



NACM Seminar
10 February 2011
Sustainability
Richard Heathcote



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-  Mitigation

-  Adaptation

Sustainable Orchards

Q & A

Climate Change



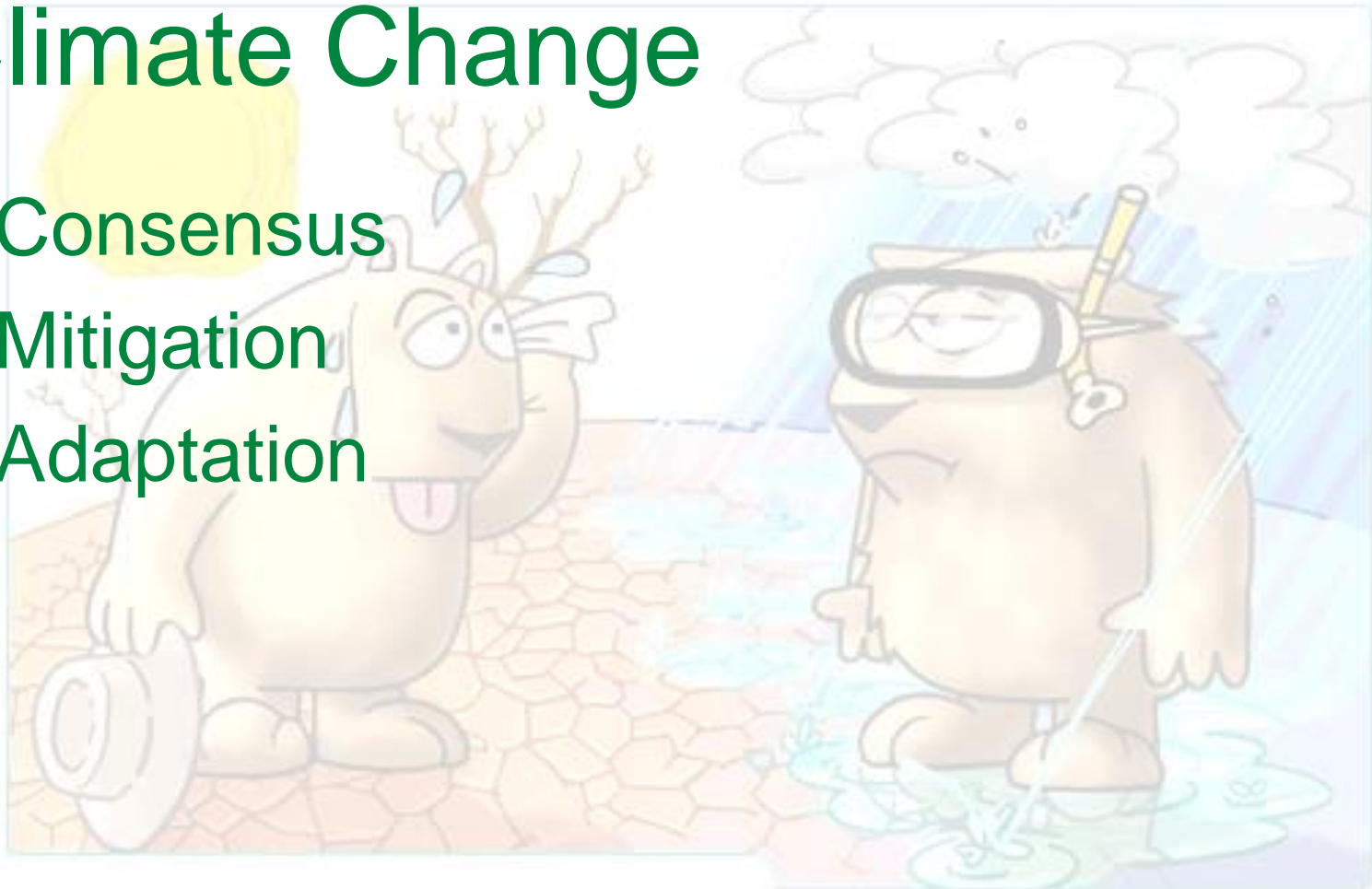


Climate Change

