

Silvo-Poultry: An Agroforestry System for Organic Chicken Production at Sheepdrove Organic Farm.

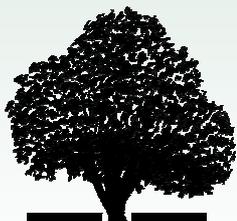
Lois Philipps

**Final Report
May 2002.**

Sheepdrove



Organic Farm



**ELM FARM
RESEARCH CENTRE**

'having looked at the plans and agree that this appears to be an excellent system for producing poultry' J Hancock SA Cert,

1. Introduction

1.1. The published objectives of DEFRA are to promote *sustainable development, which means a better quality of life for everybody now and for generations to come*, including:

- 1.1.1. A better environment
- 1.1.2. Economic prosperity
- 1.1.3. Thriving economic communities in rural areas.

1.2. It is the intention of this project to develop a system that not only delivers these objectives, but which also meets the behavioural needs of the chickens by providing an environment that is closer to their original habitat. The domesticated chicken has evolved from a ground-dwelling forest fowl that inhabited forest clearings and woodland edges. Therefore we need to re-create a woodland-style environment within the context of a commercial organic farm. The requirements are to provide an environment for chicken production that meets the following objectives:

- 1.2.1. To provide living conditions that allow chickens to express their basic behaviour, by establishing a woodland edge habitat
- 1.2.2. To supply food sources for nutritional and health benefits for the chickens from a variety of sources, trees, shrubs, herbs as well as grass/clover leys
- 1.2.3. To provide an enriched landscape for the farm to encourage an increase in biodiversity
- 1.2.4. To provide a community asset in terms of landscape and the opportunities to gather hedgerow fruits.

2. Rationale

2.1. Poultry production in the UK has developed into a highly specialised and industrial process with little regard for the behavioural and physiological needs of the birds. Even the less intensive free range systems have tended to be modifications of the industrialised model.

2.2. Organic poultry production in the UK is governed by the EU Regulations for organic livestock production. Despite the underlying IFOAM principles that organic production systems must allow the animals to exhibit their natural behaviour and provide for their physiological needs, UK organic poultry production tends to mimic the free-range systems with some modifications in terms of beak trimming, flock sizes etc. If organic farming systems are to develop there is an urgent need to redesign organic poultry production systems. It is essential that the birds are kept and managed in such away that the animals, the farmer and the wider environment benefit from the production methods. It is for these reasons

that this project is evaluating the development of a commercial agroforestry system for organic poultry production.

3. Scope

3.1. The project has two phases.

3.1.1. Phase 1: To design a commercial agroforestry system for organic chicken production at Sheepdrove Organic Farm Berkshire.

3.1.2. Phase 2: To design comprehensive monitoring programmes to evaluate the impact of the Agroforestry system on poultry production.

4. Caveat

4.1. The recommendations are based on scientific principle and experience but not on any existing system because this approach is the first of its kind in the UK.

4.2. The actual recommendations are site and soil specific although the principles are transferable to other situations.

5. Site Description

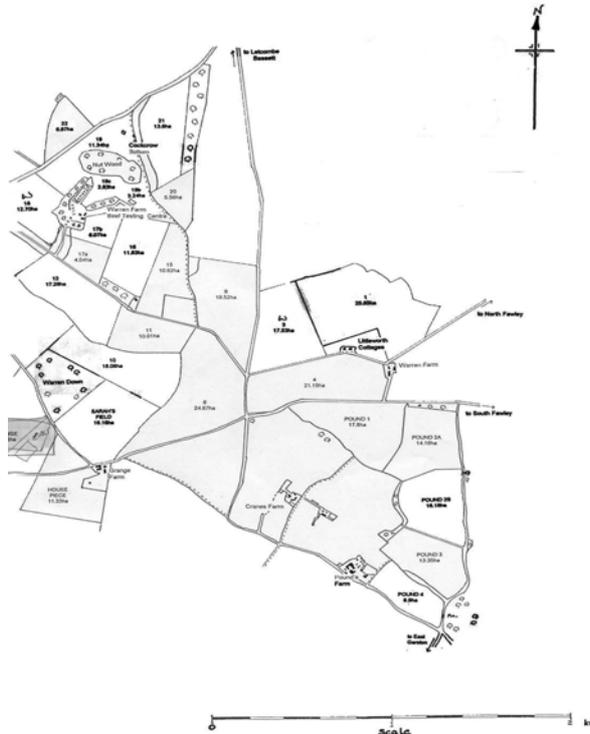


Figure 1: The Site Map

5.1. The site is on the Berkshire Downs and is largely rolling chalk downland at an altitude of 170 to 200 m. with an annual rainfall in the region of 800-900 mm

