

Defining National “Net Zero” Goals is Critical for Food and Land Use Policy

George Bishop^{a*}, Colm Duffy^{b*}, Rémi Prudhomme^c, Annette Cowie^{d, e}, Cathal O’Donoghue^f, Michelle Cain^g, Gary J. Lanigan^h, David Styles^a

^a Ryan Institute, University of Galway, Ireland

^b Ecological Sciences, The James Hutton Institute, Dundee, United Kingdom

^c CIRED, CIRAD, Montpellier, France

^d NSW Department of Primary Industries, Armidale, Australia

^e School of Environmental and Rural Science, University of New England, Armidale, Australia

^f University of Galway, Ireland

^g Cranfield Environment Centre, Cranfield University, Cranfield, UK

^h Environment, Soils and Land Use, Teagasc, Johnstown Castle, Co. Wexford, Ireland

* These authors contributed equally to this work

This Supplementary Material displays:

Figure S1 shows the relationship between adult dairy cow and suckler beef population for the 3000 non-abated scenarios which succeeded in their NZ definitions (S-NZ) within each different definition of NZ.

Figure S2 shows the relationship between milk output and new forest planted for the 3000 non-abated scenarios which succeeded in their NZ definition (S-NZ) within each different definition of NZ.

Figure S3 shows the GOBLIN model flow diagram.

Table S1 shows selected key inputs into the GOBLIN model, presenting value ranges of key variables from which each 3000 scenarios are randomised between for the year 2050.

