

Climate change impacts on UK
potato production

PCL funded project R405
2008-2010

Cranfield
UNIVERSITY



Project objectives

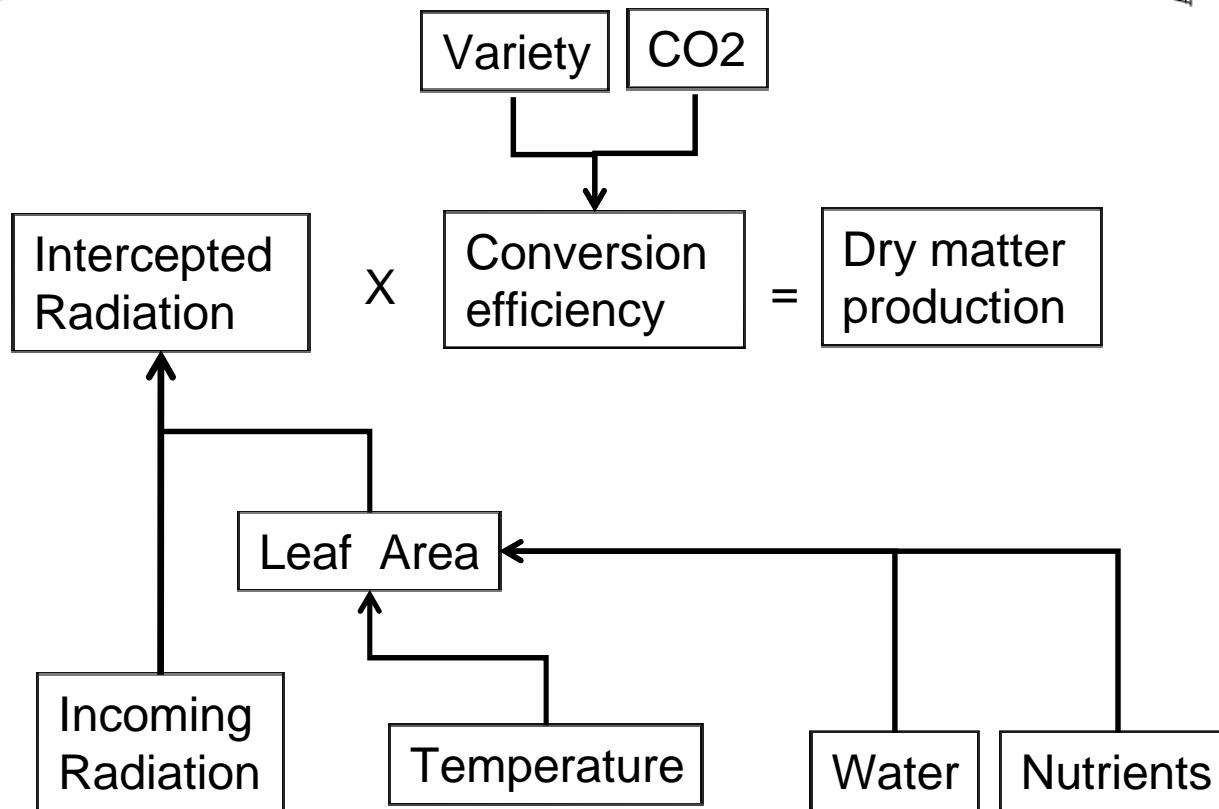
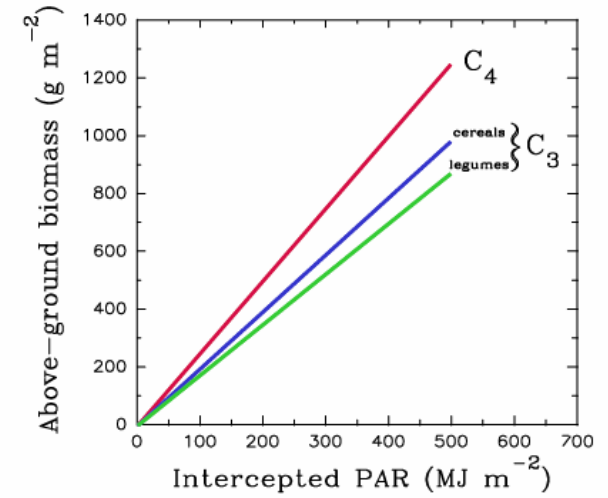
1. To assess potential impacts on crop growth and production (yield and water use)
2. To assess potential impacts on crop husbandry and land suitability
3. To assess potential impacts on water demand and water resources stress
4. To identify suitable adaptation options and responses (industry and grower level)



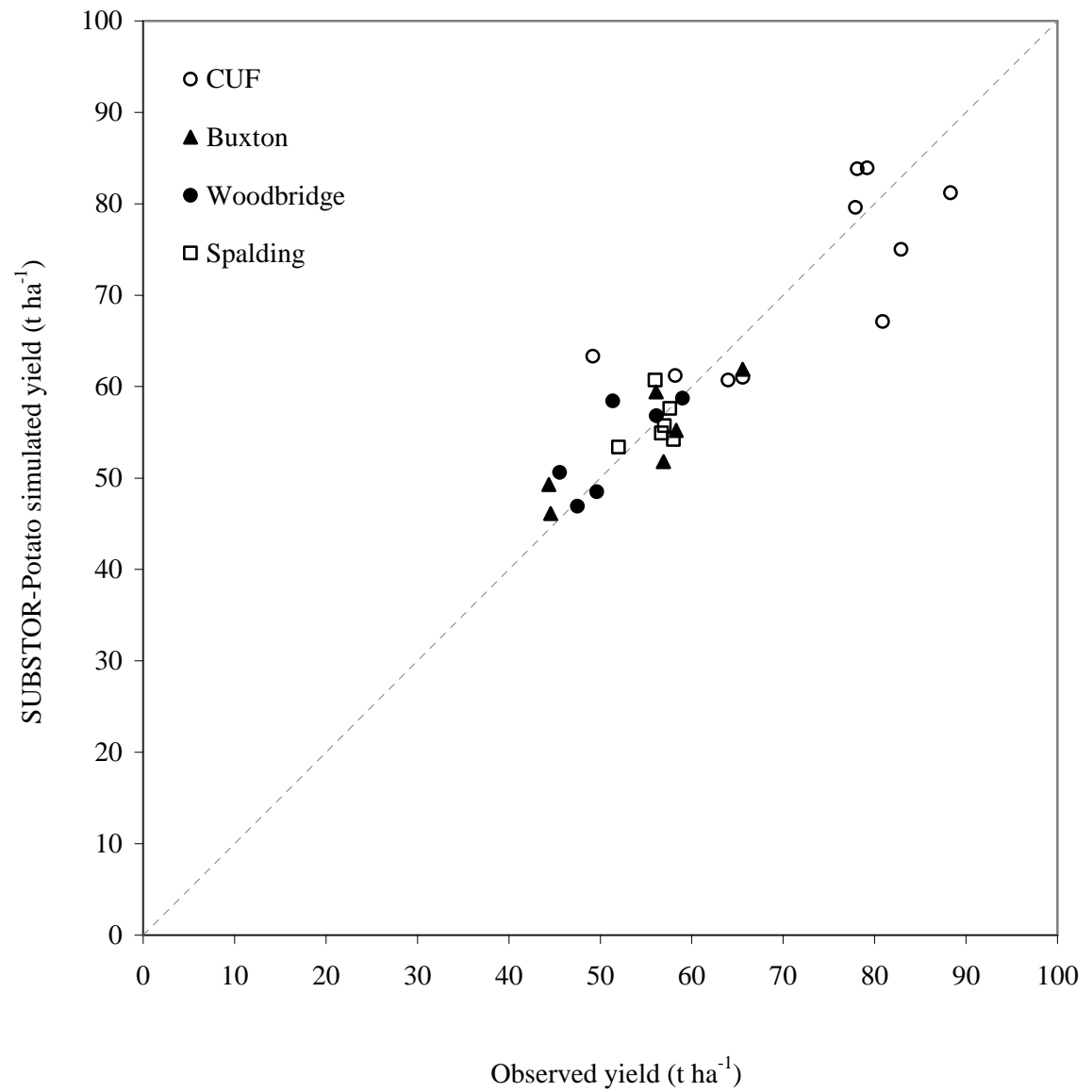
1. Latest projections and scenarios from the UK Climate Impacts Programme (UKCP09)
<http://www.ukcip.org.uk>
2. Crop modelling using a potato crop growth model (SUBSTOR-Potato)
3. GIS mapping (catchment level)
4. Working with industry through key informants, case studies, and grower workshops