5.2. Soil

Within the site there are three distinct soil types: clay with flints: thinner silty calcareous clay with flints; and a deeper colluvial silty soil. The pH across the site ranges from 6.9 to 7.6

Field	pH	P (mg/l)	K (mg/l)	Mg (mg/l)
Chicken field	8.0	30	176	56
Sarah's Field (top)	8.2	30	187	101
Sarah's Field (Bank)	8.3	22	122	61

Good nutrient reserves exist across the site increasing where soil is deeper. However, although these reserves may be good, availability could be limited by high pH and calcium status.

Field	Copper (mg/l)	Zinc (mg/l)	Calcium (mg/l)	Selenium (mg/l)	Iodine (mg/l)
Chicken field	1.7	3.3	4746	0.22	44.2
Sarah's Field (top)	6.0	4.9	5351	1.00	24.3
Sarah's Field (Bank)	4.2	4.3	4274	0.16	21.5

High levels of calcium can cause trace elements such as copper and selenium to be locked up within the soil matrix. The biological activity within the soil may also be restricted or reduced by high levels of calcium within the soil. However, the calcium enables the chickens to have an adequate supply of calcium in their diet to ensure good bone development. Poultry manure is highly acidic and these calcareous soils provide a counter balance to the manures.

5.3. Archaeology

Search of the National Monument Records database has shown no recorded sites or finds on this part of the farm.

6. Existing system

6.1. The chicks are brought in as 'conventional' day-olds and are grown on for 21-28 days in 'brood sheds'. Once fully feathered, the birds are moved into outside houses. These are managed in pairs, each house having 1000 birds. A cohort of birds is therefore 2000 per batch. They have access to grass clover leys plus supplementary cereals. The birds finish in eight weeks and are slaughtered on the farm.

7. Changes required to implement silvo-poultry system

- 7.1. In order for the birds to take full advantage of the woodland-style environment, they need to be encouraged in ranging behaviour from the point where they are brought to the farm as day old chicks. Changes to the brood sheds have been suggested to encourage and acclimatise the birds to an outdoor lifestyle. These changes have included adapting: the sheds so that the chicks can have protected access to the outside world; and playing sounds of bird songs, tractors and other livestock to the chicks in the safe environment of the shed. These sounds are thus familiar to the chicks when they are moved to the woodland-style environment.
- 7.2. The proposed changes to the poultry production system are to plant 5 avenues of trees. Each row will be 2.5 m wide and the central rows will have a combined width of 5m, separated by a central fence line. There is then a transition from the trees, through a coppiced hedge and shrubs, to a permanent 3m wide herbal strip.
- 7.3. The planting will consist of five avenues of trees, hedges and shrubs. The avenue lengths vary and are summarised in table 1 below:

Give titles and numbers to previous tables. Table 1: Length of Avenue and number of plants per avenue

Avenue	Total Length (m)	Trees At 40 m	Hedging plants At 0.3 m	Shrubs 2 per m
A	562	14	1873	1124
B	642	29	3880	2328
C	717	33	4380	2628
D	716	33	4373	2624
E	579	14	1930	1158

- 7.4. The three central avenues will have 3 x 20 m gaps to allow access from one feeding strip to the next. This will reduce trafficking and labour time in travelling between houses.
- 7.5. The whole area will be protected by fencing so individual tree guards are not required. All plants will be mulched, with Sheepdrove's own compost, to retain moisture and suppress weed competition during the tree and shrub establishment.
- 7.6. Within the houses and paddock areas perches, dust baths and grain feeders will be established to encourage the birds natural behaviour and to encourage them to roam from the houses, to take advantage of the nutritional diversity on offer in the herb, shrub and woodland areas. It is anticipated that, by ranging further from the housing, the chickens will have a more omnivorous diet, foraging for earthworms and insects that will provide them with natural sources of protein.

