SCIENCE FORUM 2018

CGIAR

Independent Science and Partnership Council

STELLENBOSCH, SOUTH AFRICA
10 - 12 OCTOBER, 2018

Win more, lose less:

Capturing synergies between SDGs through agricultural research

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Livestock, land and the environmental limits of animal source-food consumption

Mario Herrero, Daniel Mason-D'Croz, Cecile Godde, Jeda Palmer, Philip Thornton, Maggie Gill

CSIRO / CCAFS-ILRI / U. Aberdeen

The demand for livestock products 1990 - 2015

	Fish, Seafood	Milk - Excluding Butter	Eggs	Meat	Bovine Meat	Mutton & Goat Meat	Pigmeat	Poultry Meat
Europe	4.5	25.2	0.6	1.8	-8.8	-1.4	0.8	10.6
Northern Africa	8.7	47.8	1.3	12.2	3.3	1.9	0.0	6.5
Western Africa	6.8	6.6	0.3	2.8	0.2	1.2	0.4	1.6
Eastern Africa	-0.9	17.3	-0.1	0.5	-0.2	-0.1	0.4	0.4
Middle Africa	3.6	-5.5	0.4	8.4	-1.1	0.4	2.2	7.2
Southern Africa	-1.9	8.4	3.3	23.2	-1.2	-1.1	2.4	22.3
Eastern Asia	19.0	29.7	11.2	35.7	3.9	2.2	18.2	10.4
China	24.1	35.6	13.0	38.8	4.6	2.6	19.5	11.1
Central Asia	0.7	44.1	2.2	9.2	1.7	-0.5	2.0	5.4
Southern Asia	3.0	34.8	1.4	1.4	-0.5	-0.5	-0.2	2.6
India	2.0	35.3	1.6	0.2	-1.2	-0.1	-0.2	1.7
South-Eastern Asia	17.0	7.6	2.5	16.6	1.3	0.2	7.5	7.6
Western Asia	2.0	7.4	0.9	16.1	2.2	-1.4	0.1	15.4
Americas	0.9	12.3	2.9	19.2	-0.8	-0.2	1.5	18.6
United States of America	0.5	-3.6	1.1	5.8	-5.8	-0.3	-1.6	13.4
South America	2.0	33.4	2.7	31.2	3.8	-0.3	3.9	23.9
Brazil	4.7	57.0	1.1	44.0	11.8	-0.2	4.2	28.1
Oceania	8.2	-30.6	-2.1	7.6	-6.6	-13.5	6.5	22.4
Australia	9.1	-17.4	-1.5	6.9	-6.5	-13.9	6.2	23.0
World	7.0	18.9	3.1	11.3	-0.6	0.2	3.3	8.1

Change in kg/person/year between 1990-2015

-60.0 60.0

The demand for livestock products 1990 - 2015

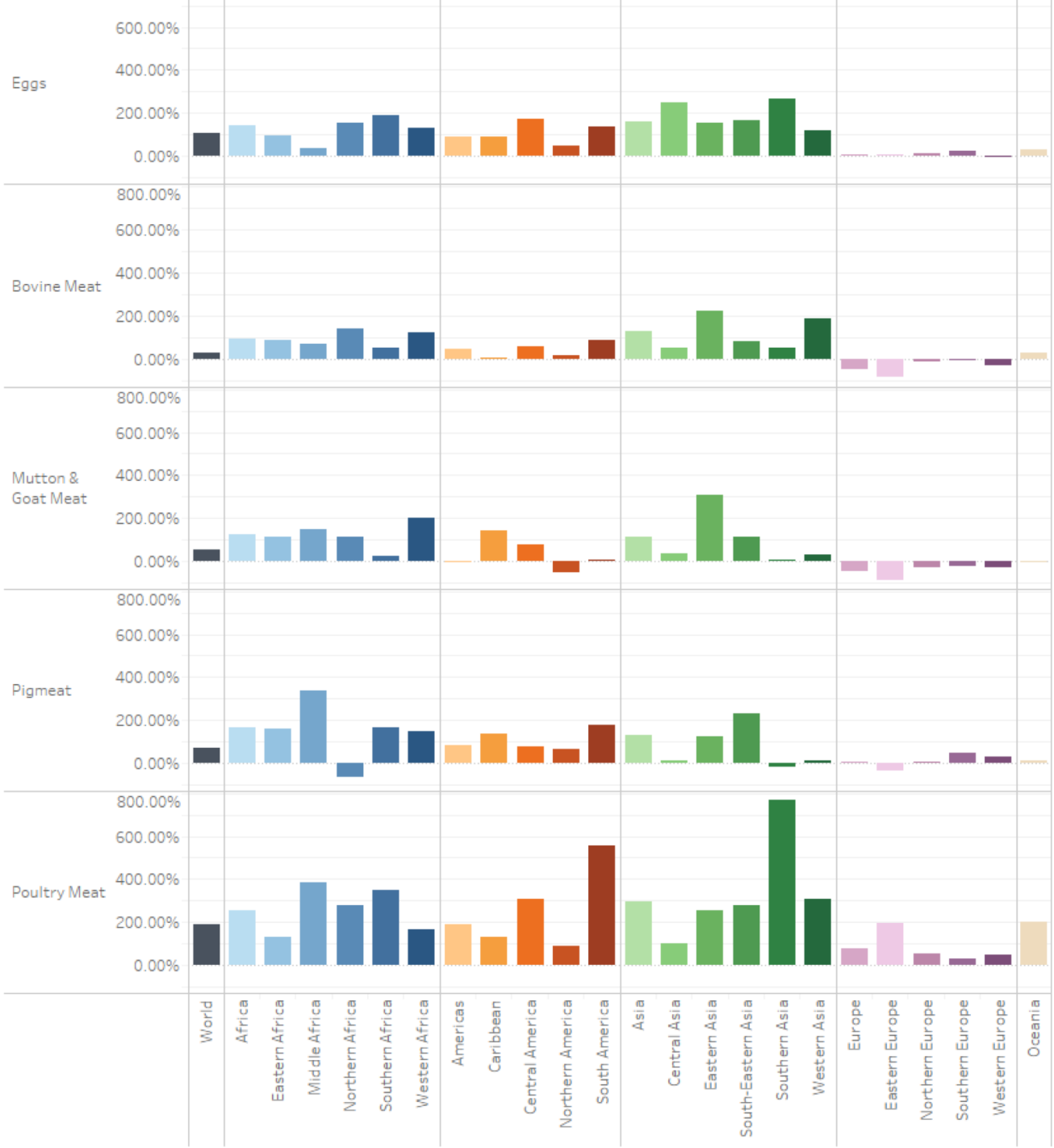
3 storylines of per capita demand:

