(A)

BEEF & DAIRY MASS ESTIMATE

dairy

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

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

global mass, $m_{dairy} \approx \frac{10^{2}\ kg}{person \times year} \times 8{\times}10^{9}\ people$

$\approx 10^{12}\ kg\ /\ year$

beef

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

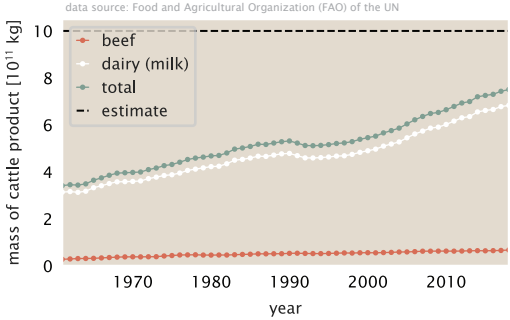
$\approx 10\ kg\ /\ (person \times year)$

global mass, $m_{dairy} \approx \frac{10\ kg}{person \times year} \times 8{\times}10^{9}\ people$

$\approx 10^{11}\ kg\ /\ year$

(B)

global mass, $m_{cow} \approx m_{milk} + m_{beef} \approx m_{milk} \approx 10^{12}\ kg\ /\ year$



(C)

CATTLE POPULATION ESTIMATE

dairy

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

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

dairy cow population, $N_{cattle}^{(dairy)} \approx \frac{10^{12} kg}{year} \times \frac{1\ cow}{10^{4}\ kg} \times \frac{f\ years}{1\ cow}$

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

beef

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

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

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

$\approx 10^{9}$ beef cattle

(D)

total cattle population, $N_{cattle} \approx N_{cattle}^{(dairy)} + N_{cattle}^{(beef)} \approx 1.f \times 10^{9}$