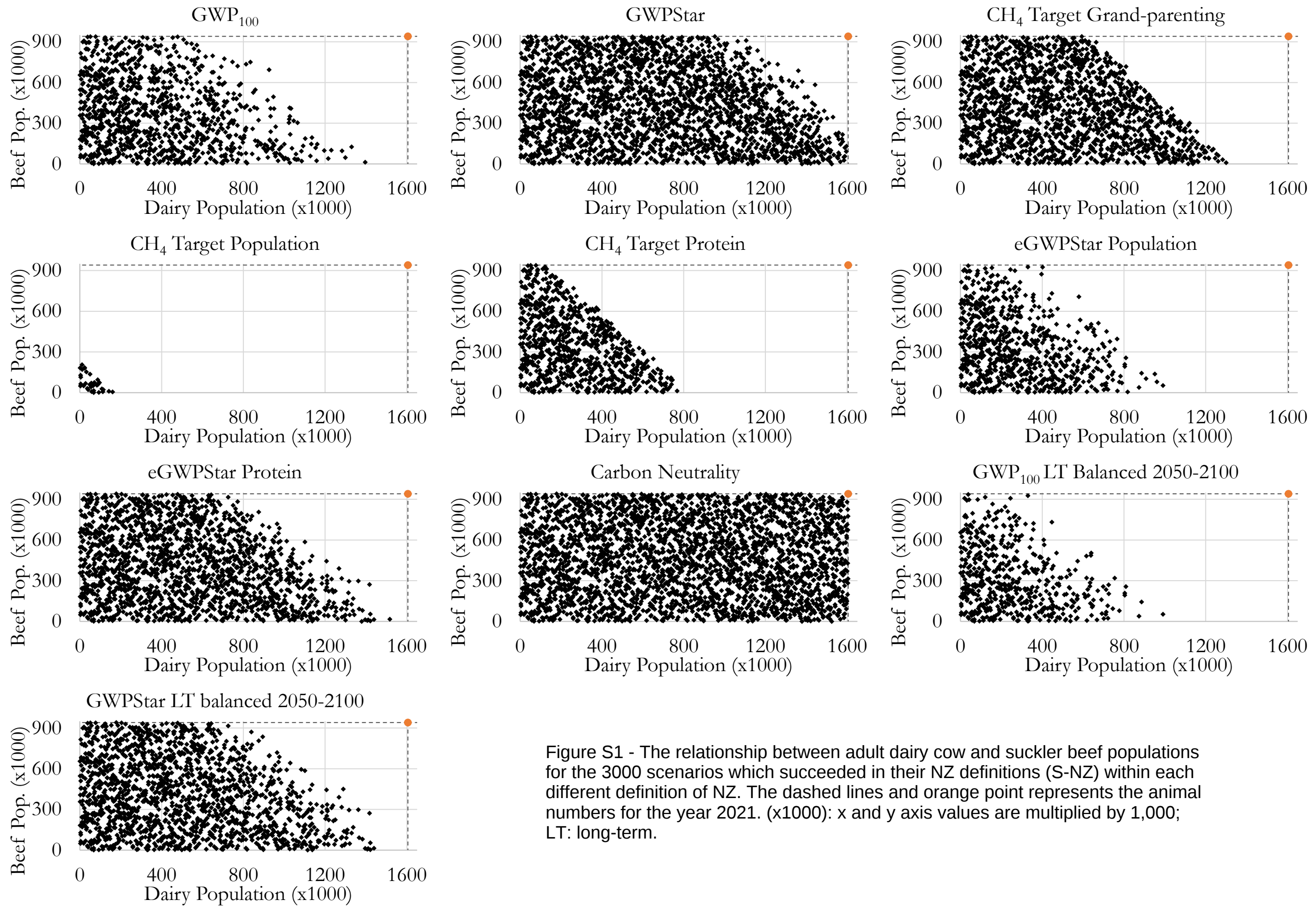


Figure S1 - The relationship between adult dairy cow and suckler beef populations for the 3000 scenarios which succeeded in their NZ definitions (S-NZ) within each different definition of NZ. The dashed lines and orange point represents the animal numbers for the year 2021. (x1000): x and y axis values are multiplied by 1,000; LT: long-term.