Pork, and poultry especially, growing at an accelerated pace everywhere, but mostly in the developing world

Dairy growing in low and middle income countries, stagnating in OECD

Red meats stagnating everywhere

Supply dynamics 1990-2015



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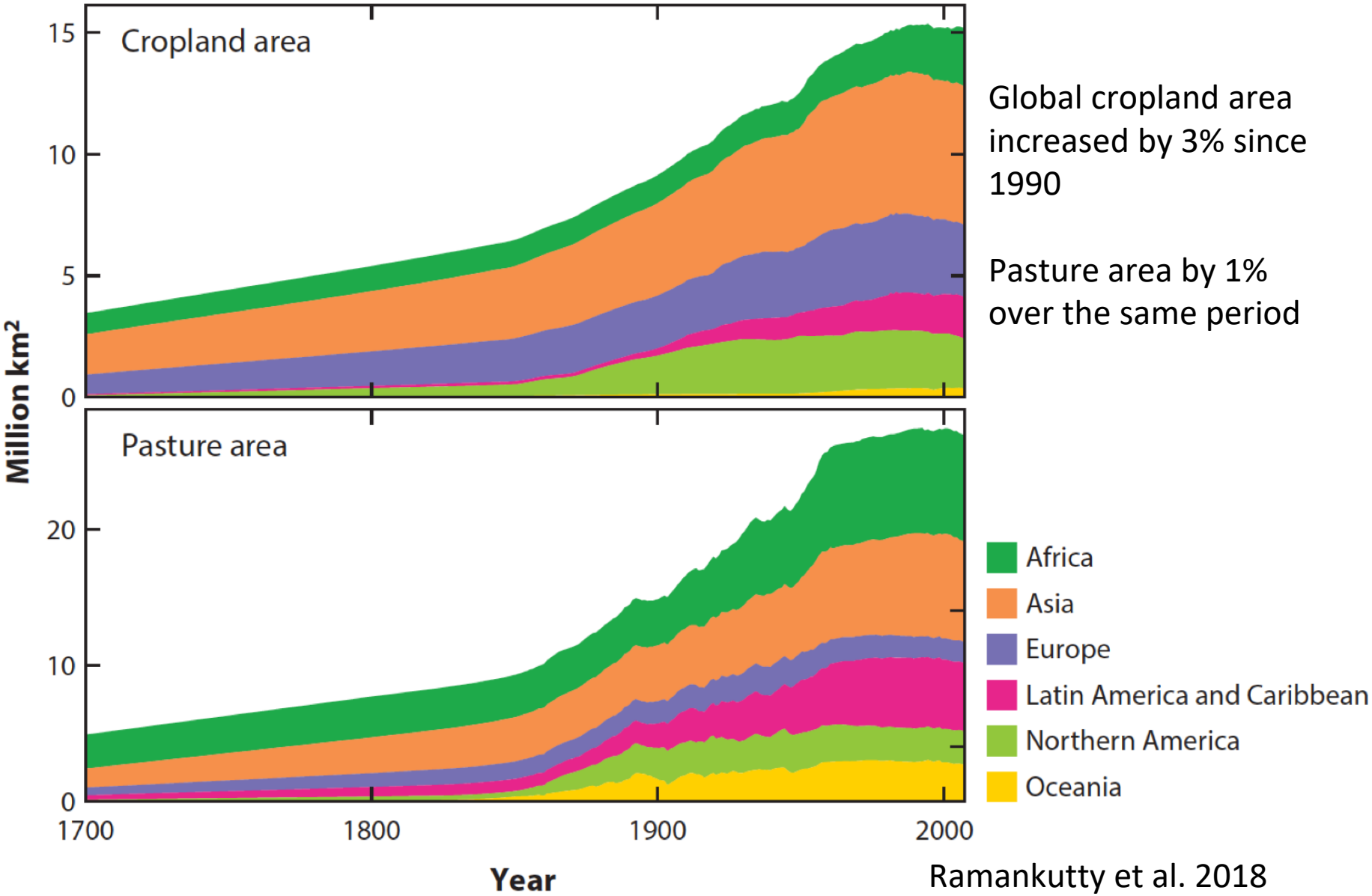
Land use dynamics



