

THE GOLDILOCKS HYPOTHESIS: MISSPECIFICATION, OMISSIONS AND ERRORS IN “SPARING LAND FOR NATURE”

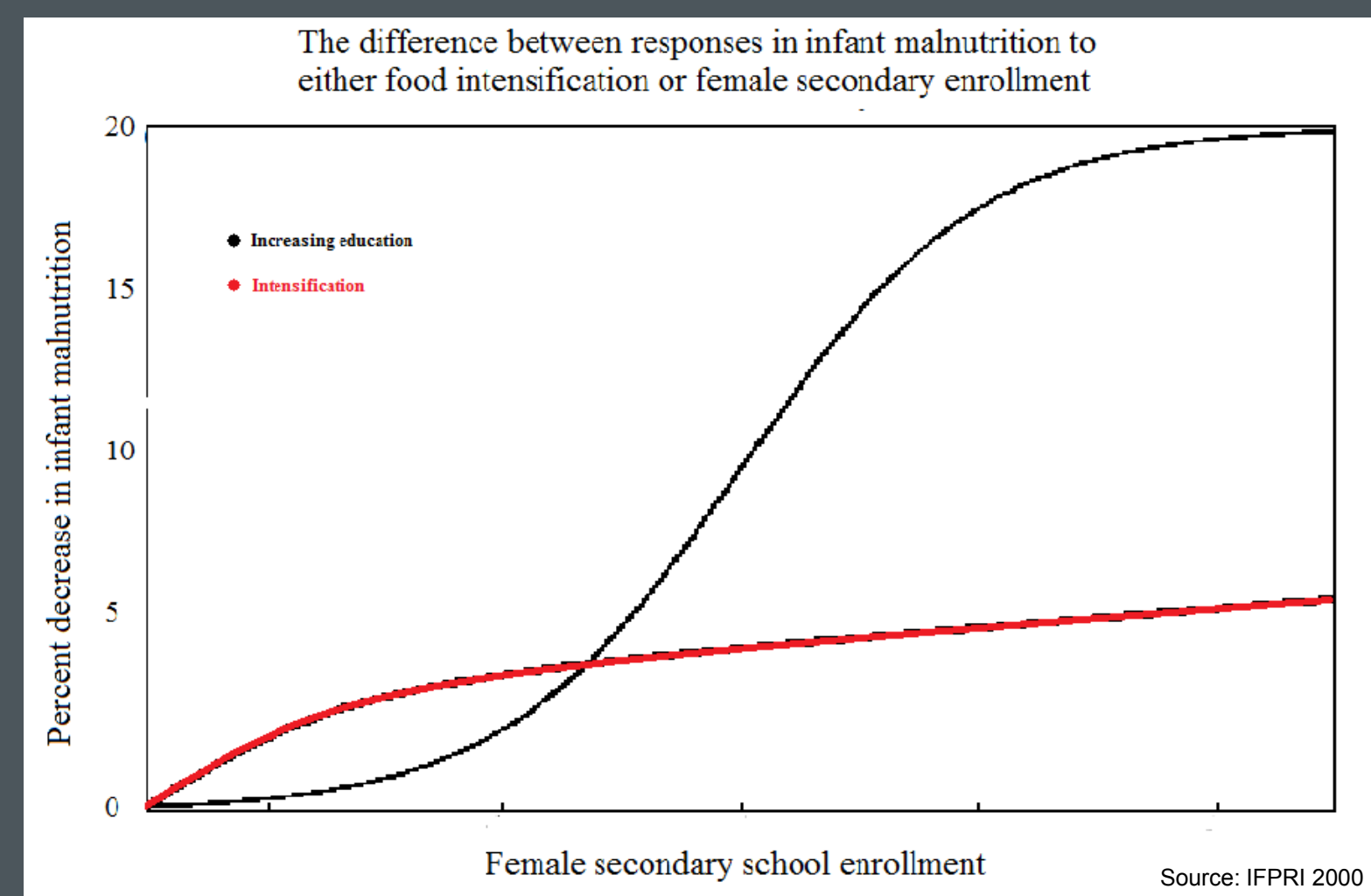
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Introduction

