

Climate Change and Agricultural Resiliency in Animal Feed Production

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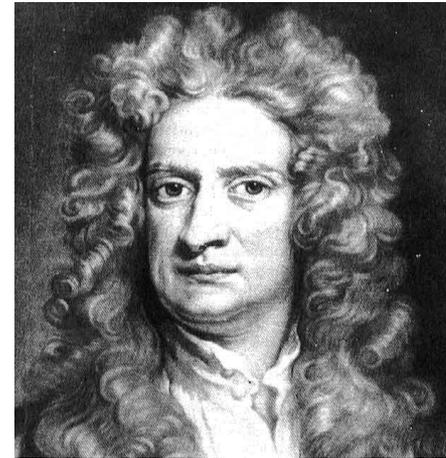
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Getting from Grass to Glass without all the Gas!

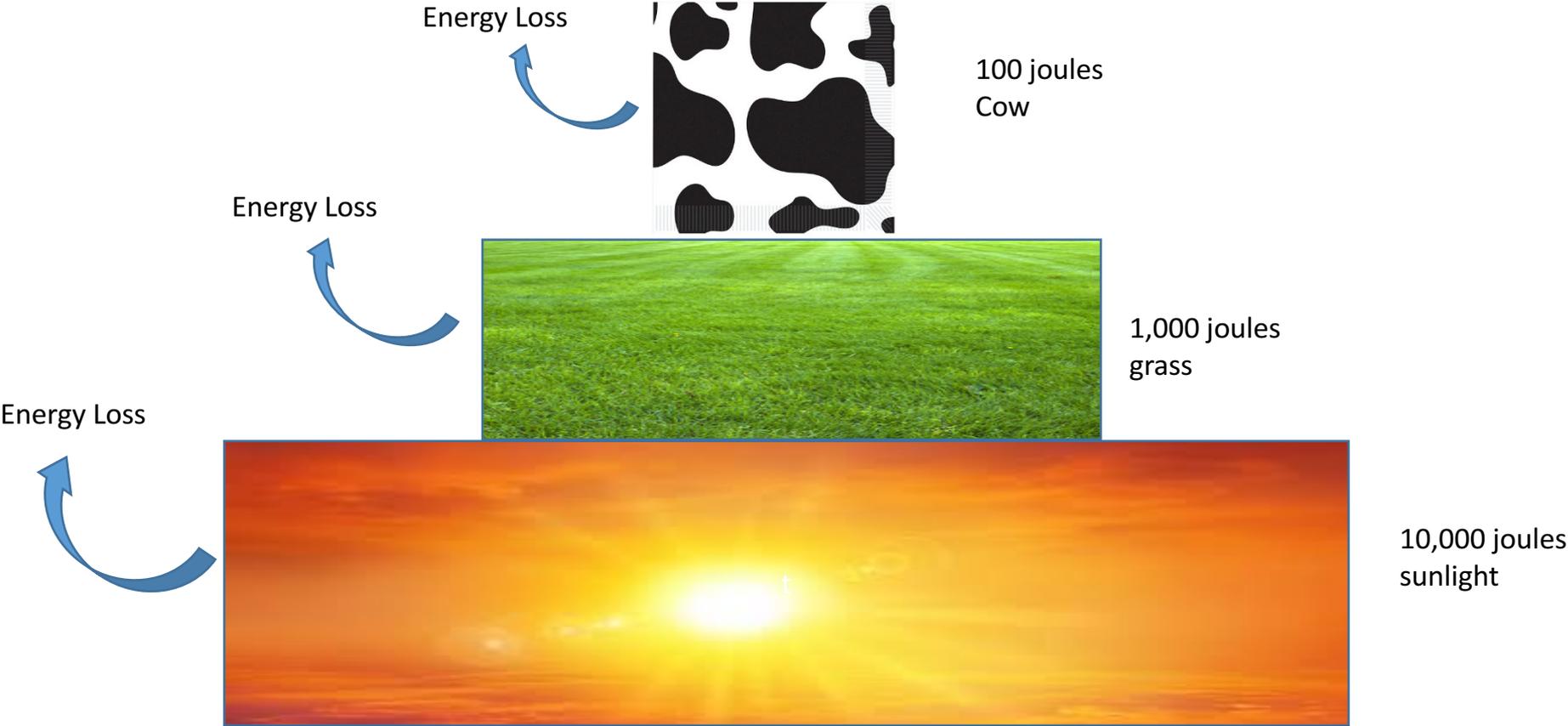