Global cropland area increased by 3% since 1990

Pasture area by 1% over the same period

Ramankutty et al. 2018

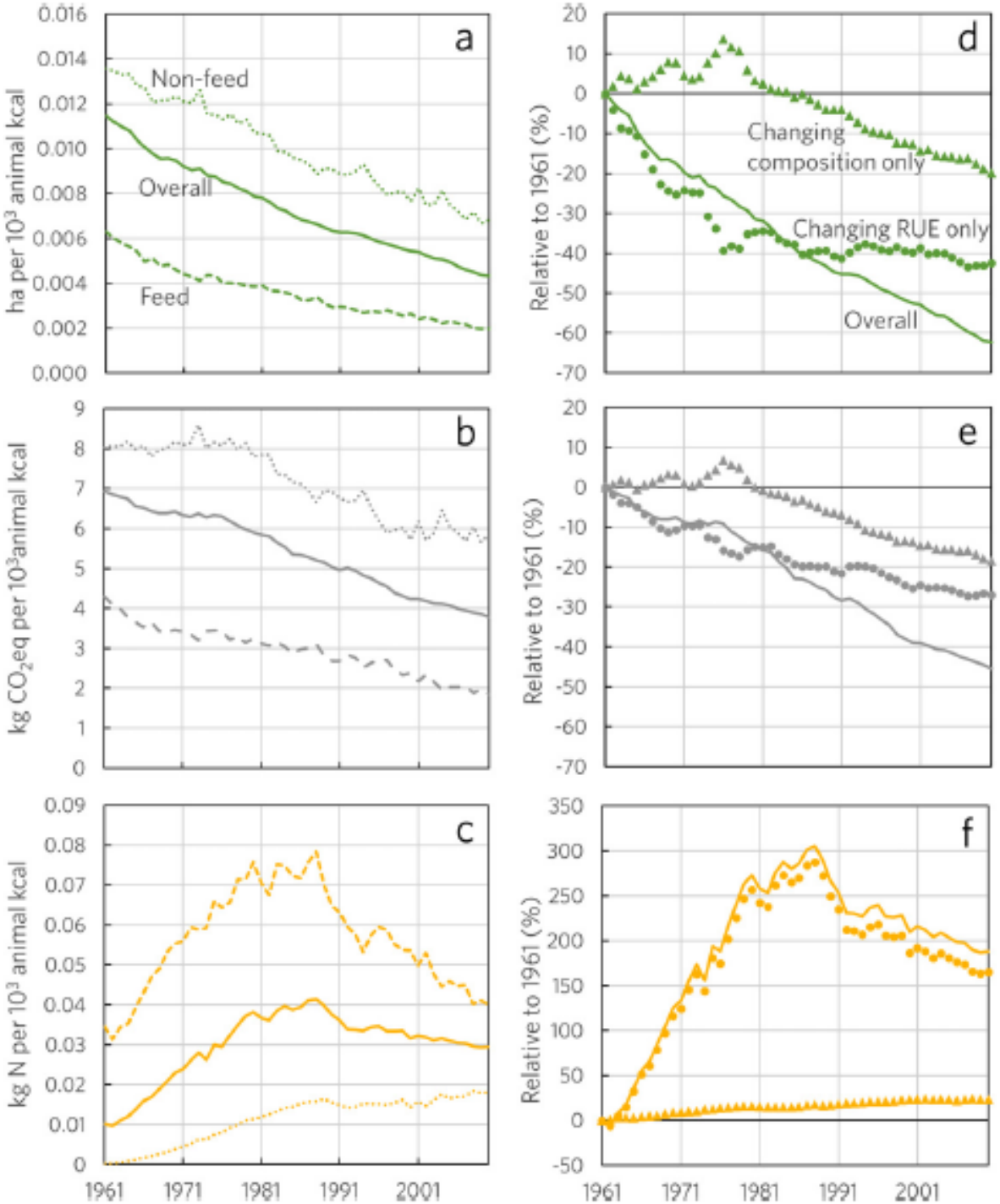
The environmental efficiency of livestock has been improving…

