

Global data, farm size and food and nutrition security

Mario Herrero


West Iowa, USA
Google Earth
Source: Google Earth

France

Source: Google Earth

Northern India

Source: Google Earth

Motivation

1. Shifts in the global research agenda on food security

2. Donors asking us always to provide them with data on the importance of smallholders in food production and nutrition

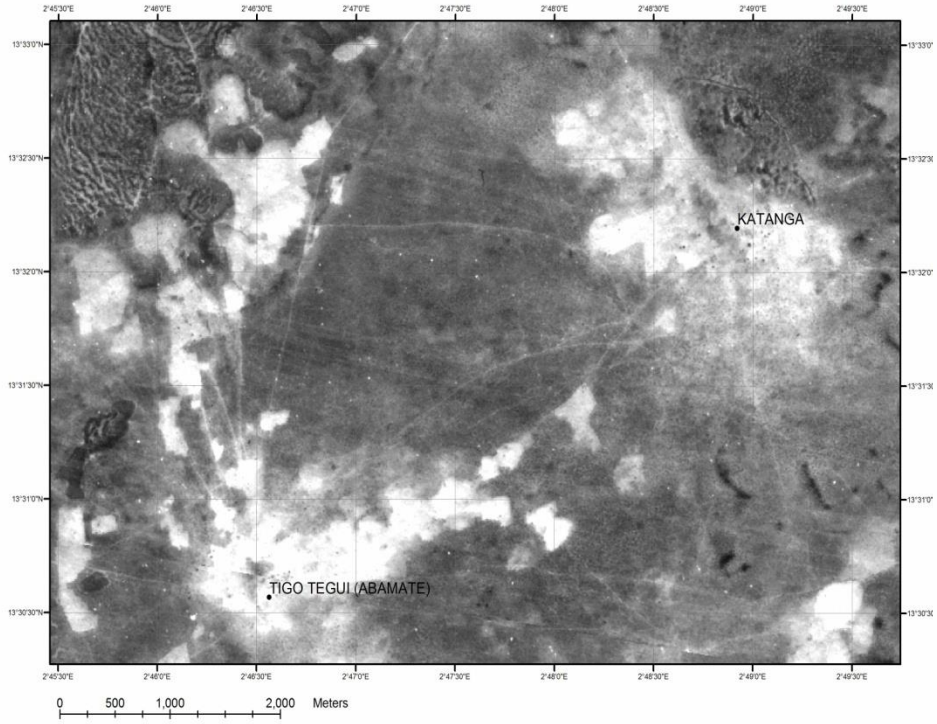
3. SDGs

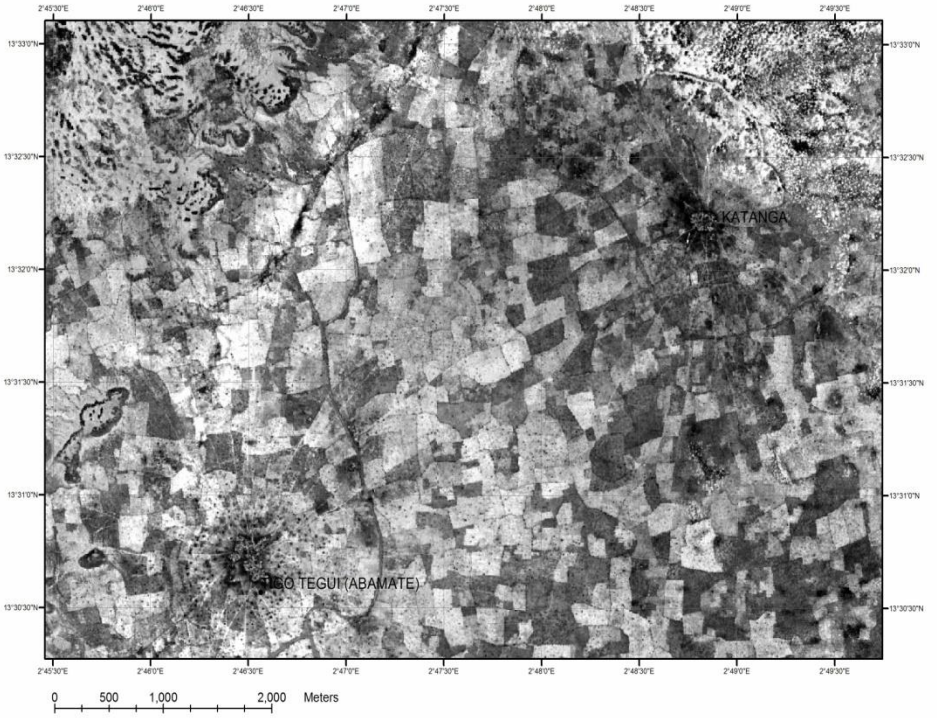
4. The need to incorporate structure of production in global integrated assessments (big farms vs small farms / diversity etc)

5. Promoting better linkages between agriculture, nutrition and health

What role for smallholders in the future?
Systems and livelihoods in transition: the target is moving!