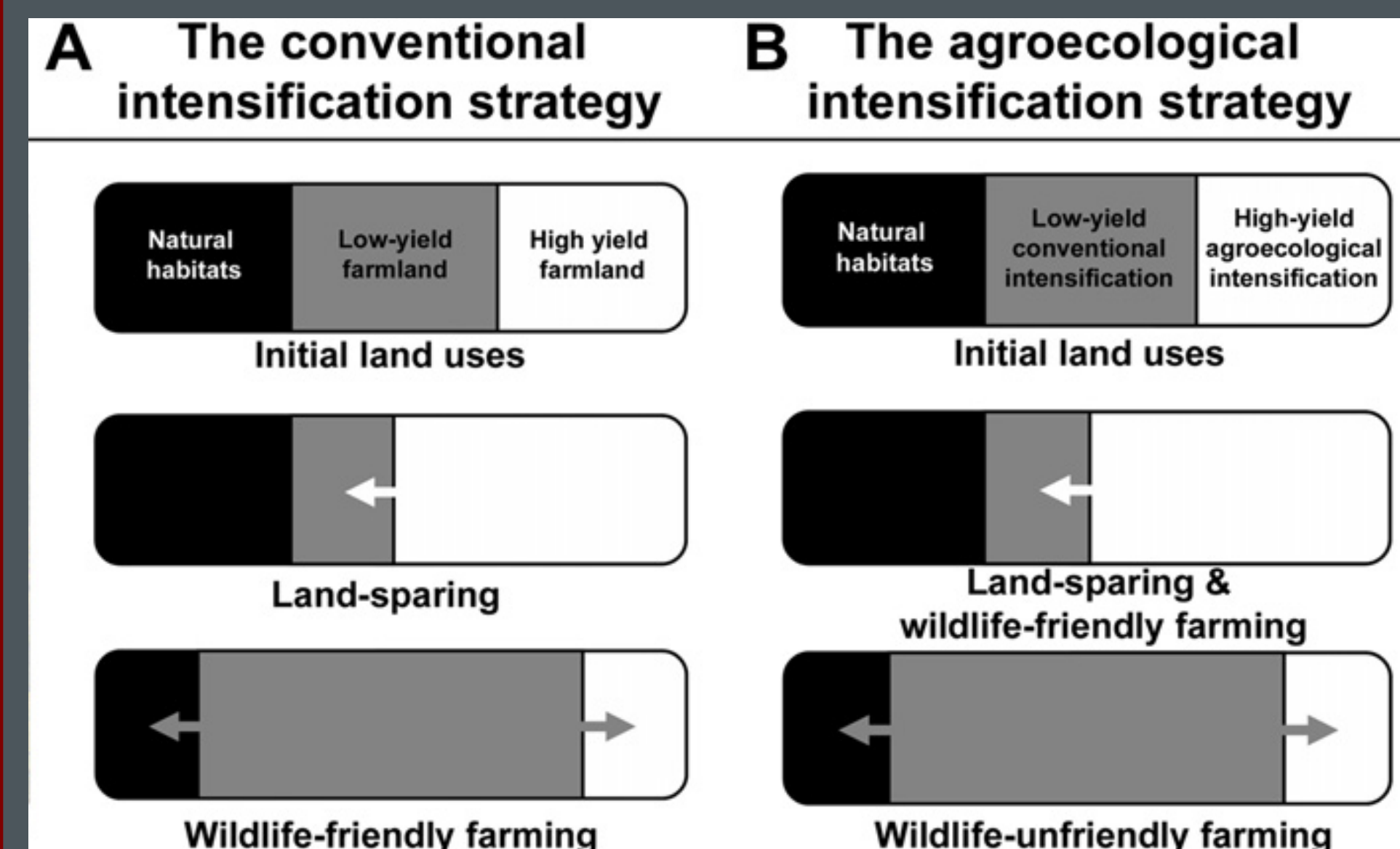
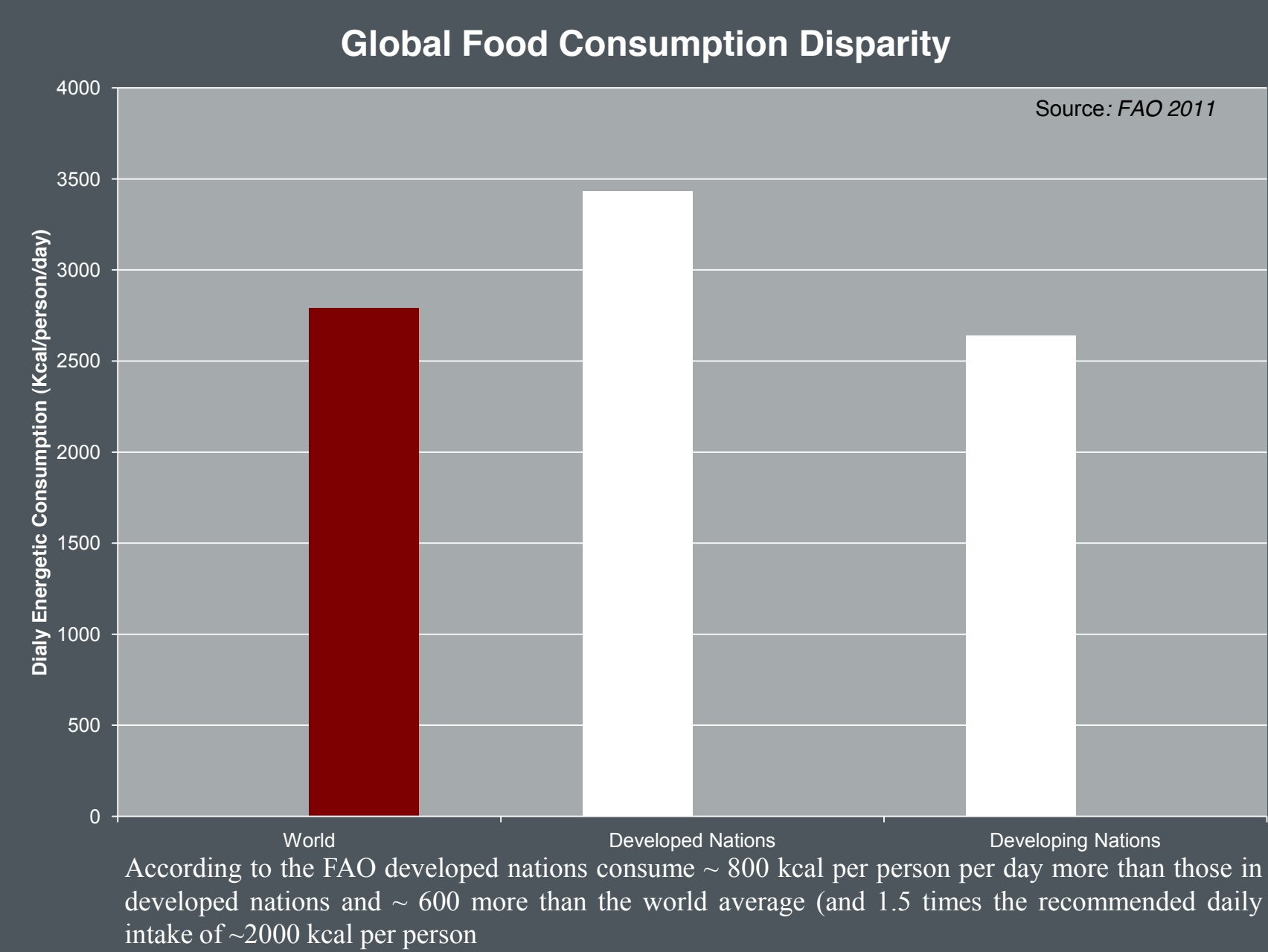
The Goldilocks hypothesis refers to the idea of land-sparing being like the story of goldilocks, that there’s an amount of production just right that all the rest of the world can be saved for nature and everyone will be fed. Unfortunately land use policy has nothing to do with number of people who are fed, and land conservation is not connected to either yield or food policy. Here we attempt to address some of the failings of the land-sparing argument and propose alternatives that attempt to encompass those failings, namely, in the areas of production, waste, equality and biodiversity.