62% less land to produce 1 kcal of livestock

45% less GHG

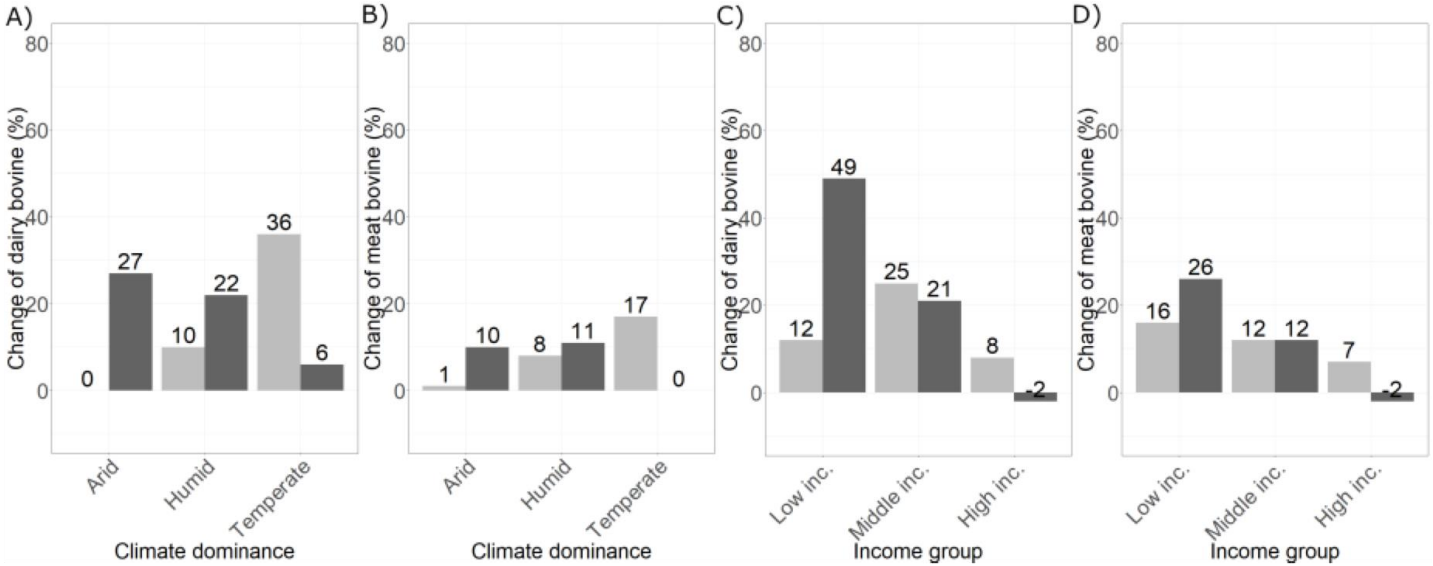
…but we have traded lower land use and emissions for increased N use

