farm to organize open days with school children and he focuses on achieving a premium price for his grain and supplying the local economy. As well as promoting training days, pizza and pasta making in the near future engaging local consumers and specialized bakeries.

