Optimal Land-use Future Scenarios Nordic Area

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CLIMSAVE

IMPRESSIONS

The CLIMSAVE project

Climate Change Integrated Assessment Methodology for Cross-Sectoral Adaptation and Vulnerability in Europe

Climate & socio-economic scenarios

Urban

Snow cover

Crop yields

Forestry

Pests & diseases

Hydrology

Water availability

Flooding

Rural land allocation

Water use

Biodiversity

Sfarmmod

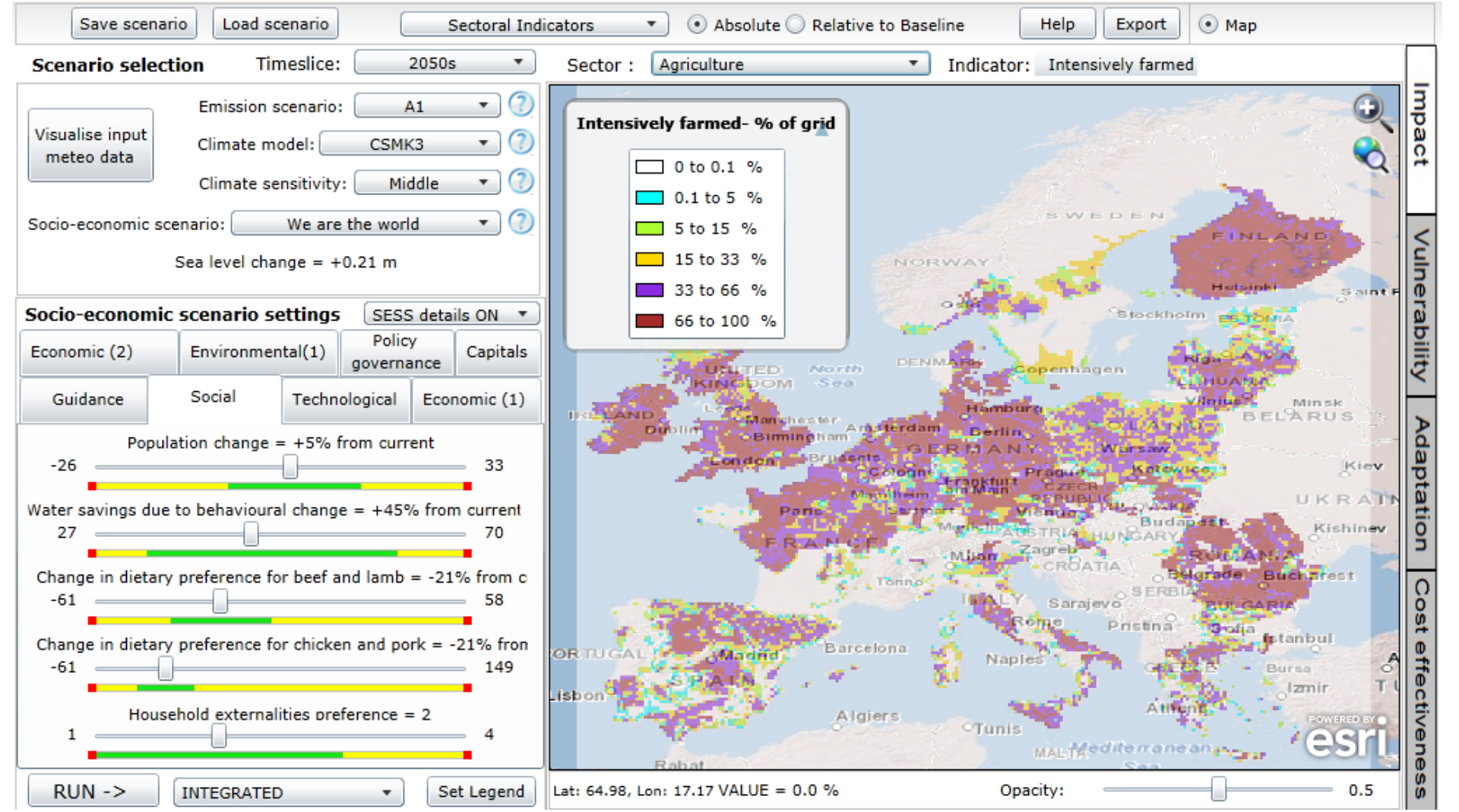
- Long term mechanistic farm land use planning linear programme
- Static comparative analysis
- 23871 10 minute grids (344 km^2) with >20 soils/grid – reduced to 6714 soil-climate clusters
- Meta-modelled by regression = faster run times
- Calibrated against EUROSTAT crop yields and areas at NUTS2 level keeping parameters consistent at each NUTS1

Sfarmmod

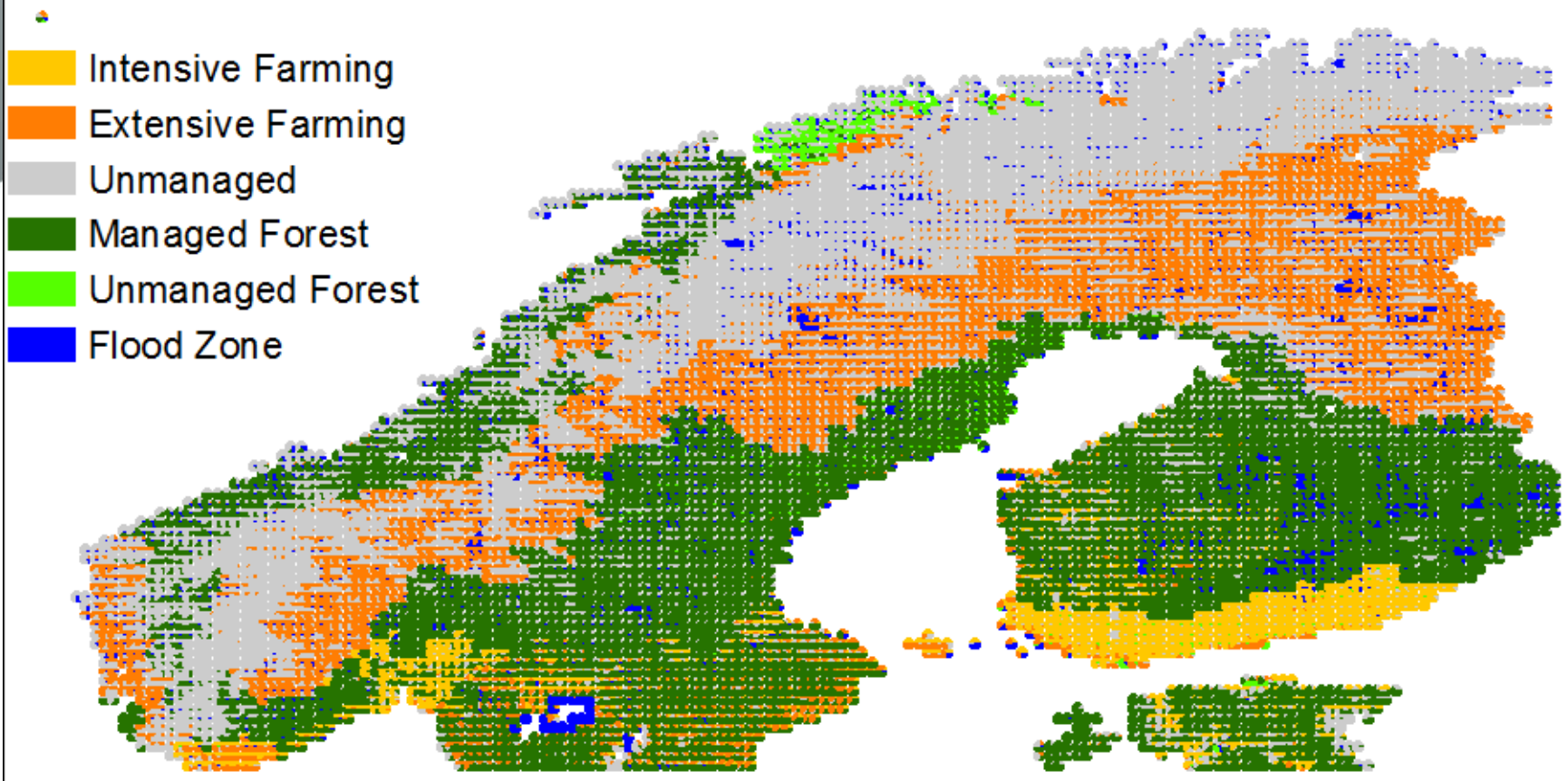
- Demand = population + changes in (ruminant meat consumption, non ruminant meat consumption, and demand for bioenergy) - imports
- Supply = yields + increase (crop breeding, efficiency of irrigation) - land removed for conservation.
- Land is *apriori* allocated to urban then on profit thresholds to arable, grass, extensive grazing, managed forest, unmanaged forest, and finally abandoned. Prices are iterated to supply demand

