

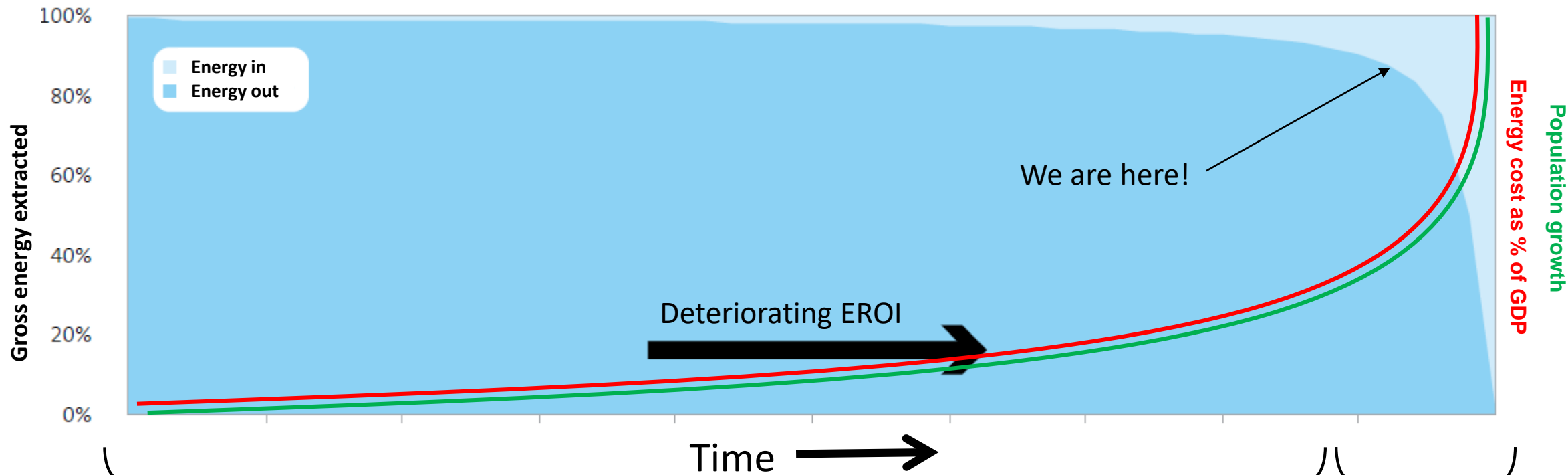


# Sustainability lenses:

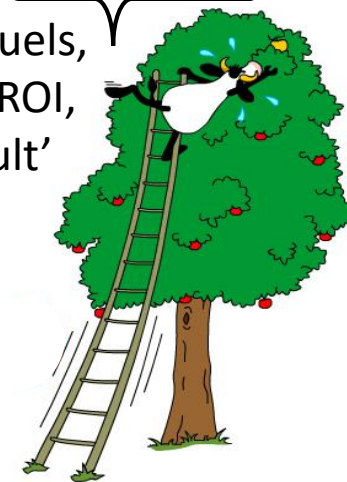
Alluding to the precautionary principle  
through energy use and agriculture.