W. Africa 1966 – pastoral system → 2004 – crop-livestock system





Herrero et al 2009

Smallholder systems can become even more important as the agenda moves towards nutritional security

Moving the agenda beyond kilocalories

Nutritional diversity is key to sustainable, nutritious diets and sustainable, profitable ecosystems

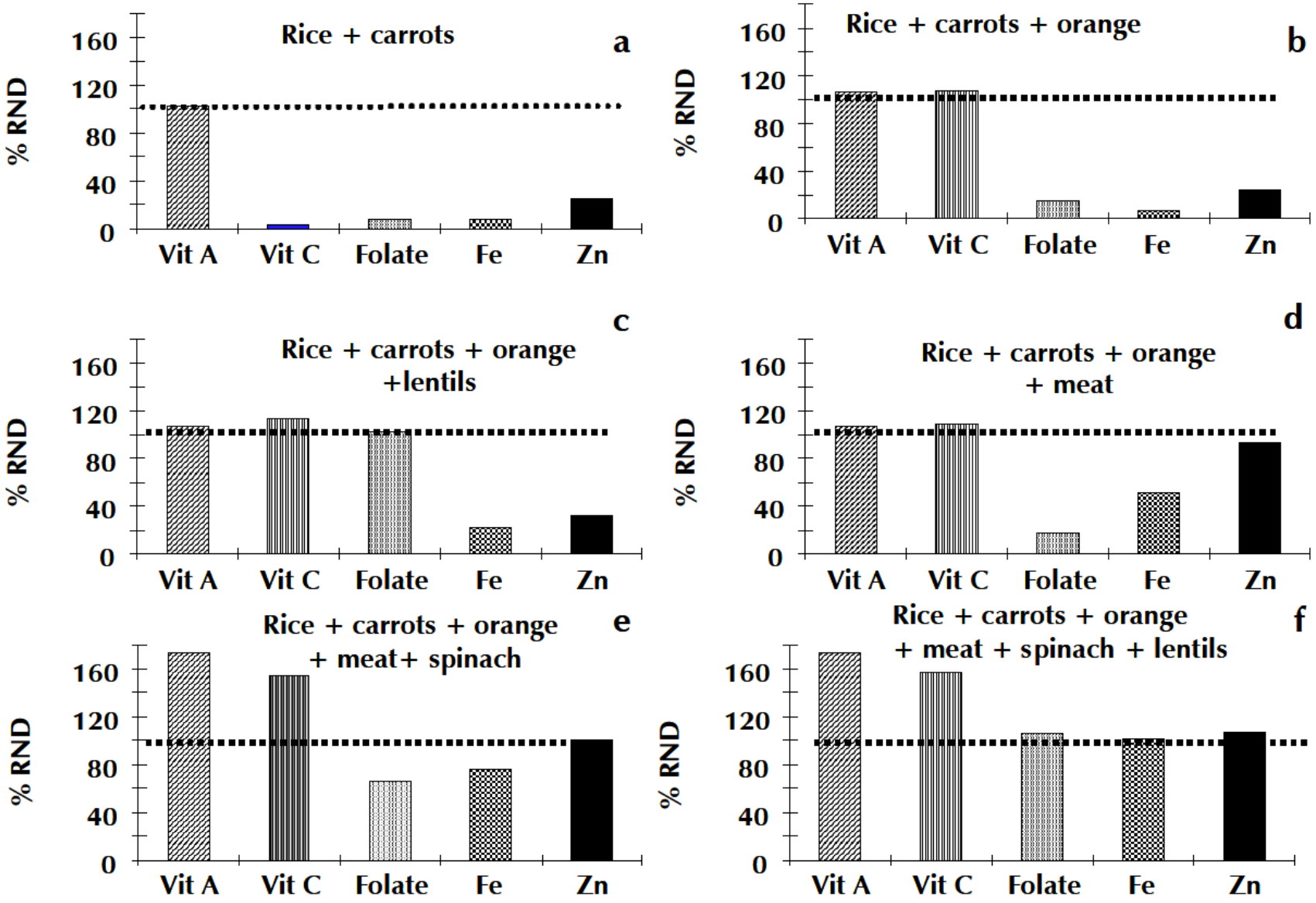
Projections of global food demand to 2050

	2005/2007	2050
Population (millions)	6584	9306
Cereals for food (kg per capita)	158	160
Cereals for all uses (kg per capita)	314	330
Meat consumption (kg per capita)	38.7	49.4
Oil crops for food (kg per capita)	12.1	16.2
Oil crops for all uses (kg per capita)	21.9	30.5
Meat production (million tonnes)	258	455
Cereal yields, rice paddy (t/ha)	3.32	4.30
Arable land area (million ha)	1592	1661