188% increase in N use

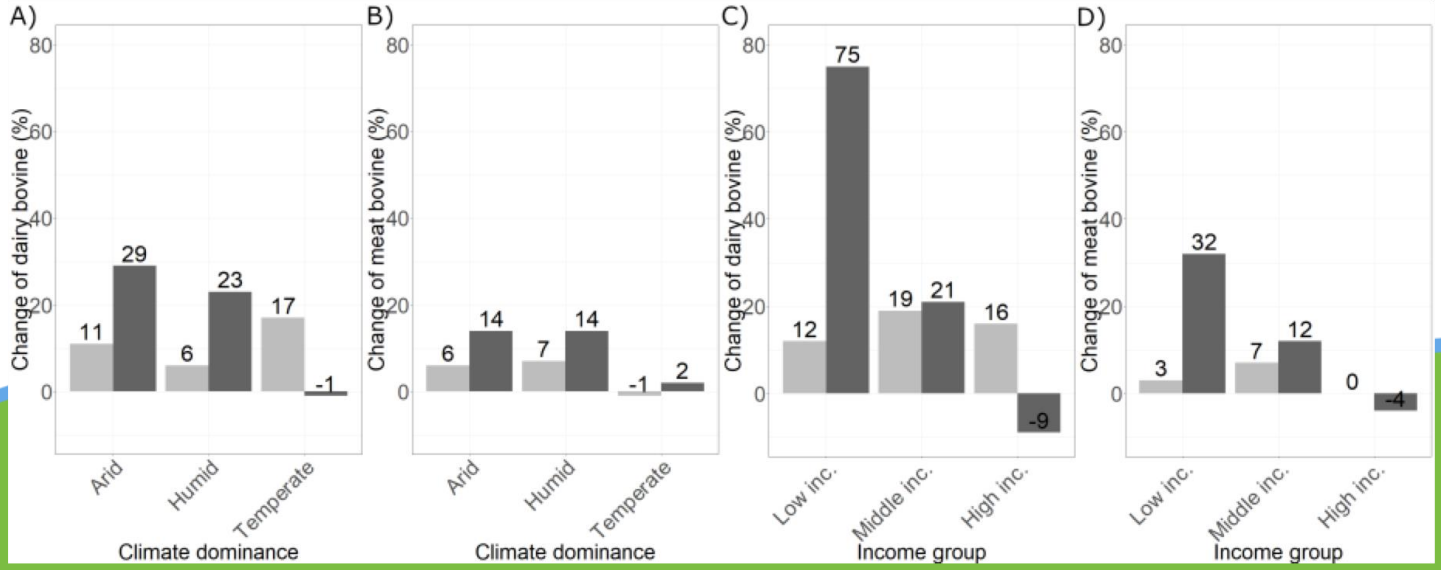


Davis et al. (2015) ERL

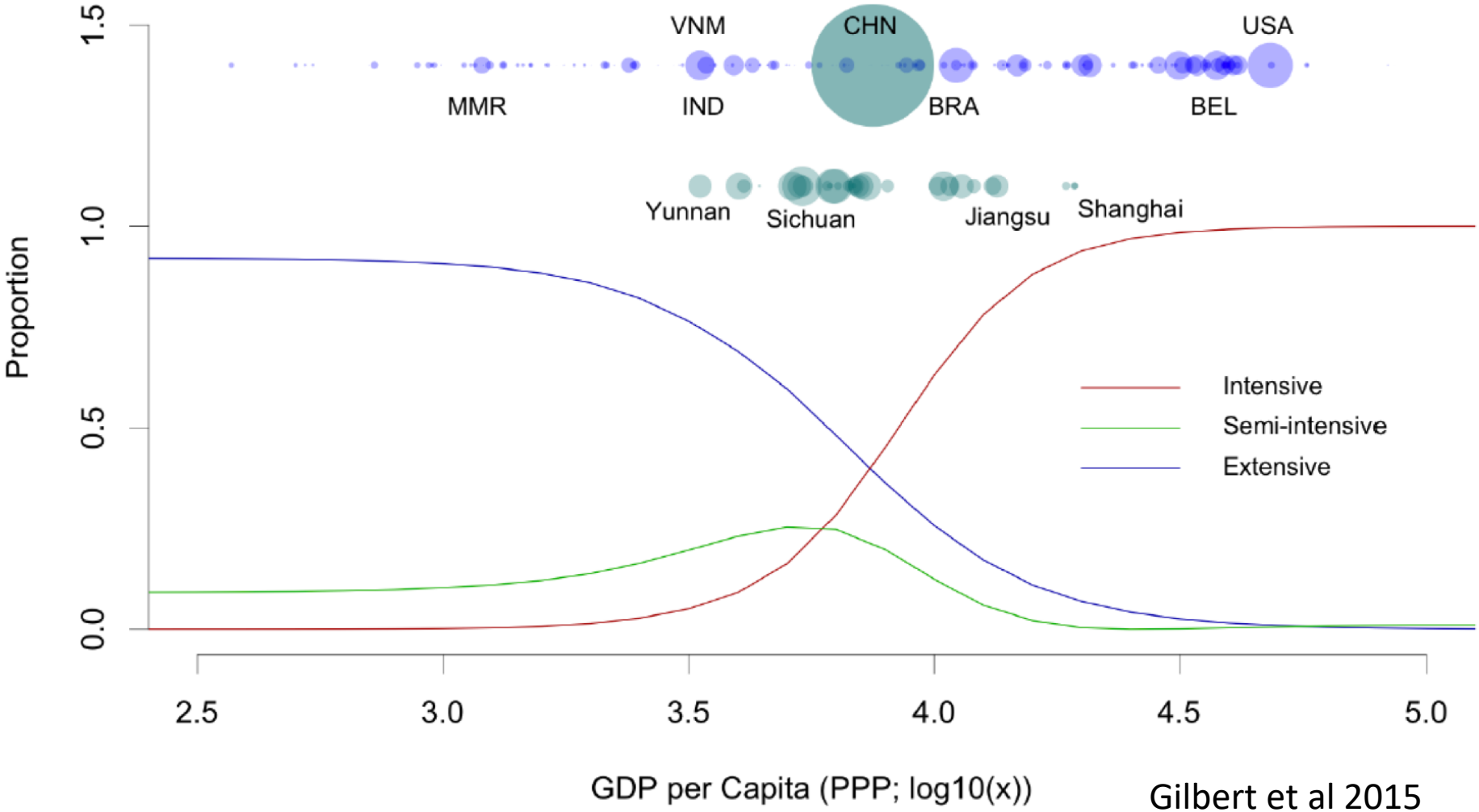
Production growth in ruminant meat and milk still driven largely by growth in animal numbers, with a few exceptions



