



(A)

BEEF & DAIRY MASS ESTIMATE



dairy mass, $m_{\text{dairy}}^{(\text{diet})} \approx \frac{f \text{ L}}{\text{person} \times \text{week}} \times \frac{1 \text{ kg}}{1 \text{ L}} \times \frac{52 \text{ weeks}}{1 \text{ year}}$

$$\approx 10^2 \text{ kg} / (\text{person} \times \text{year})$$


beef mass, $m_{\text{beef}}^{(\text{diet})} \approx \frac{f \times 10^{-1} \text{ kg}}{\text{person} \times \text{week}} \times \frac{52 \text{ weeks}}{1 \text{ year}}$

$$\approx f \times 10 \text{ kg} / (\text{person} \times \text{year})$$

global cow product mass, $m_{\text{dairy+beef}} \approx N_{\text{pop}} \times (m_{\text{dairy}}^{(\text{diet})} + m_{\text{beef}}^{(\text{diet})})$


$$\approx 8 \times 10^9 \text{ people} \times \frac{10^2 \text{ kg}}{\text{person} \times \text{year}}$$

$$\approx 8 \times 10^{11} \text{ kg} / \text{year}$$

(C)

CATTLE POPULATION ESTIMATE

DAIRY CATTLE




milk mass, $m_{\text{milk}}^{(\text{cow})} \approx 10^4 \text{ kg} / \text{cow}$

dairy cow lifespan, $t_{\text{cow}} \approx f \text{ years}$

dairy cow population, $N_{\text{cattle}}^{(\text{dairy})} \approx \frac{v \text{ kg}}{\text{year}} \times \frac{1 \text{ cow}}{10^4 \text{ kg}} \times \frac{f \text{ years}}{1 \text{ cow}}$

$$\approx f \times 10^8 \text{ dairy cattle}$$

BEEF CATTLE



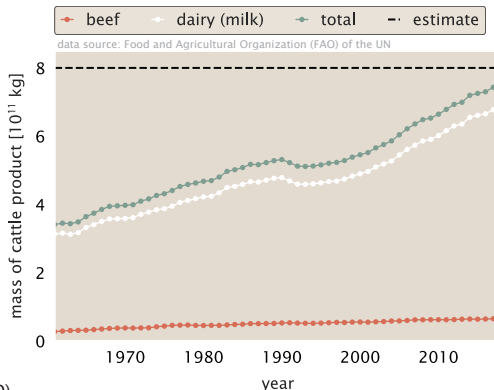
beef mass, $m_{\text{beef}}^{(\text{cow})} \approx f \times 10^2 \text{ kg} / \text{cow}$

beef cow lifespan, $t_{\text{cow}} \approx f \text{ years}$

beef cow population, $N_{\text{cattle}}^{(\text{beef})} \approx \frac{10^{11} \text{ kg}}{\text{year}} \times \frac{1 \text{ cow}}{f \times 10^2 \text{ kg}} \times \frac{f \text{ years}}{1 \text{ cow}}$

$$\approx 10^9 \text{ beef cattle}$$

(B)



(D)

total cattle population, $N_{\text{cattle}} \approx N_{\text{cattle}}^{(\text{dairy})} + N_{\text{cattle}}^{(\text{beef})} \approx 1.7 \times 10^9$