Projected consumption per capita: Cereals stable, meats and oils increasing

Alexandratos and Bruinsma 2012

Nutritional diversity matters



Rosenbum et al 2013

Using nutrition as a driver for shaping the supply response in agriculture

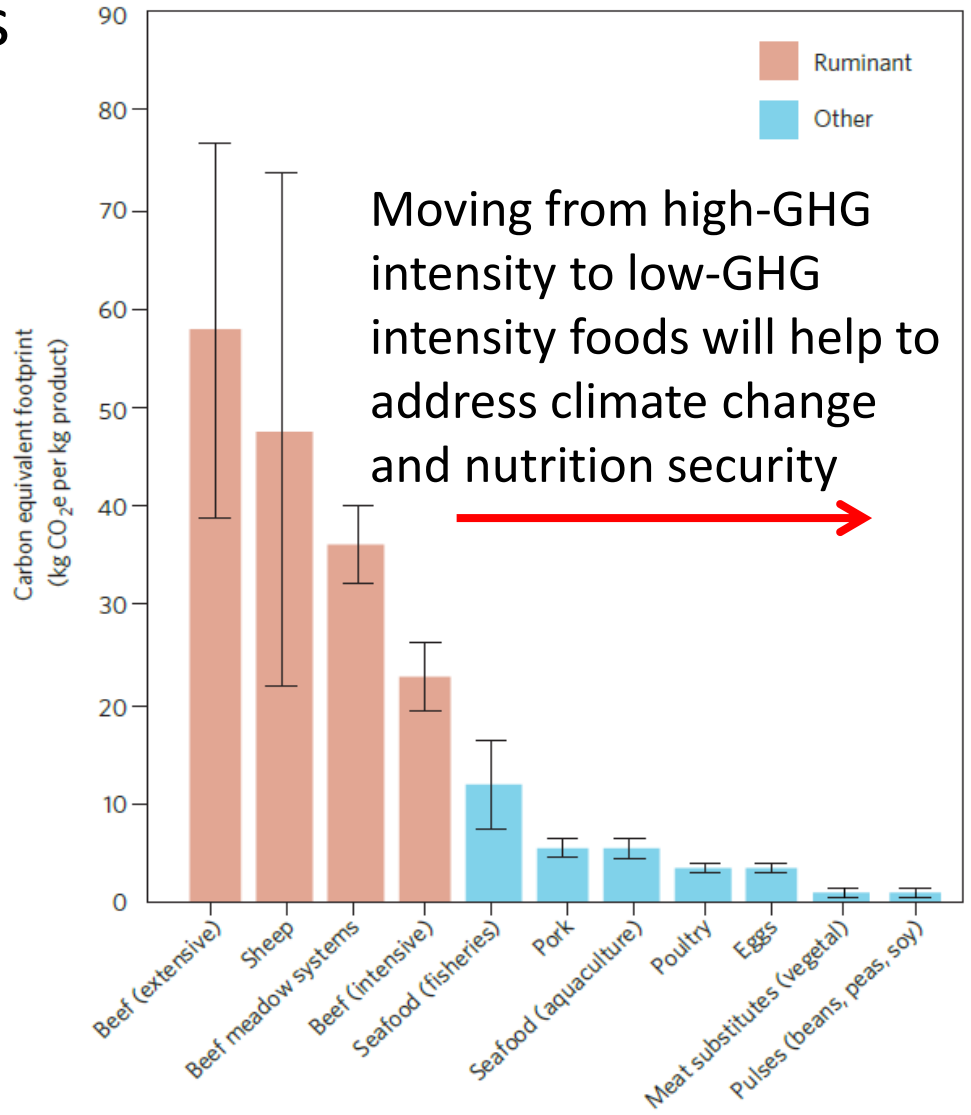
Nutritional security?
Agro-ecosystems health?
Risk management?

Resource use and emissions?
Value chains and zoonosis?
Income and employment?

Maize field in Kansas

Smallholder mixed farming

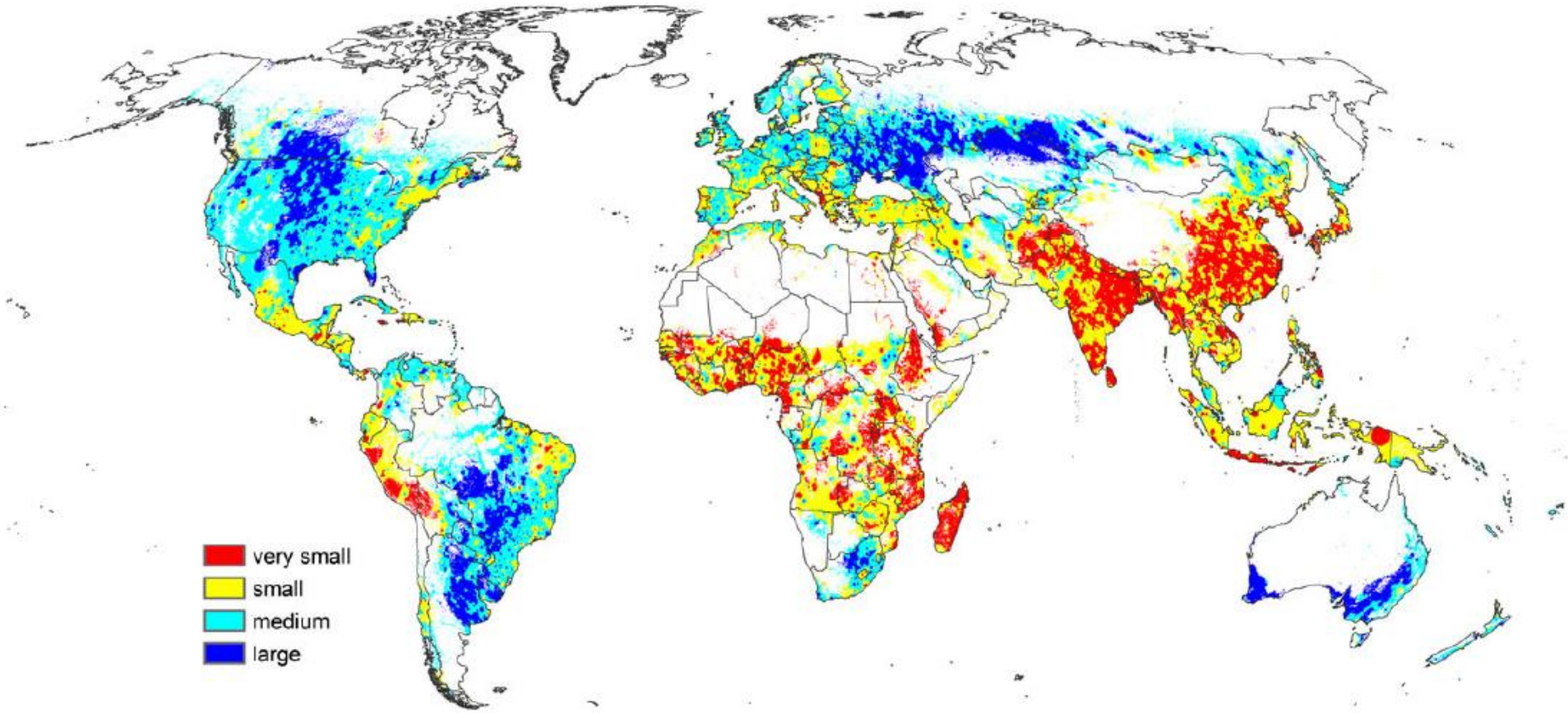
Big differences in the GHG intensity of different foods