🍏 Consensus

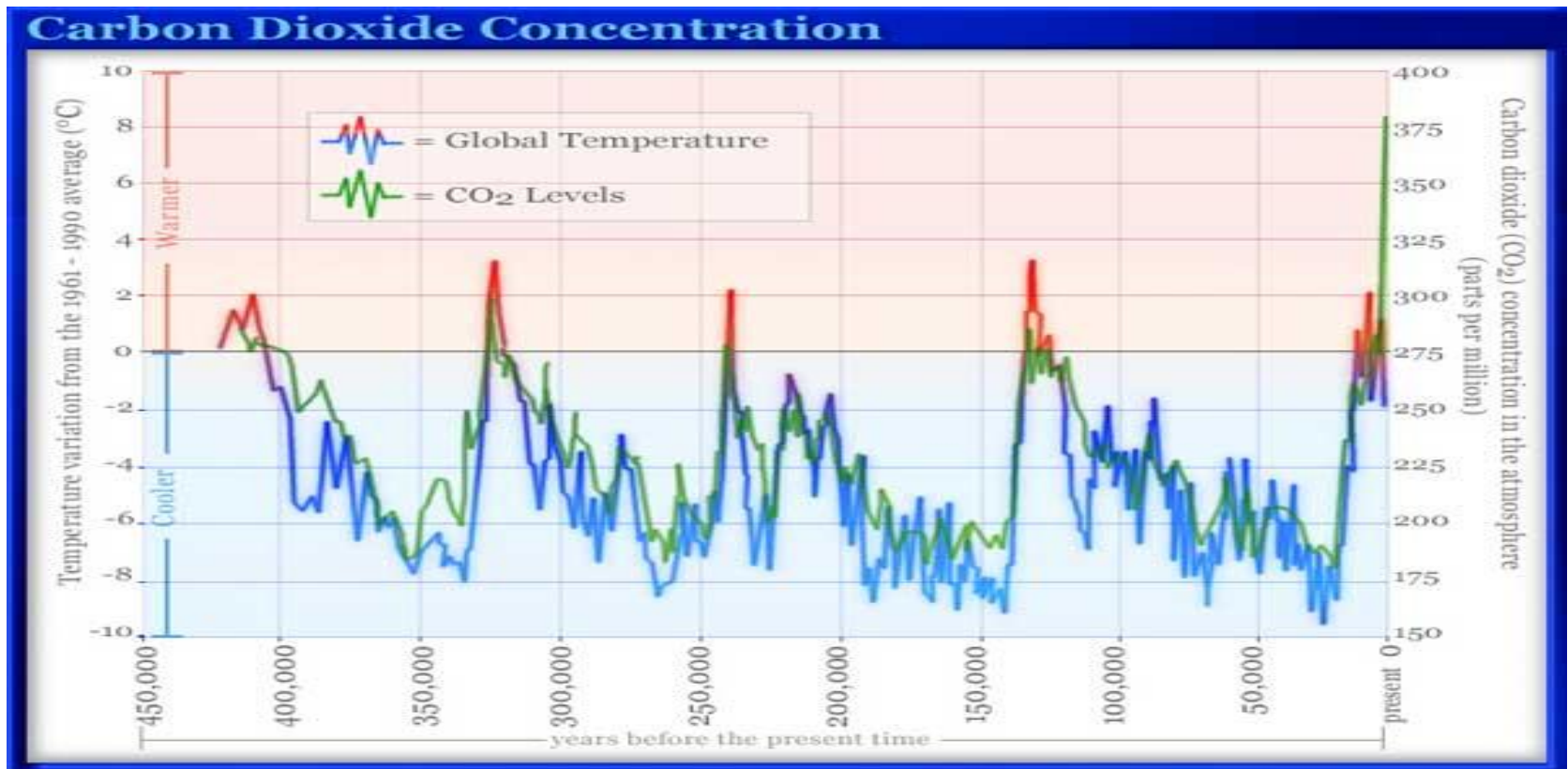
🍏 Mitigation

🍏 Adaptation





Back in time ...





Mitigation – A Mindset



Imagine carbon as a new currency of business: that will mean accounting, auditing, cost reduction, declaration, regulation etc.