The CLIMSAVE project

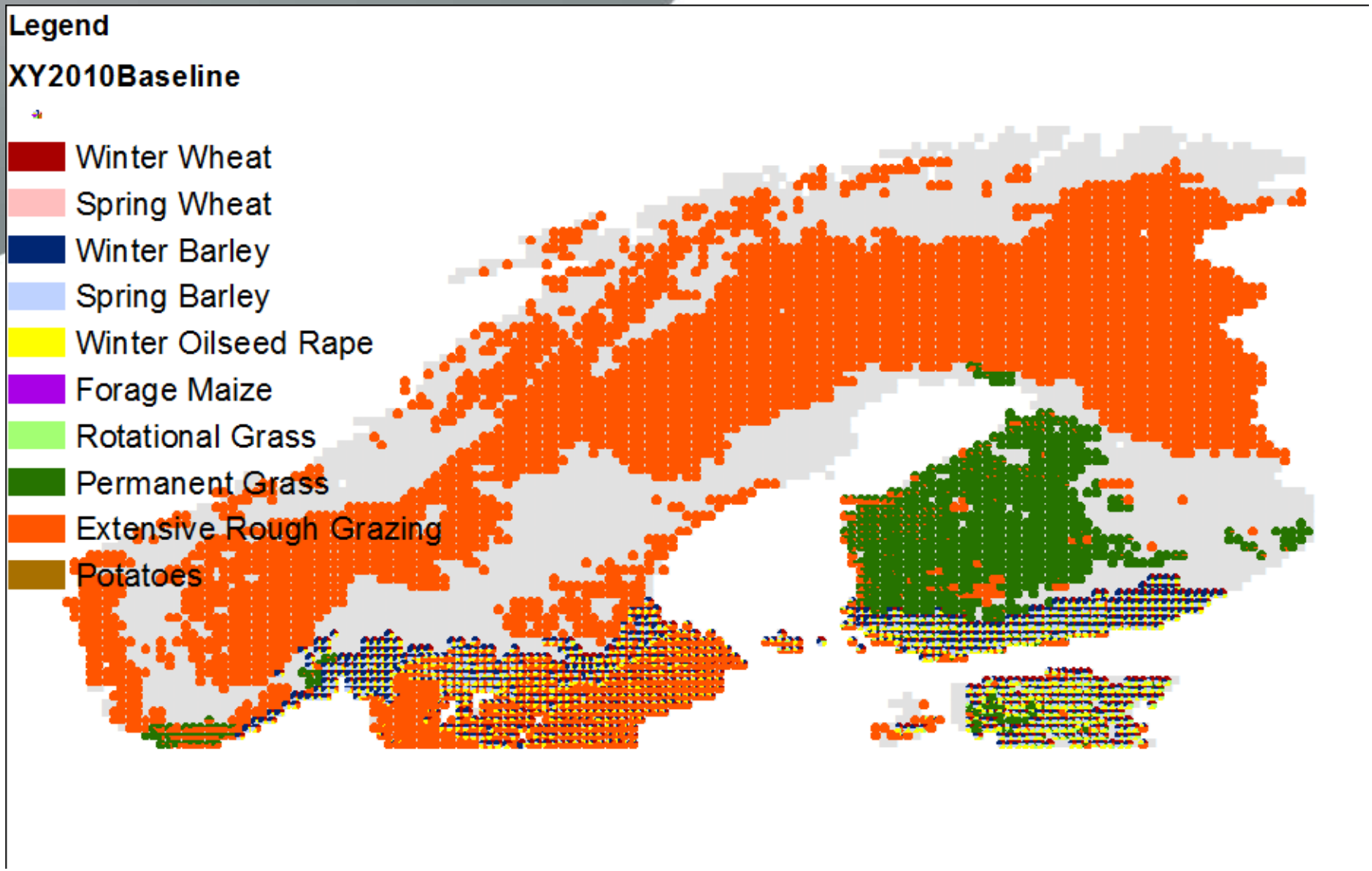
Climate Change Integrated Assessment Methodology for Cross-Sectoral Adaptation and Vulnerability in Europe



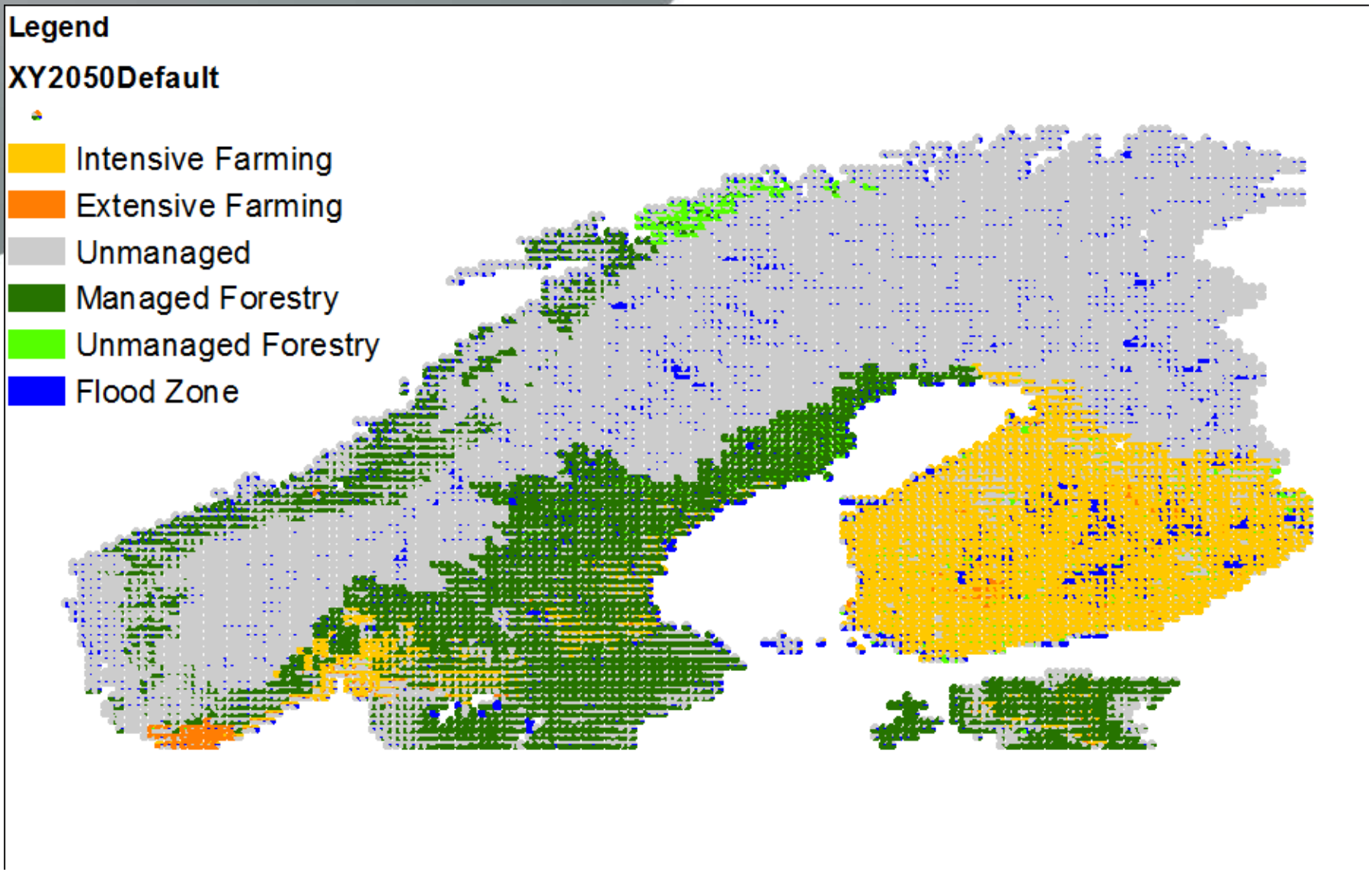
NB Whilst the absolute quality of baseline prediction was doubted, the general direction of change was more readily supported.