8. Details of costs involved

Fencing	£9835
Water supply	£17500
Cultivation Costs	£600
Standard Trees	£1695
Shrubs, coppice and hedge	£18902
Mulching	£1200
Tracks and cattle grids	

Prices based on quotes obtained November 2001

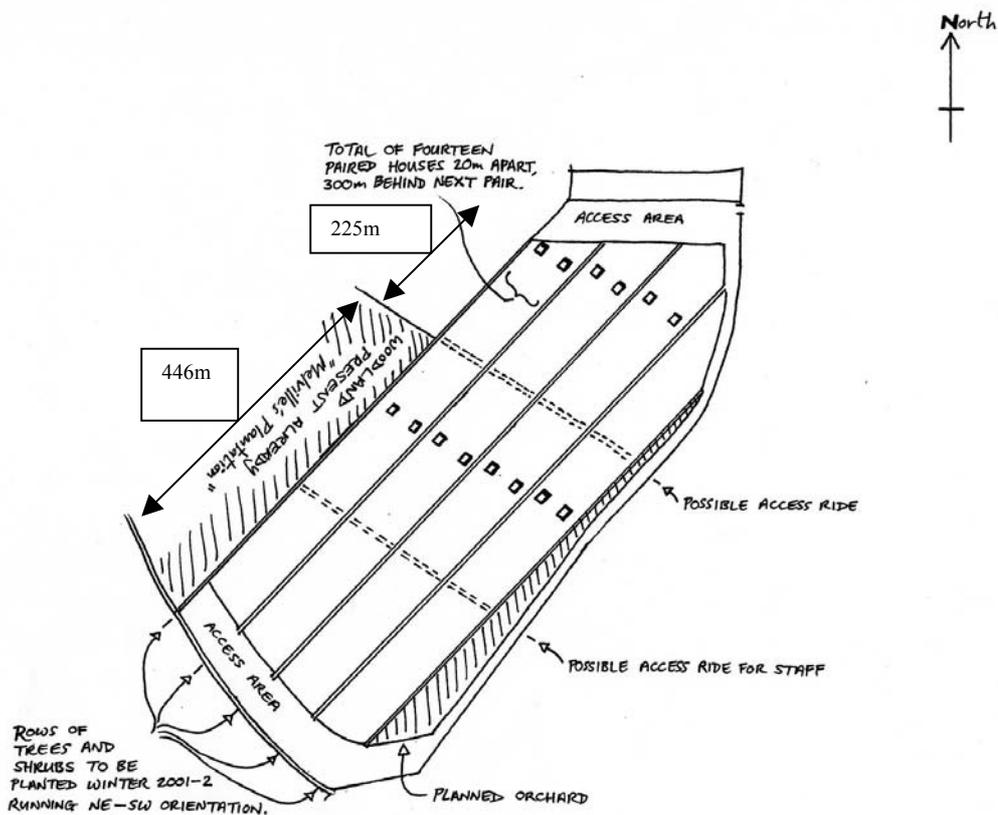


Figure 2 shows the site plan.

8.1. Plants and Planting

8.1.1. The trees will be planted at 40 m spacing per avenue either side of the central fence line. The trees sizes will be 1.5 to 2 m in height. To ensure a good establishment the trees will be planted into augured holes containing a compost mix. Where necessary the trees will be staked.

Table 2: Trees species, mix and purpose

Tree	% Mix	Purpose
Ash	18	
Beech	12	Timber and beech mast
Field Maple	12	Shelter
Alder	12	Shelter
Hornbeam	10	Timber
Cherry	6	Food and community interest
Wild Pear	5	Food and community interest
White beam	5	Shelter
Apple	10	Food and community interest
Scots Pine	5	Shelter

8.2. Shrub Species

8.2.1. The hedge will run parallel to and at a distance of 1m from the trees. The hedging species will be planted on 0.3m spacing and will be 0.6 to 0.9 m in height.

Table 3: Hedging plants, mix and purpose

Hedge Species	% Of Mix	Purpose
Quickthorn	30	Shelter
Field Maple	20	Shelter
Blackthorn	1	Shelter
Pea Shrub	10	Shelter and protein
Hazel	5	Food and Community interest
Dogwood	5	Food
Spindle	5	Food
Holly	2	Food and Community interest
Vib Opulus	2	Shelter
Vib Lantana	2	Shelter
Wild plum	*	Food and community interest
Crab apple	*	Food and community interest
Dog Rose	4	Food and community interest
Elder	10	Food and community interest
Blackberry	*	Food and community interest
Raspberry	*	Food and community interest
Gooseberry	*	Food and community interest

8.2.2. The shrub species will be planted away from the hedge in groups. The purpose of these species is not only to provide the chickens with food and shelter, but also provide harvestable fruits and wood products. The plants are similar to the hedging species but will be planted at a lower density (2 plants per m) and will be of a similar height to the hedge when planted. However, they will require more management in the coming years.