Moving from high-GHG intensity to low-GHG intensity foods will help to address climate change and nutrition security

Ripple et al.(2014)

A global map of field size

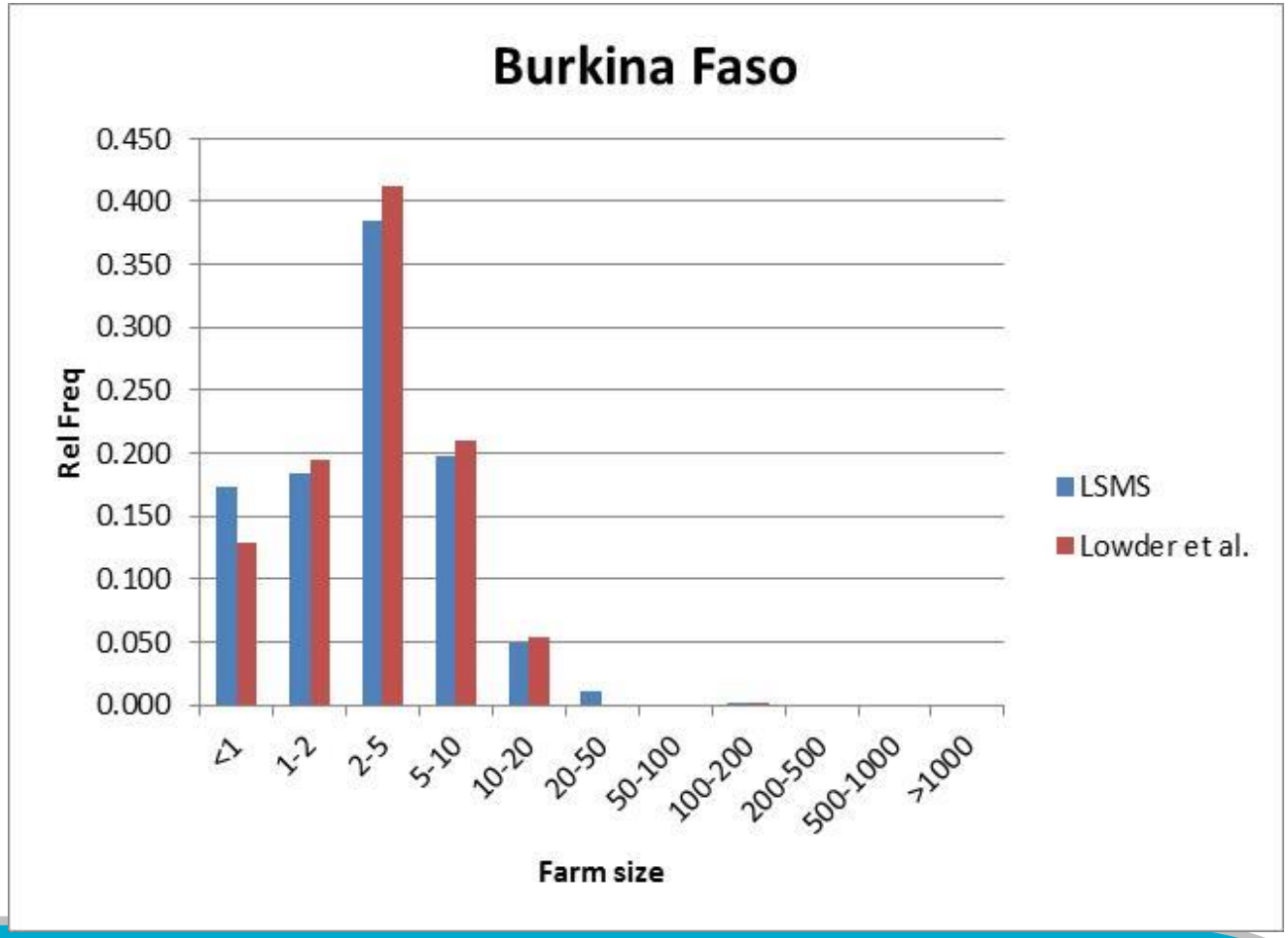


Crowdsourcing and machine learning

Fritz et al. 2015

Farm size distributions: Burkina Faso

Lowder et al. (2014) data from 1993; recent LSMS data (van Wijk et al, 2016)