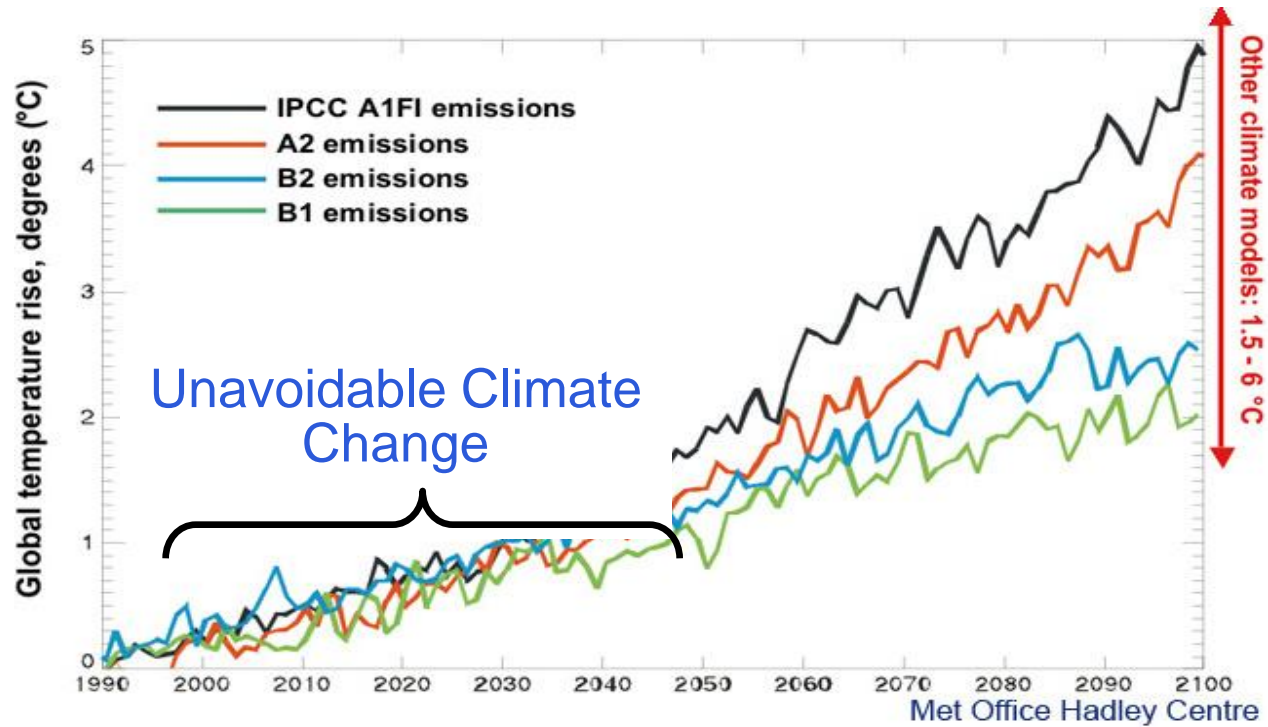


NACM Work to date

- 🍏 Established 'carbon emissions' for the industry
 - 🍏 About 68,500 tonnes of CO_{2e}
- 🍏 Have a target for 2023
 - 🍏 30% reduction against 2000 levels
- 🍏 Tracked our progress since 2000
 - 🍏 Reduced emissions by 12% so far



Adaptation





Adaptation Study - Examples

- 🍏 Lack of winter dormancy
- 🍏 Waterlogged soil
- 🍏 Heat stress in high 20°s
- 🍏 New pests and diseases
- 🍏 Changes in social drinking patterns
- 🍏 Utilities costs
- 🍏 Insurance costs against extreme events
- 🍏 Impact on transport and logistics
- 🍏 Increased energy demands (cooling load)
- 🍏 Opportunities for new products, services and markets
- 🍏 Pollination failures
- 🍏 plus another 24 identified impacts



What Next on Adaptation?

🍏 Future Planning

- 🍏 When will lack of dormancy become a problem?
- 🍏 Where should we best site future orchards?
- 🍏 How do we select for climate change tolerant varieties, bearing in mind this may mean new pests & diseases?