Craig Anderson, Plant and Food Research

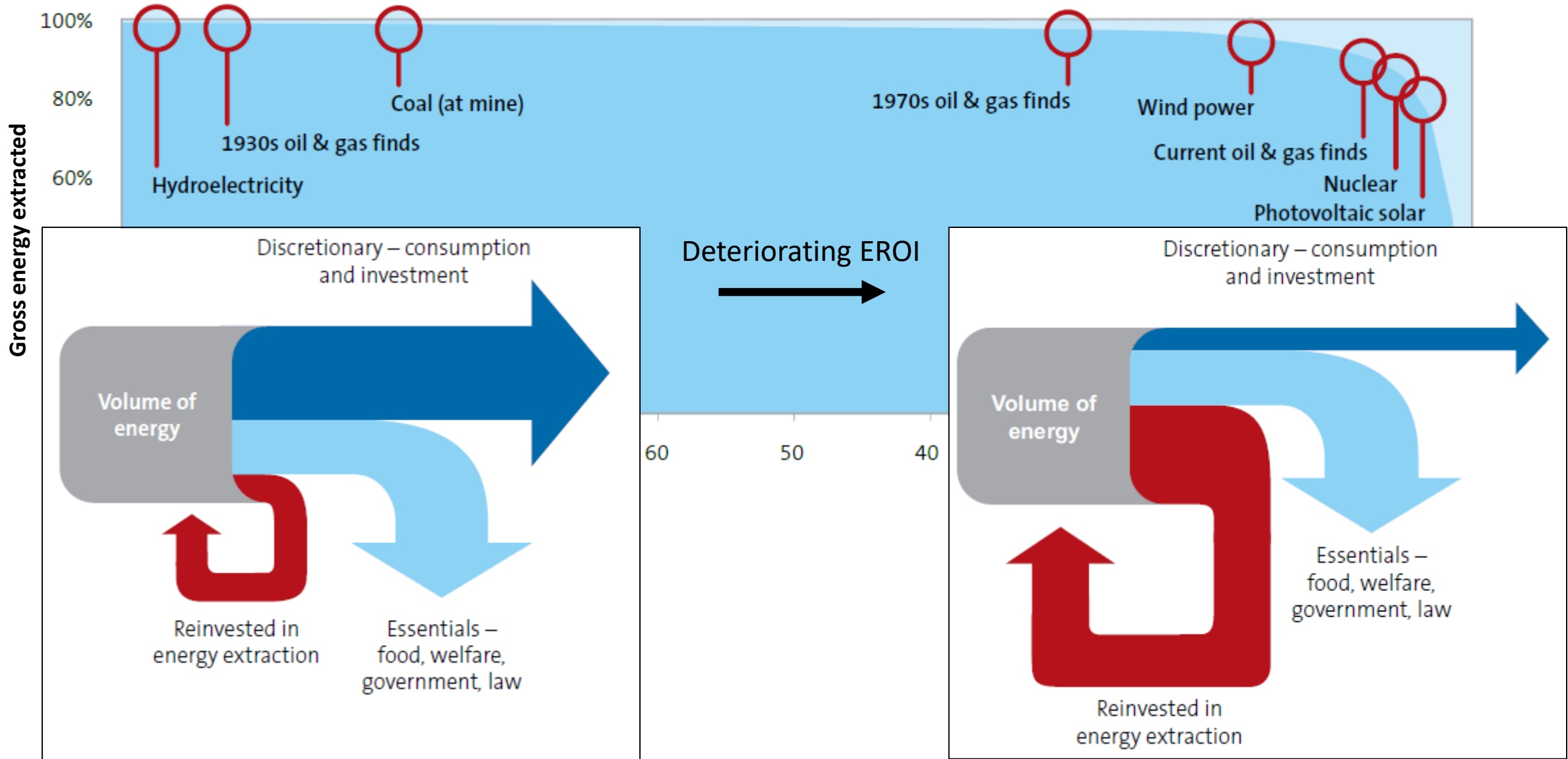
OERC, 20<sup>th</sup> November 