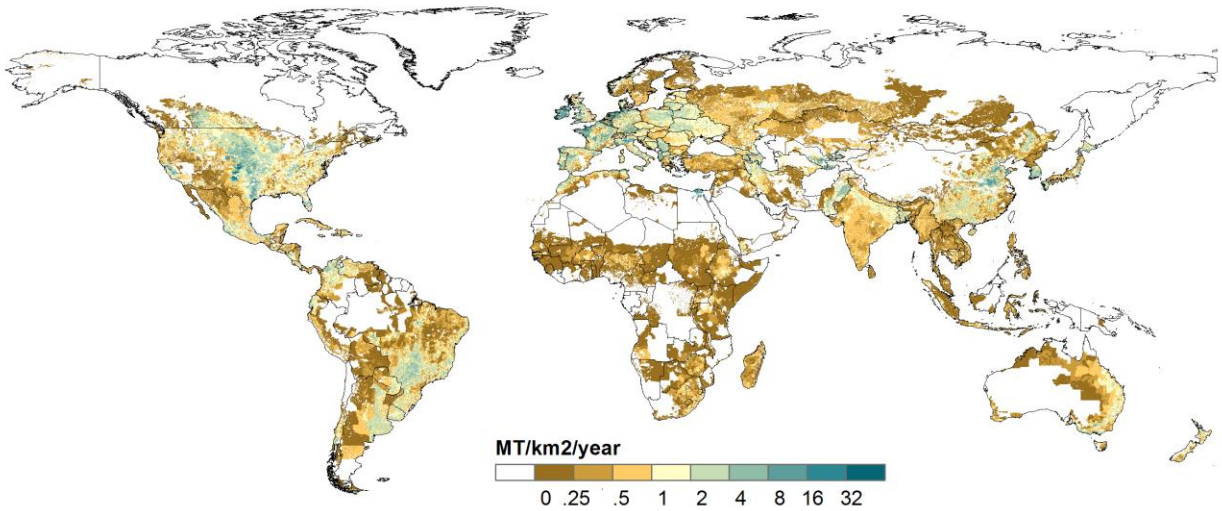


Global spatial data of crops, livestock and fish

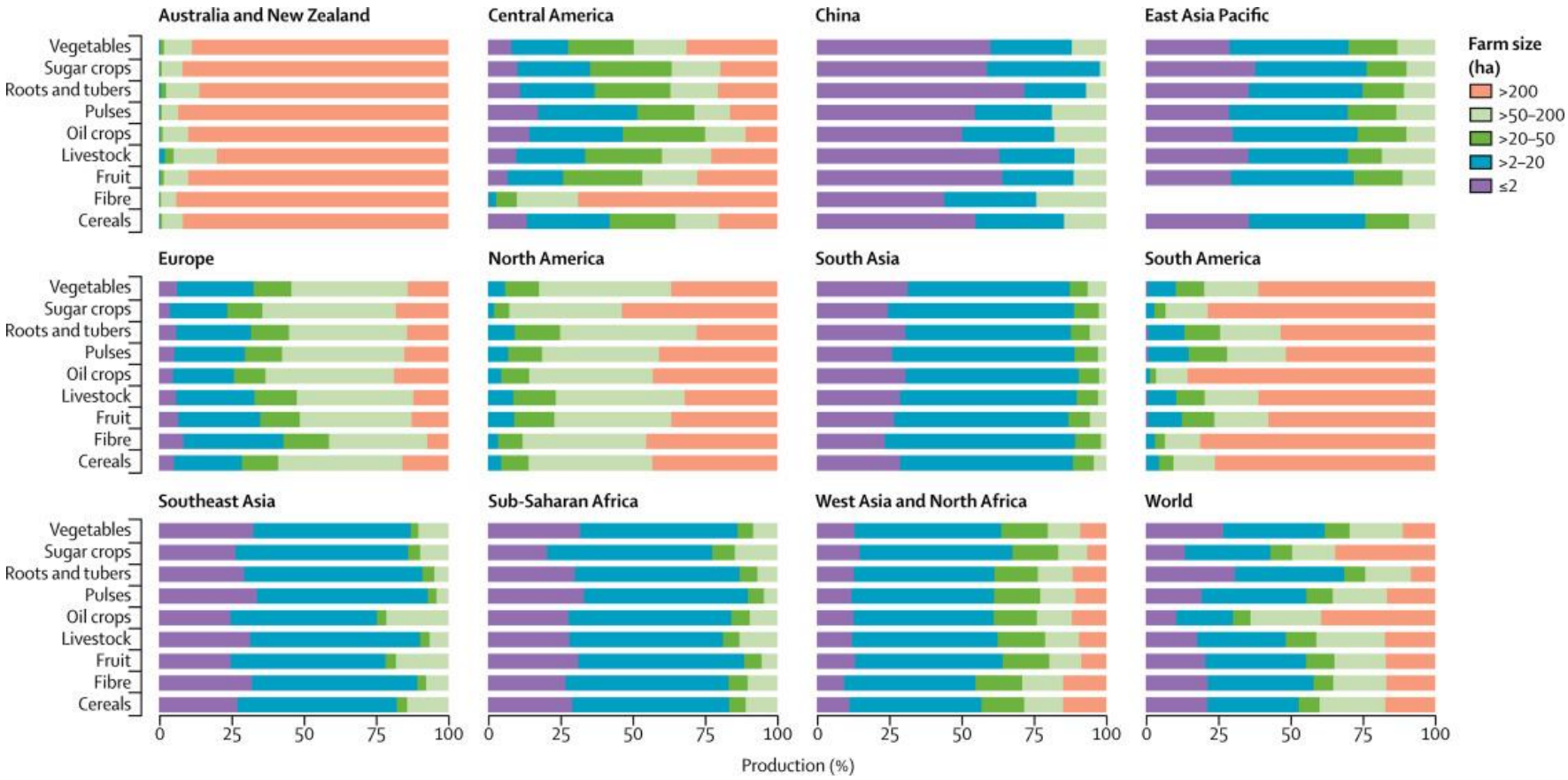
42 Crops (EARTHSTAT)