SUSTAINABLE ORCHARDS

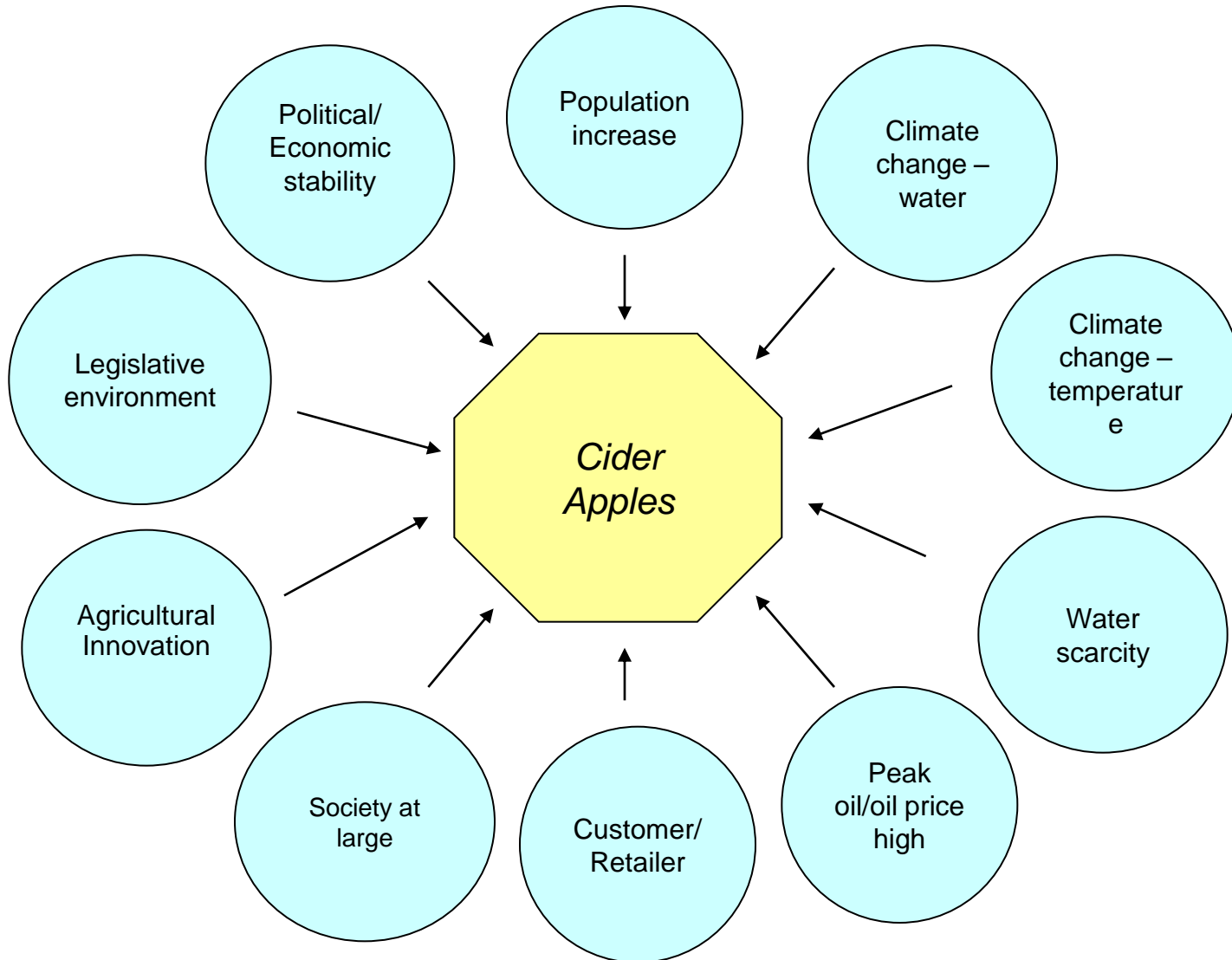




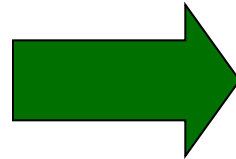
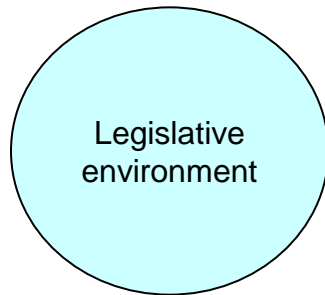
Vision

🍏 “secure a **sustainable** supply of raw materials, in the right quality and quantity, at acceptable costs, in a way **resilient** against a number of **external drivers**”

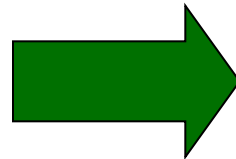
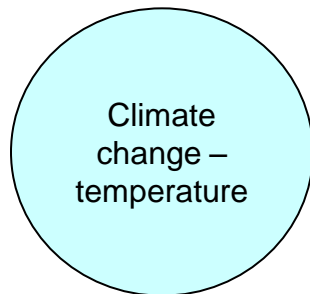
10 Drivers