Inequality and Poverty

- Globally, one billion people are malnourished, of which 70% are women and children.
- Increases in GDP are correlated to lower rates of child malnutrition. However, in countries where there is greater income inequality the correlation between GDP and malnutrition is unreliable.
- Infrastructure measures to reduce food insecurity include reliable nutrition interventions such as secondary education for women and income equalization between genders.
- Increasing agricultural yields alone does not address many of the pertinent issues facing poor women and their children, such as socioeconomic access to food through gainful employment, political rights, or self-sufficiency farming.
- Land rights in conjunction with education programs for agricultural practices have shown to decrease food insecurity.
- Programs in several African nation states which provide women access to land as well as train them in agricultural practices have realized positive results such as decreases in hunger for their entire family unit.
- Access to education is also correlated to lower prolificacy.
- Future food insecurity based on a neo-Malthusian premise would require a best practices model which includes access to information regarding planned pregnancies.

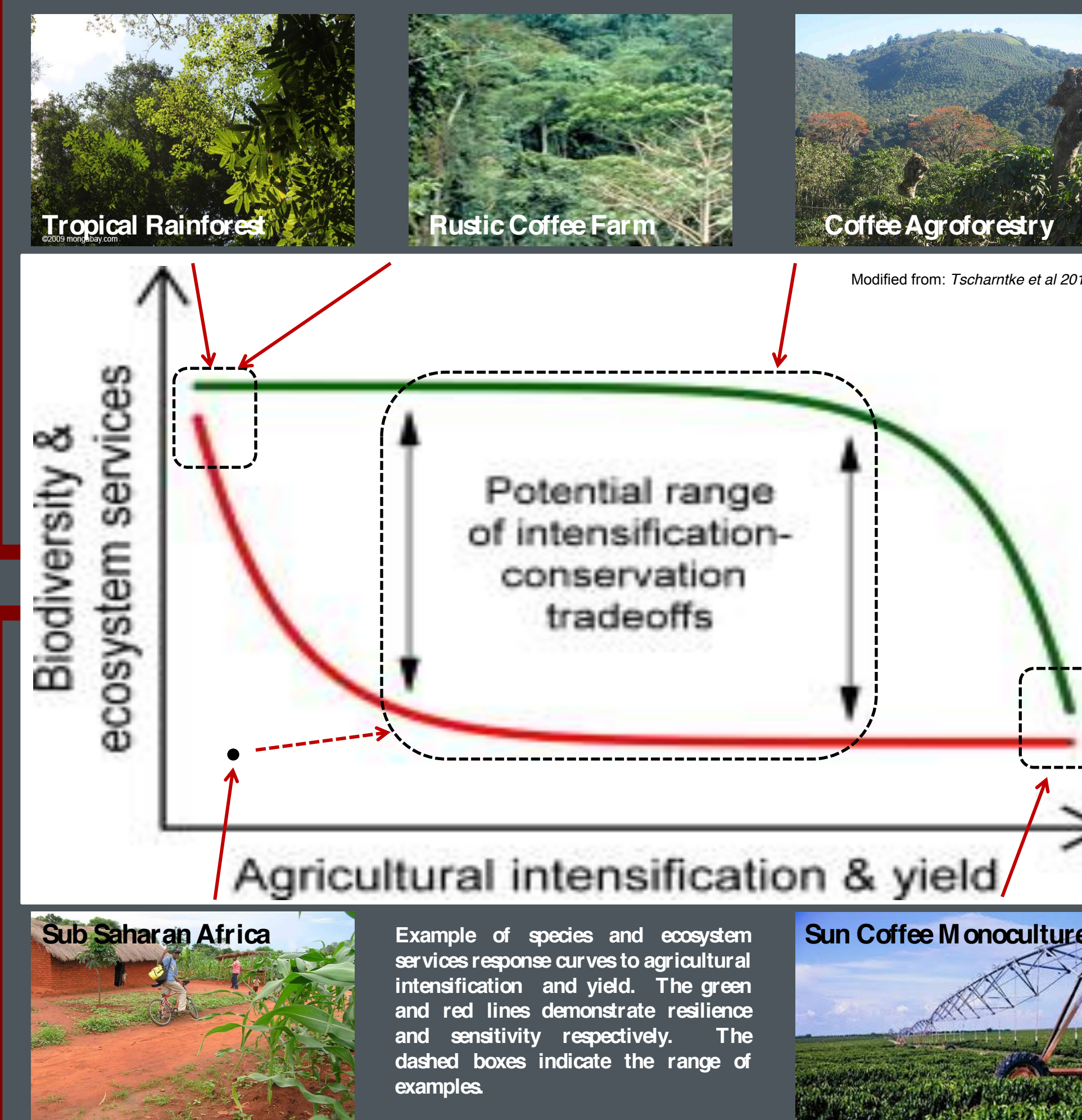


Qualitative representation of the outcomes in reducing food insecurity (FI) by increasing food availability or education for women in developing nations. Production decreases FI quickly as food availability increases, but overall results are limited. Educating women is slower to show results at lower enrollment levels but can reduce FI by nearly four times that of production at optimal enrollment levels.