7 Livestock products (Herrero et al 2013 PNAS)

11 Fish products (Watson et al 2016 Scientific Data)

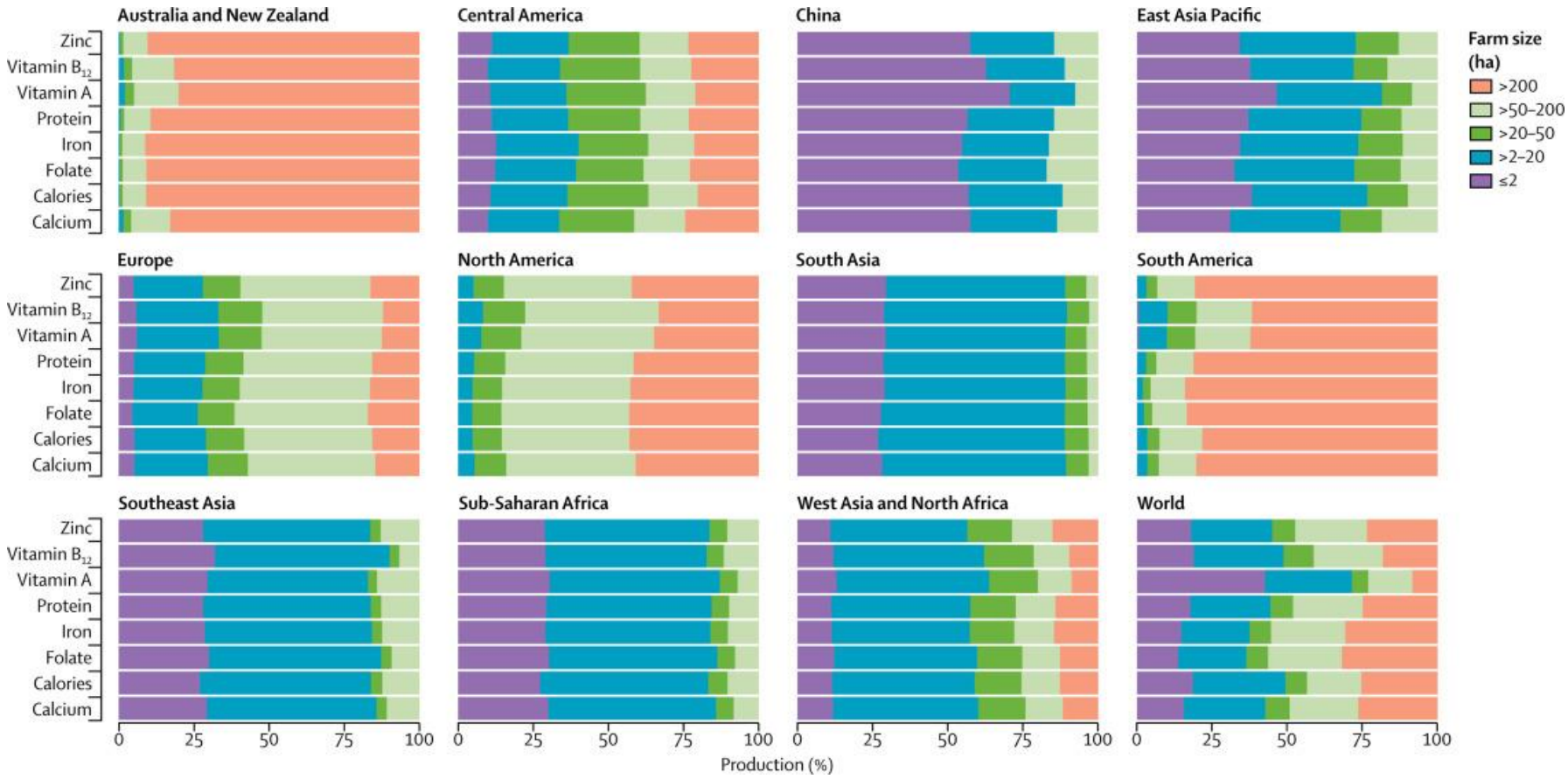


Small and medium farms produce between 50-75% of the world's food



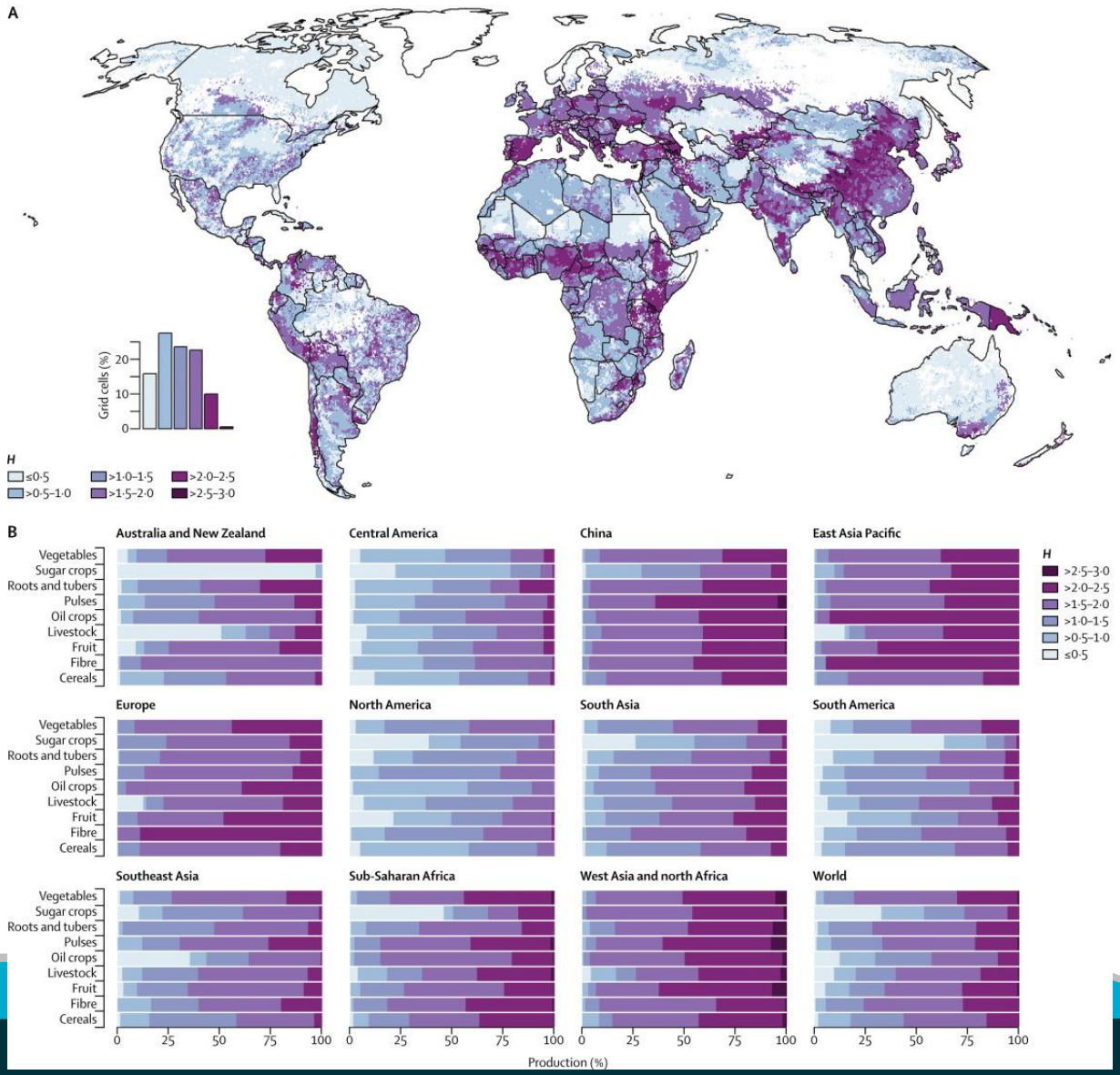
Herrero et al. 2017 The Lancet PH

A similar pattern emerges for nutrient production

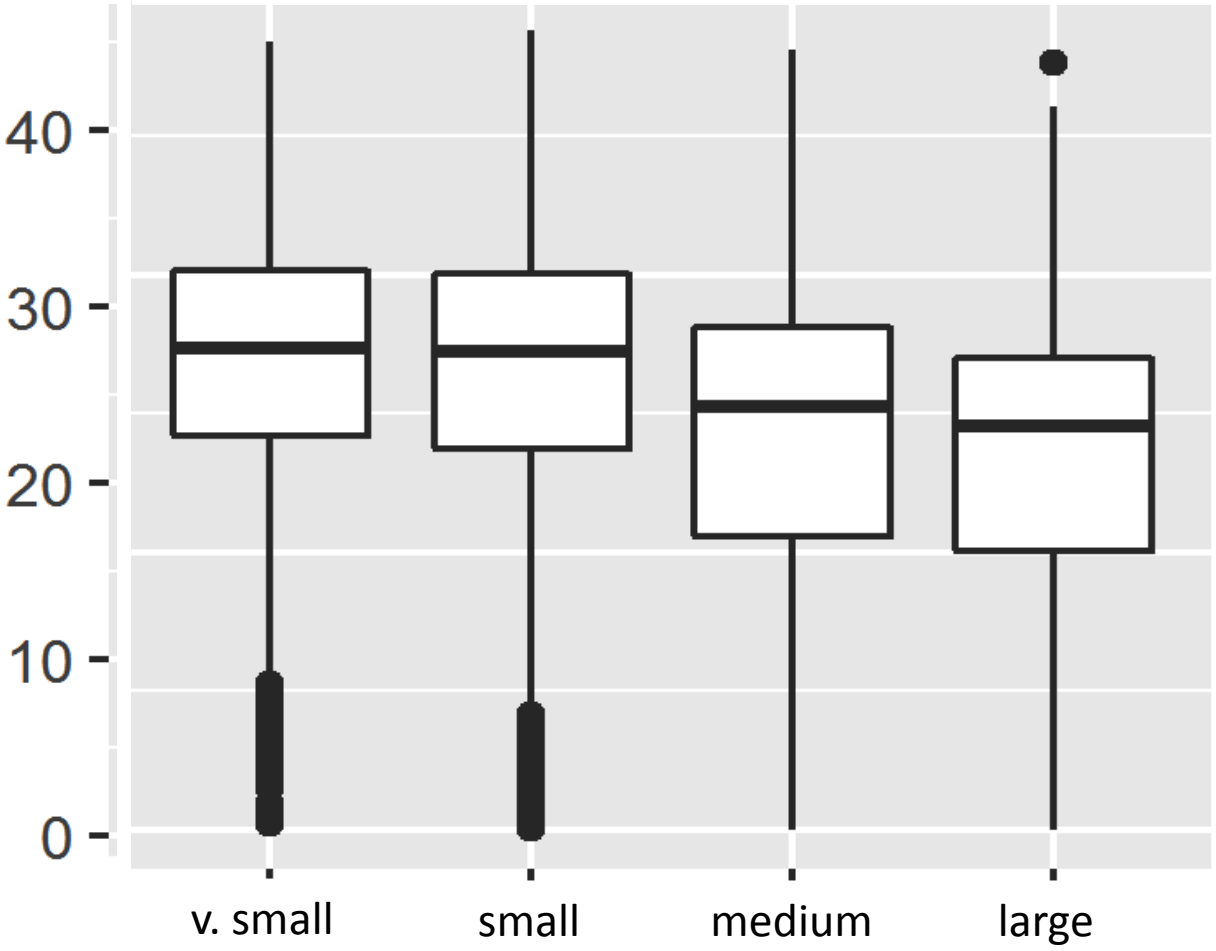


Herrero et al. 2017 The Lancet PH