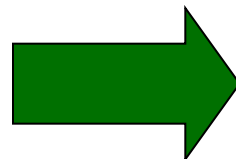
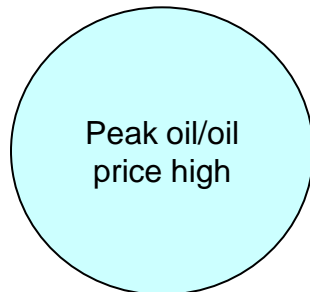
Emerging Issues for UK Cider Apples



- 🍏 Around 75% of the variable cost of an orchard is spraying for scab
 - 🍏 CPP restrictions are getting tighter
 - 🍏 The precautionary principle and high R&D costs will apply to new products
 - 🍏 Increasing oil price will drive up costs of both fertilisers and CPPs



- 🍏 Unavoidable climate change will impact aspects of tree growth,
 - 🍏 warmer winters mean no dormancy period for trees, leads to fewer buds
 - 🍏 start-stop springs lead to sporadic blooming and poor fruit set
 - 🍏 new pest & diseases emerging



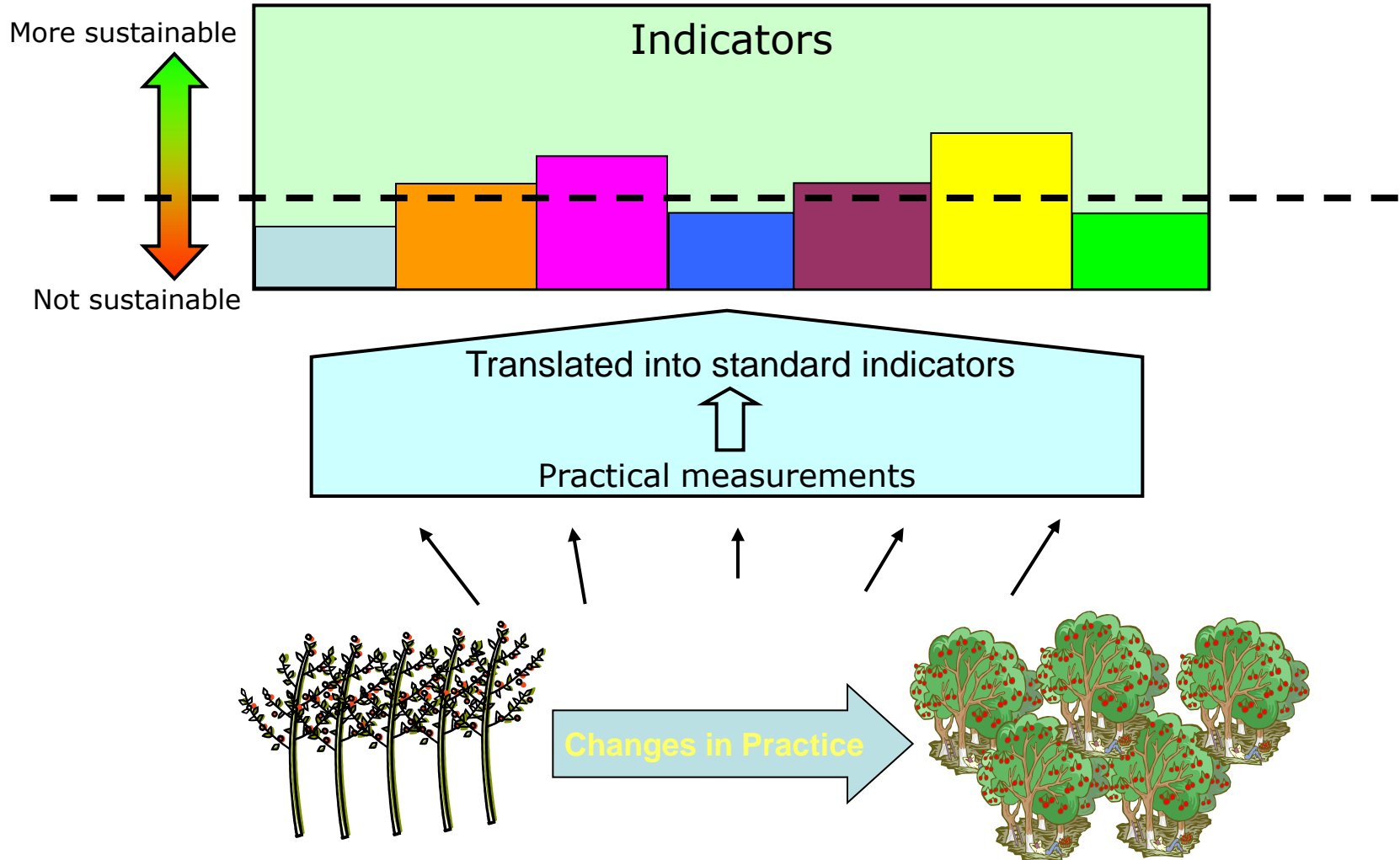
- 🍏 Cider apples get approx. 30 tractor passes per year
 - 🍏 Major cost factor as oil price increases
 - 🍏 Significant CO2 emissions