Table 4 Coppicing plants mix and purpose

Coppice Species	% of Mix	Purpose
Quickthorn	10	Shelter
Field Maple	1	Shelter
Blackthorn	10	Shelter
Pea Shrub	5	Shelter and protein
Hazel	10	Food and Community interest
Dogwood	5	Food
Spindle	3	Food
Holly	3	Food and Community interest
Vib Opulus	5	Shelter
Vib Lantana	5	Shelter
Wild plum	5	Food and community interest
Crab apple	5	Food and community interest
Dog Rose	10	Food and community interest
Elder	5	Food and community interest
Blackberry	2	Food and community interest
Raspberry	2	Food and community interest
Gooseberry	5	Food and community interest

8.3. Herb species

8.3.1. The herbs will be planted in the spring 2002. Many of the other recommended herbs such as chickweed and shepherds purse would colonise the strip naturally.

Table 5: Herbs mix and purpose

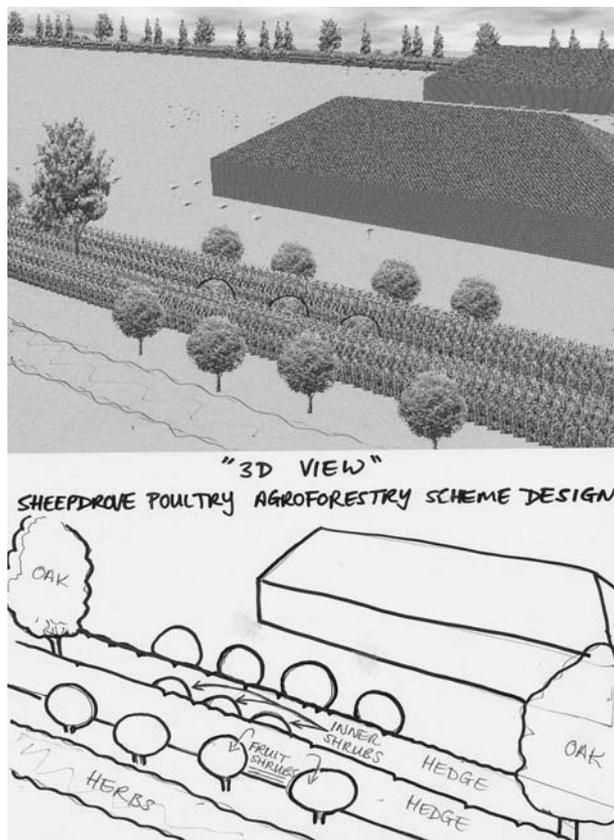
Herb	Low, Medium or High	Purpose Medicinal +
Quinoa	Medium	Nutritional
Kale	Medium	Nutritional
Plantains	High	Anti-inflammatory
Wild Garlic	High	Antibacterial, Landscape
Comfrey	Low	Anti-inflammatory
Aromatics eg Thyme	High	Antiseptic, calming de-wormer
Vetches	Medium	Vulnerary N fixation
Marigolds	Medium	Anti-inflammatory
Wild Strawberries	Medium	VitaminC, Community interest,
Fennel/dill	Medium	Calmative
Mullein	Medium	Expectorant
Wormwood	Low	Athelmintic

Key to planting density

- High** More than 20 plants per house
- Medium** Between 10 and 20 plants per house
- Low** One plant per house (medicinal benefits in low plant density but poisonous at high densities)

8.4. This planting scheme will cover 1.33ha in total. In addition to the avenues, it is proposed to plant a small woodland block adjacent to the trackway, thus providing an additional 1.31ha of woodland. However, as this land is currently receiving grant aid under the Organic Farming Scheme, and will continue to do so for the next 2 years, we suggest that this woodland block is planted after the organic farming scheme money expires, as this would give the possibility to apply for farm woodland grant money on this area at that time.

Figure 3 shows the planting plan detailing the agroforestry and herbal strip environments



9. General monitoring

Photographic records before and after

Video film for behaviour studies

Publicity

Score sheets for behavioural change need evidence not just anecdotes, marketing opportunity

9.1 Monitoring Soil, Plant, Animal, Human And Environment

9.1.1 Soil Monitoring Programme

Objective: To monitor and evaluate change over time.

Approach:

Structure of the sampling protocol can either be fixed points or random representative samples. However, sampling should include all areas of the system, under trees, hedge, shrub, herb and grass ley areas as well as from under the houses.