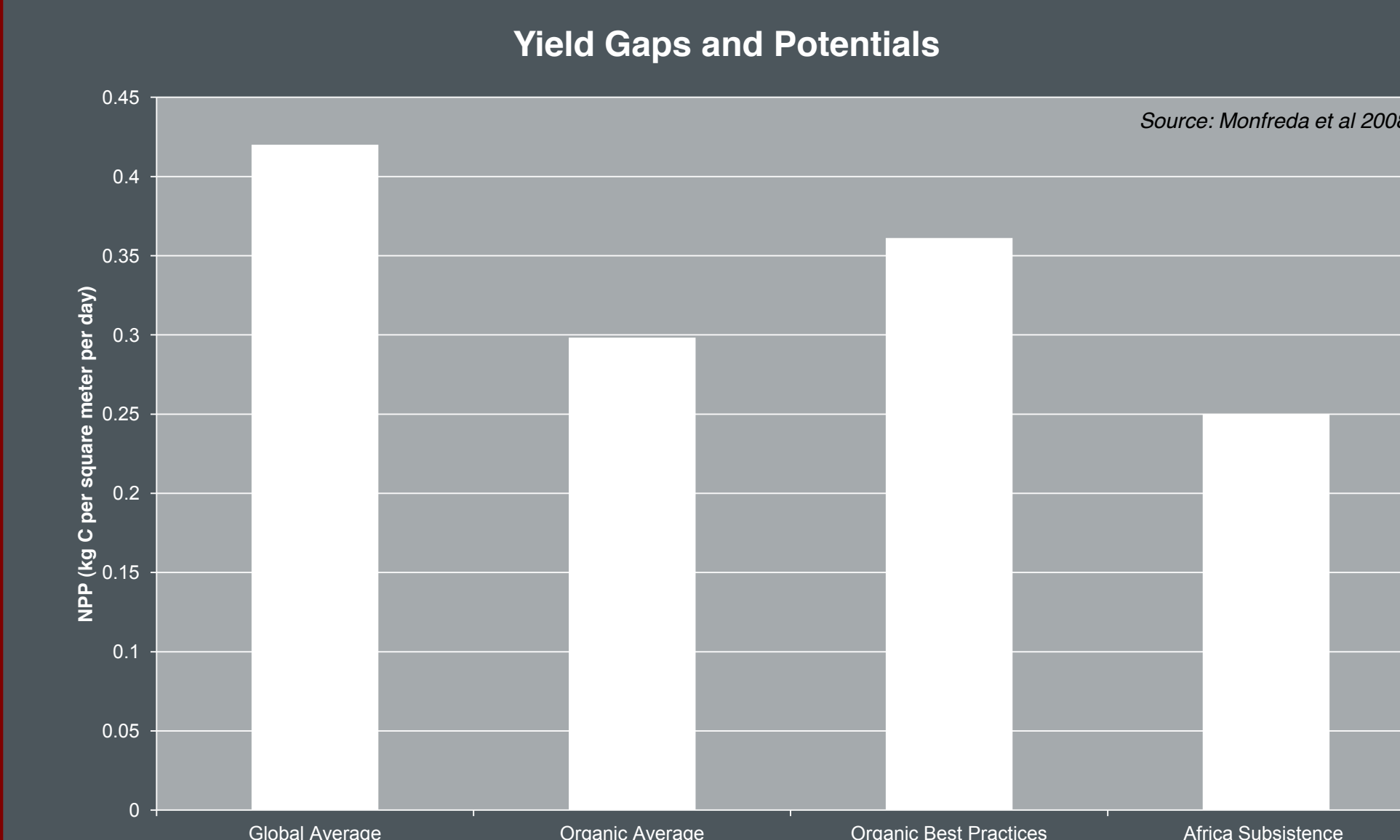


Graphical representation of the land sparing vs land sharing debate. Land sparing proponents argue that the best way to preserve biodiversity and produce food is to intensify the use of current agricultural farmland removing the need to expend into natural habitats and that land sharing (or wildlife friendly farming) is low yield and requires expanding into natural habitats to maintain food production. Land sharing proponents say this is incorrect and that agroecological production functions similarly to the intensification scheme and what land sharing proponents call wildlife friendly farming is, by definition, wildlife unfriendly.

Source: Tschamtkte et al 2012



The black dot indication Sub-Saharan African subsistence farming's position on the graph. The dashed arrow represents the idea of moving subsistence farming to agroecological farming to increase yield and biodiversity.



The yield gap refers to the gap between subsistence farming in Africa, which produces a little more than half the global average of food, and places like North America which produces the same amount as the global average. Both the global organic average and organic best practices also produce more than Sub-Saharan African subsistence farming. Closing the yield gap would increase the local and global food supply.

Conclusion