How will we know we are sustainable?

- 🍏 We know we have to define “sustainable”
- 🍏 We know we need to measure to manage
- 🍏 We know we need measures that are simple and cheap to use
- 🍏 We know we need externally verifiable, robust, outcome based indicators
- 🍏 We know we need to start ...

Measurement and Indicators



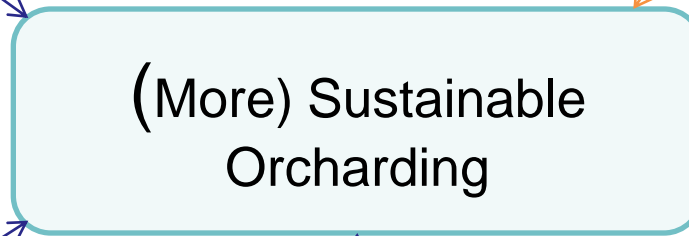
Five indicators



- Land Use Efficiency
- Diversity of Value Generation
- Retention of Money
- Farm Income
- Income Variability



- Animal Welfare
- Health & Safety
- Training
- Happiness Index



- Soil Fertility
- Additional Water use
- Non-Renewable Energy use



- Biodiversity
- Orchard health via bio-indicators
- Naturalness index
- Bee diversity/population



- Water at Risk
- Greenhouse Gases
- Chemicals Applied
- Use of "waste"



Long Term Research

🍏 The Challenge (facing agriculture)

🍏 The Research Landscape



The Challenge

Globally, food production and agriculture has a dilemma, and the views are polarising

TECHNOLOGY DRIVEN

- Inherently interventionist
- Chemistry
- Agro-chemicals
- Intensive
- Oil dependency
- GM is the solution
- Efficient maximum yield now is the driver
- Linear

.v.

ECOLOGY DRIVEN

- Inherently complimentary
- Biology
- Natural systems
- Extensive
- Less oil dependent
- GM may have a role
- Future sufficient yield is the driver
- Cyclical

The solution is, of course, both!

RESEARCH MAP

DRIVERS

- Pesticides price and 91/414/EEC & next generation
- Energy/Oil
- Climate Change
- “CR”

Short Term (pragmatic)

- Garlic wash
- Chickens
- Sheep
- Pruning techniques
- Sedum ‘herbicide’ strip
- Clover rich sward
- Leaves/mow/compost
- Mulch
- Tuned N application
- Sweep harvesting
- pilot ‘MASSA’ indicators
- Underway, sponsored by HUK

Climate Change

- Impacts of extreme weather
- Water logging
- Storm damage
- Drought
- Dormancy
- Bee populations
- Underway, sponsored by DEFRA
- Links to UKCIP

Indicators & Measures

- In development
- Require ‘gravitas’
- Broad tree crop basis
- Demonstrate outcomes
- HUK & HGSC funded
- Temp Tree Crop network

Orchard System Interventions

- Intervention Modes
 - partitioning: spatial, temporal
 - synthesis
 - modulation
- Intercropping
 - animals (chickens, sheep)
 - plants for cash crop
 - for disease prevention
- Yield .v. potency
- % water .v. sugars, tannins etc.
- tbc

GIS Database

- Layers to cover distribution, scab, rainfall, soil type etc.

