

Research Theme

Optimising grazing management of Shropshire sheep in fruit orchards

Host(s)	Meeting date(s)
Harvey Clay, Showle Farm, Monkhide, Ledbury, Herefordshire.	19/06/2014
Yarkhill Village Hall, Nr Ledbury, Herefordshire.	17/09/2014

Background

Shropshire sheep have long been recognised for their unique ability to graze safely amongst conifer plantations without damaging the trees. This has led to their widespread use across northern Europe. Indeed, there are larger populations of Shropshire sheep in countries such as Denmark, Austria, Germany, and Switzerland than there are in the UK. A body of research and information exists on the practice of using and managing Shropshire sheep within conifer plantations.

In recent years, interest in using these “tree friendly” sheep as strategic grazers in orchards and vineyards has increased amongst top fruit growers and wine producers. Every year since 2008, Shropshire sheep have been exported to France for grazing in fruit tree plantations. This year, exports have also been made to Guernsey and the Isle of Wight specifically for this purpose. Increasing use is also being made of Shropshire sheep in cider orchards in the UK, including producers in Herefordshire who supply Bulmers under contract. However, the Shropshire Sheep Breeders Association (SSBA) has much less information and evidence for the role of Shropshire sheep in these settings.

Small scale research was carried out in 2011 with the Herefordshire Orchard Network of Excellence (HONE) to investigate the potential use of Shropshire sheep within cider orchards. This work has revealed that Shropshire sheep would leave tree bark alone, but that they did lift the canopy through eating leaves on the lowest branches. However, more research is required to produce management guidelines for Shropshires in fruit tree plantations. In addition, a survey of three fruit growers using Shropshire sheep in France was conducted in 2009, which yielded some information on the practice and impacts of Shropshire sheep in cider orchards and plum orchards. Information from an EFFP report produced in 2011 suggested savings totalling over £500 from keeping a flock of 40 Shropshire ewes in a 20 acre apple orchard (£25/acre). The savings are made up of the value of manure produced, savings from a

Background

reduction in grass mowing, and reduced use of pesticides for weed control.¹ Bulmers also employed a French student on a 3 month internship to look at the potential of Shropshire sheep grazing in cider orchards.

Relevant prior research

Shropshire Sheep Breeders' Association (2008): [*Two crops from one acre*](#)
This document includes information on best practice management of Shropshire sheep in orchards, based upon research carried out in Denmark and France. In this pamphlet, Graham Allan (a shepherd in Denmark) talks about the adoption of Shropshire sheep to graze in Christmas tree plantations: "In recent years, there has been increasing interest in finding alternative methods of herbage control and one of the most innovative and successful has been the use of sheep. This is the most difficult to manage, but is at the same time the most environmentally-friendly. Furthermore, it allows the producer the opportunity to gain two crops from one plantation - a useful additional income. The whole point of grazing sheep amongst Christmas trees is that they can be trusted not to nibble the trees. On this point there is no room for compromise. Through careful breeding and good management, we can develop routines and precautions that can lead to better results than are currently being achieved"

Ullrich Mayr, Sybille Spath, Andreas Bruder and Raimund Kohl - Obst und Garten, Issue 05/2007 (2007): [*Report on the trial with Shropshire sheep grazing in apple orchards at the Research Centre for Fruit Growing, Lake Constance, Bavendorf, Germany*](#)
(n.b. linked document is in the original German)

Pippa Geddes and Raimund Kohl - Pesticides News 86 (December 2009): [*Shropshire sheep control weeds in orchards*](#)
Article summarising the above 2007 Mayr *et al* report

Field lab development

Meeting 1 - 19/06/2014: Attendees learned about the current knowledge on keeping Shropshire sheep in orchards. They also looked at Shropshire sheep grazing in orchards, identified the key drivers for them to be involved with the Field Lab, and discussed the areas they would like to research.

The key drivers for involvement were varied, with the most popular being:-

- A possible means to reduce frequency of orchard mowing
- Development of an additional complementary enterprise
- Increase access to orchard pasture for sheep flock

¹ Detailed scenarios for keeping Shropshire sheep in apple orchards. EFPF (January 2012)

Field lab development

Other key drivers included reducing costs for apple production (diesel, labour, sprays etc.), conservation/ biodiversity gains, improving ability to sell Shropshire sheep, production of two crops from one acre, enjoyment from keeping sheep, and increasing knowledge of how to keep Shropshire sheep in orchards.