2) Mixed crop-livestock systems

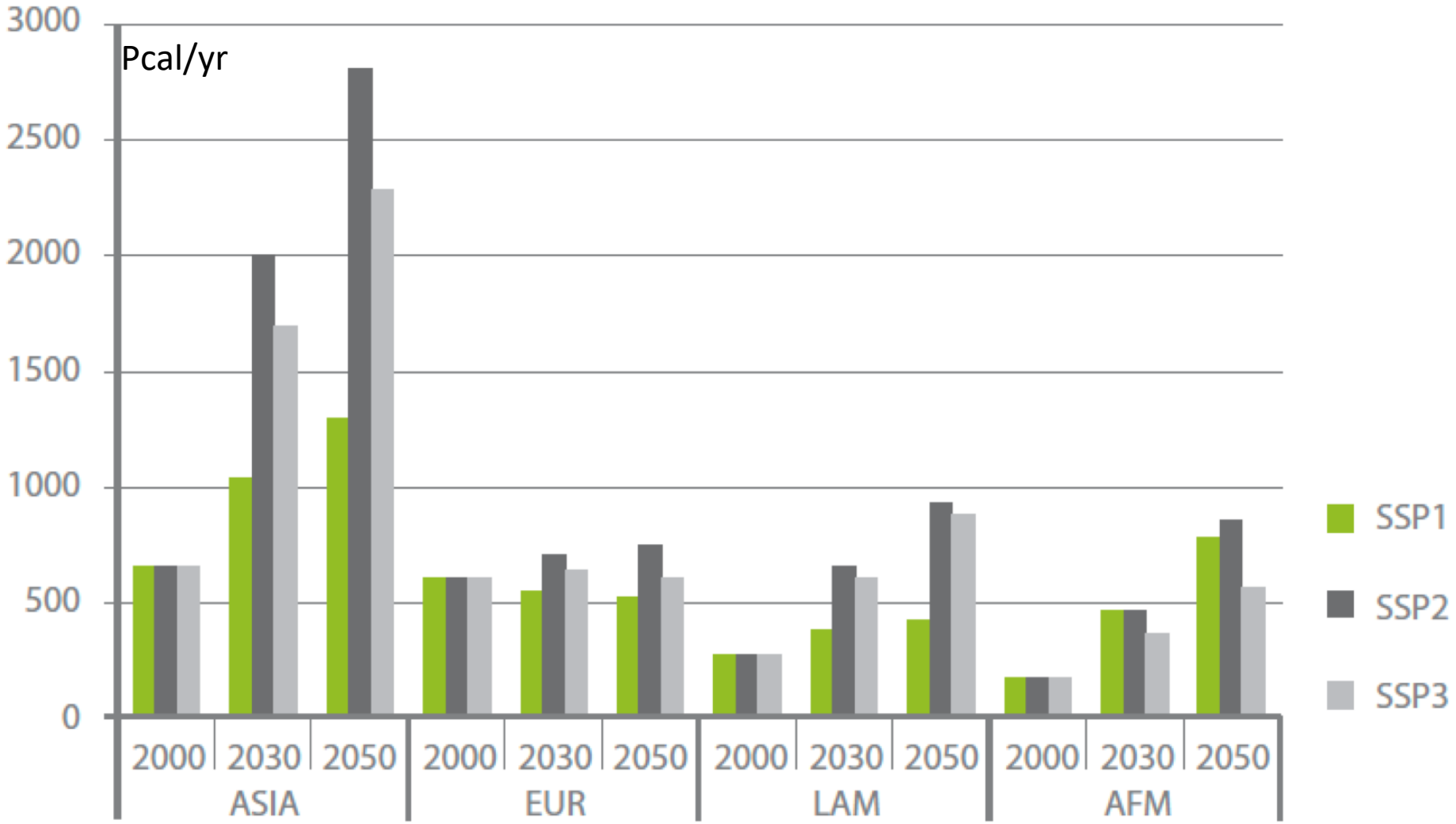


Will there be a role for smallholders?
Temporarily for poultry and pork producers