2020

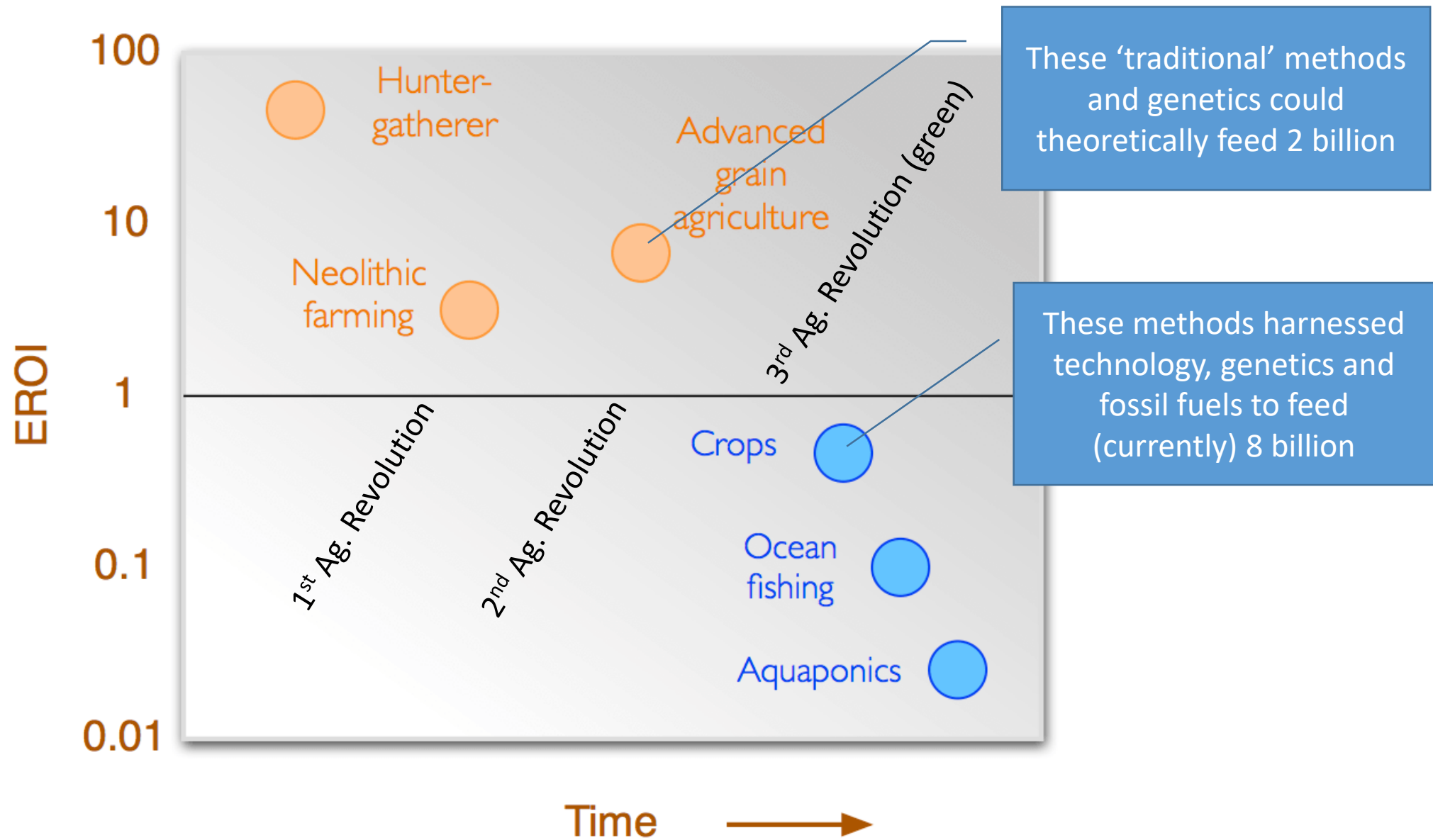


50% Fuels,  
High EROI,  
'low-hanging'