Photo above: Attendees at the first field lab meeting – 19/06/2014

The most popular research requirement from the Field Lab was the production of proven guidelines for keeping Shropshire sheep safely in orchards. A second favourite was identification of swards which will meet Shropshire sheep requirements, with information on the impact of the canopy raising effects of Shropshire sheep on apple yield coming in third.

A contact group for the Field Lab has been established with information being circulated amongst group members via email. This group will be used to embrace evidence from farmers themselves. It could be that a database will be set up to collate anecdotal evidence and collect relevant research papers.

Although not discussed at great length by attendees, the need to establish with absolute certainty that Shropshire sheep are much safer than other breeds for grazing in orchards was debated by the researchers for this field lab. It was suggested that Shropshire sheep should be tested against other downland breeds which might be substituted for Shropshires (such as Dorset Downs and Hampshires) and against other breeds (e.g. Lleyms) which might be competitors to Shropshires. This could be done in orchards which are due to be grubbed up so that any damage would not be a great problem. We are looking into working with animal behaviour researchers from Harper Adams on this as to the best research design.

Meeting 2: 17th September 2014

Field lab development

During a group discussion, the following points relating to sheep management in orchards were raised:-

Clearing up of fallen leaves by sheep in orchards – both from eating and via trampling, which encourages the process of decay. There was some evidence from the German trials that sheep eating leaves can help with scab control.

There is less soil compaction from sheep grazing compared to that caused by machinery used to top the sward beneath fruit trees (a minimum of three passes per year is typical).

The importance of defining the grass mix was confirmed by many members of group. The inclusion of grasses and herbs with natural anthelmintic and medicinal properties is a possibility, and this will be an important consideration on the proposed trial sites.

The different types of orchard were also discussed as these will have different features that may affect possible grazing periods. The range is from orchards with standard, open canopy, and often older trees (where organic management is more typical) to more modern commercial orchards, typically containing bush type trees which are more densely planted and lower growing for easier management and harvesting. See [Appendix 1](#) for more detail on grazing periods.

Spraying period is typically March to June when grazing is not possible (there are no guarantees from spray manufacturers as to whether their products are safe for sheep – only for the herbicides typically used in grassland).

Producers who supply Bulmers are required to remove sheep for 8 weeks or 56 days prior to harvest. Emily feels this could be challenged as there is little evidence that this is necessary.

Apple harvest dates vary from September through to November.

Sheep are kept out of the orchards during pruning, which is typically carried soon after harvest. Not only do sheep get in the way of the pruning operation, but prunings are initially left on the floor before being cleared up and burned. The presence of prunings on the floor may encourage sheep to start grazing tree bark.

Available grazing periods were identified as possibly early spring, end of June through to August, and over winter post-harvest. See [Appendix 1](#).

The subject of establishing when modern bush orchards are safe to graze for the first time was also discussed. The feeling in the group was that 5 years after planting should be the earliest date, but this may still need to be tested.

Field lab development

For novices keeping sheep in orchards, the advice is to start small with low numbers of sheep, and to make sure of having some back up grazing if and when the sheep need to be removed from the orchard.

The archive of research papers from Long Ashton is [available online](#), and this may include useful information for this project. A literature search may well be fruitful.

All agreed that an important part of the field lab is to produce a set of guidelines for keeping sheep safely in fruit orchards. To contribute to this, Paul Burgess will produce a number of case studies.

A third field lab will take place in May 2015 to review trial progress and the collated data from members who keep Shropshire sheep in orchards. This meeting will also include more detail on the economic pros and cons of grazing sheep in orchards, and include an account of the management time for keeping sheep compared to topping the orchards.

Experimental question(s)

1. Can a set of proven guidelines for keeping Shropshire sheep safely in orchards be produced?
2. Is it possible to identify the type of swards which will meet the requirements of Shropshire sheep grazing in orchards?
3. Does the canopy raising effect of keeping Shropshire sheep in apple orchards noticeably impact crop yield?