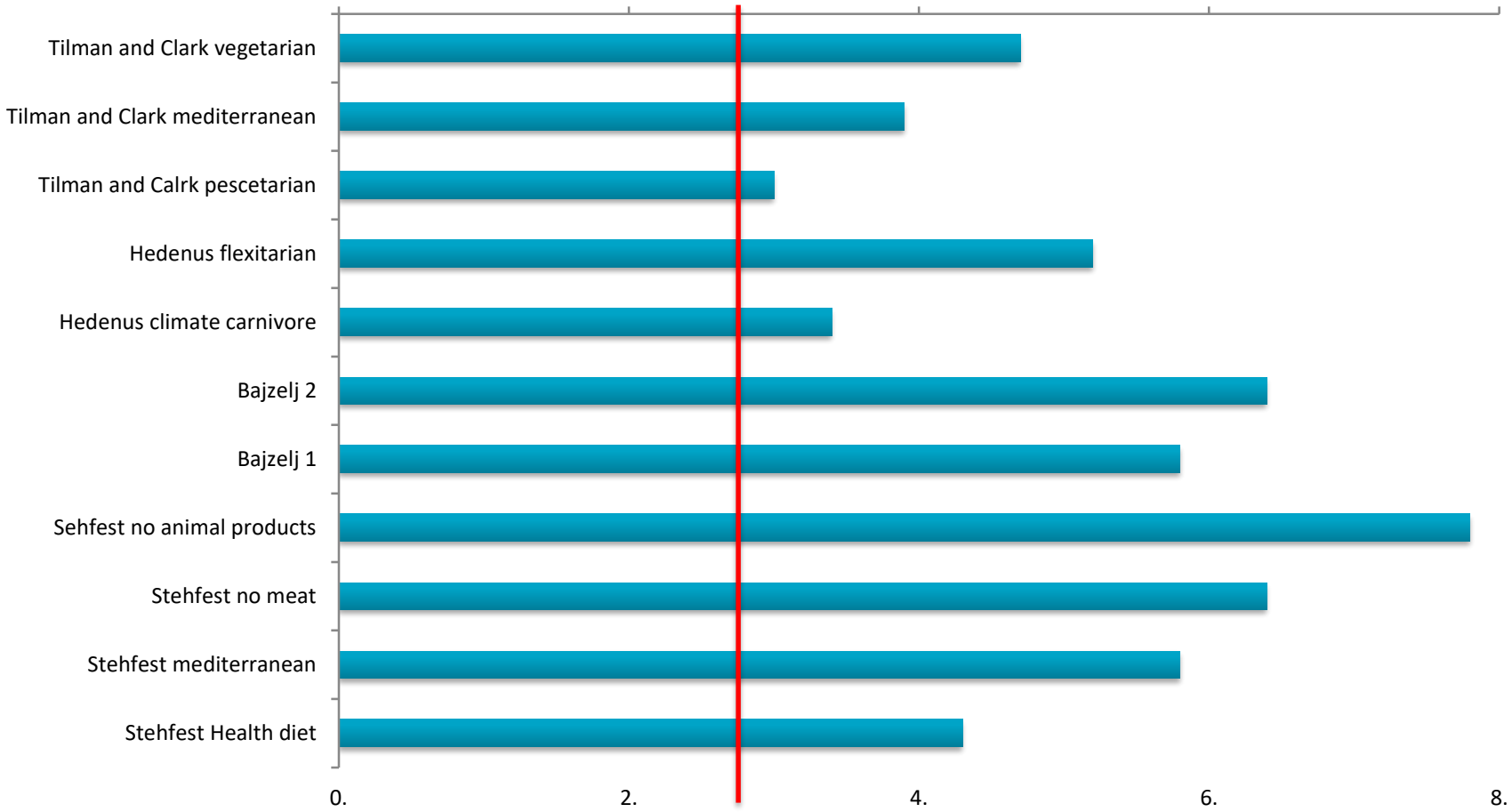
Gilbert et al 2015

Scary feed projections
Grain as food to double, but as feed to QUADRUPLE



Herrero et al. 2014

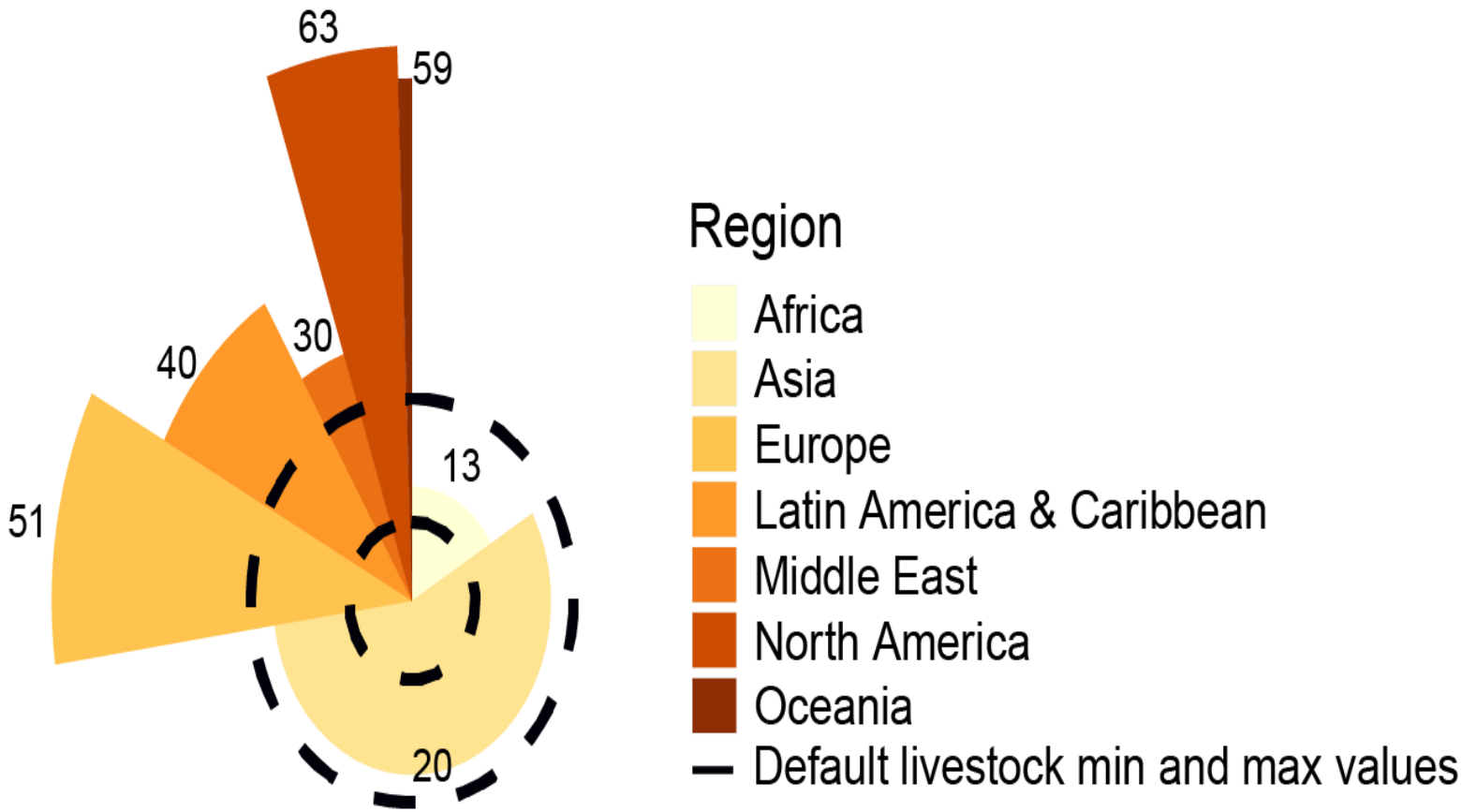
What if the livestock sector had to contribute significantly to mitigation targets?