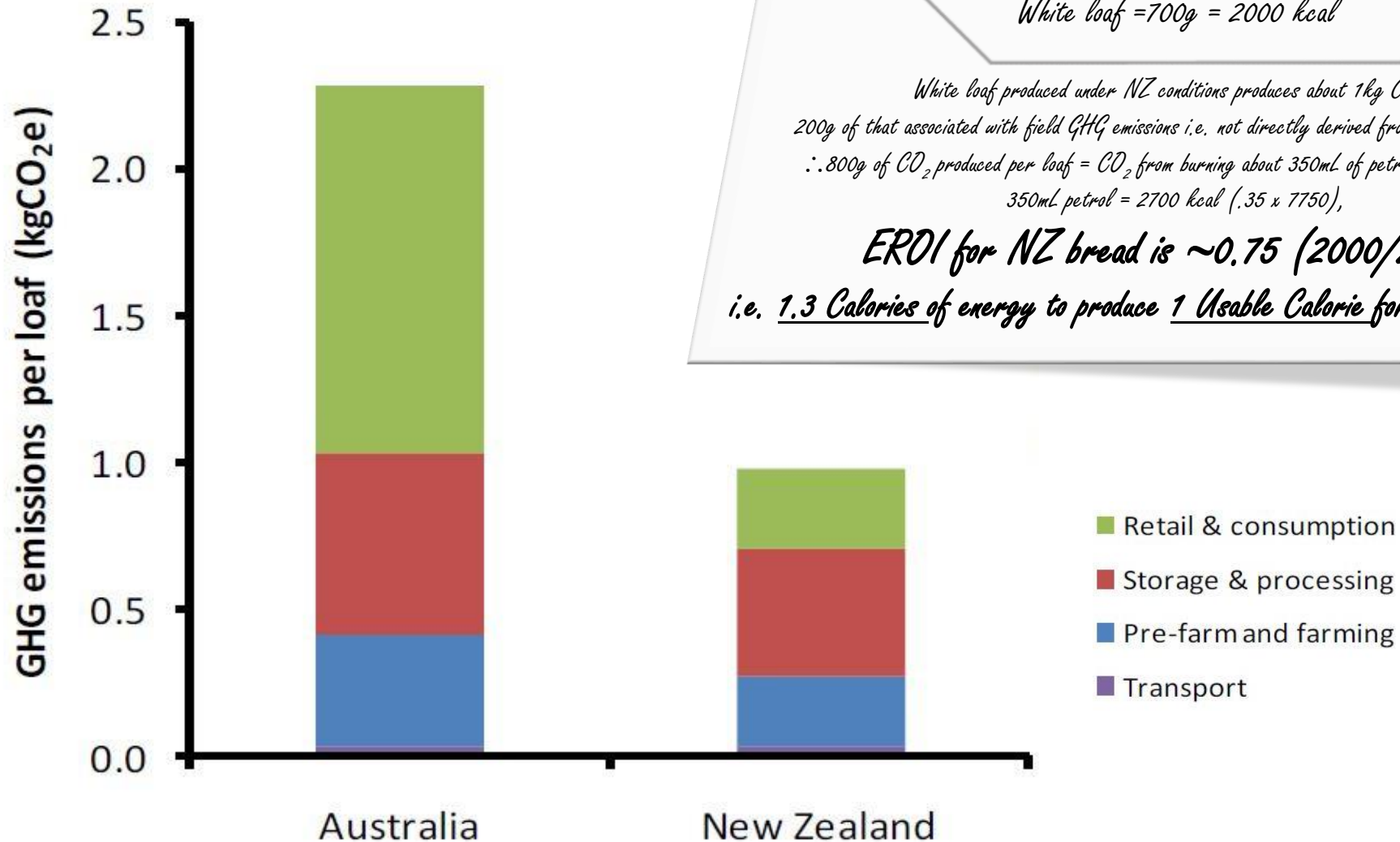


50% Fuels,  
Low EROI,  
'difficult'