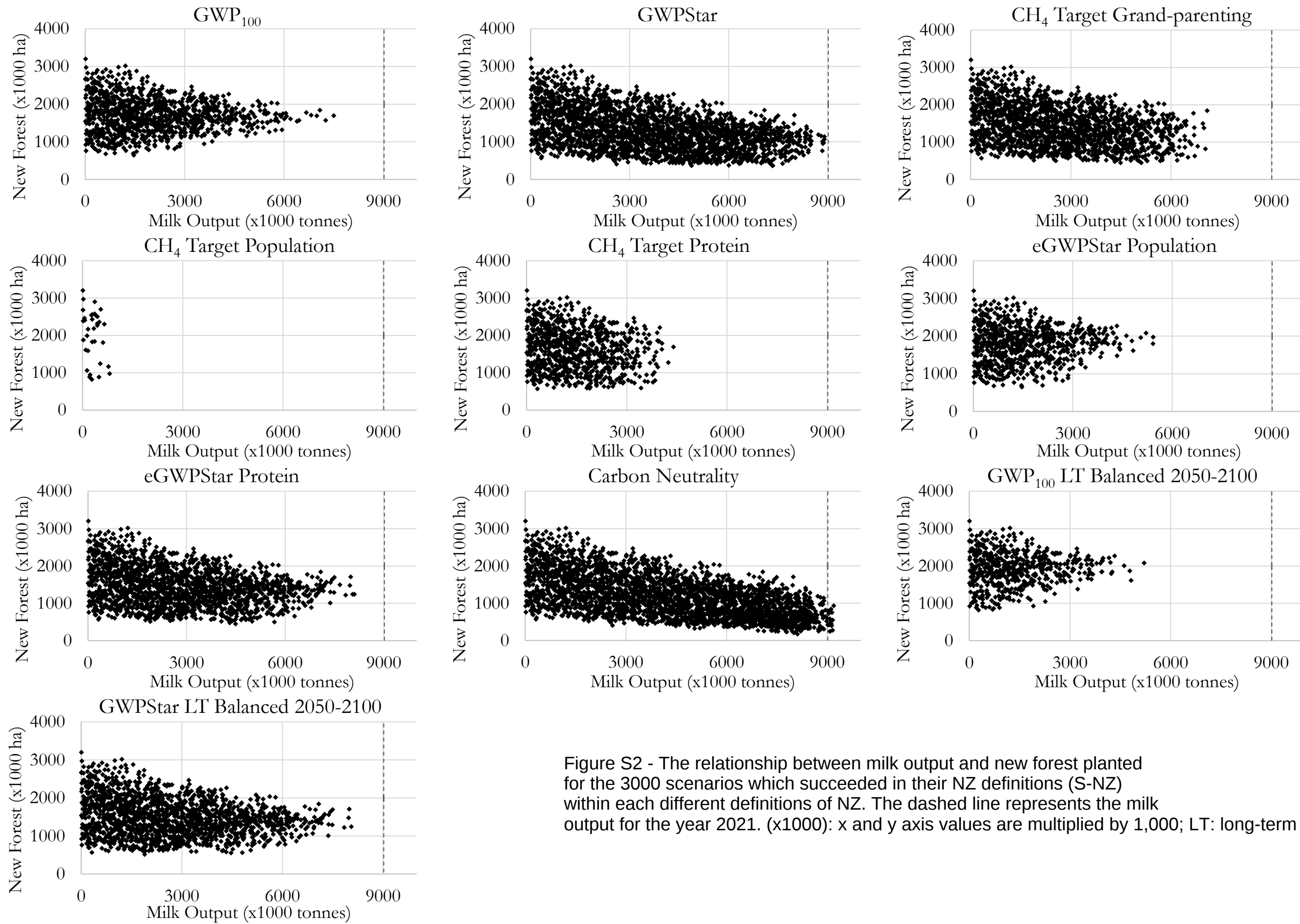


Figure S2 - The relationship between milk output and new forest planted for the 3000 scenarios which succeeded in their NZ definitions (S-NZ) within each different definitions of NZ. The dashed line represents the milk output for the year 2021. (x1000): x and y axis values are multiplied by 1,000; LT: long-term