SUBSTOR-Potato

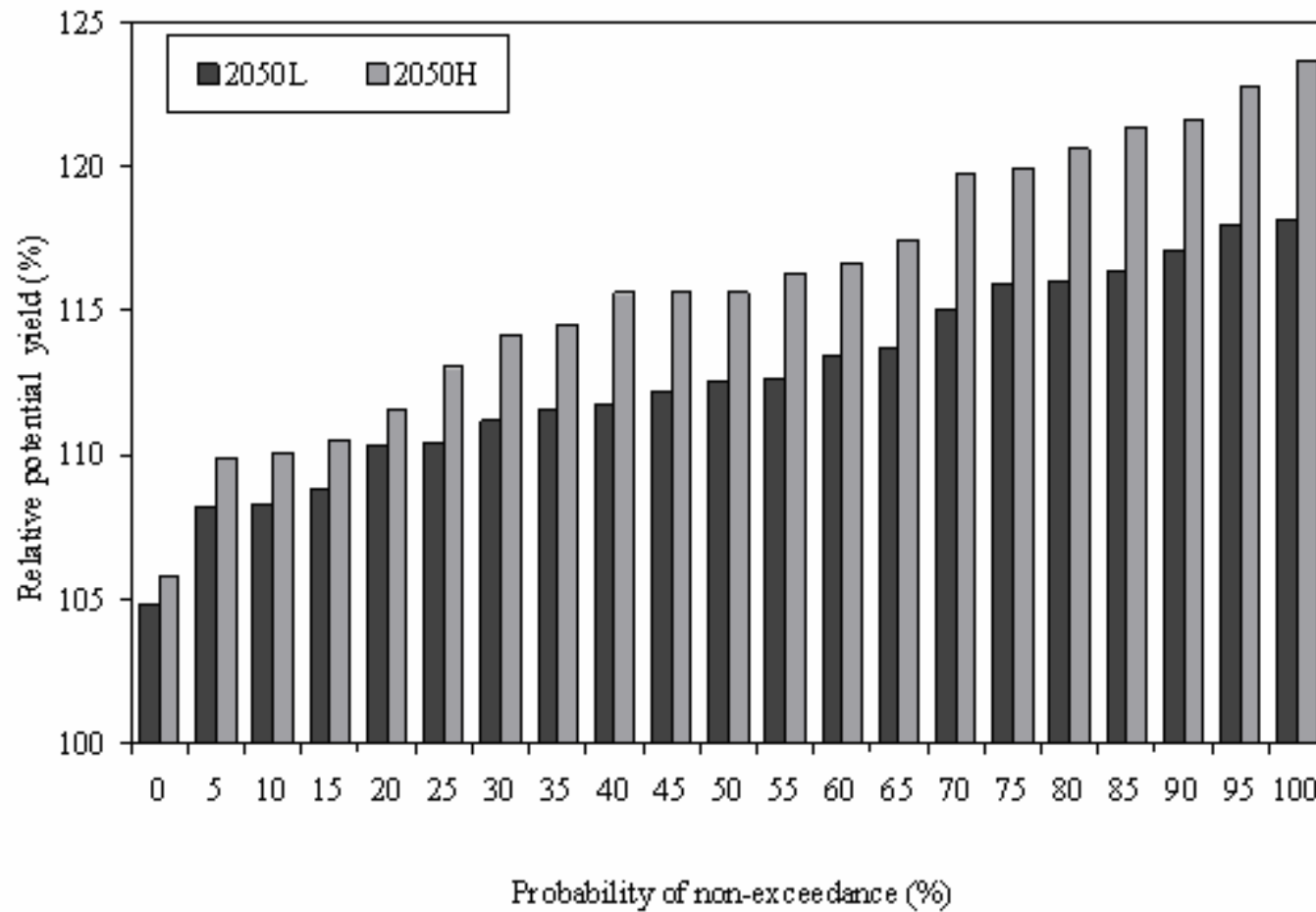
(Solar driven Engine)



