# Temperate silvo-arable systems from around the world

**Stephen & Lynn Briggs**

Bluebell Farms ltd

Abacus organic services ltd.

.....Organic Advice That Counts

# Bluebell Farms Ltd

## Morcott Rutland

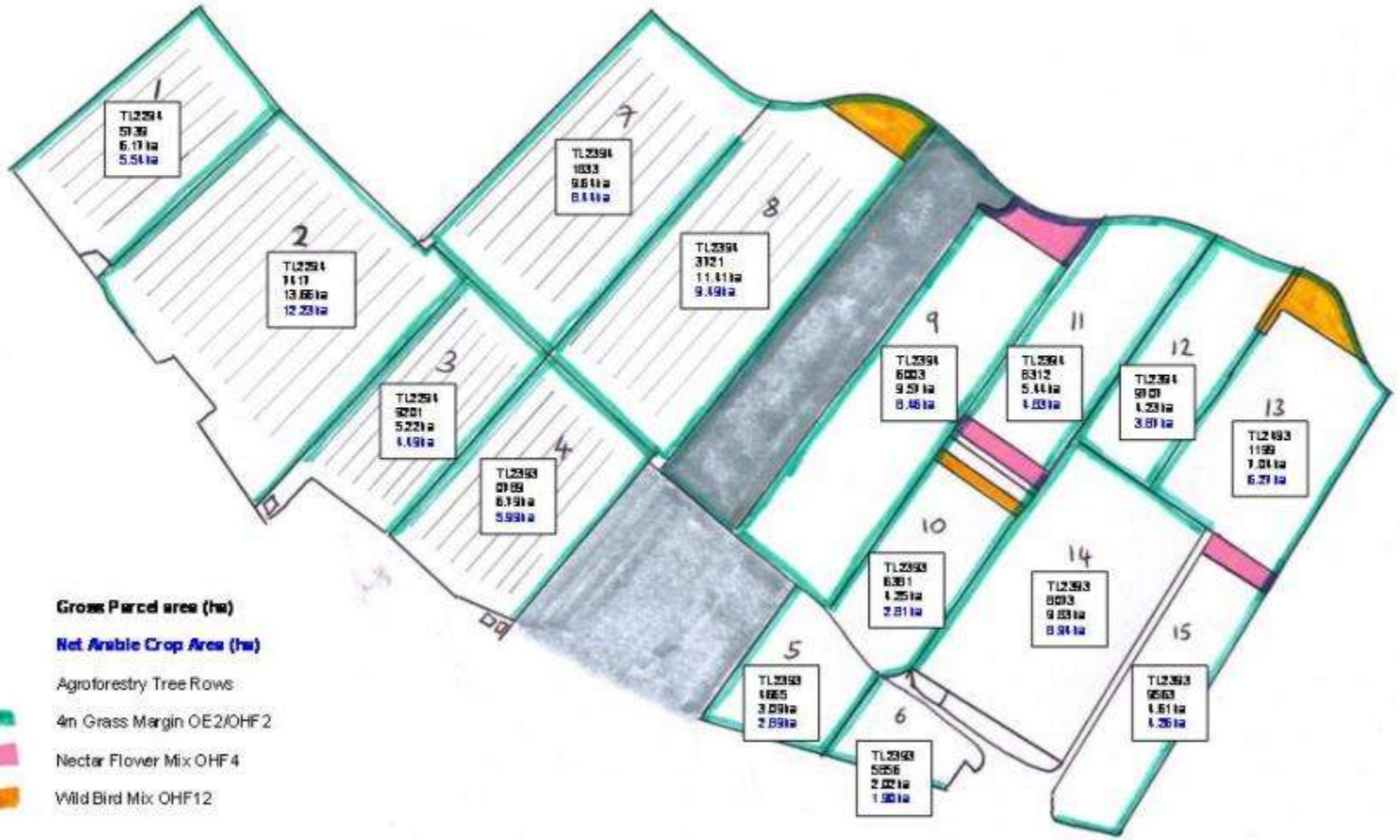
- 20ac Owned grade 2/3 cotswold brash sandy clay loam
- Cereals
- Clover > Clover > Wheat > Oats > Oats (seed crops)

## Whitehall Farm

- Tenant Cambridgeshire County Council
- 250ac grade 1 peat soils & grade 3 clay soil
- Cereals, root crops & Agroforestry
- Clover > Wheat > Pots > Barley > Onions/Veg

# Whitehall Farm


Bleasdell Farms ltd
Whittlesea Farm, Ramsey Road, Farcet, Peterborough, PE7 3DR
Tel 01733 219988
Steve 07855 341309, Lynn 07800 534988



**Soil Analysis**

**Whitehall Farm**

| Farm Site | Whitehall Fm |
|---|---|
| Texture | Organic sandy clay loam |
| pH | 6.4 - 7.2 |
| Extractable P (mg /l) | 39 |
| Extractable K (mg/l) | 498 |
| Extractable Mg (mg/l) | 129 |
| P index | 3 |
| K index | 4 |
| Mg index | 3 |
| Organic matter (%) | 23.8 |

# Whitehall Farm Cropping

| 2014 | 2013 | 2012 | 2011 | 2010 | 2009 | 2008 | 2007 | 2006 | 2005 | 2004 | 2003 | 2002 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Wheat | Pots | Wheat | Barley IC | W Wheat | Onions | W Wheat | S Beet | W Wheat | Pots | S OSR | Mustard | W Wheat |
| Wheat | Pots | Clover 1 | Barley IC | Barley IC | W Wheat | W OSR | W Wheat | S Beet | W Wheat | Pots | W Wheat | S Beet |
| Wheat | Onions | Barley | Clover 1 | Barley IC | W Wheat | Onions | W OSR | W Wheat | W OSR | W Wheat | S Beet | W Wheat |
| Wheat | Onions | Barley | Barley IC | Clover 1 | Pots | W Wheat | Onions | W Wheat | W OSR | W Wheat | S Beet | W Wheat |
| Pots | Barley | Barley | leeks | Clover 1 | Barley IC | W Wheat | W OSR | W Wheat | W OSR | W Wheat | Pots | W Wheat |
| Pots | Barley | Barley | leeks | Clover 1 | Barley IC | W Wheat | W OSR | W Wheat | W OSR | W Wheat | Pots | W Wheat |
| Onions | Wheat | Pots | Barley IC | Barley IC | W Wheat | S Beet | W Wheat | Pots | W Wheat | S Beet | W Wheat | W OSR |
| Onions | Wheat | Pots | Barley IC | Wheat IC | W OSR | W Wheat | Pots | W Wheat | S Beet | W Wheat | W OSR | W Wheat |
| Clover 1 | Onions | Wheat | S Barley | Wheat IC | Clover 1 | W Wheat | W OSR | W Wheat | S Beet | W Wheat | Pots | W Wheat |
| Wheat | Clover 1 | Onions | S Barley | Clover 1 | Barley IC | W Wheat | W OSR | W Wheat | W OSR | W Wheat | Pots | W Wheat |
| Wheat | Clover 1 | Onions | W Wheat | Barley IC | Barley IC | W OSR | W Wheat | W OSR | W Wheat | S Beet | W Wheat | Pots |
| Wheat | Clover 1 | Onions | W Wheat | Barley IC | Barley IC | W OSR | W Wheat | W OSR | W Wheat | S Beet | W Wheat | Pots |
| Wheat | Clover 1 | Pots | W Wheat | Clover 1 | Barley IC | W Wheat | S Beet | W Wheat | W OSR | W Wheat | S Beet | W Wheat |
| Pots | Wheat | Clover 1 | leeks | Wheat IC | Vetch | Pots | W Wheat | W OSR | W Wheat | W OSR | W Wheat | Pots |
| Pots | Wheat | Clover 1 | S Barley | Wheat IC | Vetch | S Beet | W Wheat | S Beans | W Wheat | Pots | W Wheat | S Beet |