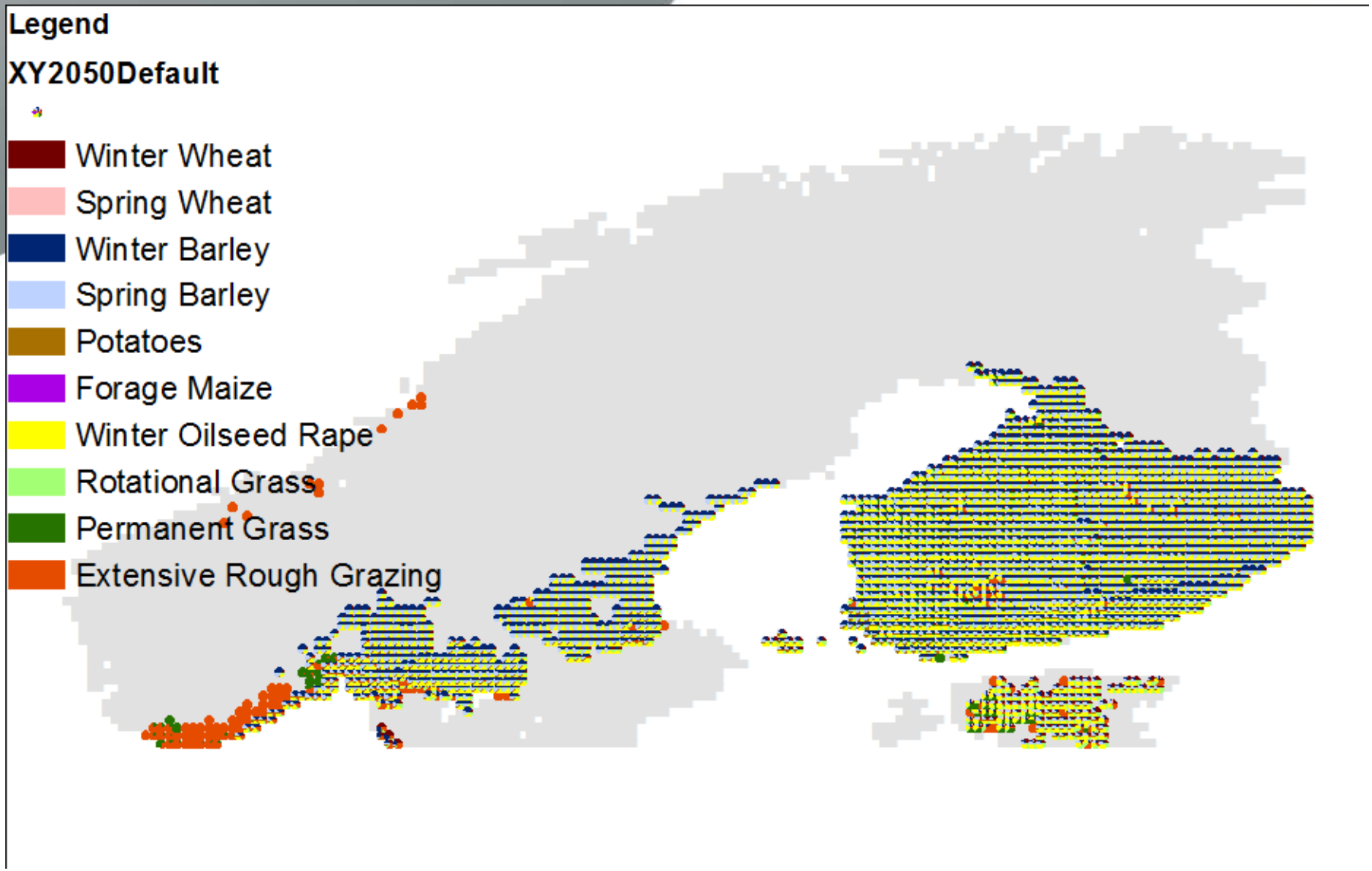


NB each 10 minute grid is a pie chart made up of the list of land uses.
The effect is like the points of a TV screen



NB Forestry and unmanaged land have been removed to focus on the use of farm land –
it makes the farmland look more intensive but identifies the areas of arable crops, grassland and extensive grazing


Legend
XY2050Default
Intensive Farming
Extensive Farming
Unmanaged
Managed Forestry
Unmanaged Forestry
Flood Zone



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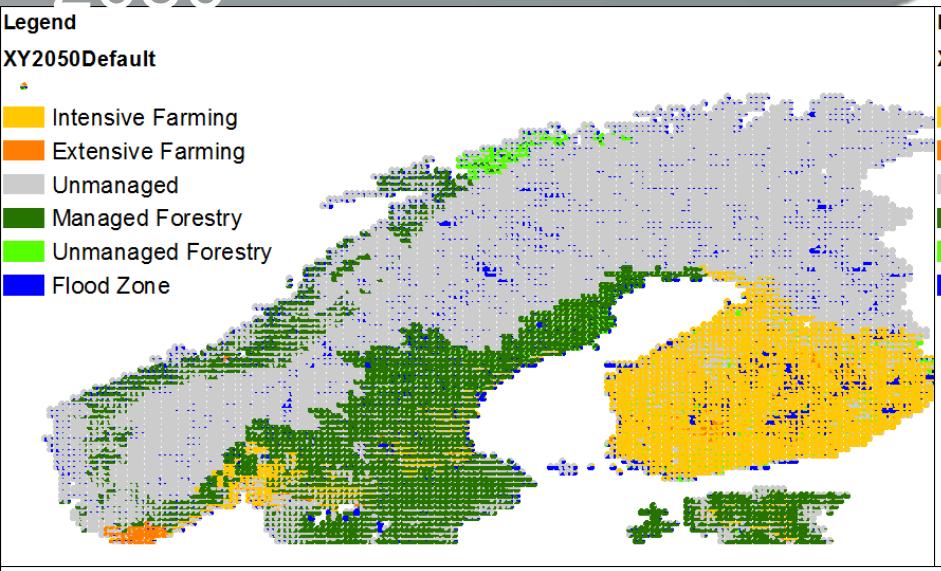
	2010Baseline	2050Default
Food production (000 TJ)	484	1,972
Food per capita (000 000 kcal/day)	763	5,176
Timber production (000 Mt)	71	92
Intensively Farmed, %	6.2	15.9
Extensively Farmed, %	20.6	0.5
Unmanaged Land, %	37.5	60.5
Managed Forest, %	30.5	17.0
Unmanaged Forest, %	0.8	1.0
Flood Zone, %	3.3	3.6
Total area, 000 000 ha	106.0	106.0

Vulnerable!

Global Climate models

- Five models
    1. CSMK3 (default)
    2. HadGem
    3. CPM4
    4. GFCM21
    5. MPEH5
- 2020 and 2050 time slices
- 2010 driven to 50% wetter winter, 50% drier summer, 700ppm CO2, 2m sea level rise, 6c temperature rise