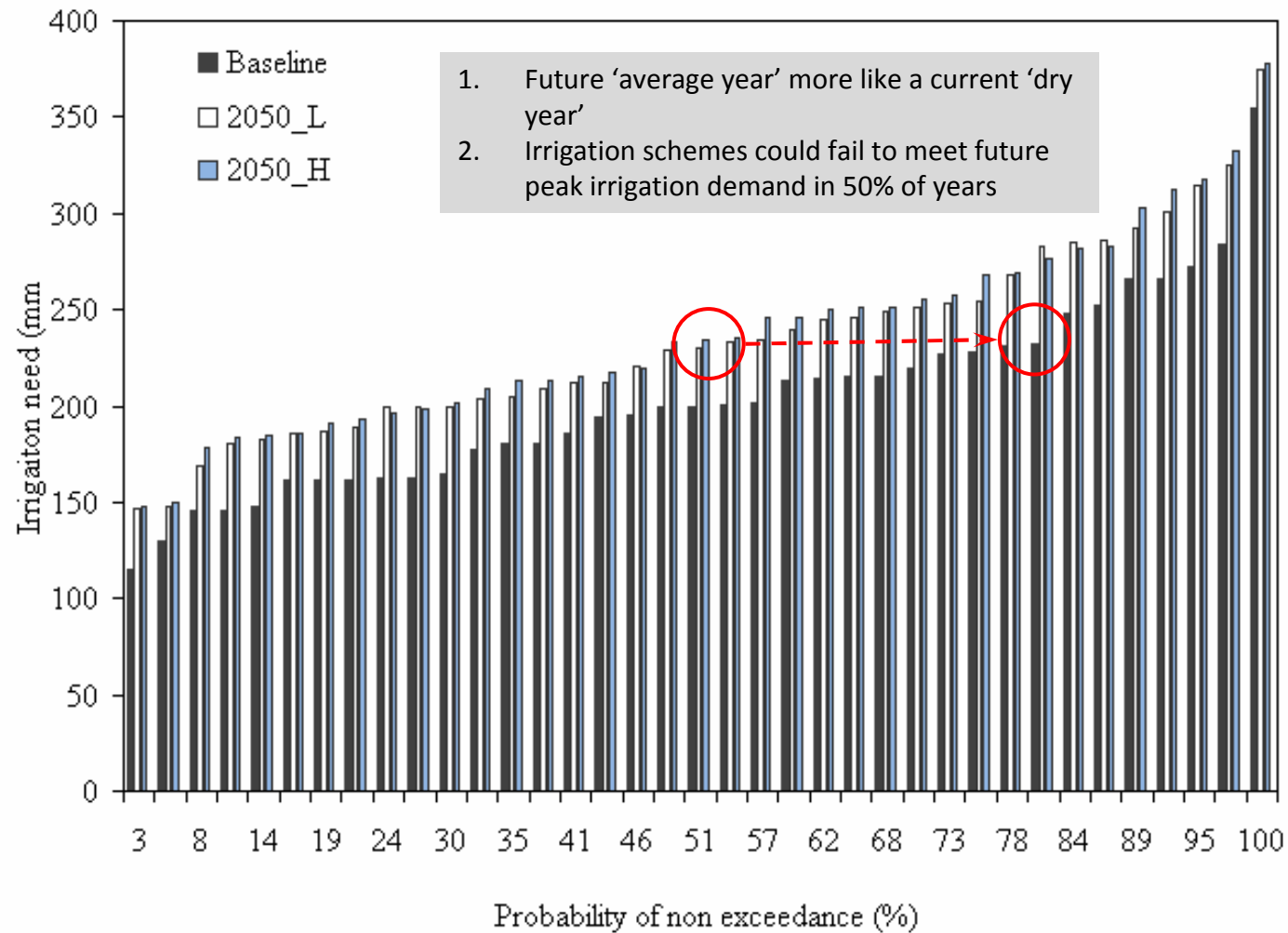
Model calibration 2002-2008



Predicted changes in yield (t ha⁻¹) 2050s

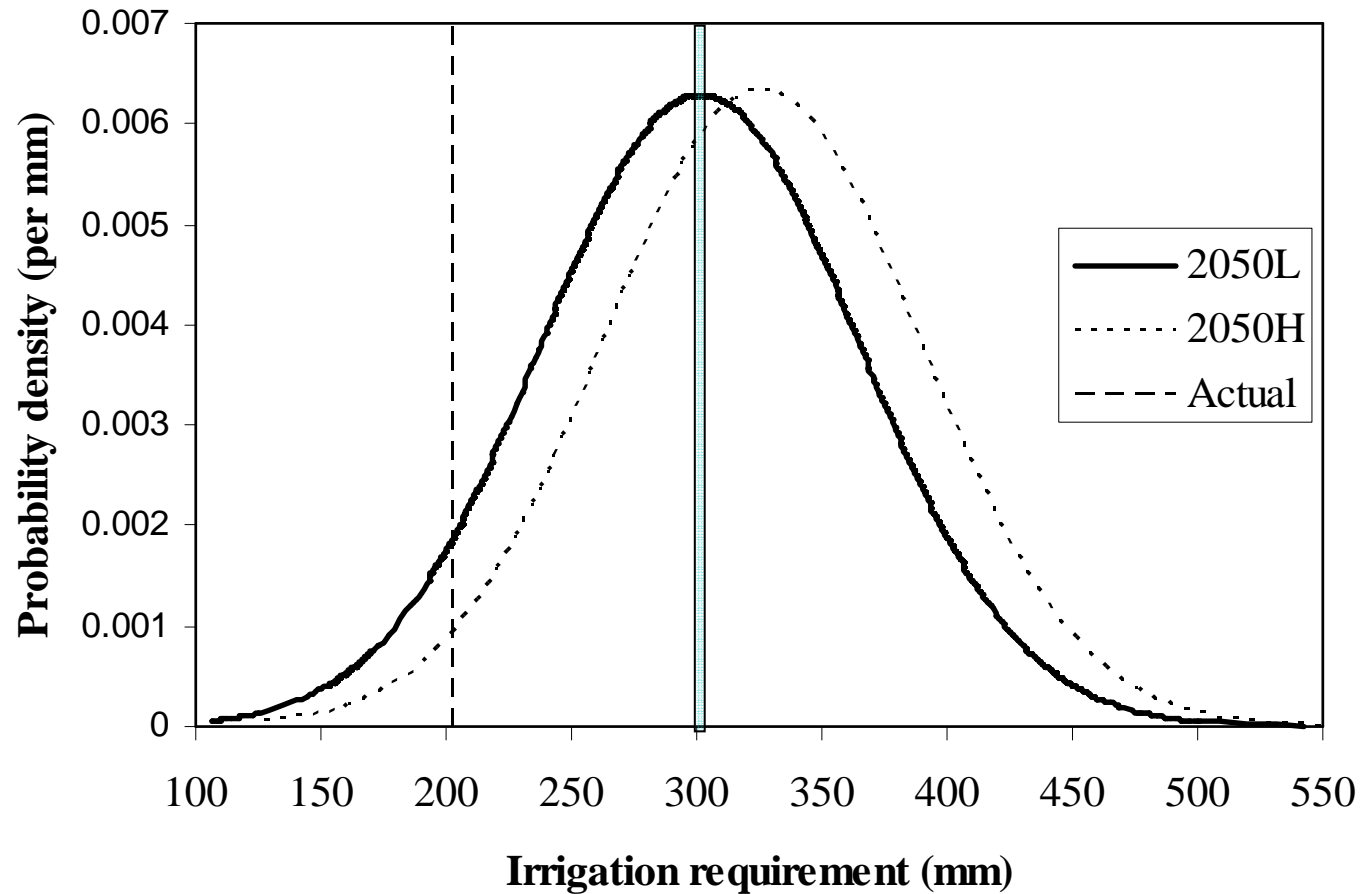


Future irrigation needs (mm) 2050s

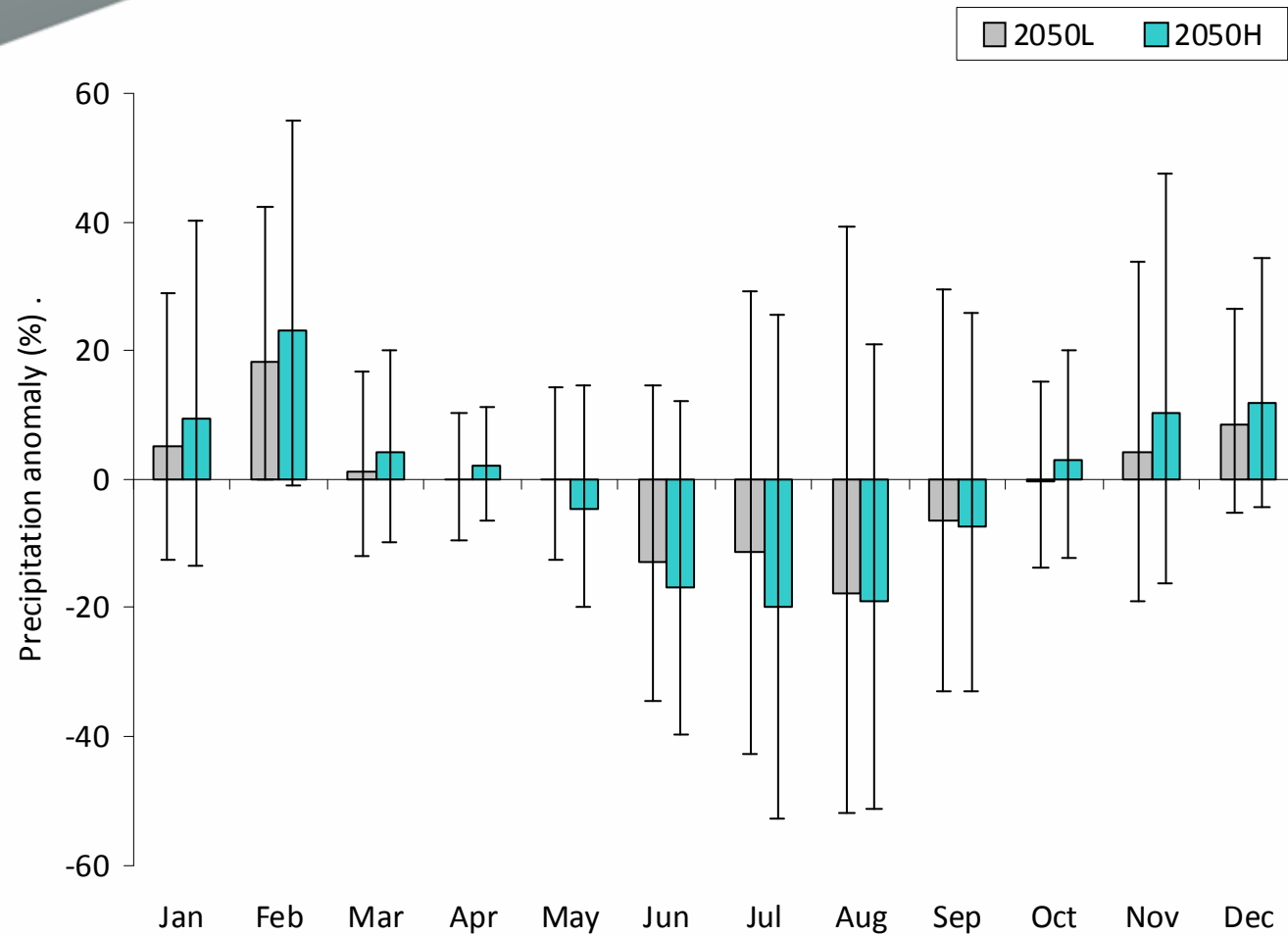


Climate uncertainty - impacts on irrigation (mm)

1995, typical dry year



Predicted changes in rainfall (NIAB, 2050s)



Farm management for future simulations (no adaptation)

Variable		CUF	Buxton	Woodbridge	Spalding
Planting depth (m)		0.12	0.15	0.13	0.19
Plant population (per m ²)		3.4	3.4	2.9	3.3
Planting date		16 Apr	1 Apr	1 Apr	5 Apr
Date of harvest		30 Sept	16 Oct	15 Aug*	12 Sept
N fertilizer application	Date of application - Base	Planting	Planting	Planting	Planting
	Amount applied (kg ha ⁻¹) -Base	180	100	150	160
	Date of application - Top dressing	—	15 May	20 May, 6 Jun	18,26 Jun, 10,17,21,28 Jul, 4,14,20 Aug
	Total amount applied (kg ha ⁻¹) - Top dressing	—	80	100	45
Irrigation System		Sprinkler	Sprinkler	Sprinkler	Drip
Soil texture		Medium sandy loam	Medium sandy loam	Loamy sand	Silt

Findings



- Future potential yield is expected to increase by 13-16%
- Marginal increase of farm yields (3-6%)
- Future irrigation needs will increase by 14-30% to maintain the same level of production
- Actual capacity of irrigation schemes might fail to meet future peak irrigation needs in nearly 50% of years

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- 2. To assess potential impacts on crop husbandry and land suitability**
3. To assess potential impacts on water demand and water resources stress
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1. Current land suitability
2. Future changes in land suitability
3. Land suitability and water availability

Applied to both rainfed and irrigated potato production

Agricultural Land Classification (ALC)