The fear of being unable to produce enough food for a rapidly growing human population is unfounded. Globally, food is produced far in excess of caloric need. In fact, we have the capacity to increase supply by at least 25% by addressing the yield gap, utilizing agroecological practices which also preserve biodiversity. Rather than espousing conventional intensification, with the concomitant environmental harm, addressing waste and equality increases food security by improving accessibility.

Biodiversity

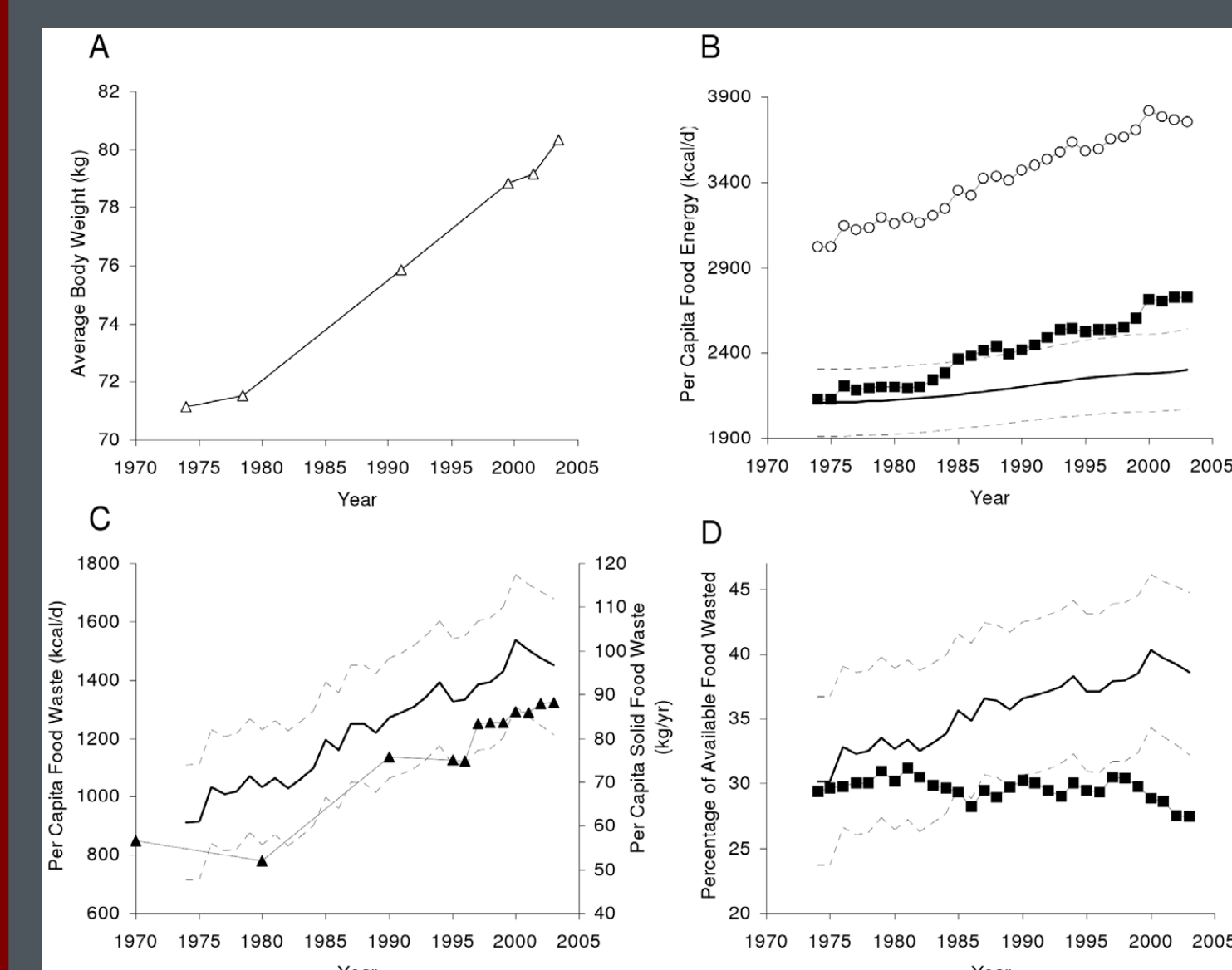
- Agricultural land accounts for 11% of global land use. The FAO estimates agricultural land use will exceed 120 million hectare in the next thirty years.
- There are a number of ecosystem services provided to agricultural land including: pollination, biological pest control, soil structure and fertility and availability of water.
- The economic cost of pollinator services are estimated at \$14.5 to \$21.5 billion for honey bees alone.
- Agroecological models seek a “best practices” course of action which increases biodiversity within the agricultural system, increases predator prey relationships, and reduces use of pesticides which may harm beneficial pollinators.
- Greater yields are observed in Central Africa where conservation practices are in place.
- Much of the credit for increasing yields is attributed to improving soil health by increasing soil organic matter and promoting soil microbial activity.
- More organisms, large and small, generally result in better soil which produces higher yields.
- There is an inverse relationship between farm size and production. Small farms produce higher yields, increase efficiency, improve equity and rural food insecurity and maintain farm practices that encourage soil health and biodiversity.