2050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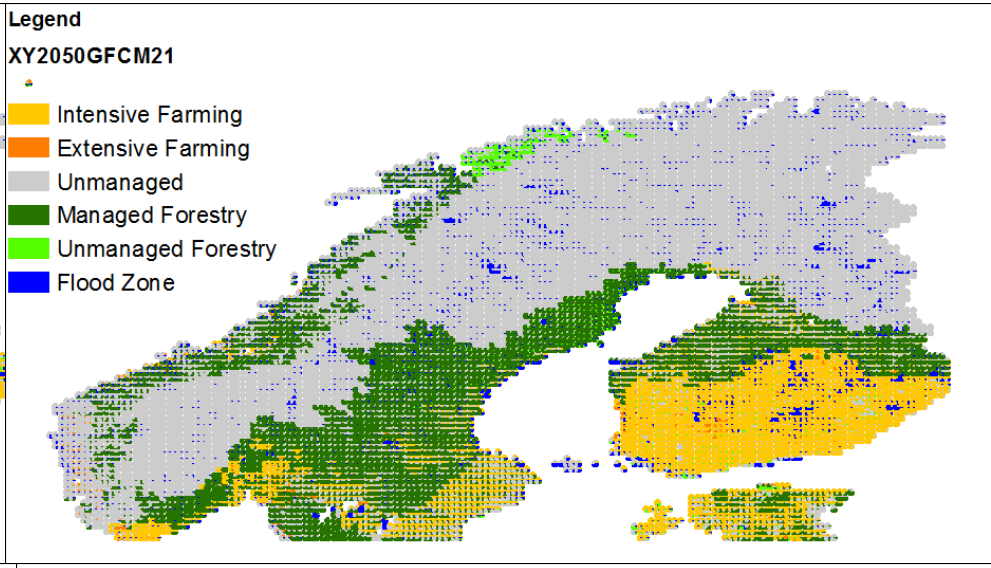
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XY2050GFCM21
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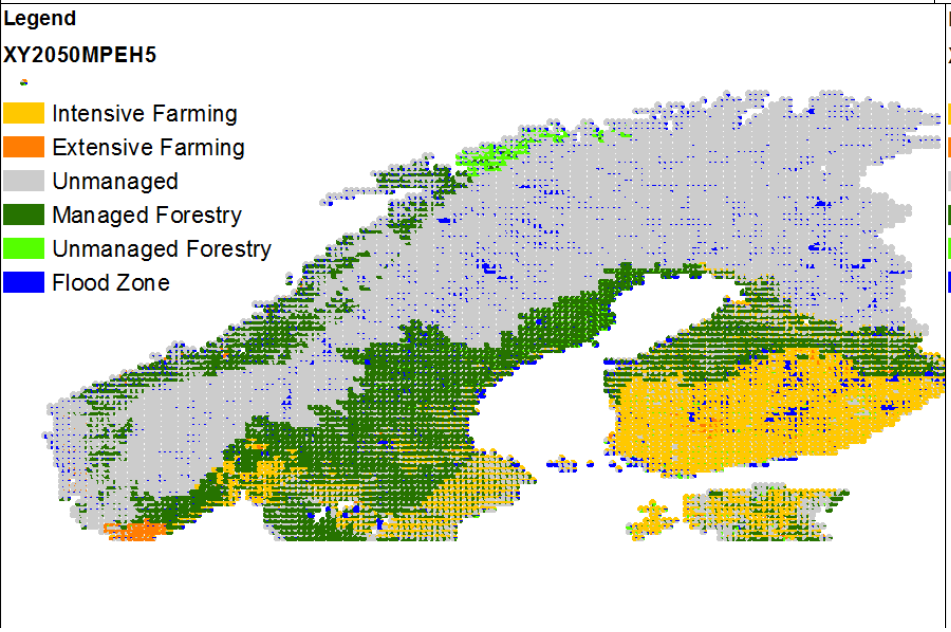
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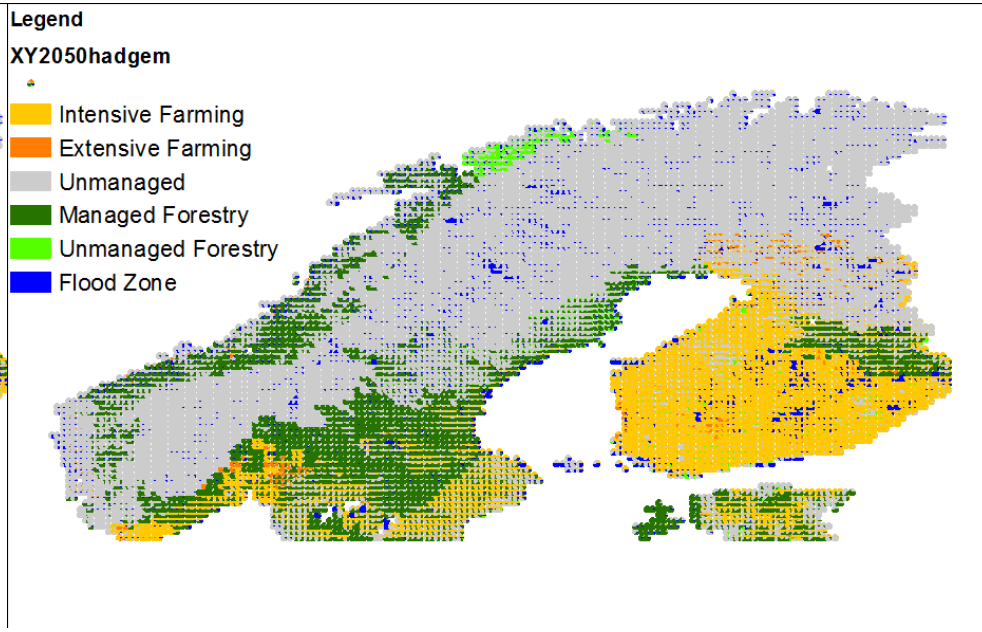
Legend
XY2050hadgem