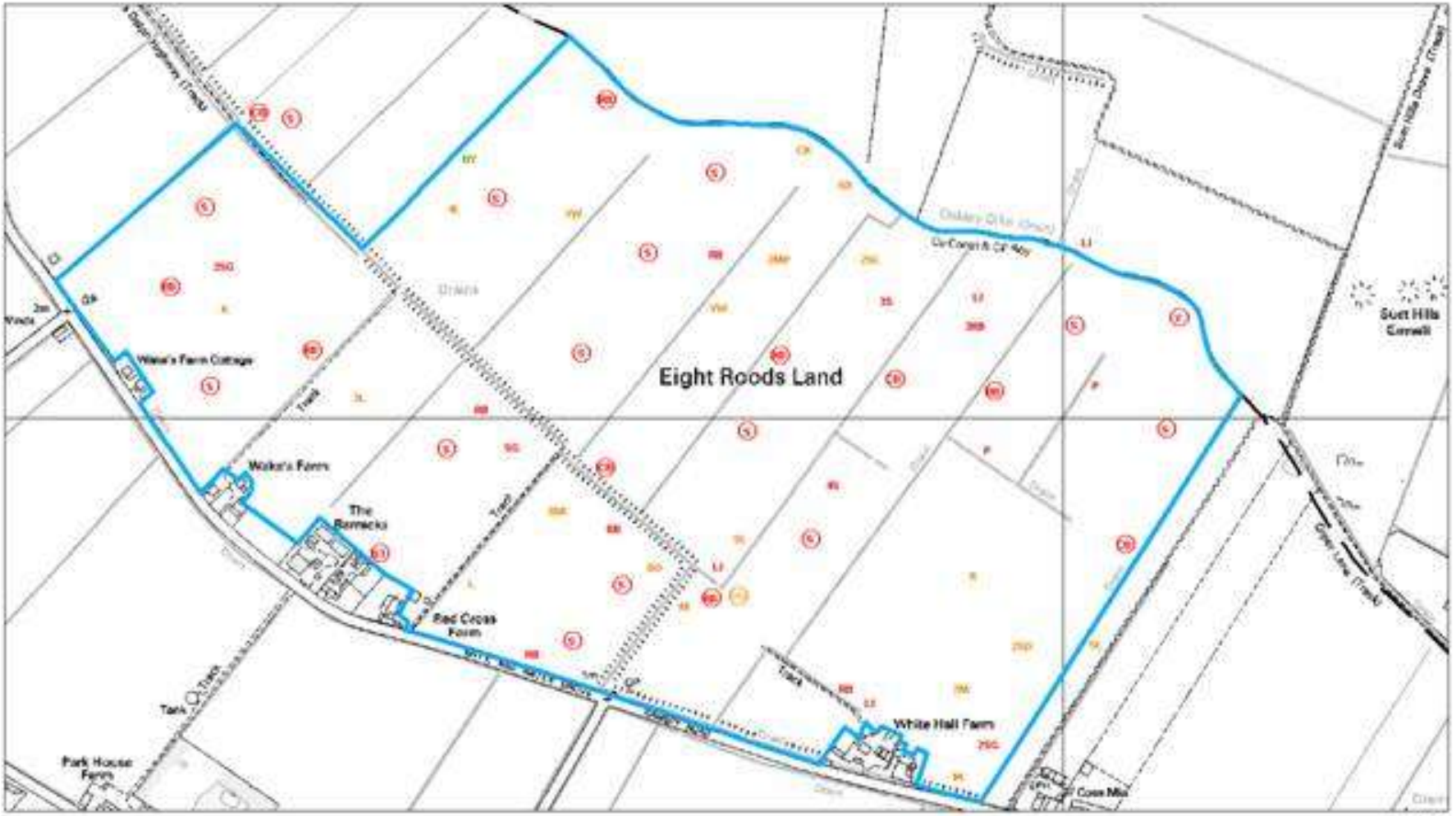
# Whitehall Farm 2011 cropping

| | |
|---|---|
| Clover | 4.49ha |
| W Wheat | 14.97ha |
| S Barley | 57.22ha |
| Leeks | 13.73ha |
| Apple trees | 4.0ha |
| Env | 6.0ha |
| Total | 100.41ha |

- ***2009-2010 yields***
- WW av.5.2t/ha (2.1t/ac)
  - Best 6.25t/ha (2.53t/ac)
  - Worst 4.4t/ha (1.78t/ac)
- S Barley av.4.5t/ha (1.8t/ac)

- Conventional yields (historic)
  - WW 8.6t/ha (3.5t/ac)
  - OSR 3.7t/ac (1.5t/ac)
  - S Beet 60.5t/ha (24.3t/ac)

- Organic WW is 73% of conventional WW yield




# RSPB Volunteer & Farmer Alliance 2008

## Whitehall Farm Bird Survey- Key Results

**Species Key**

| | | | | | |
|---|---|---|---|---|---|
| BO | barn owl | M | mistle thrush | SO | starling |
| CB | corn bunting | MP | meadow pipit | SL | swallow |
| CK | cuckoo | P | grey partridge | ST | song thrush |
| HY | hobby | RB | reed bunting | Y | yellowhammer |
| K | kestrel | RK | redshank | YW | yellow wagtail |
| L | lapwing | S | skylark | | |
| LI | linnet | SD | stock dove | | |

**Symbols Key**

RED species of high conservation concern
AMBER species of medium conservation concern
GREEN all other species of lower concern

Circles indicate territories

Scale = 1:5,564. Central grid reference: TL 224 939



Registered Charity England & Wales no 207076, Scotland no SC037654

# Birds at Whitehall Farm

- Barn Owl
- Blackbird
- Black headed gull
- Carrion Crow
- Chaffinch
- Collared Dove
- Corn Bunting
- Common Tern
- Garden Warbler
- Goldfinch
- Great black backed gull
- Greenfinch
- Grey Heron
- Grey Partridge
- Hobby
- House martin
- Kestrel
- Lapwing
- Linnet
- Little Egret
- Little Owl
- Magpie
- Mallard
- Marsh Harrier
- Meadow pipit
- Mistle trhrush
- Moorhen
- Pheasant
- Quail
- Red leg partridge
- Reed bunting
- Reed warbler
- Redshank
- Robin
- Sedge warbler
- Snipe
- Skylark
- Song thrush
- Starling
- Stock dove
- Swallow
- Tawny owl
- Whitethroat
- Wood pigeon
- Wren
- Yellow wagtail
- yellowhammer

# OELS / HLS

- **OELS**
- 4m margins – all fields
- Ditch management
- **HLS**
- 20ha /yr Over winter stubble OHF6
- 5ha - Nectar Flower Mixtures OHF4
- 2ha - Wild Bird Mixtures HF12
- Field Corners OHF1
- Pond / Scrape creation
- Hedge planting/ Management HB11, HB12
- Top Fruit conversion
- Educational Access HN8