Food Production

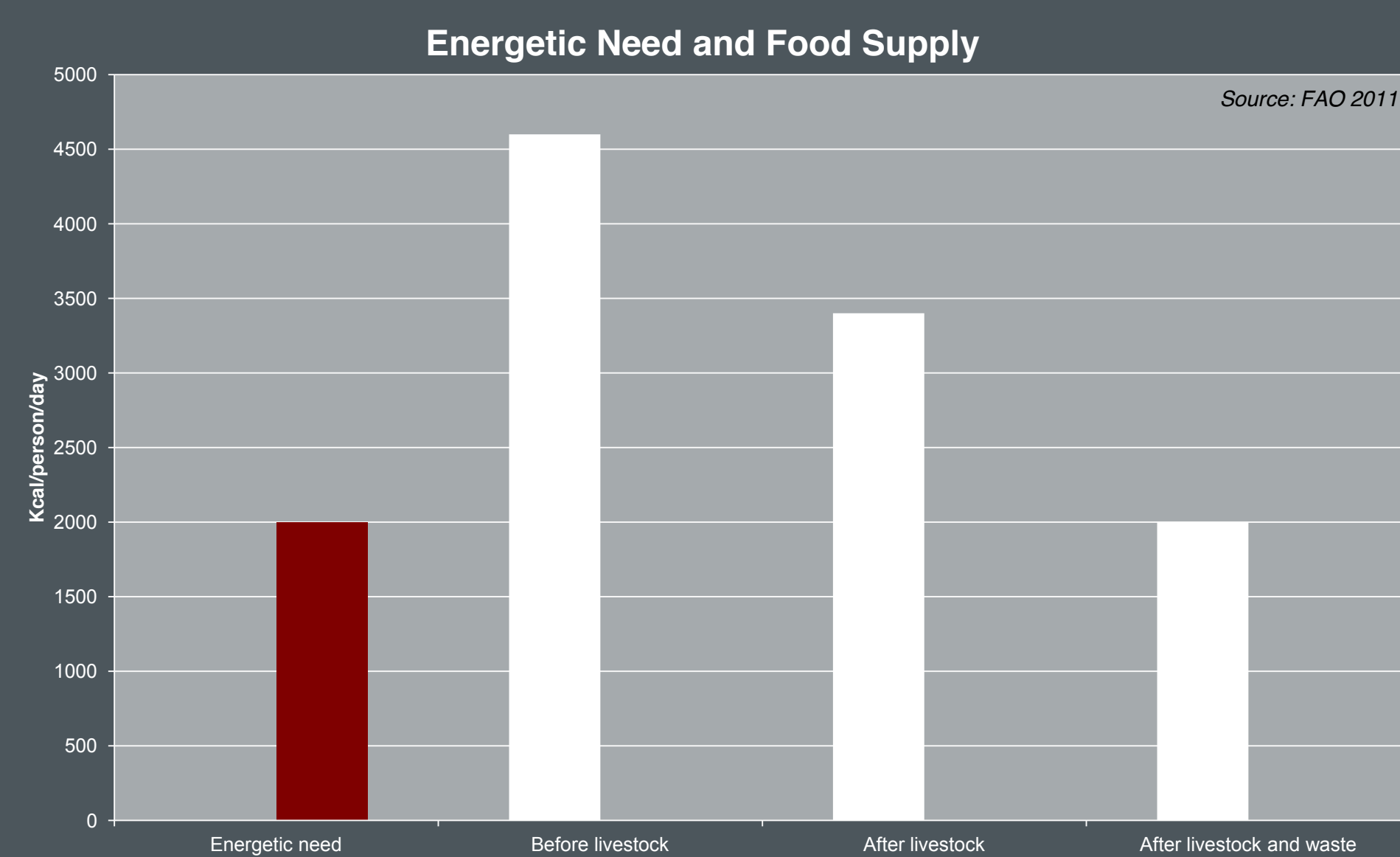
- A 2001 study by Smil estimated 4600 kcal per person per day were produced worldwide; however, after losses, waste and livestock production only 2000 kcal per person are available.
- Globally, enough food is produced to feed every person 3400 kcal per day without reducing meat consumption. Allowing for 5% post-harvest losses in developed countries drops food availability to 3170 kcal per person per day; reducing current waste by 50% increases available food to 2770 kcal per person per day.
- Sub-Saharan subsistence farmers currently realize yields slightly over half the global average. Addressing this yield gap, the variance of production between areas of similar conditions due to different growing practices, could increase local food supply drastically and provide food security to the people that need it the most.
- Closing the yield gap of key crops by 75-95% would provide between 1100 and 2000 kcal per person per day.
- Subsistence farmers switching to organic practices have realized a 50-100% increase in yield, bringing them close to or surpassing the current global average yield.
- Adopting organic or agroecological practices to close the yield gap would eliminate the need to expand agricultural production into natural habitats as well as provide a high-quality matrix and conserve biodiversity.

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Source: Hall et al 2008



The red bar indicates the average recommended daily caloric intake and the white bars show the global food supply. First, gross production before losses to livestock production, second, net supply after subtracting losses (and adding new gains) from livestock production and finally, after net losses from livestock production and wastage.

Food Waste

- Globally, 5-50% of all food is wasted. Nevertheless, few studies have attempted to quantify food waste at a global, or even national, level.
- Developed nations waste 30 to 50% of their food supply, primarily at the retail and consumer level.
- Developing nations waste 5 to 35% of their food supply, primarily at the farm level due to inadequate storage facilities and transportation networks.
- However, waste occurs along the entire supply chain. Food is lost:
 - on the farm as cosmetic standards cause a percentage of crops to be wasted;
 - during shipment, due to inefficiencies at processors;
 - at the retail level as the “perception of plenty” sales practice puts more food on the shelves than will sell before expiry;
 - retail ordering practices often cause excessive waste due to poor estimation of sales; and finally
 - consumers buy and prepare too much, waste edible food during food preparation and throw out food based on labeling that suggests it is bad long before it is.
- Reducing waste by only 10% could provide over 1.5 billion people with 2000 kcal per day.