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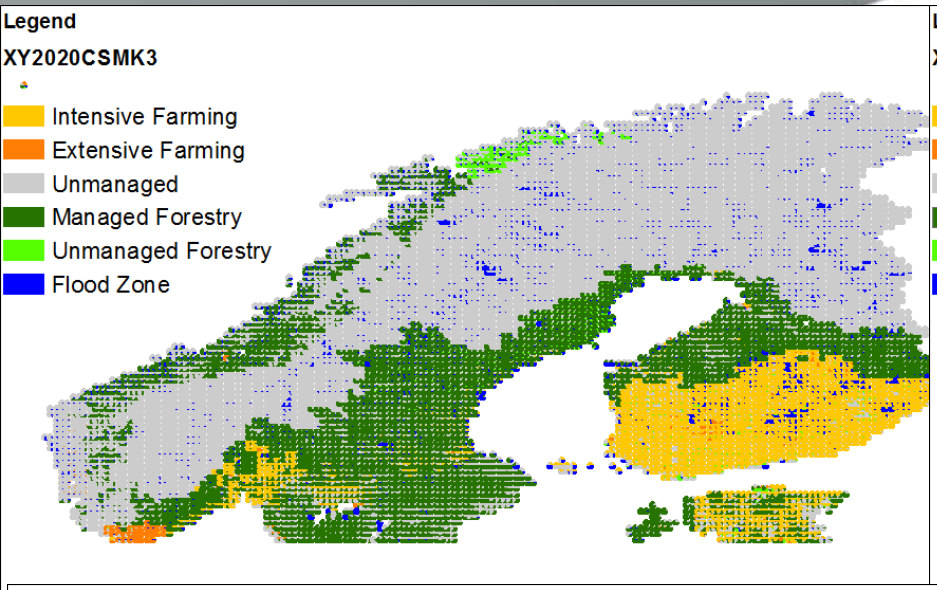
2020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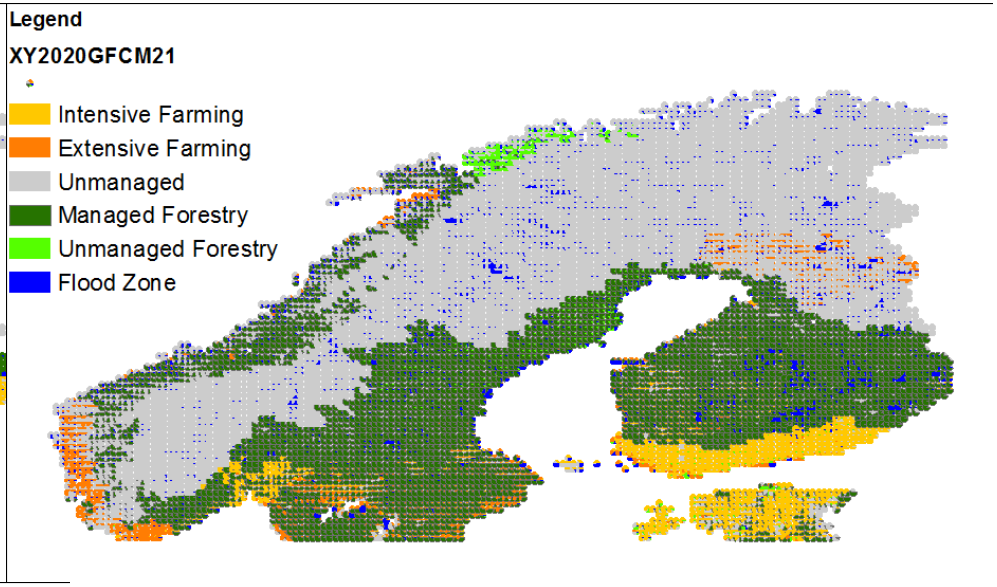
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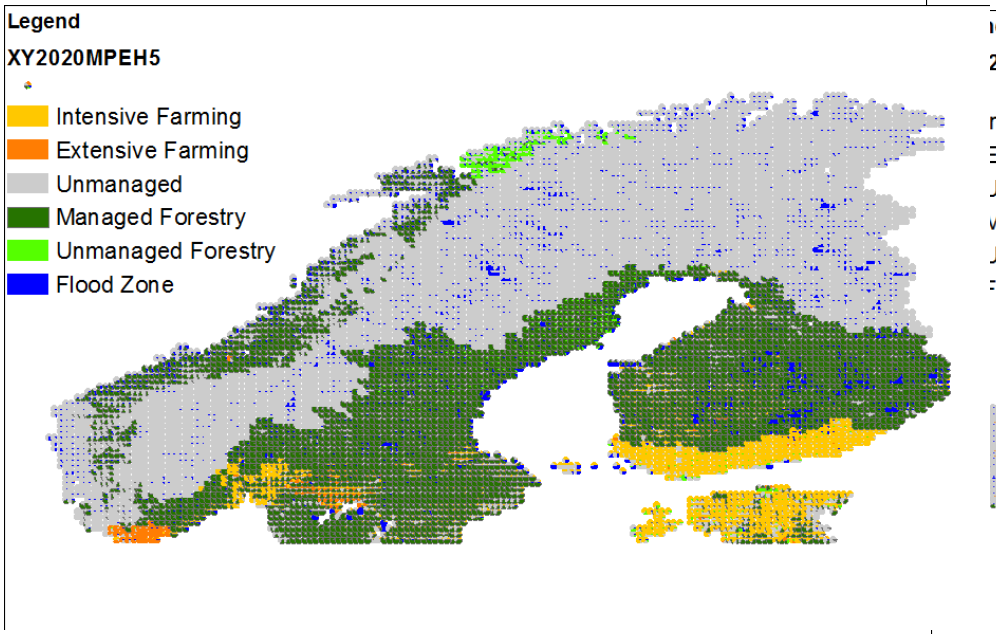
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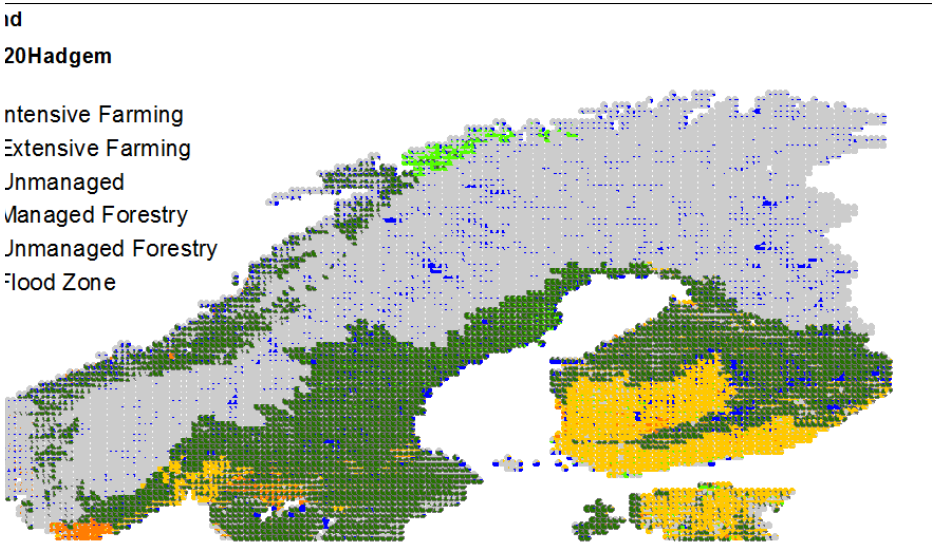
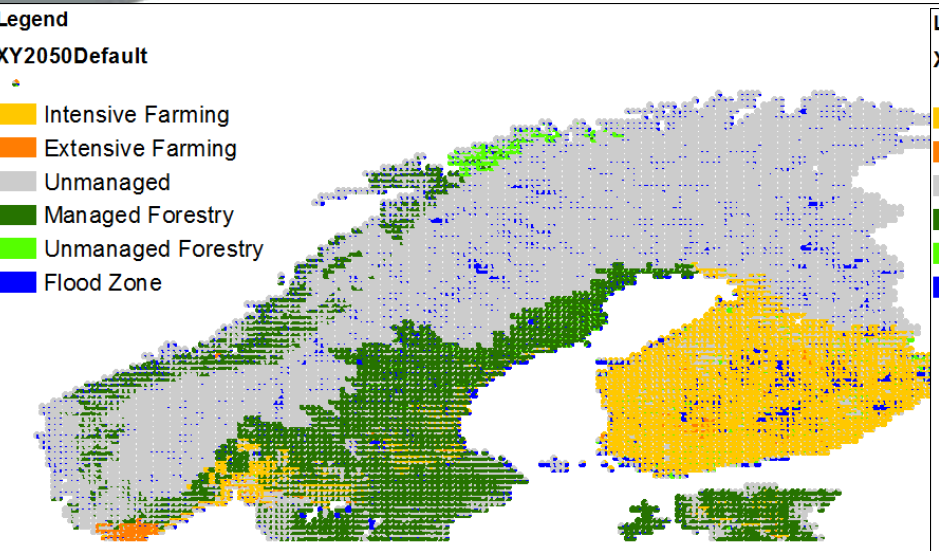