Method of trial(s)

Nine of the attendees have orchards, and three have Shropshire sheep. All those with orchards are prepared (in principle) for their orchards to be used within any research agreed for the Field Lab.

Method of trial(s)

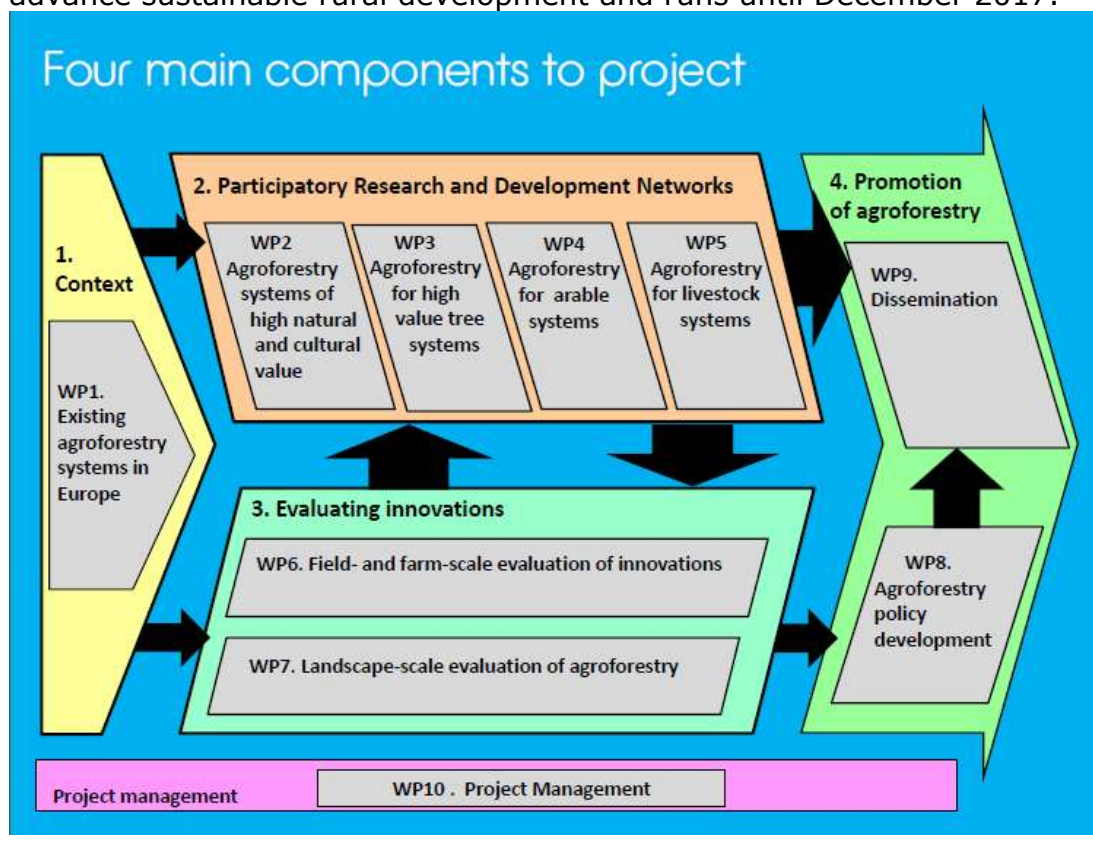


Photo above: Shropshire sheep in orchards at Showle Court, Herefordshire

Emily Durrant (Researcher), Paul Burgess (Agforward Project), and Liz Bowles (Facilitator) will talk on Skype to discuss how best to develop a research methodology to meet the identified needs of the group.

It is possible that future research may be jointly supported through work package 3 of the Agforward project and the Duchy Originals Future Farming Programme (DOFF).

The Agforward project aims to promote agroforestry practices in Europe that advance sustainable rural development and runs until December 2017.