# Fossil Energy Required for New Zealand Wheat Production

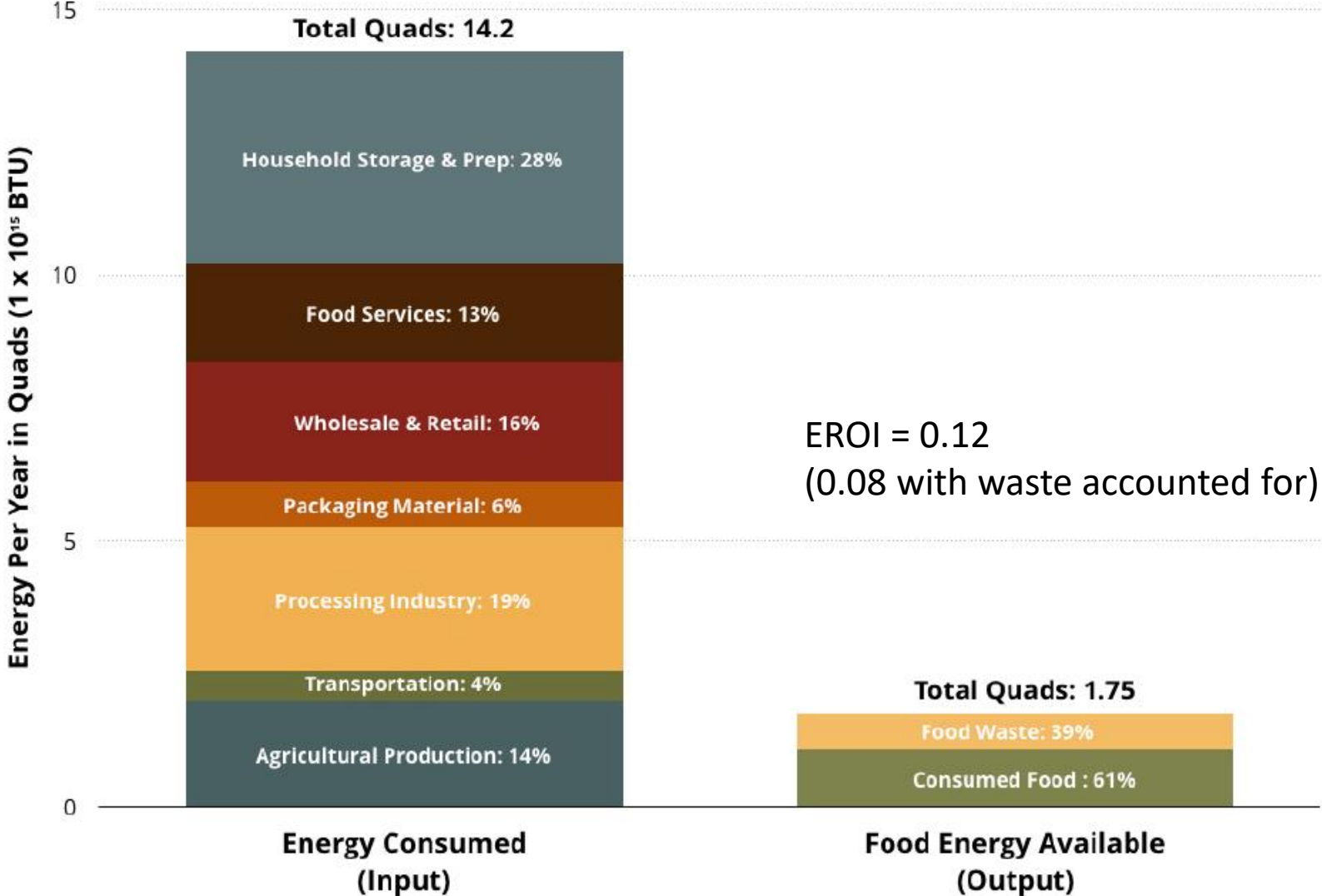


$1L \text{ petrol} = 2300g \text{ CO}_2 = 7750 \text{ kcal}$   
 $\text{White loaf} = 700g = 2000 \text{ kcal}$

*White loaf produced under NZ conditions produces about 1kg CO<sub>2</sub>*  
*200g of that associated with field GHG emissions i.e. not directly derived from fuel consumption.*  
 $\therefore 800g \text{ of CO}_2 \text{ produced per loaf} = \text{CO}_2 \text{ from burning about } 350\text{mL of petrol } (800g/2300g).$   
 $350\text{mL petrol} = 2700 \text{ kcal } (.35 \times 7750),$

**EROI for NZ bread is  $\sim 0.75$  ( $2000/2700$ )**  
*i.e. 1.3 Calories of energy to produce 1 Usable Calorie for human consumption.*

# Energy use in US food production...



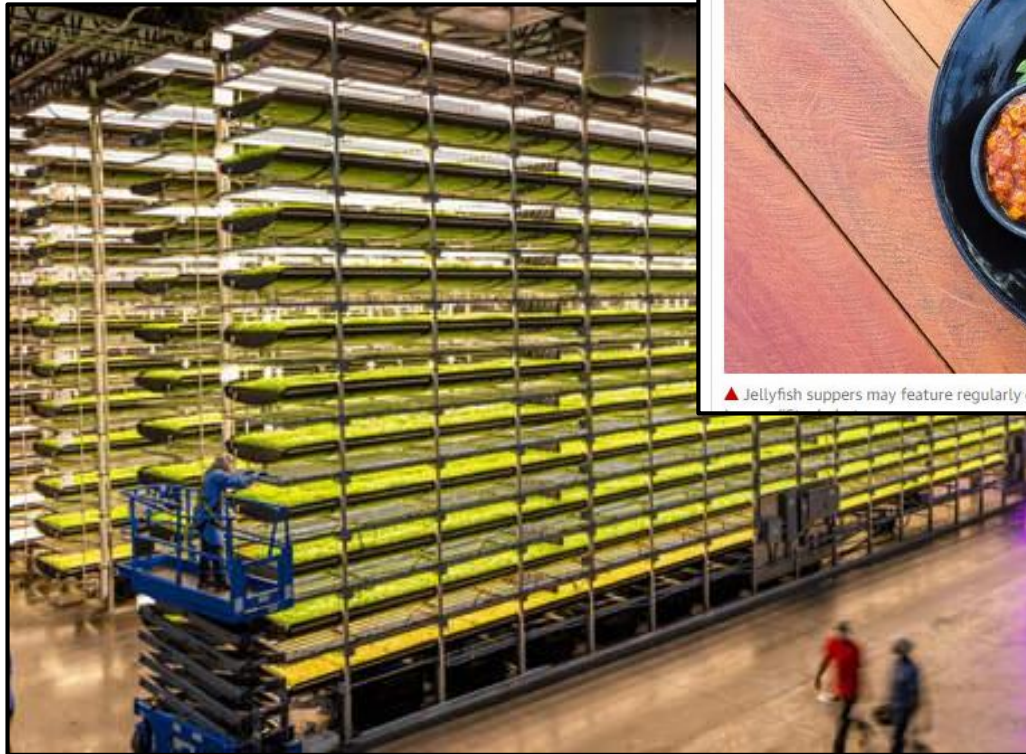
# Urban Farming, future foods...