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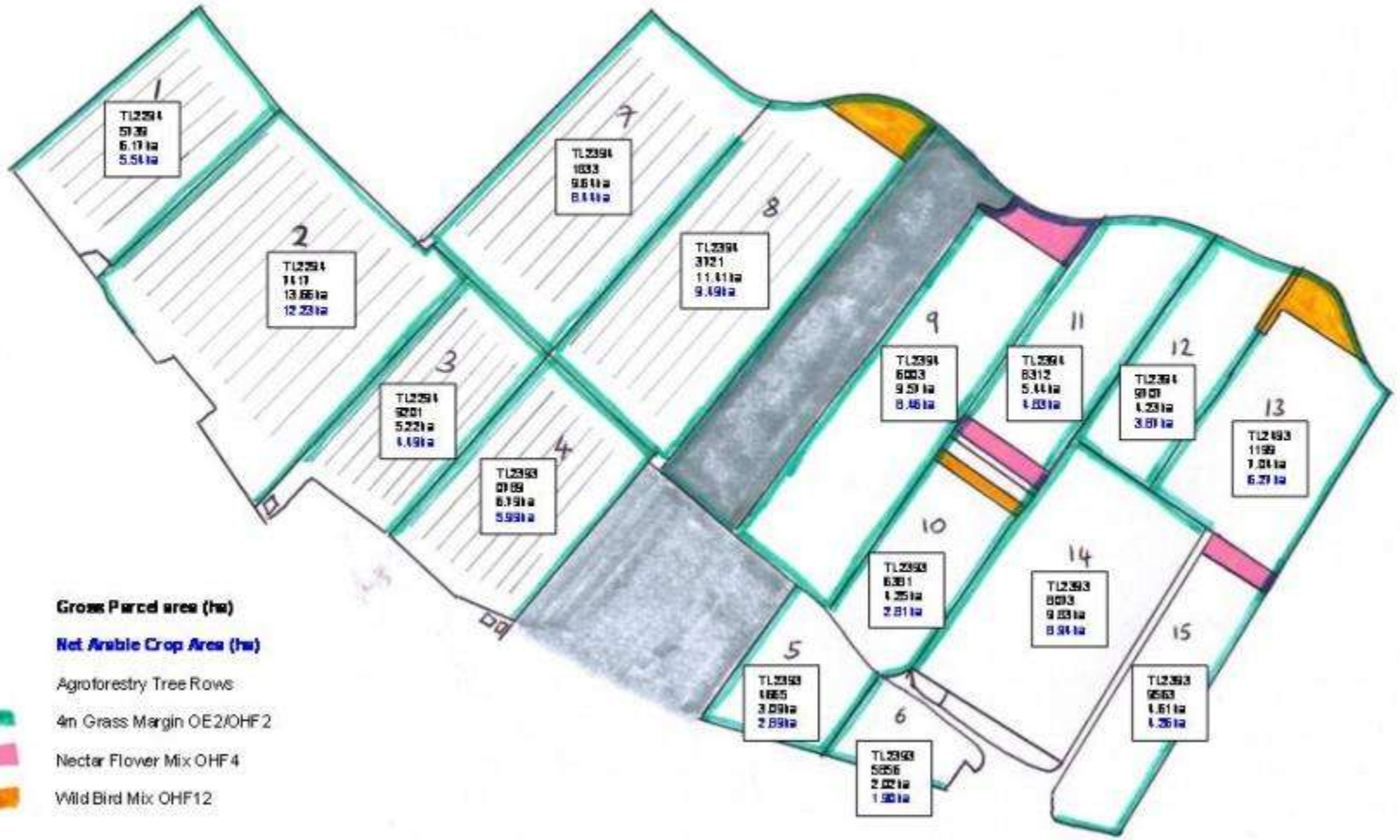
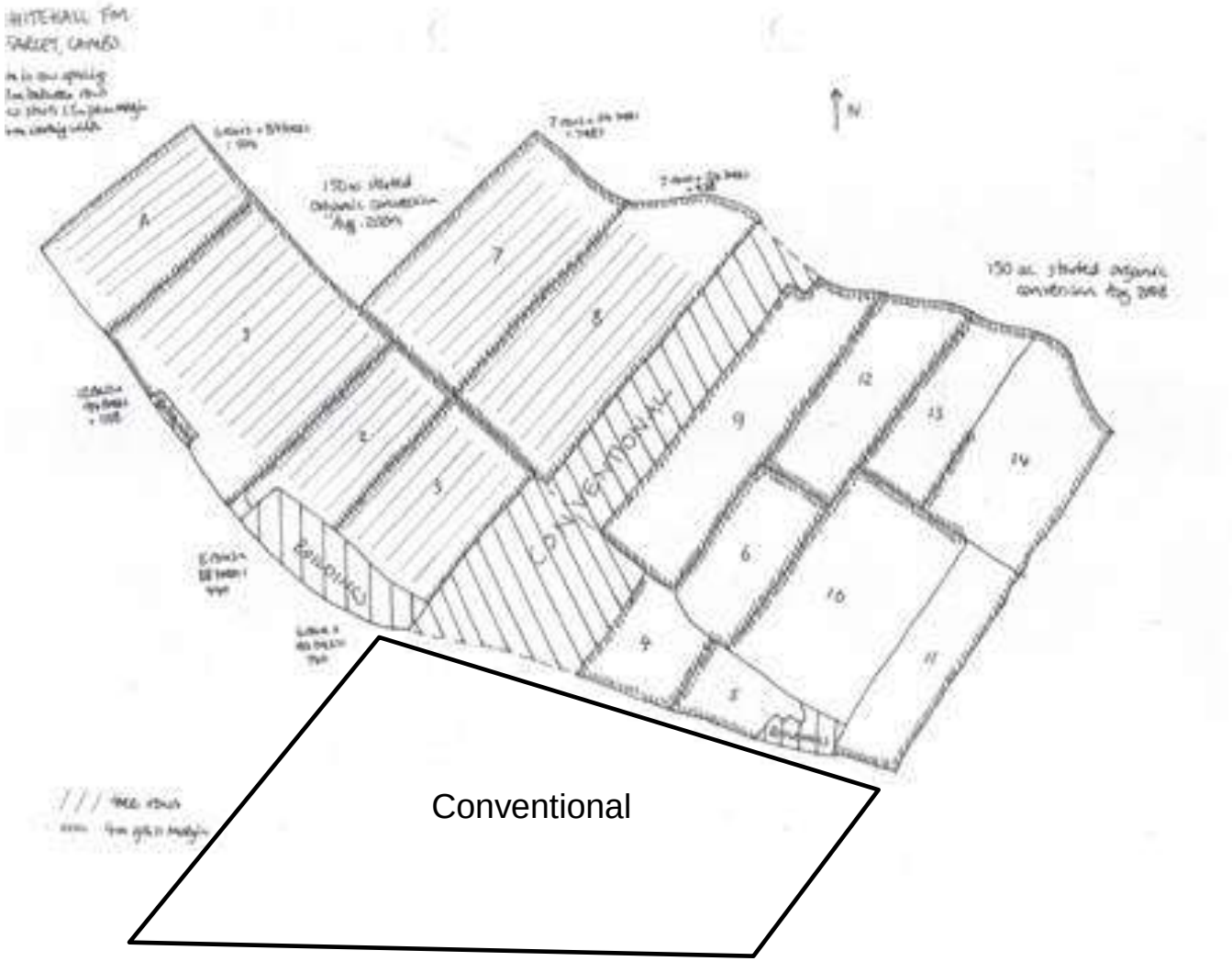


# Research

- RSPB
- Barn Owl breeding & monitoring
- Wheat Link
- Legume Link
- ORC Eco-system services – baseline fauna survey and on –going with PhD
- ORC Agroforestry
- Reading Uni – MSc Soil Structure differences organic vs conventional farms
- Reading Uni – PhD insect and work populations under legumes
- Own work on Min-Till and Agroforestry

# Summary of biodiversity baseline data from Whitehall Farm, 2009
# Butterflies, bumblebees and flora

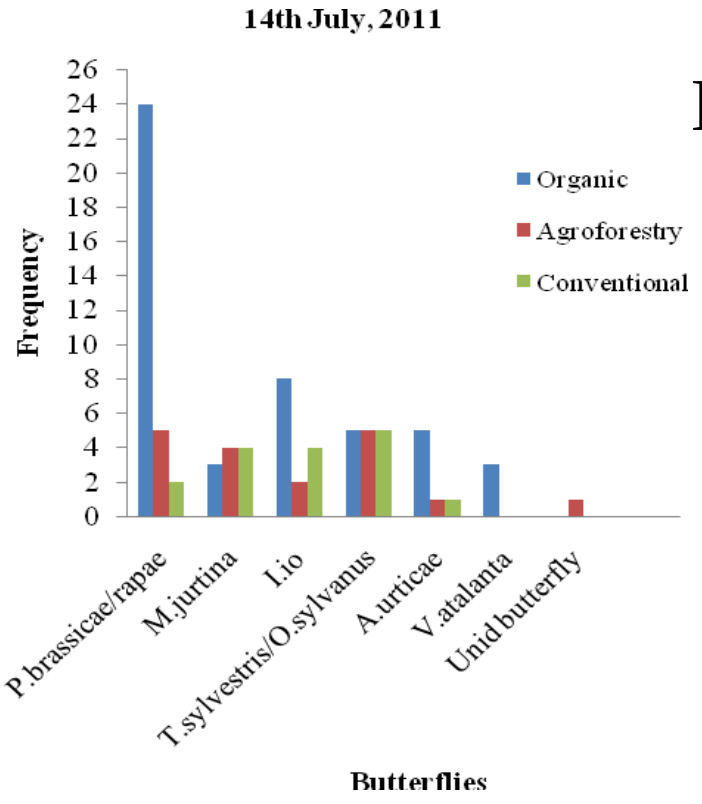


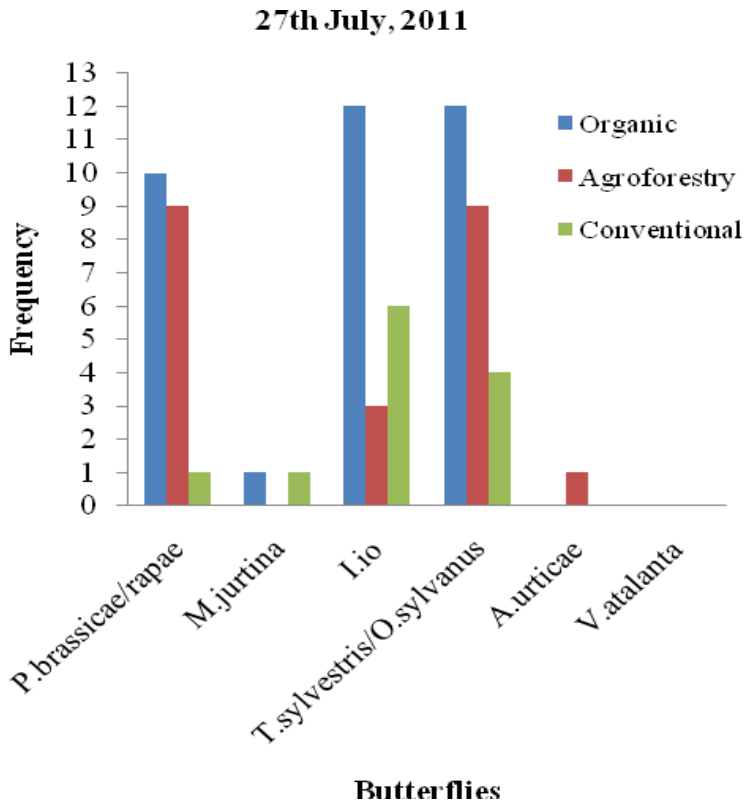
# 2009 – year 1

| | Organic Arable | Agroforestry | Conventional |
|---|---|---|---|
| *Pieris brassicae/rapae* | 47 | 23 | 18 |
| *Pieris napi* | 4 | 2 | 3 |
| *Maniola jurtina* | 13 | 39 | 7 |
| *Inachis io* | 8 | 20 | 11 |
| *Pyronia tithonus* | 2 | 3 | 8 |
| *Vanessa cardui* | 0 | 1 | 1 |
| *Aglais urticae* | 1 | 2 | 0 |
| *Ochlodes sylvanus/Thymelicus sylvestris* | 5 | 7 | 1 |
| Total abundance | 80 | 97 | 49 |
| Total no. Spp. | 7 | 8 | 7 |