Method of trial(s)

Suggested research areas to be developed

1. Comparison of Shropshire sheep with three other sheep breeds on their safety within fruit orchards (Dorset Downs, Hampshires, and Lleys)
2. Engagement with others with experience of grazing sheep within trees and developing a database and point of collection for anecdotal evidence on the subject
3. Timing of grazing and integration with orchard operations such as pesticide applications
4. Collation of data on palatability to sheep of grass types routinely used in orchards. Research into the potential for introduction of legumes into grass mixes used within orchards
5. Development (from scratch) of systems integrating sheep and fruit orchards
6. What effect on yield does the change in canopy height make?
7. Collection of data from producers integrating sheep in fruit orchards on the financial impact of this practice.

At the second session the group agreed trial protocols and required records including:-

- Sheep grazing days (number of sheep multiplied by the number of days grazed in the orchard)
- Stocking rate
- Weight gain of sheep when in the orchard (in and out weights)

Two areas of research were identified by the group as being important. These are:-

Data recording and collation

Recording requirement for members who currently graze sheep in orchards:-

1. Grazing dates when sheep turned in and out of orchards
2. Number of sheep
3. Size of orchard
4. Any supplementary feeds and minerals
5. Age of sheep
6. Health problems with the sheep and any vet treatments.
7. Weight of sheep in and out of orchards.
8. Details of tree damage – trunk or branch, definitely sheep or by tractor operations, photographs with scale.
9. Inputs used on trees – sprays and sward topping etc.
10. Apple yields or estimates
11. Tree type – bush, standard, and variety.
12. Soil type if known

This data will be collated once received from group members and used at subsequent field lab sessions

Method of trial(s)

Farm trial

During the field lab meeting, a farm trial was discussed and a protocol agreed:

Grazing Shropshire sheep in a bush apple orchard with Toby Lovell.

This will compare sheep grazed in an orchard plot of 350 trees to a similar plot with a comparable number of trees which will be mown and not grazed. All trees are in bush form and they were planted a minimum of 5 years ago.

To complete the trial, the following recording criteria were defined:

1. Dates of sheep entering and leaving the orchards.
2. Weight of sheep when entering and leaving the orchards.
3. All inputs to the sheep such as minerals/supplements and veterinary treatments.
4. All inputs and treatments to the orchard plots – details of sward topping, sprays used etc.
5. Tree damage at start and end of trial, including the number of trees with broken branches.
6. Tree canopy measurements (bottom and top) for a sample of 30 trees in each plot, taken at the start and the end of trial.
7. Apple yields from each plot: weights of trailer loads, number of trailer loads.
8. Varieties of apple trees in each plot.
9. Soil types in both orchard plots.

Limitations and assumptions

- Availability of information on grasses in swards
- Difficulty in amending grass quality (this is outside the timeline of the field lab)
- Limitation of ease of access for soil amendments such as lime

Developments and adjustments

Outcomes/results

Broome Farm Trial protocol and results

Outcomes/results

An initial trial has been conducted at Broome Farm Peterstow to investigate the impact of Shropshire sheep grazing in a cider fruit orchard. 40 Shropshire sheep were put into 5 acres of a bush orchard planted with Harry Masters cider apple variety planted a min. of 10 years ago. The soil at the trial site is a well-drained coarse loam over sandstone.

This orchard is not typical in that pruning in February this year included removing the lower branches, effectively raising the canopy. This is to increase the air flow through the orchard to reduce risk of scab infection.

Although the orchard is not organic no pesticide sprays have been used for three years and this includes not spraying an herbicide strip beneath the trees which is typical practice on most bush orchards; commonly this will be repeated 2-3 times a year. This is practiced instead of mowing to reduce competition to the trees from the grass sward but results in apples falling onto bare earth during harvest which speeds up rot. This can be a significant loss of usable apple yield. The competition from the sward may be perceived but not actual.

Trial design:

- Sheep went into the trial area on the 20th May 2015 and were removed on the 1st August in order to comply with customer requirements on livestock in cider fruit orchards.
- A double or triple strand electric fence was used to contain the sheep.
- 20 ewes went back into the same area in the orchard on the 15th December and stayed there until grass availability dictates they should be moved (February 2016).
- This produced 134 total grazing days between May 2015 and February 2016.
- Over the whole year this represents a stocking rate of around 2.5 ewes / acre. This could have been increased if the grazing limitations below could have been addressed.