## Jellyfish supper delivered by drone? Radical future predicted for food

Algae milk, insect protein and nutrients consumed through a patch or pill may become norm, report says



▲ Jellyfish suppers may feature regularly on our menus, a report has predicted. Photograph: armcreation/



### Beef Burger

vs.

### Bean Burger

vs.

### “Beyond” Burger



**Ingredients:**  
Grass-fed beef.



**Ingredients:**  
Black beans, quinoa,  
onion, flaxseed,  
olive oil & sea salt.



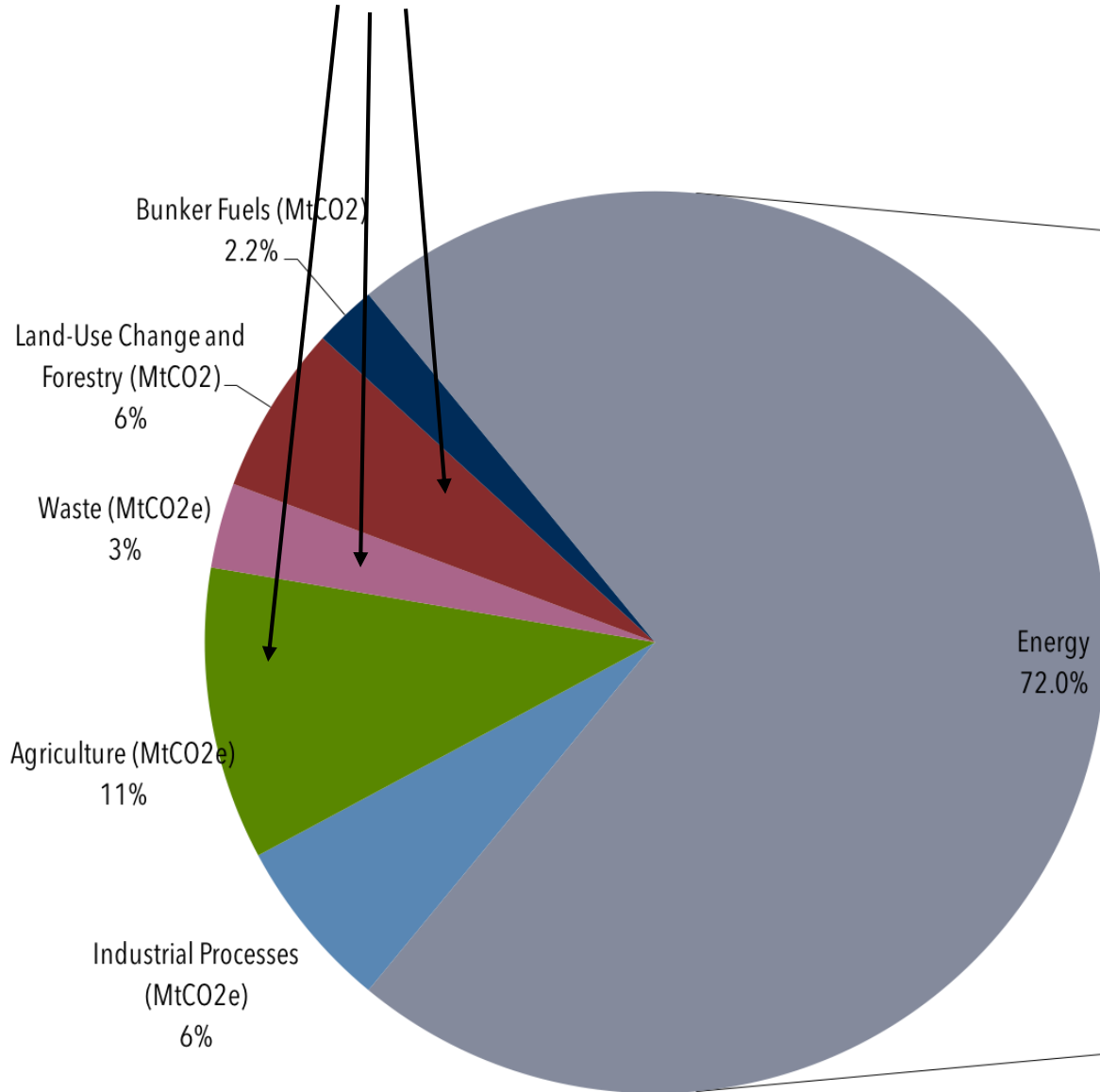
**Ingredients:**  
Pea protein isolate, canola oil,  
coconut oil, water, yeast extract,  
maltodextrin, natural flavors,  
gum arabic, sunflower oil, salt,  
succinic acid, acetic acid,  
non-GMO modified food starch,  
cellulose from bamboo,  
methylcellulose, potato starch,  
beet juice extract, ascorbic acid,  
, annatto extract , citrus fruit  
extract, vegetable glycerin.