**Table 1.1** Butterfly abundance in three management systems, Farcet, Cambs.

# Butterflies



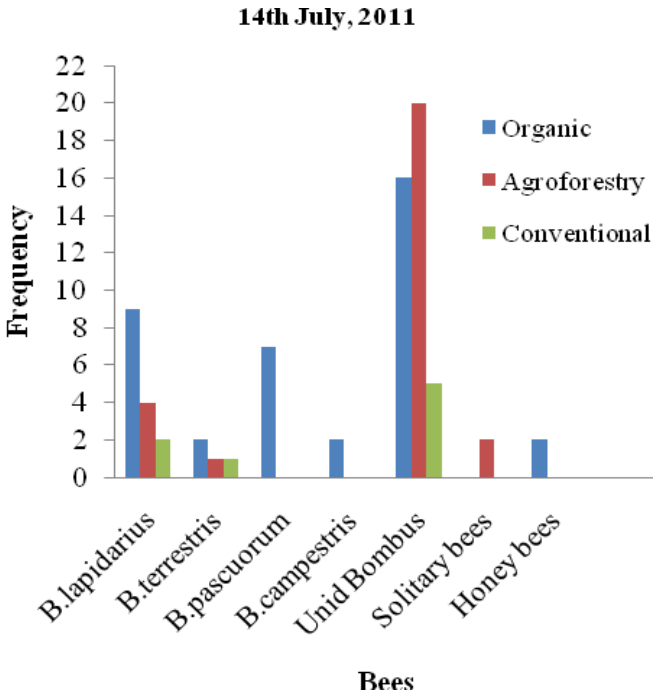

- <u>Butterflies (Lepidoptera)</u>
- Higher abundance on the 14th than 27th July - 82 and 68 individuals.
- Highest abundance in the organic system - 48 and 34 respectively.
- On the 14th July the organic and agroforestry systems equally had the highest number of butterfly species- 6 spp.
- On the 27th July the agroforestry and conventional systems equally had the highest number of butterfly species- 4 spp

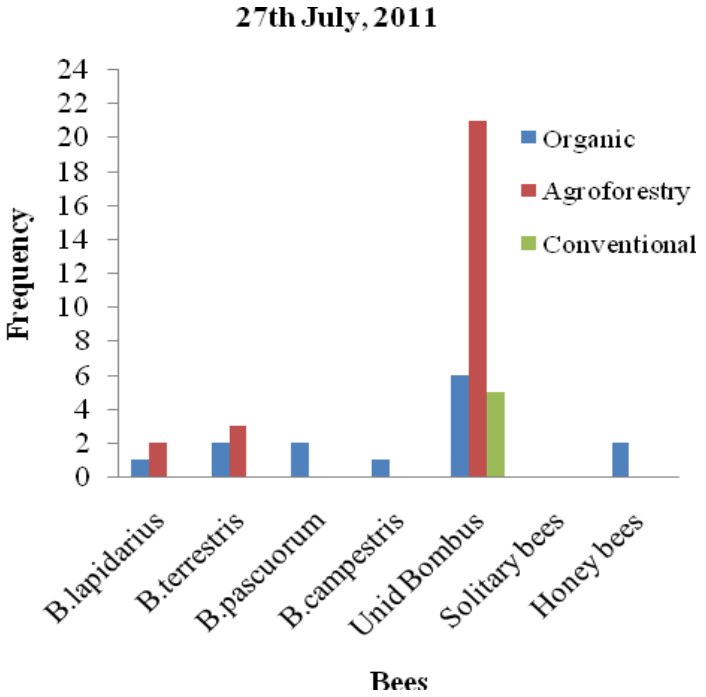
# 2009 – year 1

| | Organic Arable | Agroforestry | Conventional |
|---|---|---|---|
| *Bombus lapidarius* | 37 | 43 | 6 |
| *B.terr/luc* | 13 | 25 | 10 |
| *B.pascuorum* | 3 | 0 | 0 |
| *B.hortorum* | 1 | 0 | 0 |
| Total abundance | 54 | 68 | 16 |
| Total no. spp | 4 | 2 | 2 |

**Table 1.2.** Bumblebee abundance in three management systems, Farcet, Cambs.

# Bees



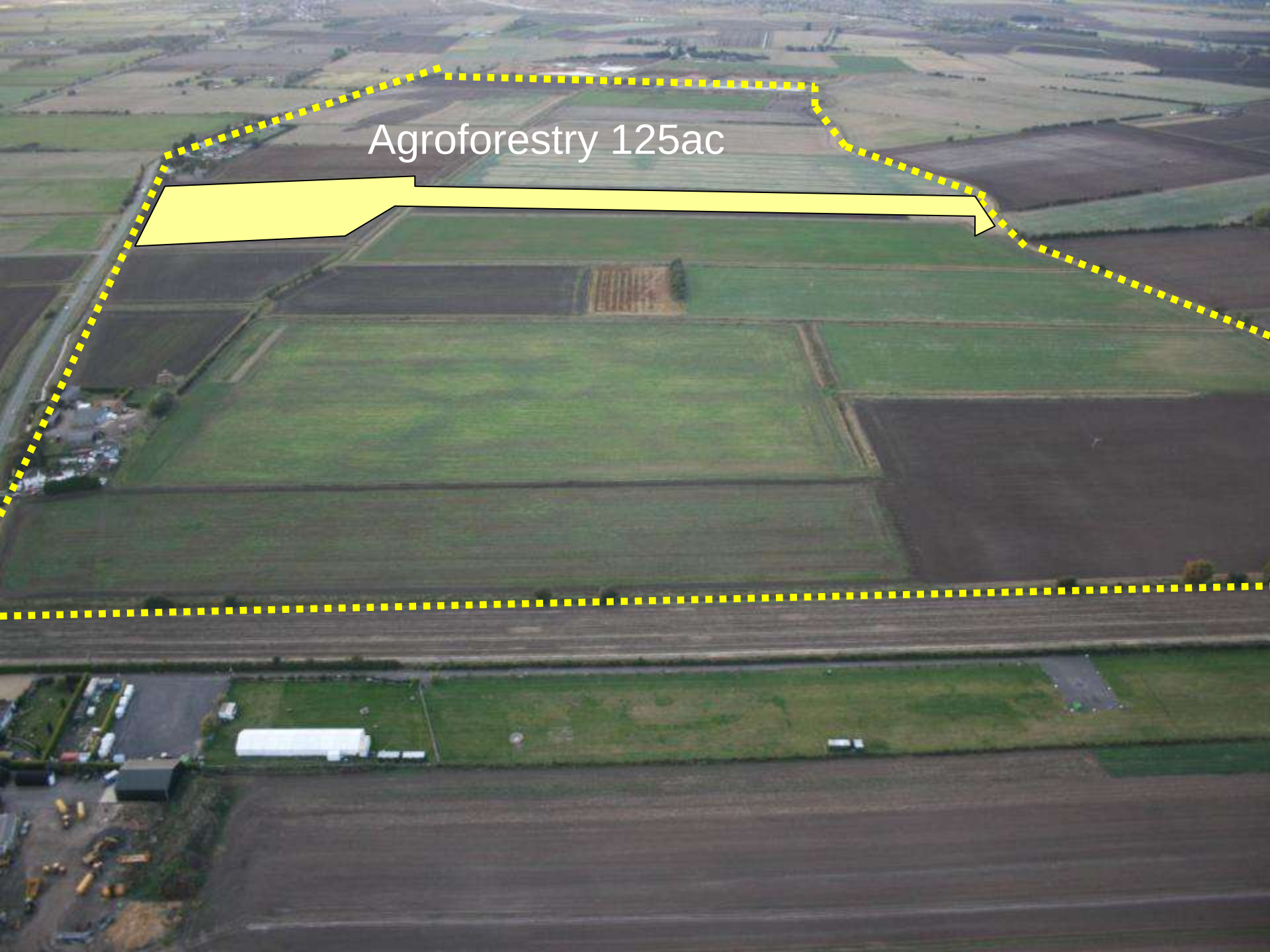

- <u>Bees (Apidae)</u>
- Higher on 14th than on the 27th July - 73 and 45 individuals respectively.
- 14th July highest abundance organic system - 36 individuals
- 27th July the highest abundance in the agroforestry system- 26 individuals
- On both the 14th and 27th the highest number of bumblebee species were recorded in the organic system- 4 spp. On both the 14th and 27th July honey bees were recorded only in the organic system. On the 14th July solitary bees were recorded only in the agroforestry system

