

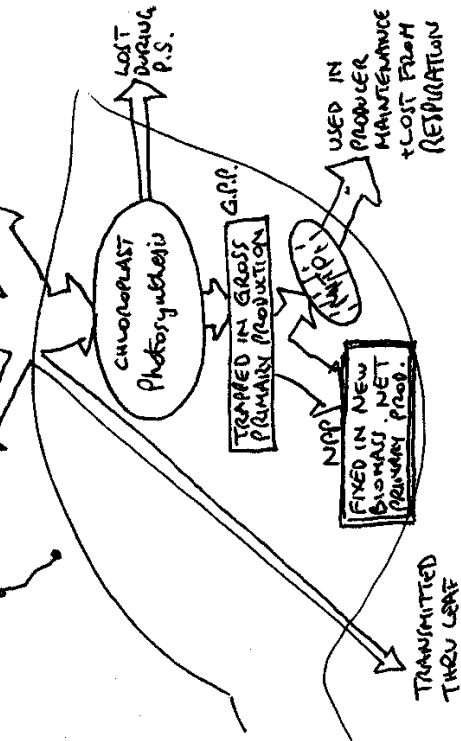
**ENERGY TRANSFER BETWEEN LEVELS:**  
 Typically 5-10% of NPP actually is used by the primary consumer - much of plant biomass is indigestible + passes thru animal - not all of a plant is eaten (but all of biomass eventually decomposed unless part is formed).

Amount of energy entering the system is major factor determining productivity.

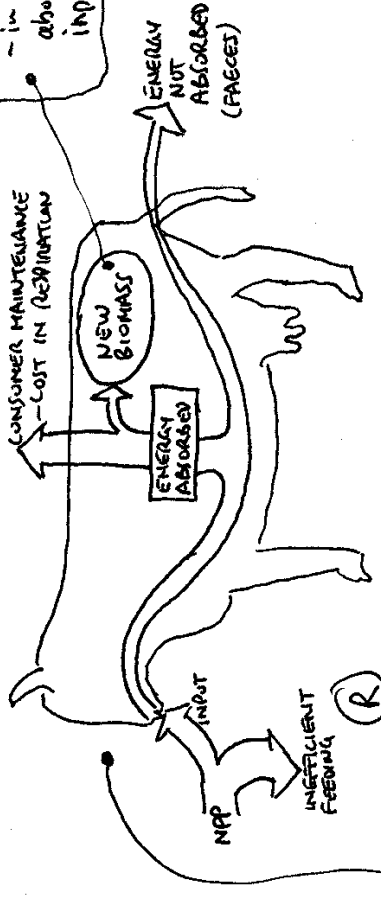


SOLAR RADIATION

Most energy is absorbed, reflected or scattered in the atmosphere. Only a small portion is available for PHOTOSYNTHESIS.



**ENERGY BUDGET OF A 1Y CONSUMER:**



**THE LENGTH OF A FOOD CHAIN IS LIMITED** by:  
 - amount of incoming solar energy of the producer in N.P.P.  
 - the huge energy losses at and between each link in the chain.  
 These losses are typically 90% at each step.

**DECOMPOSERS** are consumers which feed on detritus. **DECOMPOSERS** break down (by extracellular digestion) organic matter and are VITAL in the RECYCLING of materials. (see C+N cycles)

N.P.P. is available for next stage in food chain.  
 N.P.P. is typically about 50-60% of G.P.P.

**LOSSES FROM RESPIRATION** - All organisms require energy from respiration to drive cellular activities:  
 - active transport  
 - biosynthesis  
 - movement.  
 Respiration is at best 40% efficient. All energy is eventually lost as HEAT, (which is of value to ENDOTHERMS).

This is SECONDARY PRODUCTION - in beef cattle it is about 5% of energy input.

**REPERCUSSIONS FOR HUMANS:**  
 1) Much more energy available if humans feed as primary not secondary consumers. Modern agriculture aims to increase efficiency of NPP and of secondary production by:  
 - selective breeding  
 - genetic engineering  
 - use of pesticides + weedicides  
 - artificial fertilizers  
 - hormones + antibiotics  
 - intensive husbandry etc.  
 2) Ethical + human health issues

3) Consequences for the environment  
 + conservation  
 - habitat loss  
 - species loss  
 - agricultural pollution  
 - soil erosion  
 - depletion of fossil fuels  
 - global warming etc.