Technical potential of supply side measures

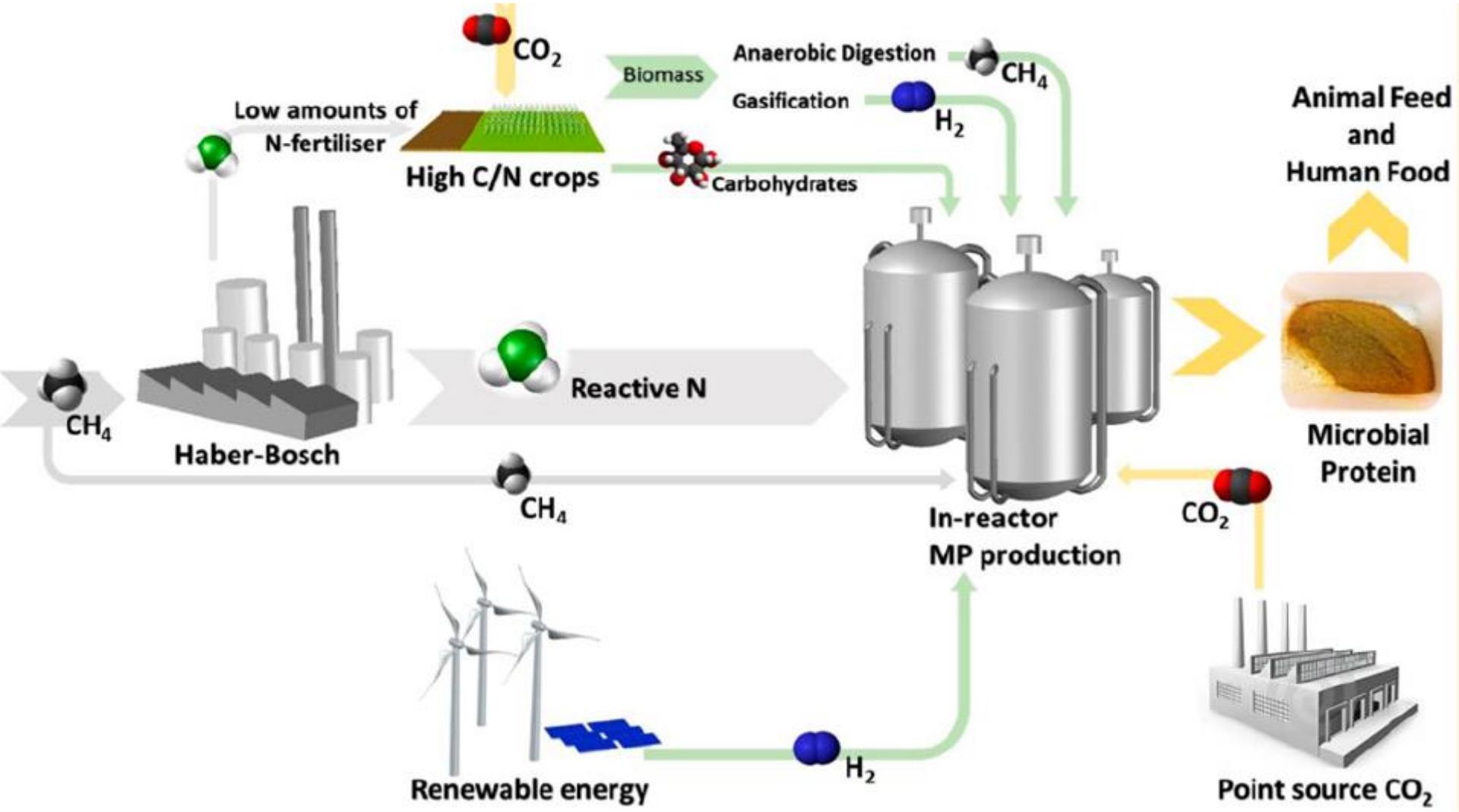
Herrero et al 2016

Decoupling livestock from land through a circular economy



Van Zanten et al. 2018 Global Change Biology

Trasformational options:
Turning waste into high quality feed



Pikaar et al. 2017 Env Sci Tech

RESEARCH Open Access

New feed sources key to ambitious climate targets

Brian J. Walsh[1*], Felicjan Rydzak[1], Amanda Palazzo[1], Florian Kraxner[1], Mario Herrero[2], Peer M. Schenk[3], Philippe Ciais[4], Ivan A. Janssens[5], Josep Peñuelas[6,7], Anneliese Niederl-Schmidinger[1] and Michael Obersteiner[1]

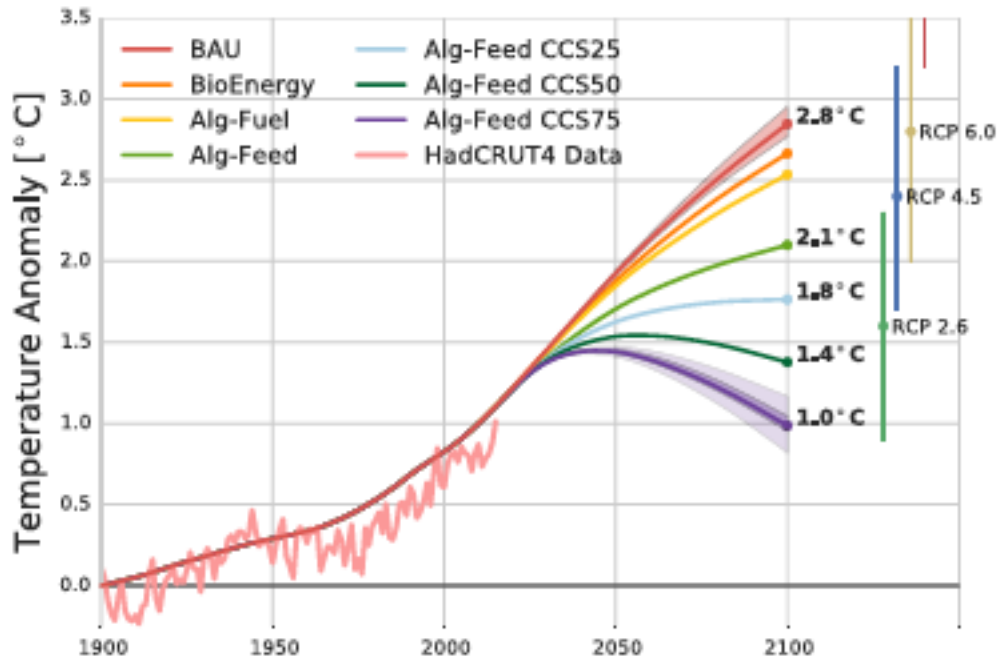


Fig. 4 Global observed average temperature change relative to preindustrial levels. *Dark shaded* ranges show the effects of population growth on temperature change in the *BAU* and *Alg-Feed+CCS* scenarios. The *lighter-shaded* regions display the sensitivity of *BAU* results to alternative RCP scenarios and of *Alg-Feed* results to the

Use of algae for energy and feed could reduce emissions to meet the 2 C degree climate target

Walsh et al. CBM 2015

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