# Agroforestry

- Bluebell Farms – drivers & vision
- Structural challenges & ES - SPS,  Tenancy etc
- Planning, layout & timing
- Planting
- Agroforestry & cropping

# Drivers

- Multifunctional land use
- Cropping & enterprise diversity
- Soil protection
- Conservation & Habitat creation
- Market opportunities


Agroforestry 125ac

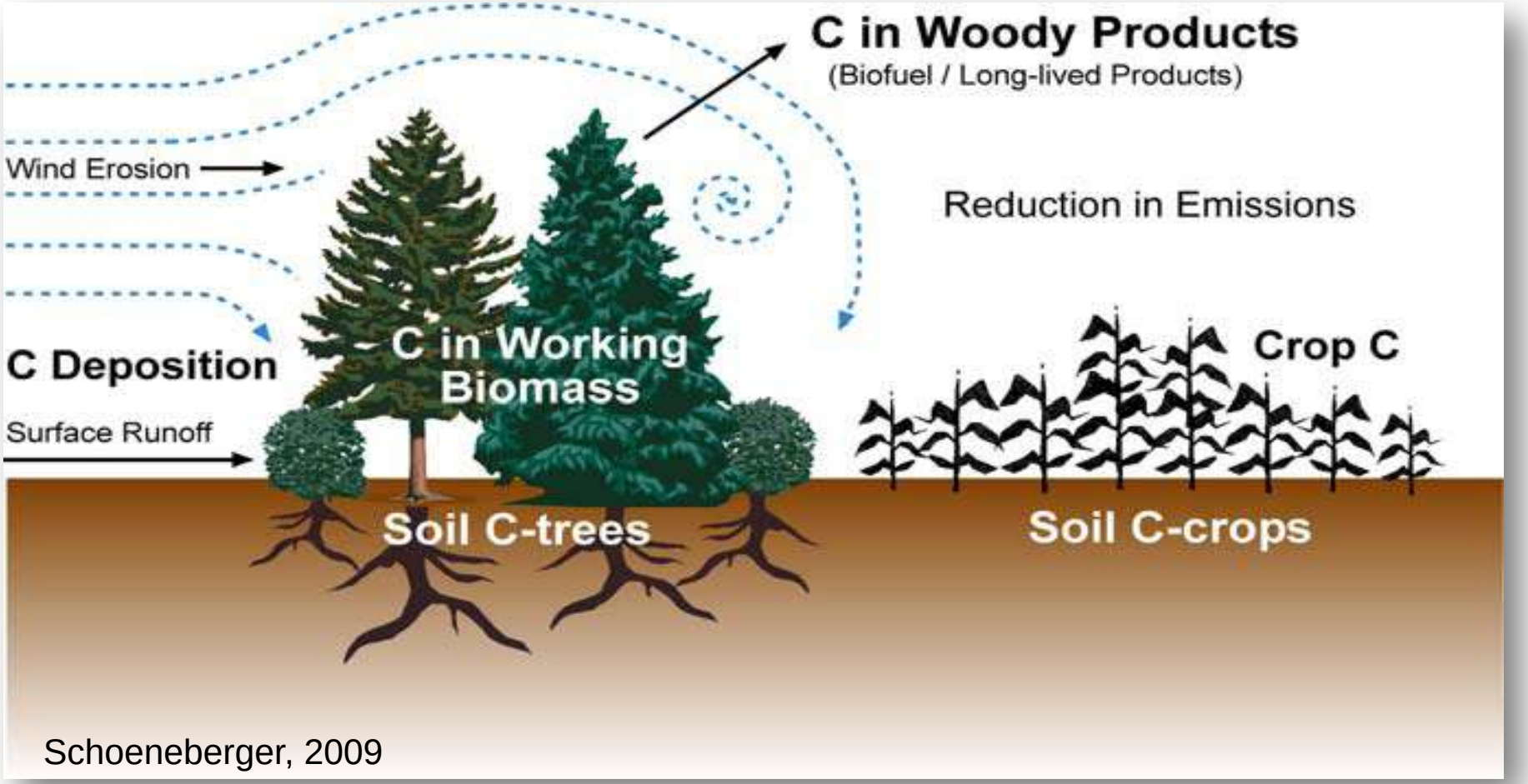
# Soil erosion - a serious issue!

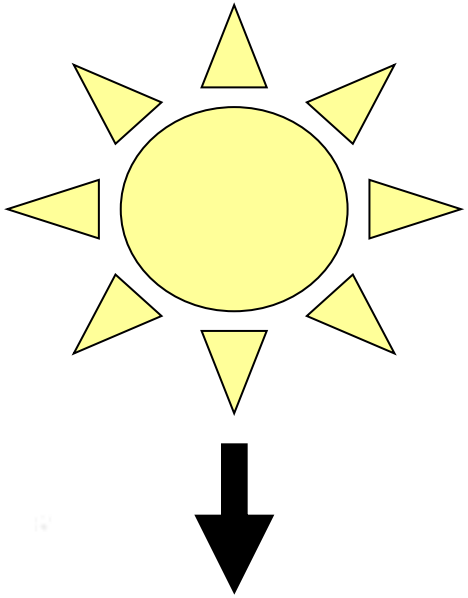
# Vision

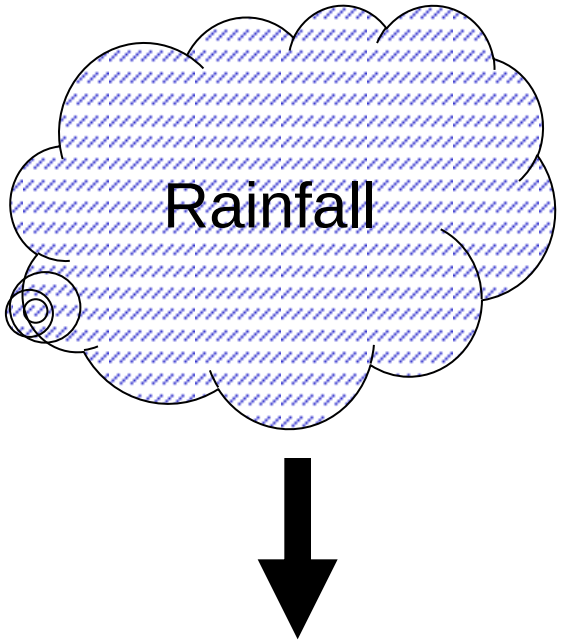
- Mixed fruit tree & arable crop landscape
- Enhanced soil protection
- Habitat creation
- New markets and more robust business

# Climate regulation – Global Climate

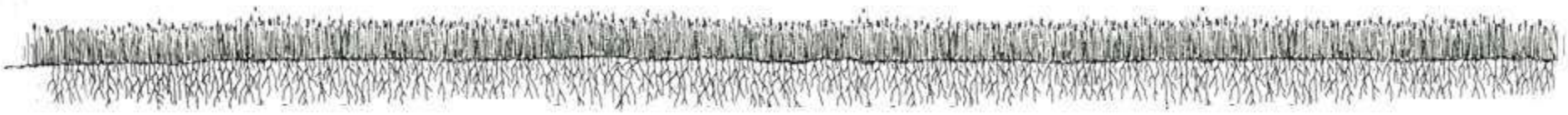
- **Mitigation: C sequestration, GHG abatement**
- **Adaptation: extreme events, renewable energy**