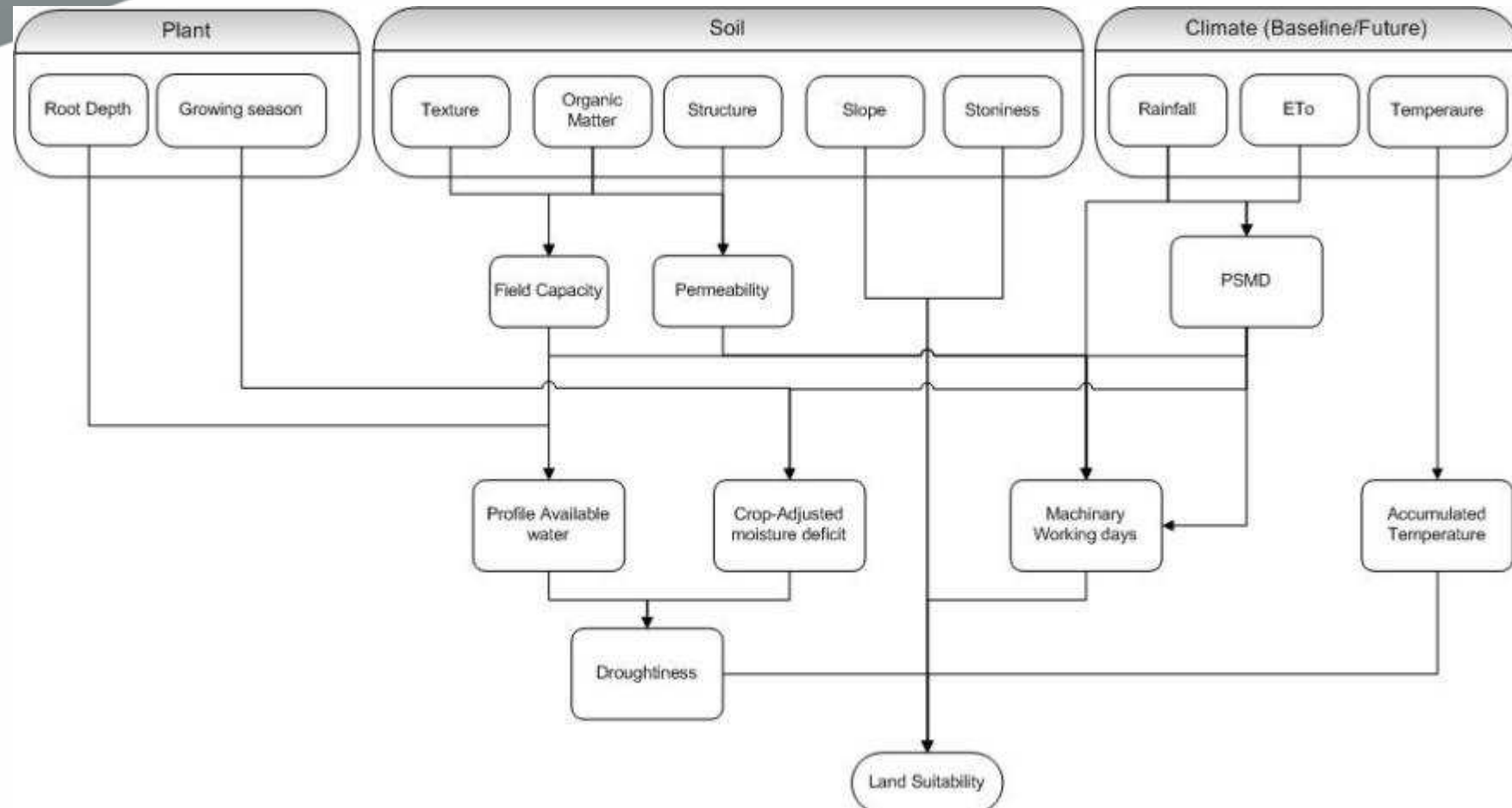
Land defined as being one of 4 classes:

- Suitable (Well, Moderate, or Marginal)
- Unsuitable

3 criteria used to assess 'unsuitable' land
PSMD, accumulated temperature, and slope

2 criteria used to assess 'suitable' land
trafficability (MWD) and droughtiness (AW and SMD)