# The Digital Farm...



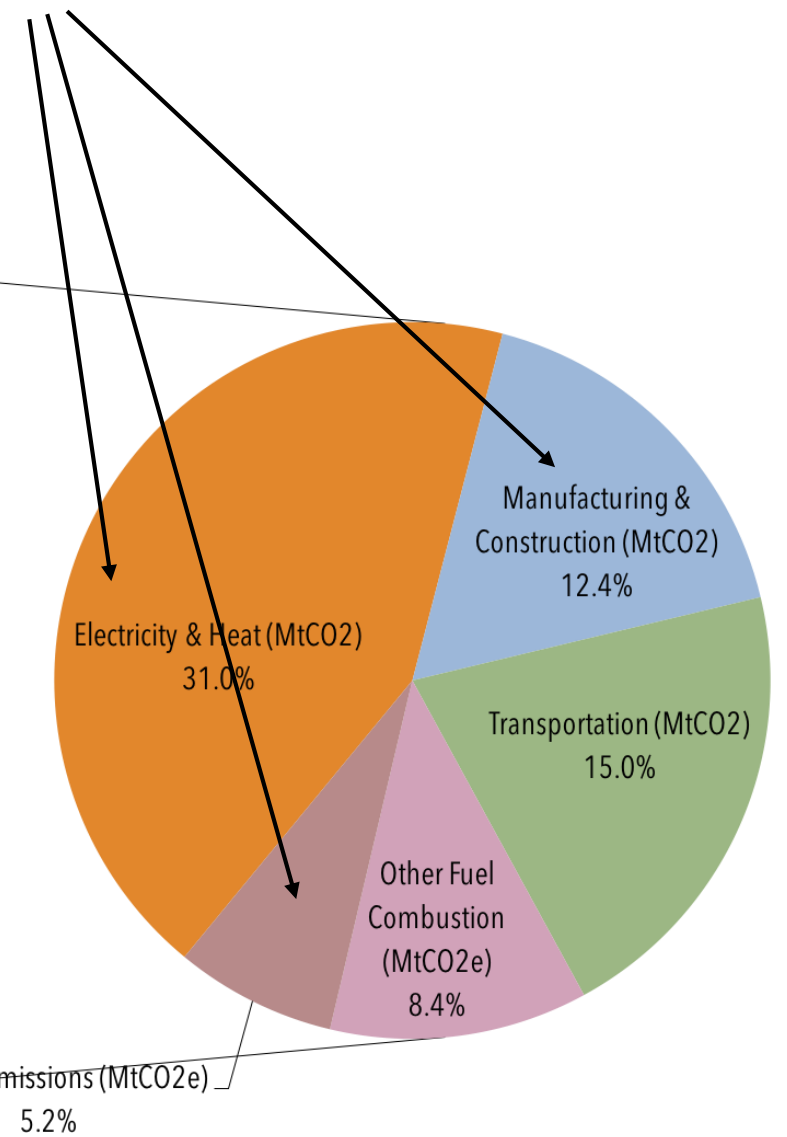


Digital ag. *may* decrease emissions here:



Digital ag. *will* increase emissions here:

2017 Emissions



# We have some serious problems...

- Environment
- Economy
- Energy

We can't keep growing on a finite planet!