Crops grow 0 -1 m above ground only

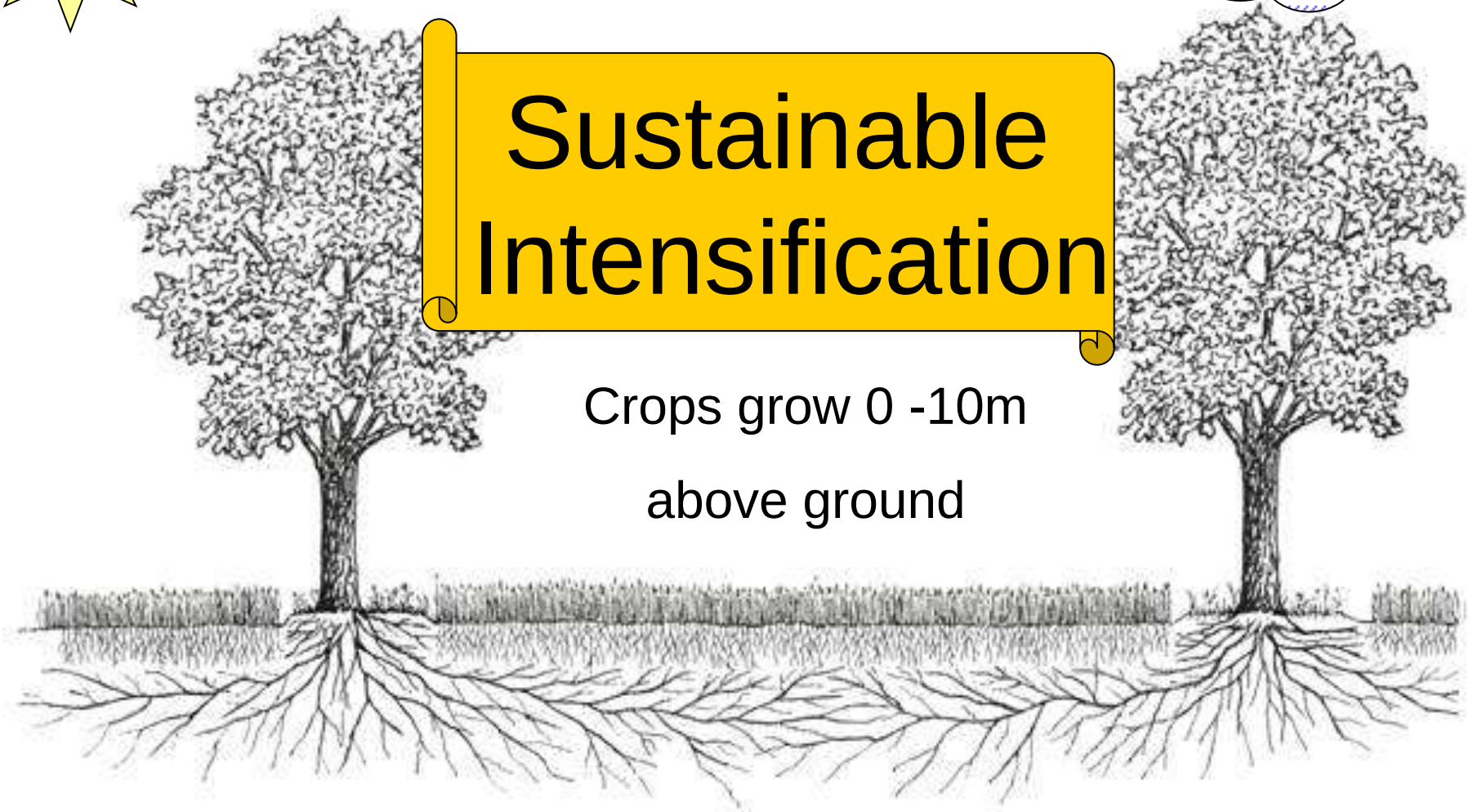


Roots grow 0 -1 m below ground only

Improved use of sun & water

# Sustainable Intensification

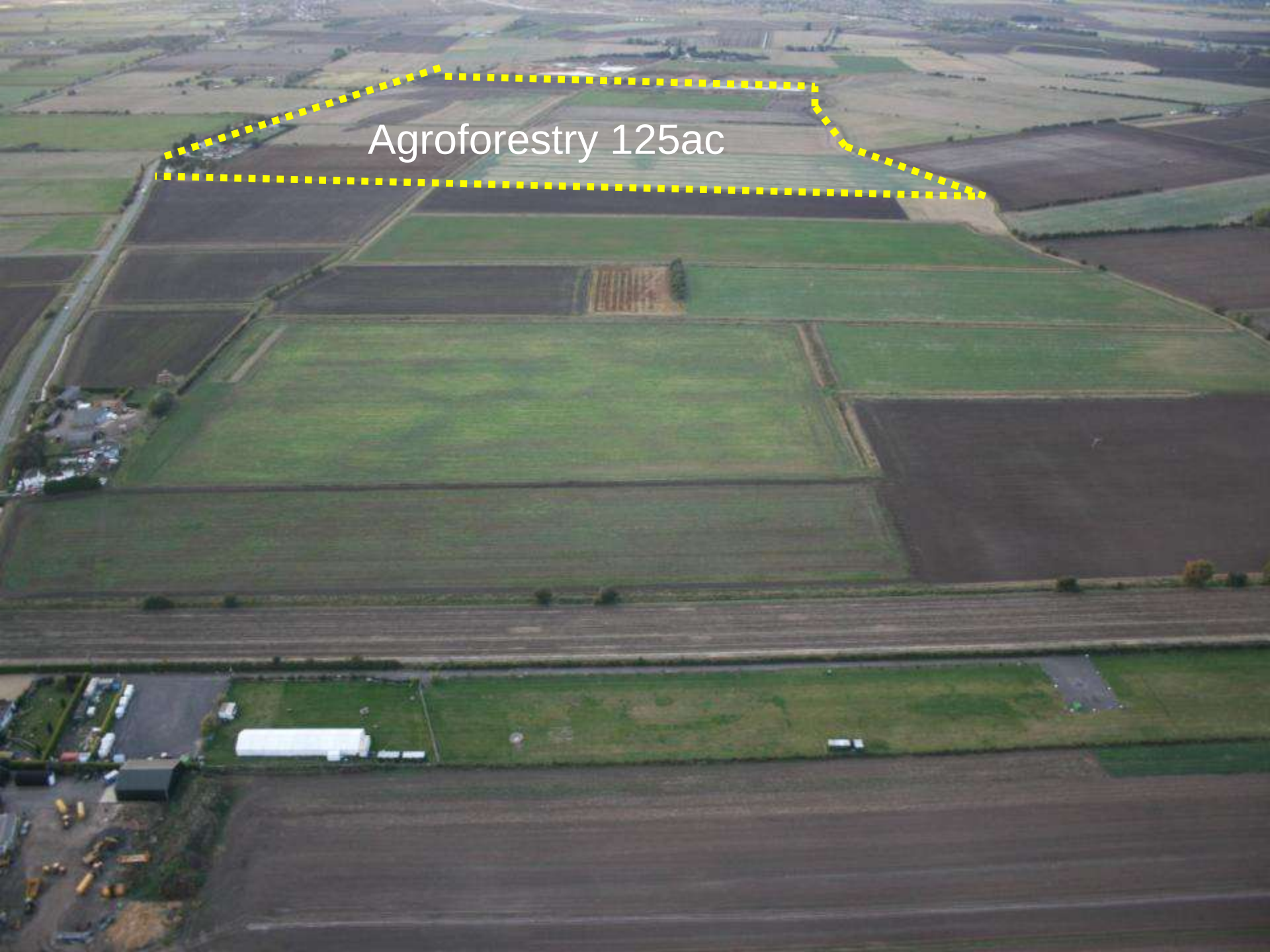
Crops grow 0 -10m above ground



Improved root growth, nutrient use & reduced leaching

# Structural challenges & ES

- **FBT (15yr )**
  - agree terms with landlord pre establishment
- **Single Farm Payment Scheme**
  - Fruit, vines, nurseries SPS eligible from May 2009
- **OELS/HLS**
  - OELS already in place on part of farm
  - Conversion delayed to 2009 on 125ac for SPS eligibility
  - OELS funding conversion
  - HLS application submitted


Agroforestry 125ac

# Planning, layout & timing

- Trees ordered Autumn 2008 – 1 yr in advance
- Landlord permission obtained autumn 2008
- 2009 cereal crops harvested
- Pollen & nectar rich ‘Strips’ set out
- Trees delivered & planted Aut 2009
- Land commenced organic conversion 1/8/09
- Trees planted October 2009
- Organic cereals from Aug 2011
- Organic fruit from Aug 2012
- Full fruit production from 2014