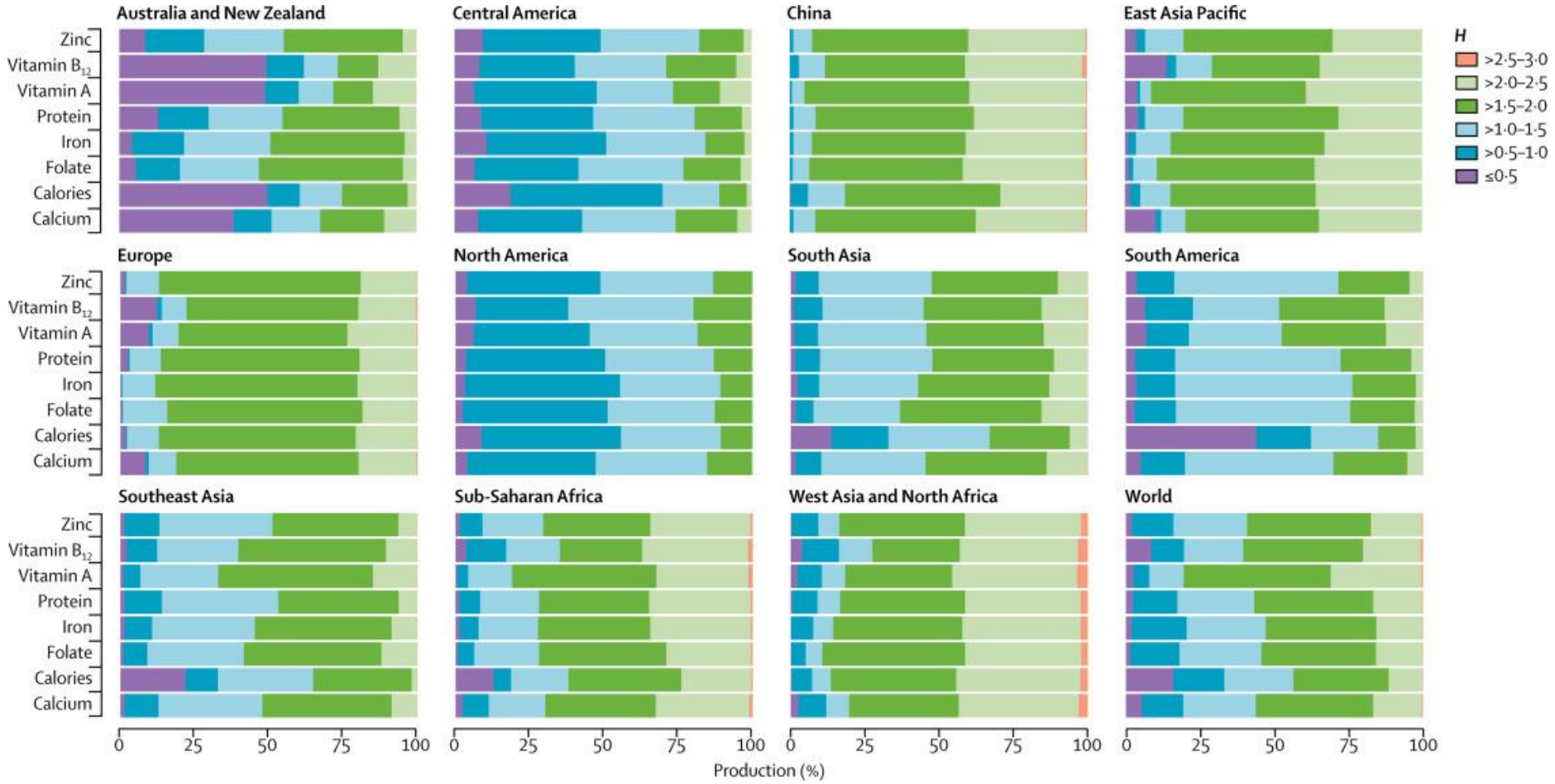
More diverse landscapes produce more food



H-index
As farm sizes increase, agricultural diversity decreases



More diverse landscapes produce more nutrients



Uses and few researchable gaps

1. Uses already: Global burden of disease, Global Nutrition Report, Lancet EAT Commission

2. How can we promote sustainable intensification without losing diversity?

3. Policy influence on the structure of farming

4. Is agricultural diversity linked to biological diversity, resilience, climate adaptation/mitigation, health outcomes?

Some resources

Food Matters website

http://www.environmentreports.com/foodmatters/

ESRI Story Maps

http://arcg.is/2pYtnHf

The paper

http://thelancet.com/journals/lanplh/article/PIIS2542-5196(17)30007-4/fulltext

Thank you

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