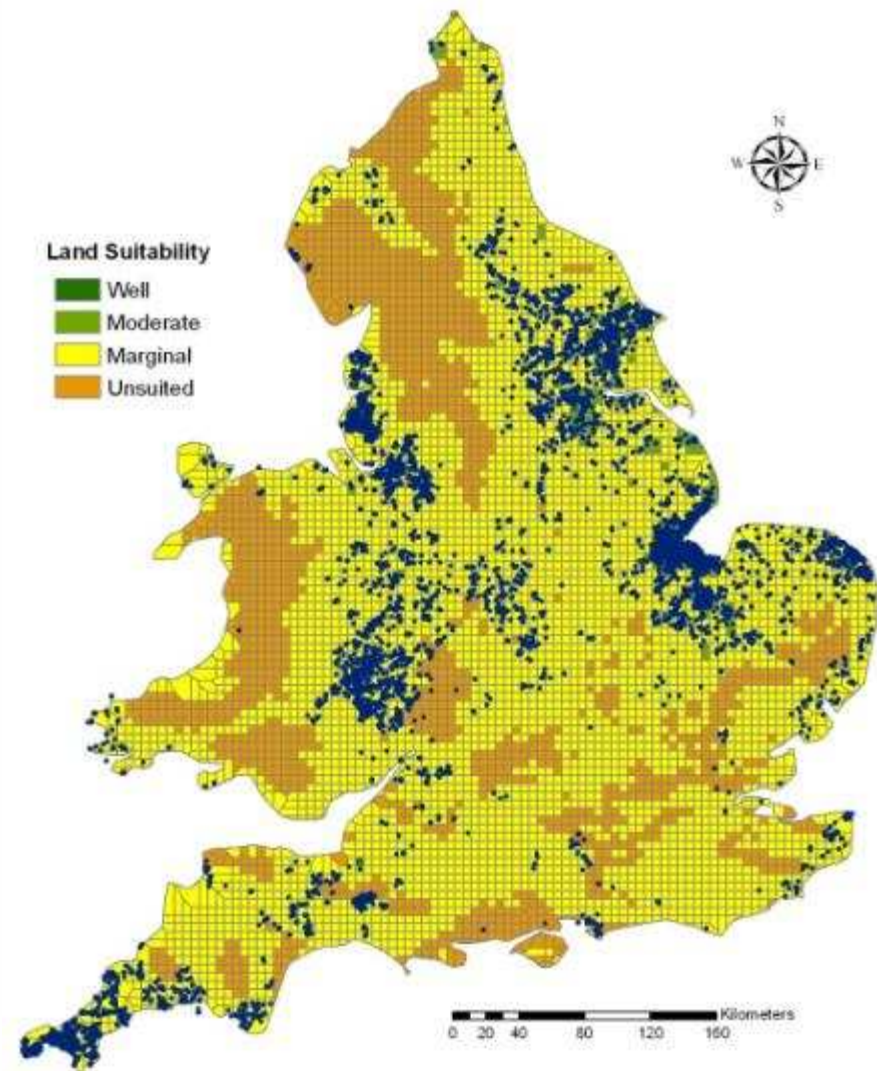
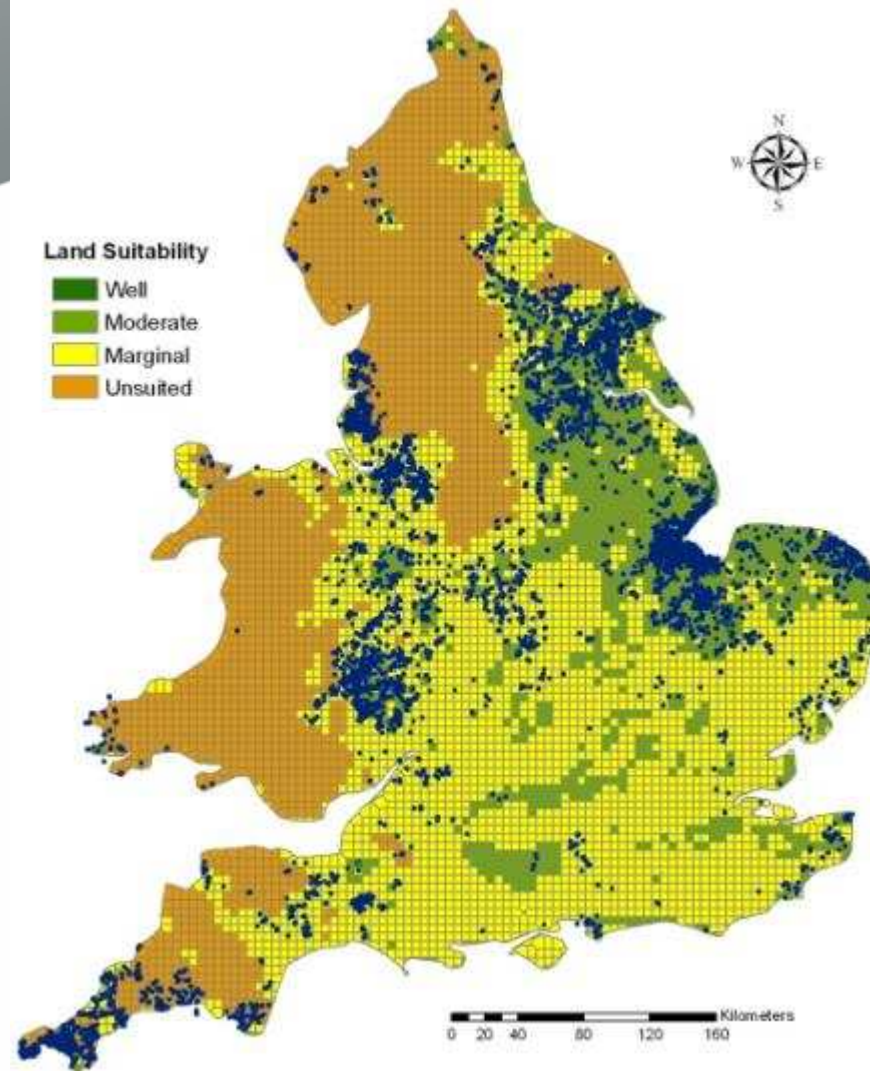
Assessing land suitability



Current and future land suitability (rainfed)