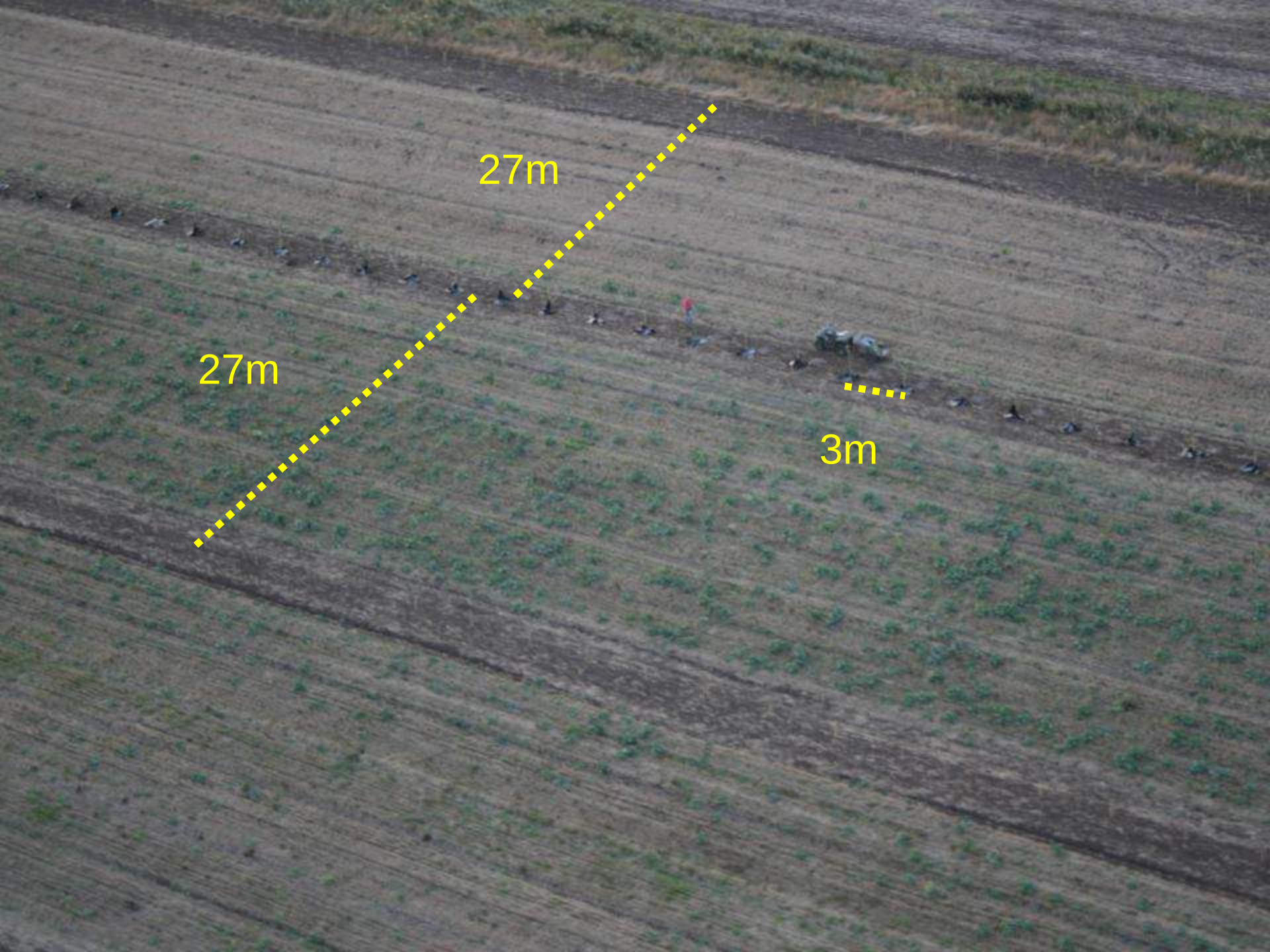
# Intensive Organic orchard – 850 trees per ha

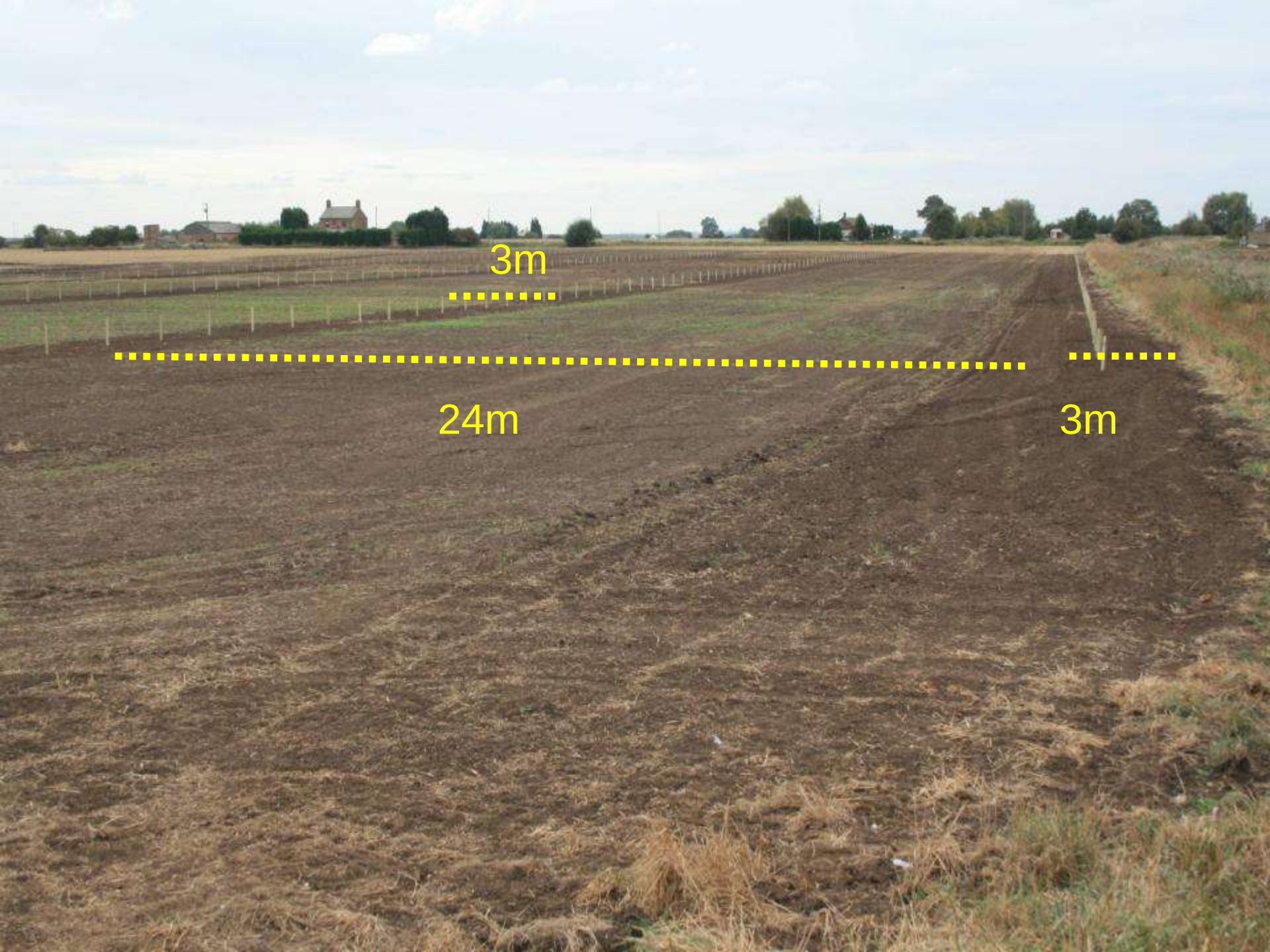
# Agroforestry system - 85 trees per ha

# Layout

- 85 Vs 850 trees per ha
- 3m between each tree in the row
- 27m between each row
- 3m pollen rich strip under trees
- 24m working width between rows


27m
24m


27m
27m
3m


3m
24m
3m

# Variety selection

- Rootstock & Vigour
- Pest & Disease tolerance
- Soil suitability
- Locality / drought & scab tolerance
- Low input '*easy care*' system
- Eating vs Juicing
- Picking – not early vars!.
  - Start picking mid Sept onwards

| | |
|---|---|
| Pinova | 388 |
| Fiesta | 313 |
| Red Devil | 195 |
| Limelight | 184 |
| Red Windsor | 540 |
| Rajka | 300 |
| Red Falstaff | 1102 |
| Herefordshire Russet | 350 |
| Saturn | 278 |
| Bramley | 482 |
| Adams Pearmain | 90 |
| Ashmeads Kearnell | 89 |
| Chivers Delight | 89 |

- Picking – mid Sept (Red Windsor) to late October (Pinova)
- Heritage vars. Located to aid pollination
- MM106 rootstock to suit soils, tree vigour and wooly aphid resistance


SULKY

# Inter-crop layout works fine

# Unexpected Issues

- Security – gates
- Plastic mipex
- Dry autumn/spring – establishment
- Wind
- Hares-re-guarding
- Pigeons & Rooks
- Road safety
- Planes!