Grazing limitations for 2015

- There were delays in the spring due to lambing and shearing, this led to excessive grass growth requiring grass to be topped before the sheep were first introduced into the orchard.
- Removal of sheep by 1st August to comply with Bulmer/NACM regulation of a 56 day break between sheep grazing and harvest date to prevent faecal contamination.

Initial findings from this unreplicated trial

Reduction in need to mow grass:

The 'no sheep' area was mowed three times during the year, compared with once in the sheep trial area. If sheep could have been introduced earlier into the orchard this mowing would not have been required and the overall sheep stocking rate achieved could have been higher.

Outcomes/results

Tree damage:

On close inspection of the orchard there was no visible damage to the trees in the sheep grazed area, the occasional broken lower branch is most likely attributed to machinery used for grass topping and apple harvest.

There was very limited evidence of low bark grazing on these broken branches but this was rabbit damage as predated sheep re-entry to the orchard.

The host farmer did report some leaf nibbling of lower branches over the summer but nothing to raise concern or affect apple yield.

During the day the group had an opportunity to examine an area of the orchard not in the trial to which Friesland sheep broke into by accident. Tree damage was obvious as areas of barking to the trunk, and reports from the host farmer involved in trial, this happened as soon as the sheep gained access to the trees ignoring the grazing and going first to browse on the trees. Incidentally these were a different variety of tree, Ellis Bitters. ¹

Group discussion

During the orchard inspection the following issues arose from members of the group:

1. Is there need to define the amount of tree damage done by sheep before there is harm to yield? Of importance if grazing of the trunk bark allows access of fungal/bacterial disease.
2. Soil health may be significant to tree health and affect the apple yield. Importance of mycorrhiza to plant health and growth is well documented and they should be present, particularly in apple orchards where soil is not disturbed for significant periods. Soil tests could be used to indicate presence and abundance of mycorrhiza and practices such as herbicide strip spraying assessed for harm to fungal growth.
3. Presence of high earthworm numbers may be important in processing leaf litter down into the soil alleviating risk of scab infection. They may also help in reducing soil compaction following periods of heavy machinery use such as harvest which can be when soil conditions are less than ideal.
4. Price penalties for apples that are not clean and good quality may be preventing growers from trialling new growing approaches particularly if reducing pesticide use.

Additional orchard monitoring

During the orchard visit (15th December) photographs of the leaf litter in the sheep area and the control area were taken to be compared with photographs at the same sites in March 2016.

Barriers to sheep in orchards

Outcomes/results

We asked all present, after what we have learned so far - What are the remaining barriers preventing orchard grazing?

- Many bush cider orchards will have their entire farmed area down to orchard and hence no alternative grazing sites for sheep to allow for periods of orchard exclusion.
The group came up with possible answers of using store lambs that could be sold off the farm, finished and sheep brought in on grazing contracts. These contracts need to be secure agreements to prevent overgrazing (that could lead to tree damage).
- Spray exclusion periods are vague as many pesticide sprays used on trees are not licensed for sheep.
Generally sheep are removed for a week during and following spraying but there is no scientific evidence behind this.

Conclusions

Farmer feedback

The Clay family are long term growers of cider apples and have kept Shropshire sheep for over a decade. The sheep are used to graze within their bush and standard fruit orchards.

Their experience is that the sheep do a good job at reducing the need for mowing and spraying. They do not damage the bark, but do raise the height of the canopy in the bush orchard. However, the farmer finds this useful as it reduces the need to prune the lower branches.

The sheep do need to be managed whilst grazing in orchards. This includes providing them with free access minerals, and moving them to fresh grazing once the grass has been reduced to a minimum height.

Future trials

Appendix 1

Orchard Types	Grazing System	Grazing
Old Standards – cider or dessert	Typically old swards	If orchard is organic (no spraying) sheep can be in field up until May.
New standards (<10 years) – cider/dessert		
Half standards – cider/dessert		
Bush Orchards – cider only	Typically hard wearing swards to withstand machinery, tractors, etc. Sheep graze only after 5 years Sheep out for spraying typically March – June. Sheep out for harvest and pruning (annual to once in 3 years). Typical harvest dates range over Sept, Oct and Nov	Sheep in over winter, Jan – March Sheep in post spraying – June, July, August, mid sept depending on harvest date.