Sampling includes:

- Soil nutrient status
- Soil structure
- Soil biodiversity

Year 1

Protocol development

Establishment of baseline data for nutrient, soil structure and soil biodiversity

Year 2, 3

Implementation of monitoring programme

9.1.2 Plants Monitoring Programme

Objective: To monitor and evaluate change over time. This is a key monitoring objective as it not only impacts on the accumulation of knowledge and understanding of the functioning of the system but also contributes directly to management decisions

It is recommended that a sampling protocol is established and implemented in year 1 of the silvo-poultry system to establish a baseline data set.

Approach: Transects or fixed quadrats to monitor establishment, plant community development (mosaic and structure). The sampling programme should measure plant numbers, the relative contributions of individual species to the overall community, in terms of biomass production and the nutritional quality of plants. Sampling would be conducted on an annual basis; May/June would be the most suitable time.

9.1.3 Animal Monitoring Programme

Objective: To monitor and evaluate change over time. This is a key monitoring objective as it not only impacts on the accumulation of knowledge and

understanding of the functioning of the system but also contributes directly to management decisions.

It is recommended that a sampling protocol is established and implemented in year 1 of the silvo-poultry system to establish a baseline data set as against the animal performance data collected from the existing 'conventional organic system'.

- Performance
- LWG
- Health
- Nutritional
- Microbiology- methodology to be developed, advice needed Richard Young, VEERU
- Analysis before during, after coccidiosis, campylobacter at appropriate intervals
- Parasitology
- Worm burdens
- Soil, sward, bedding, and hens
- Sampling may show initial increases BUT then a decline as system becomes established.

9.1.4 Human Monitoring Programme

The first year will be a developmental year researching and establishing protocols and identifying potential collaborating partners to develop the 'human monitoring' programme. The major resource implication for this component of the research programme would be staff time plus some consultancy costs and travel

Areas considered important for evaluation

- Staff
- Economics
- Public perception (CCRU Survey maybe)
- Marketing
- Human quality, taste, texture etc

9.1.5 Environment Monitoring Programme

The biodiversity monitoring programme should be developed in conjunction with the Sheepprove biodiversity officer. It would be looking to monitor changes in population and distribution of key species eg voles in relation to predator species such as barn owls.

It would also be important to monitor pest and vermin species that might impact on the chicken production system. One of the potential problems of a silvo-poultry production system is that it is likely to increase fox numbers.

The development of a monitoring programme for gaseous emissions and the impact of the new system on landscape and local climate are long-term considerations

9.1.6 General Project Management

To ensure that the project during the three year funding period provides value for money and high quality output and is delivered according to the project plans, there will be two project steering committee meetings a year.

9.1.7 Staff

Dr Bruce Pearce

To oversee this project within the context of all R&D work at Sheepdrove

Ms Lois Philipps

Project manager with responsibilities for soil and nutrient aspects of the project.

Input to the project 36 days/year

Post Graduate Researcher (to be appointed)

To be responsible for the livestock and human monitoring programmes

Input to the project 90 days/year

Mr Jason Ball

To be responsible for the biodiversity monitoring programme

Dr Cindy Engle

Consultant with input at the steering committee level

Input to the project 5 days/year

Prof Martin Wolfe

Consultant with input at the steering committee level

Input to the project 3 days/year

Costs

Resources	£ per annum
Staff Input	£17,400
Consumables, (soil analysis etc)	£3,000
Total Costs	£20,400

9.1.8 Output

The project will provide annual reports

Articles for the popular and trade press

Technical briefings for advisers, certification bodies and policy makers

Presentations will be offered to organic and other scientific conferences

The project will provide material for the Sheepdrove and EFRC websites

EFRC Bulletin articles

Presentations will be made at Sheepdrove and EFRC open days

10. Conclusion

The development of the silvo-poultry system at Sheepdrove Organic farms should be used to demonstrate how organic standards could be developed for organic poultry production.

The development of the silvo-poultry system should also be used to inform policy makers on the potential developments that could be encompassed within the agri-environment framework.

Finally the site should be used to inform consumers about the conditions and circumstances in which their food is produced.

11. Acknowledgements

We thank Juliet and Peter Kindersley for their interest, enthusiasm and backing for this project, and the farm staff for their positive and active co-operation. We also thank Prof. Martin Wolfe and Dr Cindy Engel for their thoughts and contributions to this work.