20Hadgem
Flood Zone

Extreme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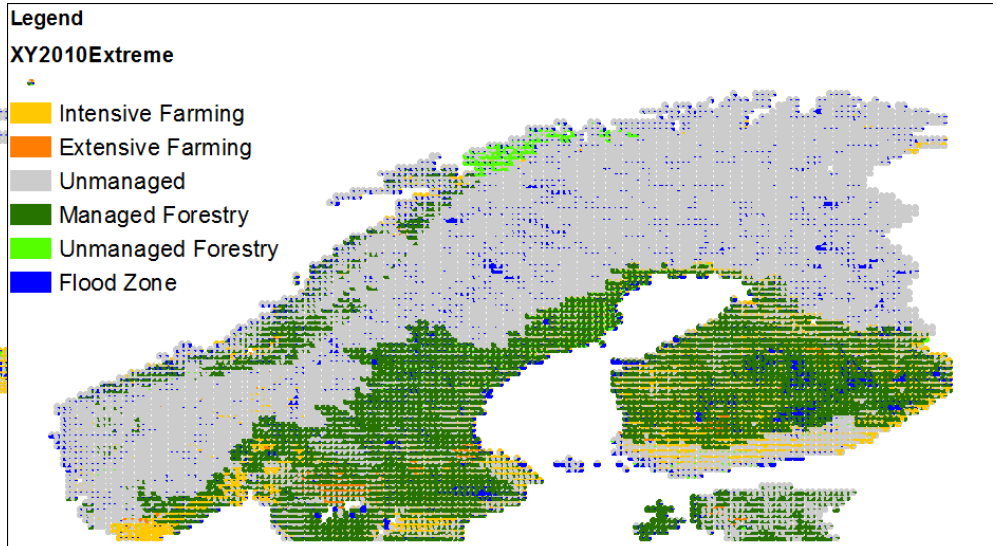
Legend
XY2010Extreme
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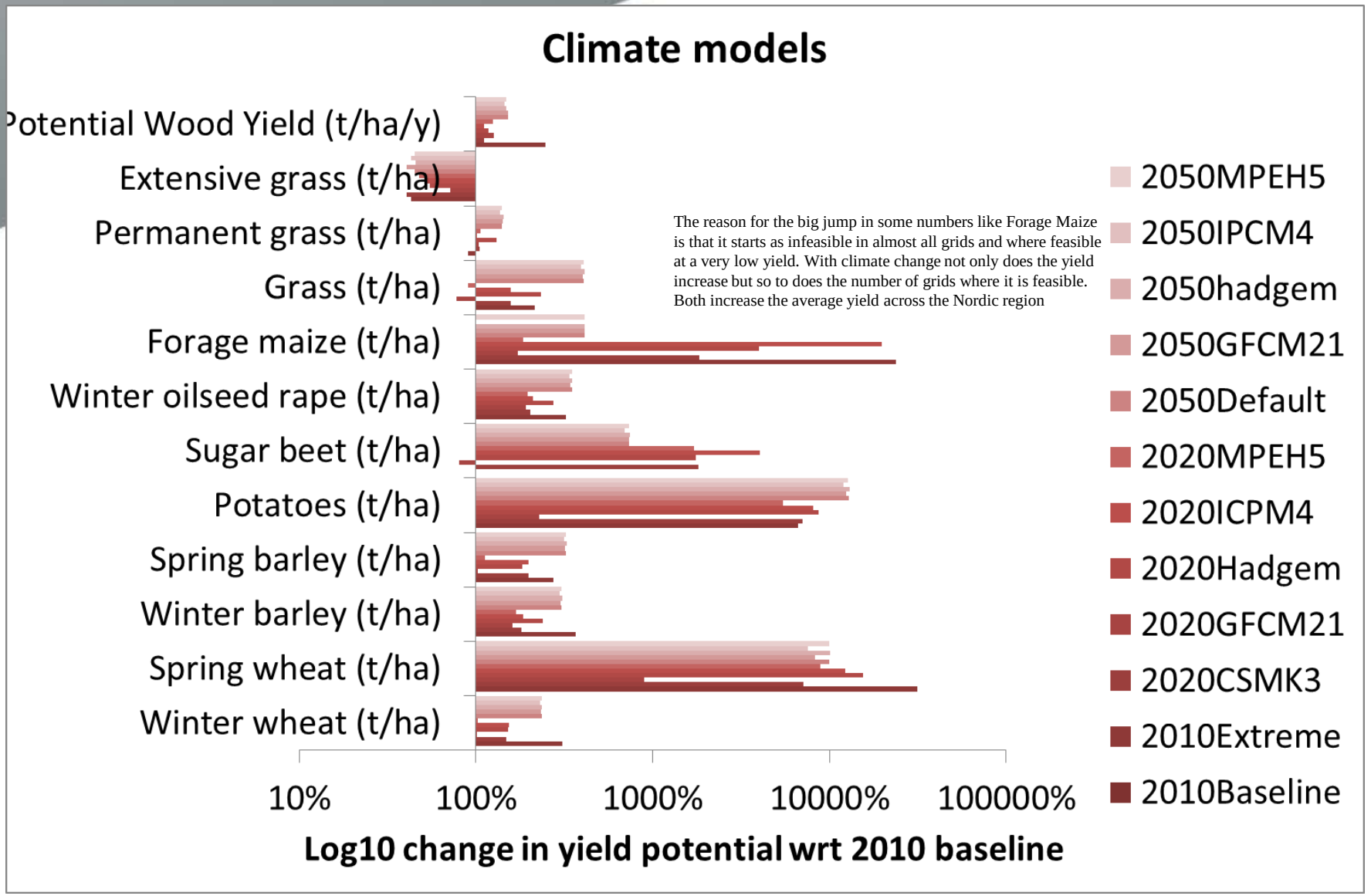
In all cases extensive grassland is worse off and this maybe due to poor species suitability or this soils that readily dry in hotter summers.
NB In the mountains there are no means of cultivating the land to change the grazing

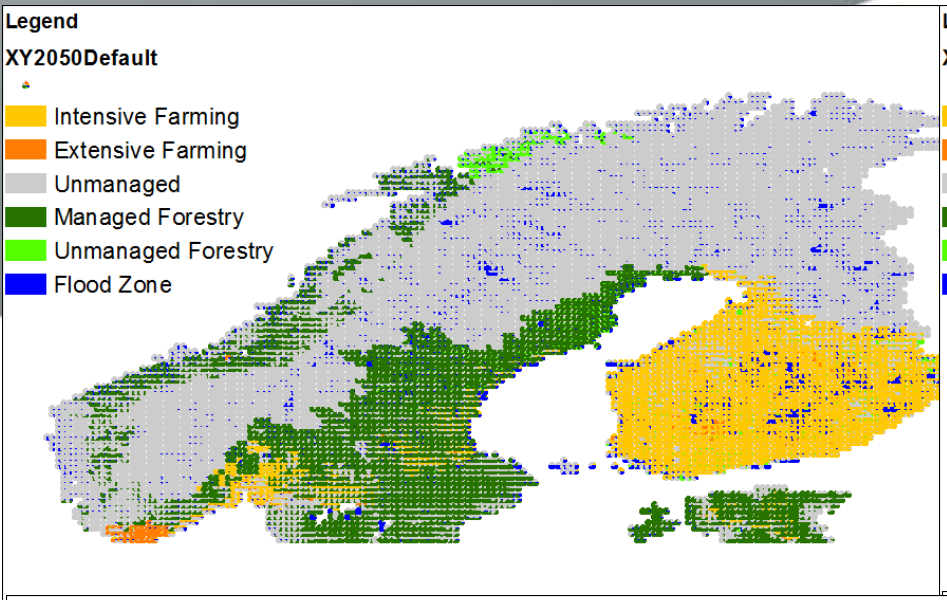


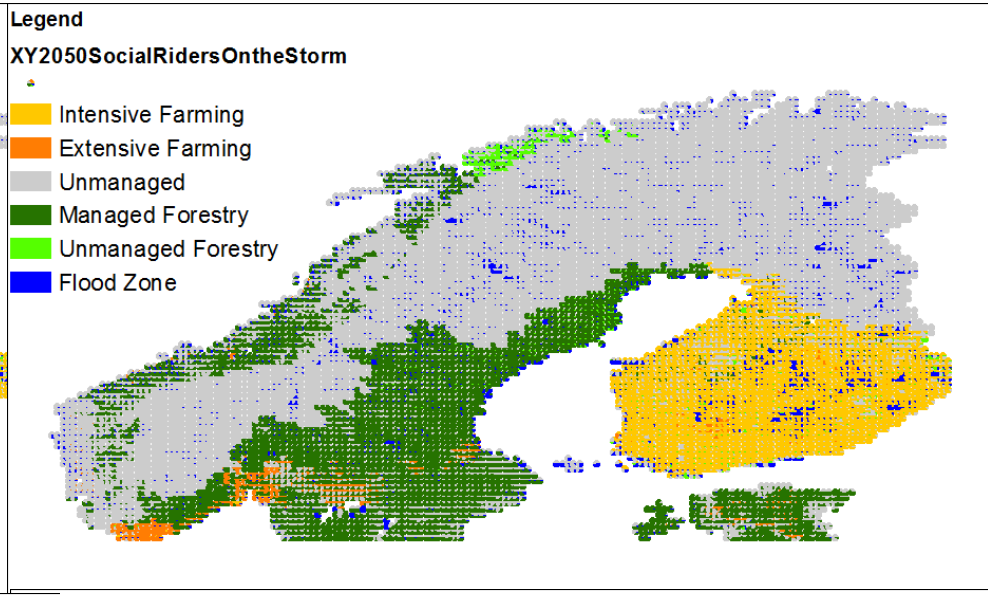
The reason for the big jump in some numbers like Forage Maize is that it starts as infeasible in almost all grids and where feasible at a very low yield. With climate change not only does the yield increase but so to does the number of grids where it is feasible. Both increase the average yield across the Nordic region