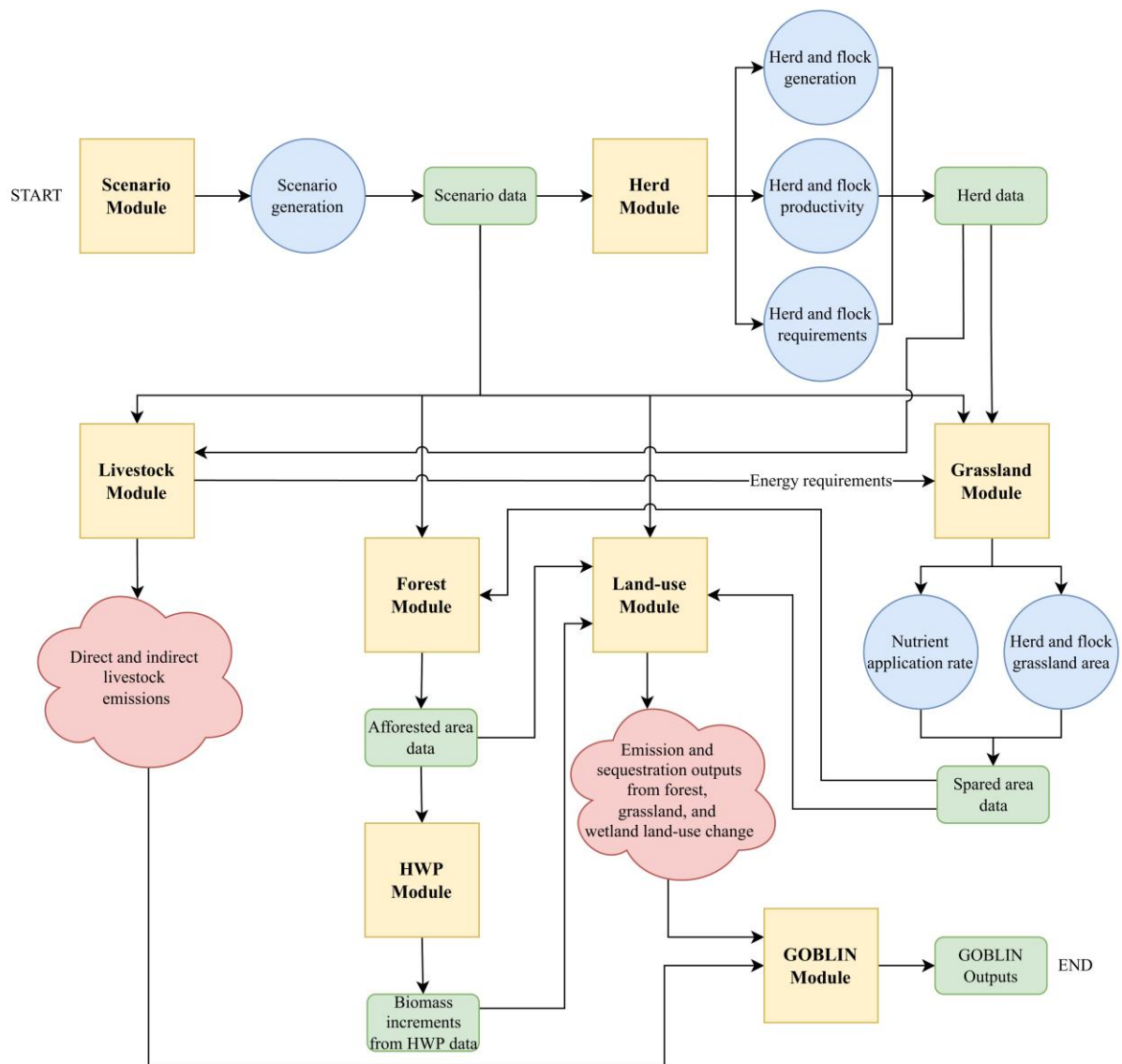


Figure S3 – GOBLIN model flow diagram. Arrows represent data flows, modules are represented by yellow squares, outputs are denoted by blue circles, green rectangles represent data stores, and red clouds correspond to greenhouse gas flows

Table S1 – Selected key inputs into the GOBLIN model, presenting value ranges of key variables from which each 3000 scenarios are randomised between for the year 2050

Parameter	Definition	Scenario Value Range	
		Min	Max
Livestock Population	Milking cow numbers	1	1,604,500
	Suckler cow numbers	1	940,300
	Lowland ewe numbers	1	2,252,320
	Upland ewe numbers	1	563,080
Productivity	Milk output head ⁻¹	13.8 kg d ⁻¹	15.9 kg d ⁻¹
	Heifer weight head ⁻¹ (1 year)	276 kg	322 kg
	Heifer weight head ⁻¹ (2 years)	431 kg	504 kg
Grassland Area	Area of grassland to support national herd and flock	Deduced	
Cropland Area	Area under crop	361.6 k ha	
New Wetland area	Area of available drained organic soil to be rewetted	20%	100%
Grassland Utilisation	The proportion of grass production consumed by livestock via grazing and feeding on conserved grasses (silage and hay)	67%	80%
New Afforested Area	The proportion of spared grassland area on mineral soils that will be utilised for forest	20%	80%
Proportion Broadleaf	Proportion of new forest area that is under broadleaf (vs conifer)	30%	70%
Proportion Conifer	Proportion of new forest area that is under conifer (vs broadleaf)	30%	70%
Proportion Conifer Harvested	Proportion of conifer area that is harvested	50%	90%
Proportion Conifer Thinned	The proportion of harvested conifer area that is thinned	50%	