# Future challenges

- Disease pressure ?
- Yield expectations ?
- Watering trees & irrigating crops
- Pruning
- Cultivating, cropping & machinery (24m)
- Security
- Building conversions – apple storage
- Market development

# Harvesting & Labour

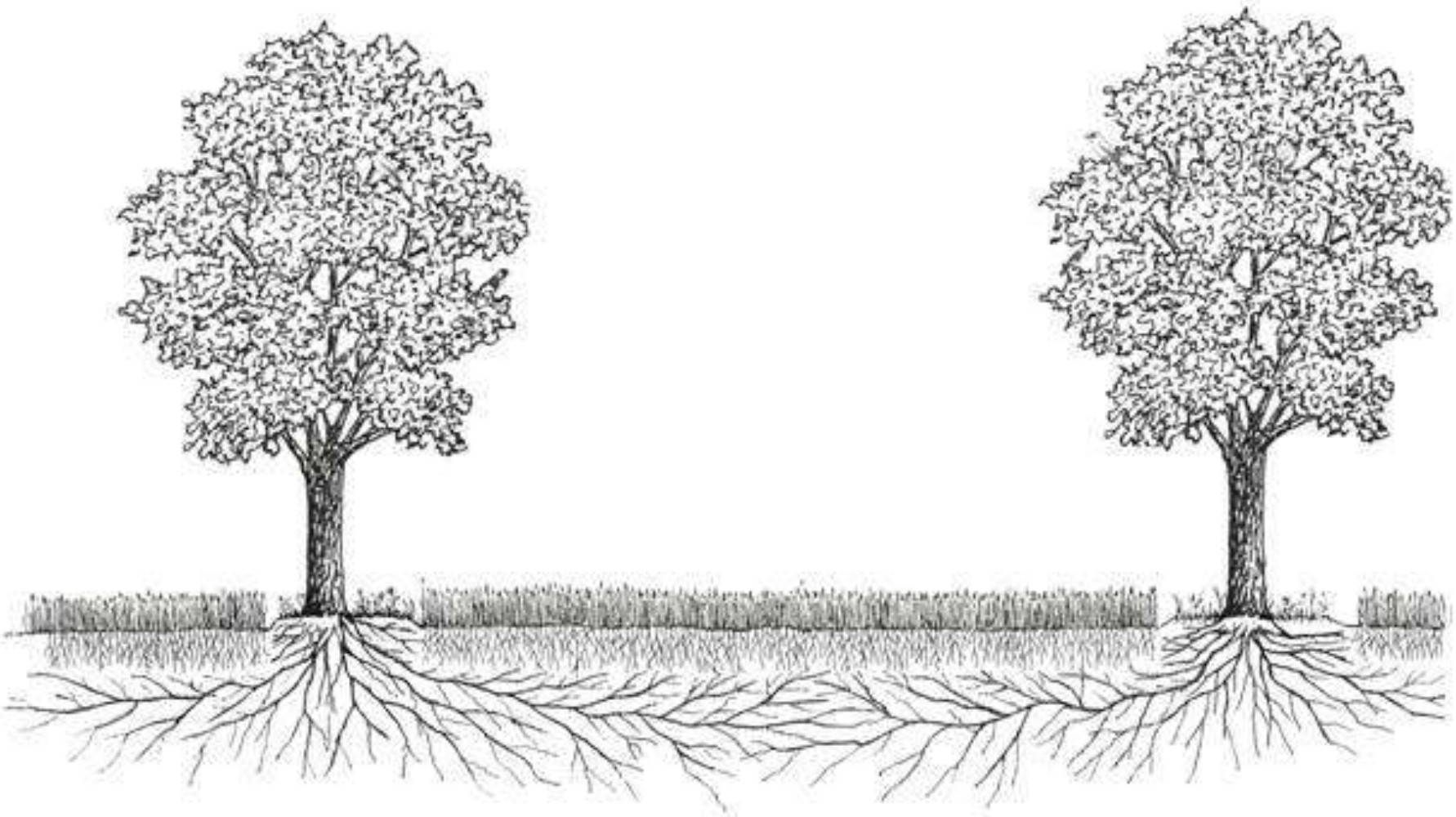
# Storage


Processing


# Market

# Lessons from overseas

Nuffield Farming Scholarship



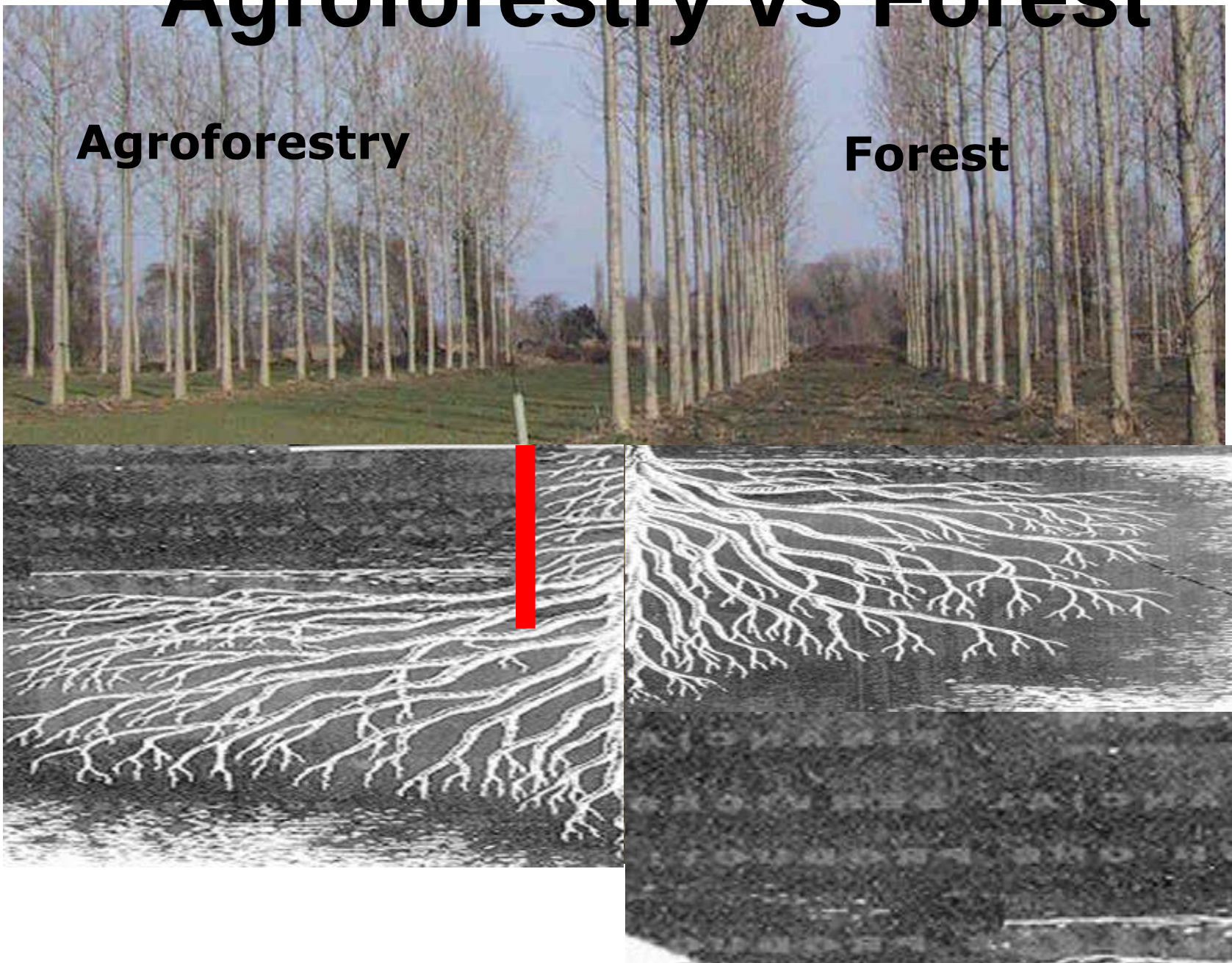
Forest

Roots grow in the top 1.0m

Poplar agroforestry

Roots develop deeper than 1 m, reaching a depth of 2.5 m

# Agroforestry vs Forest




Gloucestershire
Poplar


Devon Poplar


Gloucestershire
Apples


Buckinghamshire Walnut


Buckinghamshire
Ash


Cambridgeshire
Apples


Suffolk (mixed spp)


Canada


USA

France


France



France


The Center for Agroforestry
University of Missouri
A Global Center for Agroforestry Entrepreneurship and the Environment
HYBRID

# Mature Agroforestry