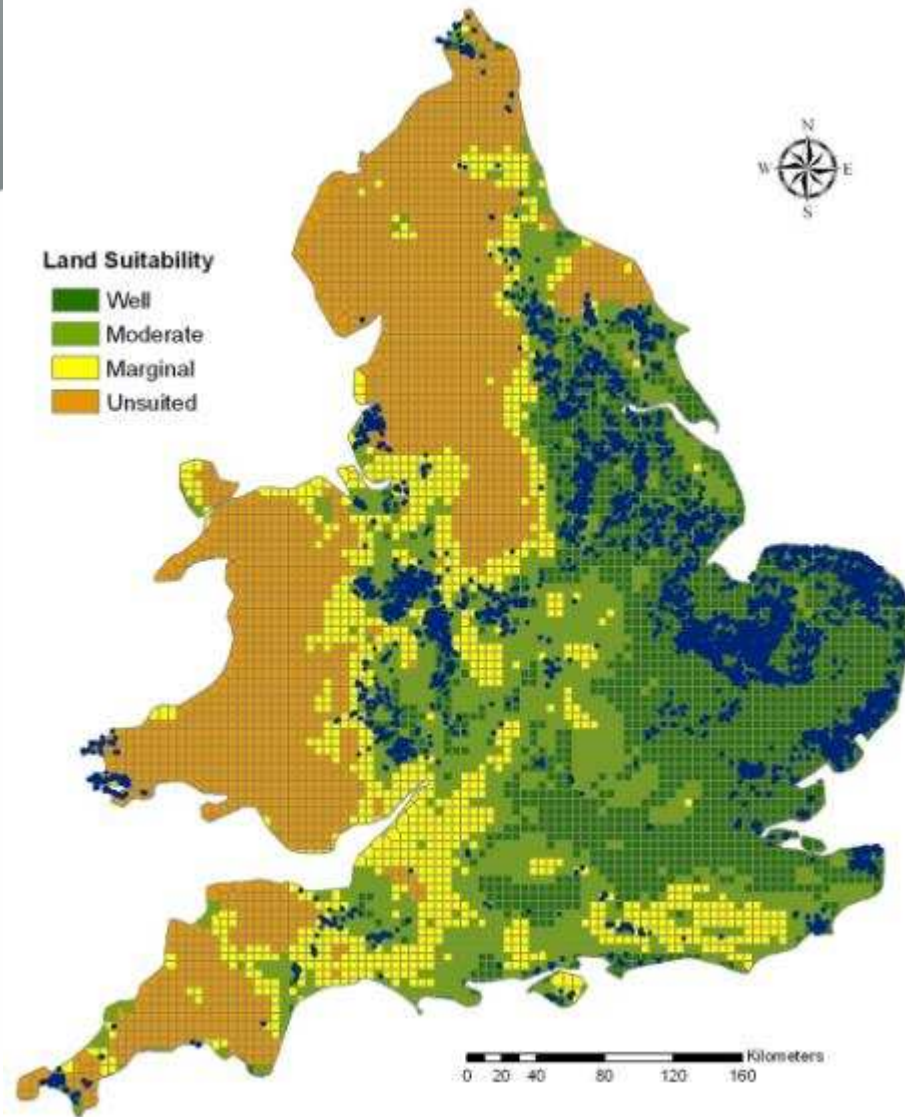
Baseline

2050H

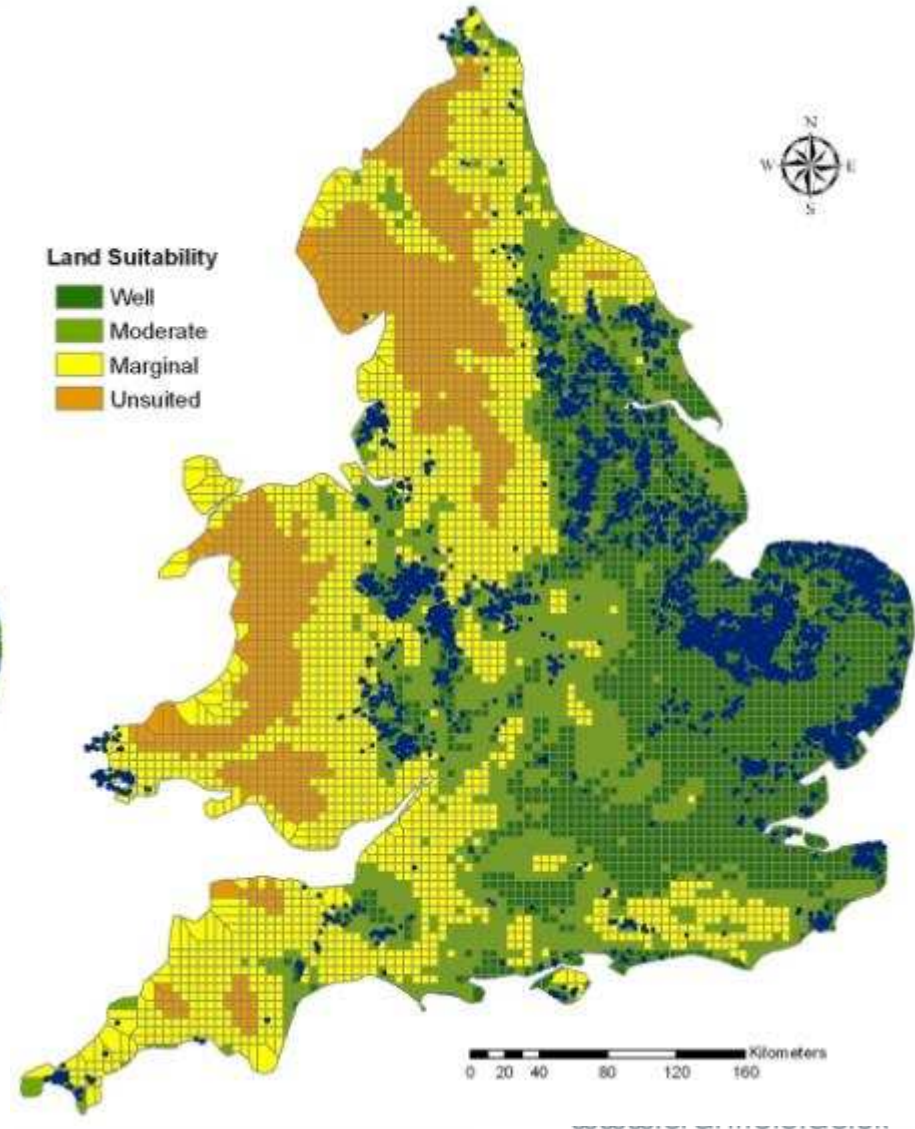


Current and future land suitability (irrigated)