Disease (focus on SCAB)

- Epidemiology
- ‘inherent’ natural level & role
- Economic impact
- Treatment
- Life cycle, other agents
- Benign treatments (GRAS)
- Genetic marking (resistance)
- Detailed ‘symbiosis’ with apple histological interaction with apple tissue pathology
- tbc

Soil Science

- Nutrient storage, transport and cycling within orchards
- Use of the sward: composition, water retention
- Mycorrhizal developments
- tbc

Ecology/Biology

- How to apple trees grow ‘natively’
- What is their role as deciduous fruit trees
- What is their overstorey, understorey?
- Insects, mammals, birds, microfauna, non-flowering plants?
- Metrics/Statistics
 - Size of apple
 - Prevalence of disease
 - Size of tree
 - Yield
- What is a healthy tree and health index
- What’s been lost from the genome?
- Selection criteria for breeding
- Biodiversity
- Field visit to Kyrgyzstan
- Potentially funded by NERC and Darwin Fund

Sustainably Grown Apples

Ecosystem Service

- Carbon sequestration
- Water retention
- Untilled farmland
- Same as deciduous woods?
- Can it be farm income?
- Social impact value (HOCE work)
- Potentially funded by NERC

OUTCOMES

- Reduced scab
- Increase output
- Maximise value
- Improved SD indicators
- Security of supply



Short Term

- 🍏 The need to change practice is understood by growers, as are entrepreneurs in their own right
- 🍏 To gain momentum with growers we need to improve grower income/security as well as broader sustainability
- 🍏 We need to share the risks as well as the benefits
- 🍏 Intention: a number of short term (< 3 years) trials which are mainly related to orchard management
- 🍏 The HONE Project





2010 Fact Finding & Preliminary work

- 🍏 Use of garlic wash as tree tonic to better help tree fight disease
- 🍏 Comparative nitrogen trials: what is the best amount of nitrogen and to what extent can this be fixed by use of nitrifying bacterial sprays
- 🍏 Calcium transport: can tree health and fruit quality be improved
- 🍏 Pollination: does the sward make a difference to pollinating insects and 'fruit set' rate
- 🍏 Collection, shredding and composting of leaves to reduce over-wintering scab spores
- 🍏 Understand what role sheep could play, and what constraints would need to be overcome



To achieve the above we have to
start!!



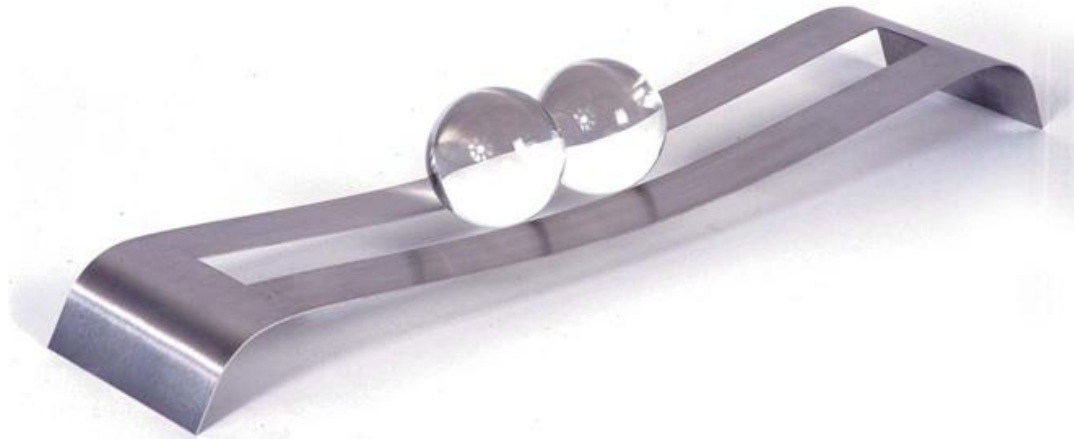
Biggest Barrier - Conventional Wisdom



“we’ve always done it that way”



Results in Inertia



... and so the need to overcome it



“Problems cannot be solved at the same level of awareness that created them.”
Einstein



Summary

- 🍏 The world is changing fast and there is a pressing need to address climate change and find more sustainable orchard management systems
- 🍏 There is much we can and should learn from nature, including efficient use of all our crop's resources
- 🍏 A combination of research, trials and monitoring will get us there
- 🍏 Change is always difficult, but necessary and rewarding