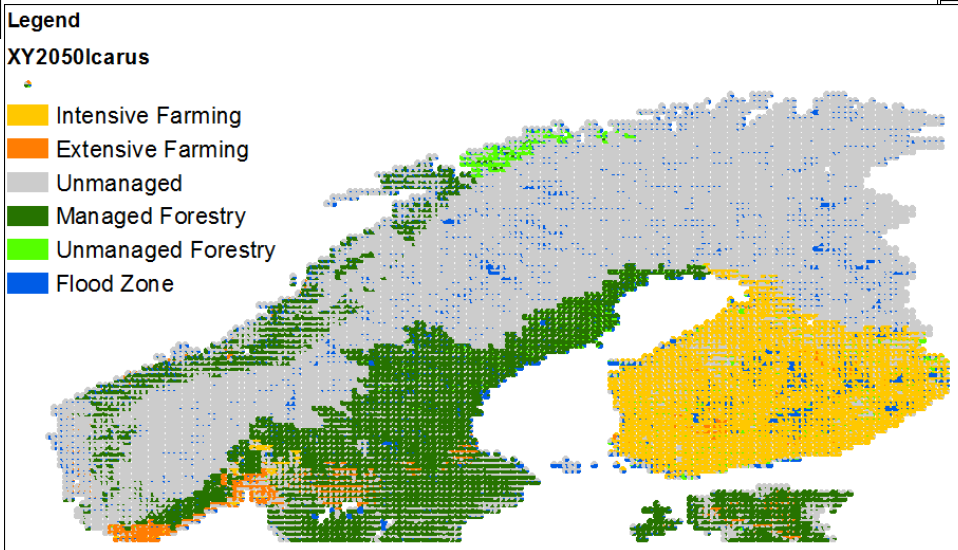
Socio economic scenarios

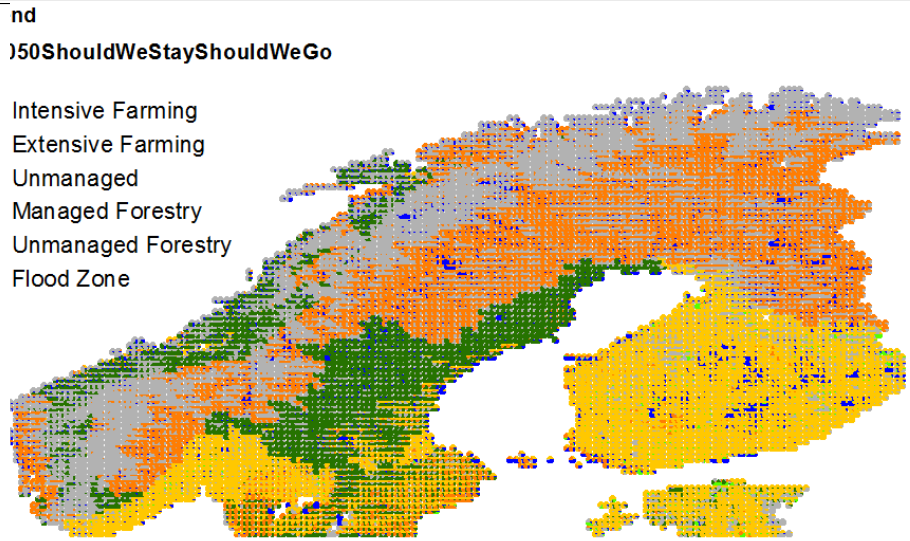
- **We are the world**= WatW (default)
- **Icarus** = Icarus
- **Should I Stay Should I Go** = SiSSiG
- **Riders on the Storm**= RotS
- **Baseline =** Base

Socio economic







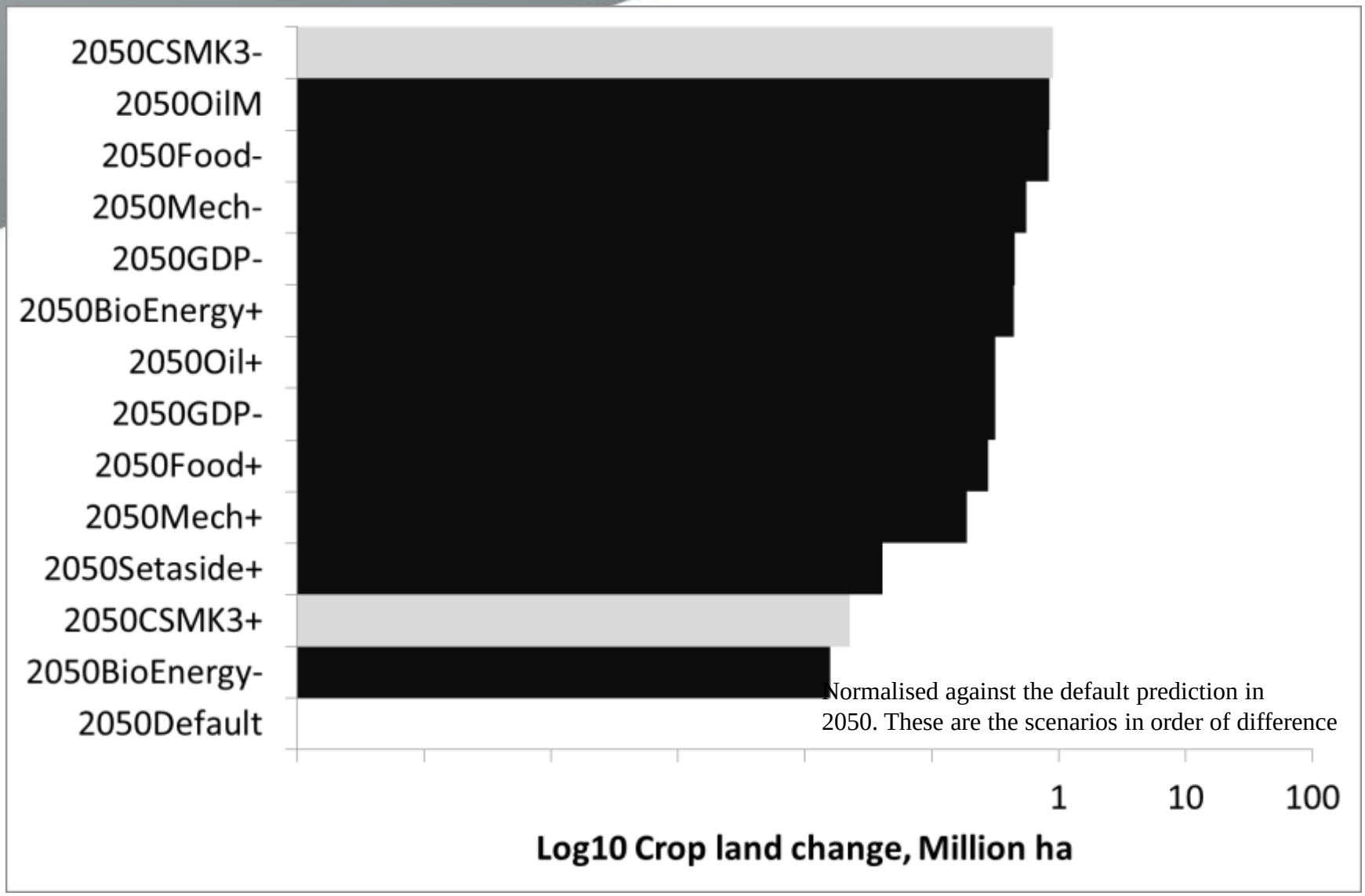


	Base	WatW	RotS	Icarus	SwSoSwG
Population Change	0	5	16	-9	23
GDP change	0	94	54	0	-36
Oil price change	100	73	210	210	163
Change in food imports	0	-13	-13	-6	-13
Change in bioenergy production	0	2	2	7	2
Change in agricultural yields	0	15	26	-9	-3
Change in demand for meat from ruminants	0	-21	-9	10	0
Change in demand for meat from non- ruminants	0	-21	-9	10	0
Change in agricultural mechanisation	0	44	77	10	5
Change in irrigation efficiency	0	26	58	-9	-21
Water savings due to techical change	0	29	45	-35	-60