Baseline

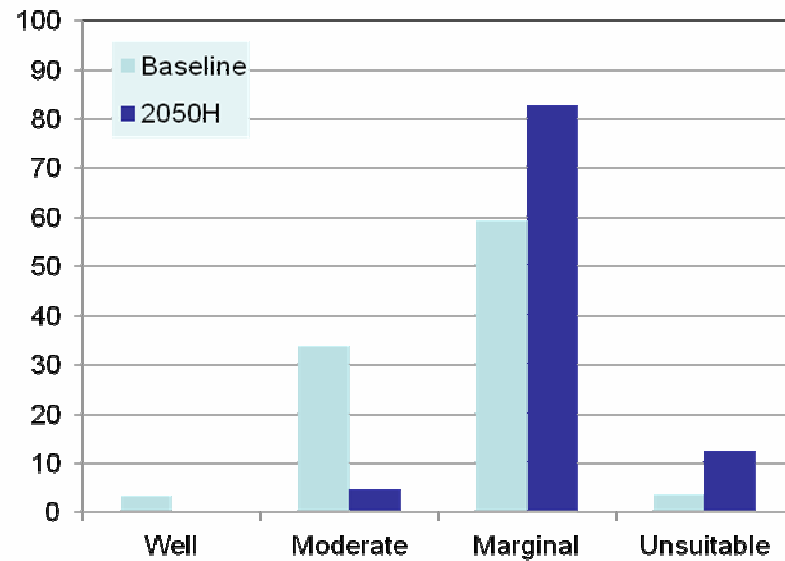


2050H

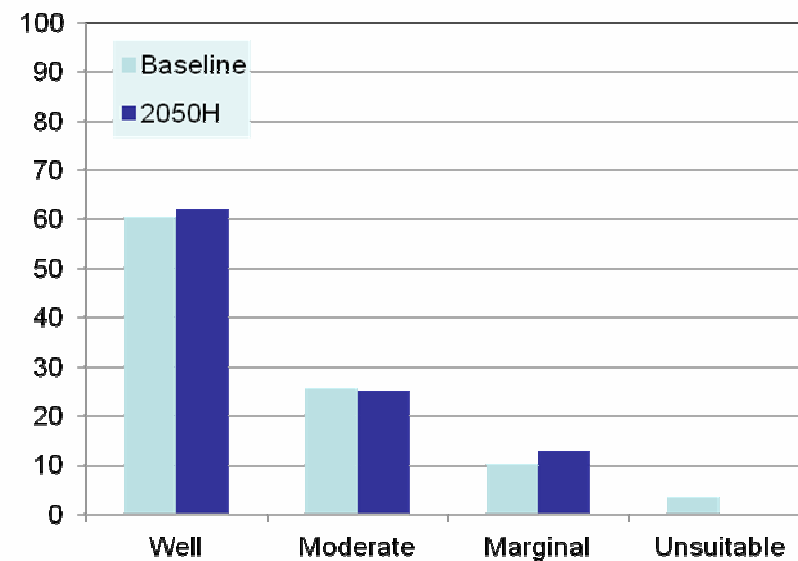


Climate change impacts on land suitability

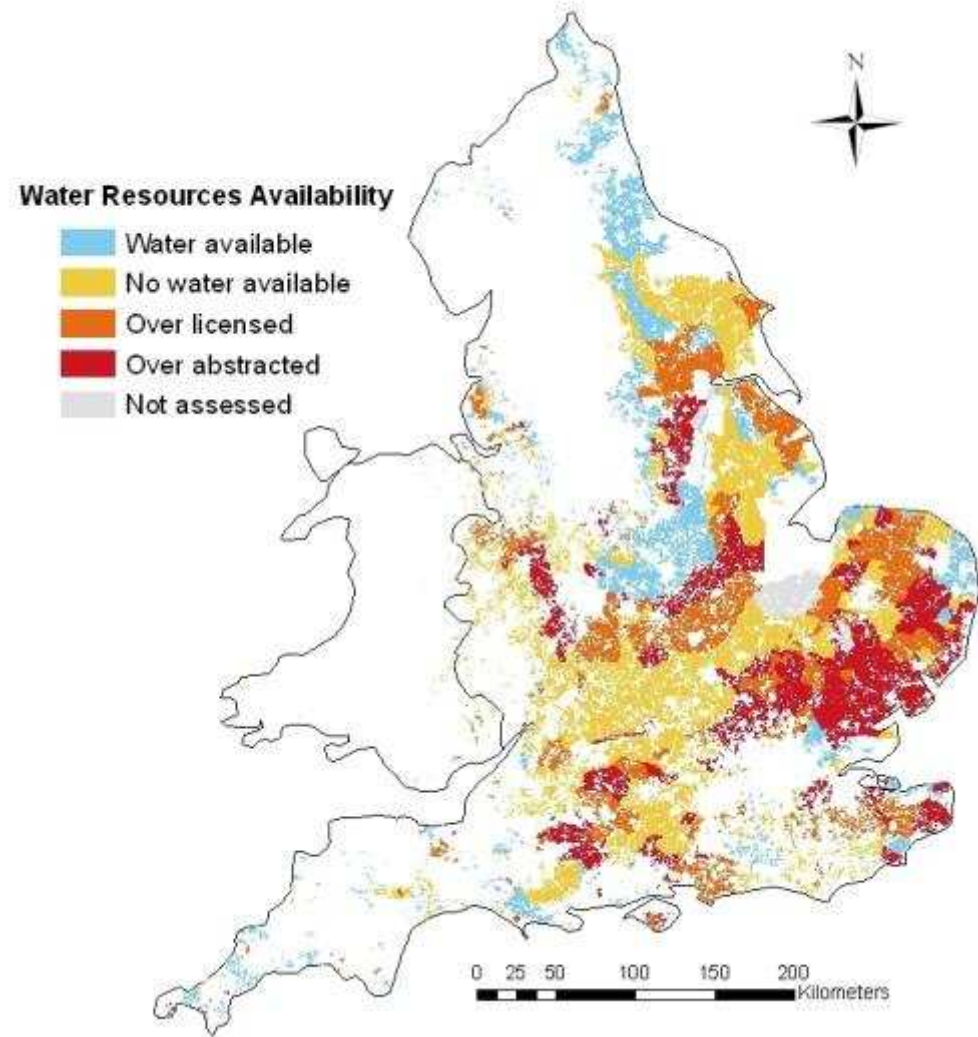
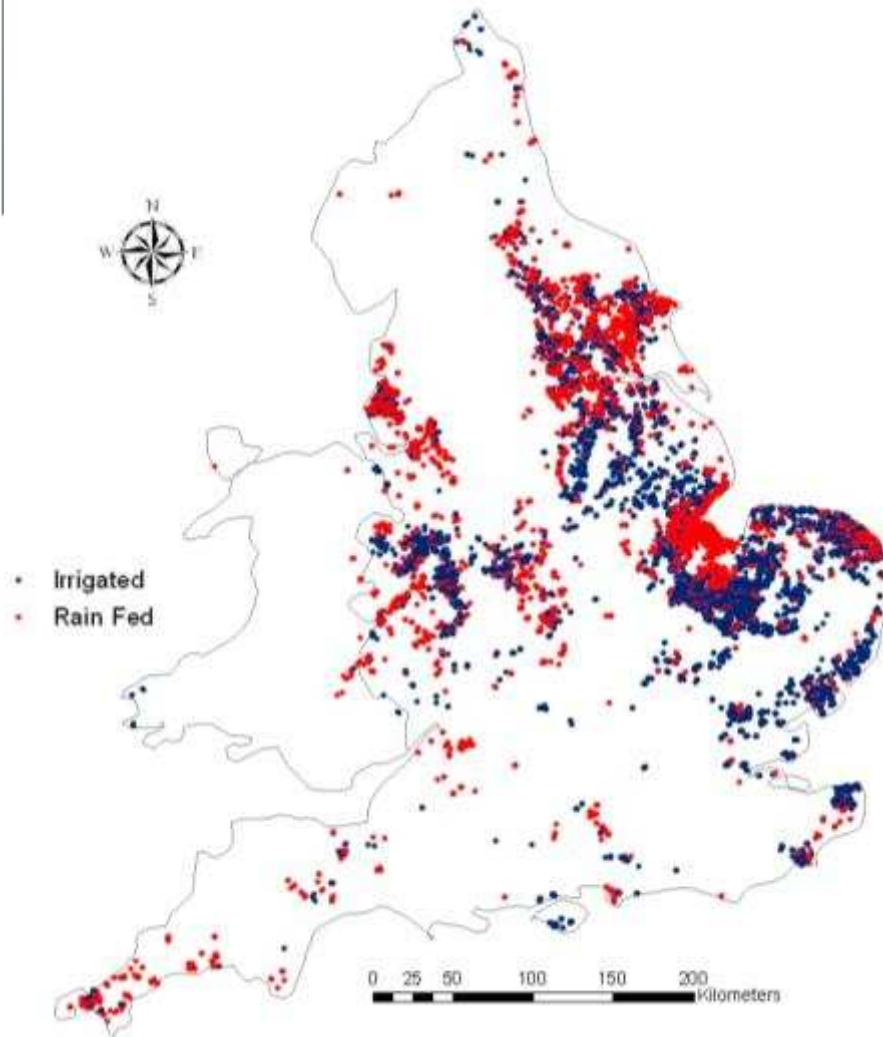
Rainfed potatoes



Irrigated potatoes



Land suitability and water resources



- Land currently well to moderately suitable for rainfed production is projected to decline by 74-95% due to increased droughtiness
- 85% of land will be suitable for irrigated production
- Expansion, relocation to suitable land will be constrained by water availability

Research impact and dissemination

- 3 PCL grower workshops
- Information booklet for potato growers
- UKIA Annual Conference 2011 (tbc)

High impact research journals (top 10%)

- *Agricultural and Forest Meteorology*
- *Agriculture, Ecosystems and Environment*
- *Climatic Change*