Individual variables

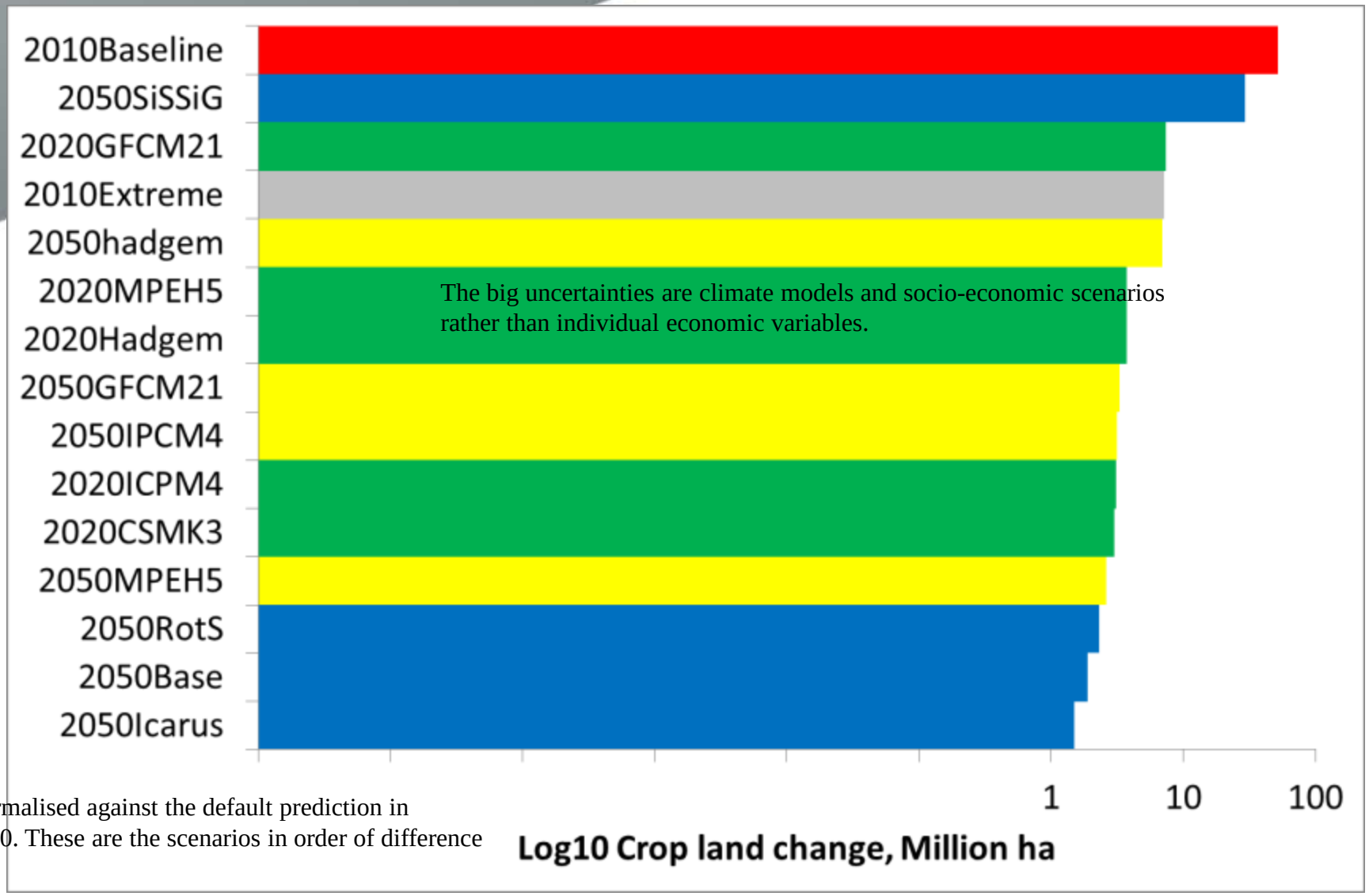
	-	default	+
GDP	+50%	+94%	+138%
Oil price	+48%	+73%	+97%
Bioenergy demand	+0.4%	+2%	+2.3%
Food imports	-19%	-13%	-9.6%
Climate sensitivity	Low	Middle	High
Mechanization	+23.3%	+44%	+76.7%
Conservation land		0%	3%

Rank order of cases



Normalised against the default prediction in 2050. These are the scenarios in order of difference

Continued



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Conclusions

- Extensive grassland is a vulnerable system and very soon
- There are increase opportunities for cash cropping in some places
- Socio-economic scenarios and Climate model uncertainty make a big difference
- Individual economic variables have a much smaller impact.

Feedback -10/12/2014

- The baseline predictions were doubted, but the general direction of change and vulnerability predicted was recognized.
- Norway is not part of the EU and Common Agricultural Policy and that needs to be considered:
  - 1) It is free to implement its own policies to protect its agricultural sectors and prevent production moving to elsewhere in Europe
  - 2) The data obtained in the baseline calibration were different and only available at the NUTS1 level (but we can do better with cooperation)

End

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OK **?**

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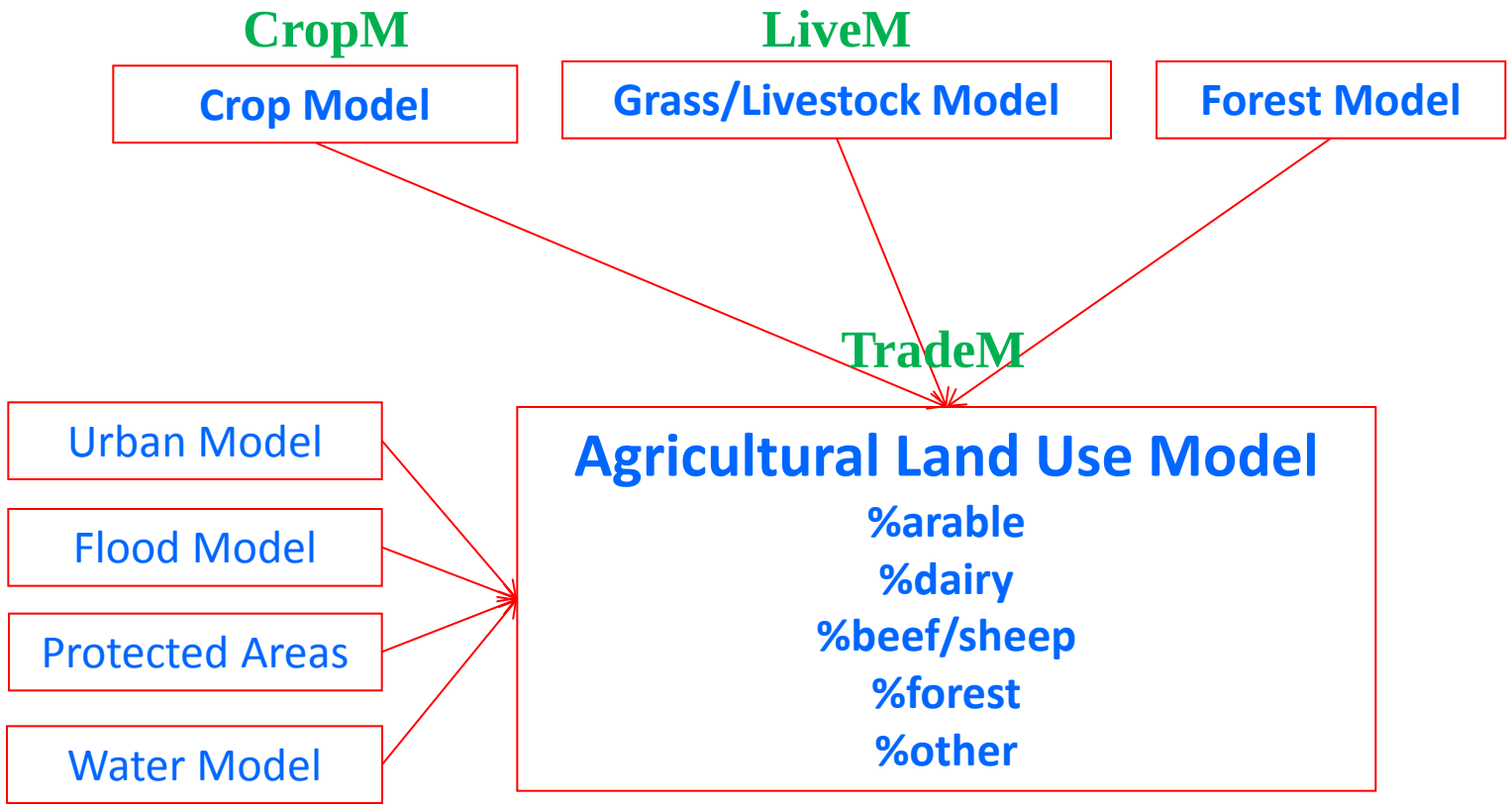

Have crop, livestock and trade models