Second Law of Thermodynamics



*As energy is transferred
or transformed, more
and more of it is wasted.*

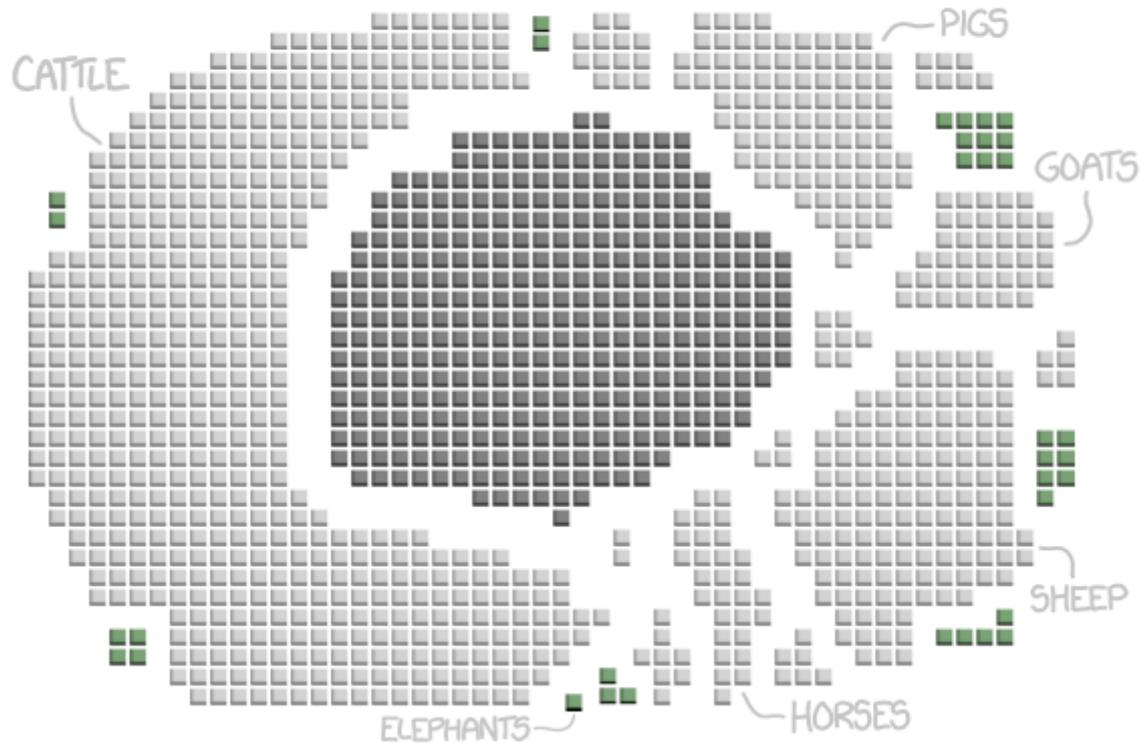
Dairy Food Chain



EARTH'S LAND MAMMALS BY WEIGHT

■ = 1,000,000 TONS

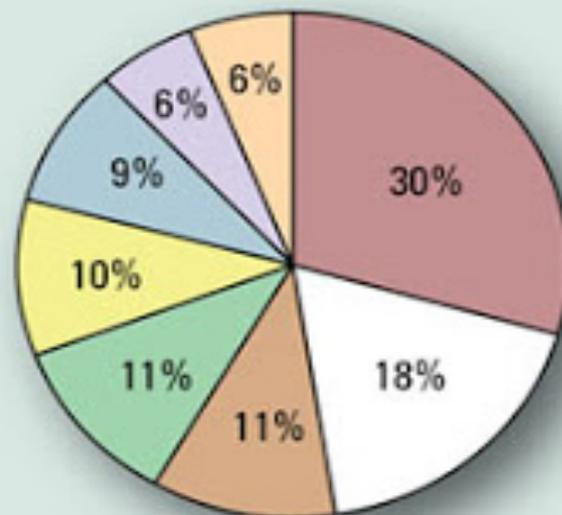
■ HUMANS ■ OUR PETS AND LIVESTOCK ■ WILD ANIMALS



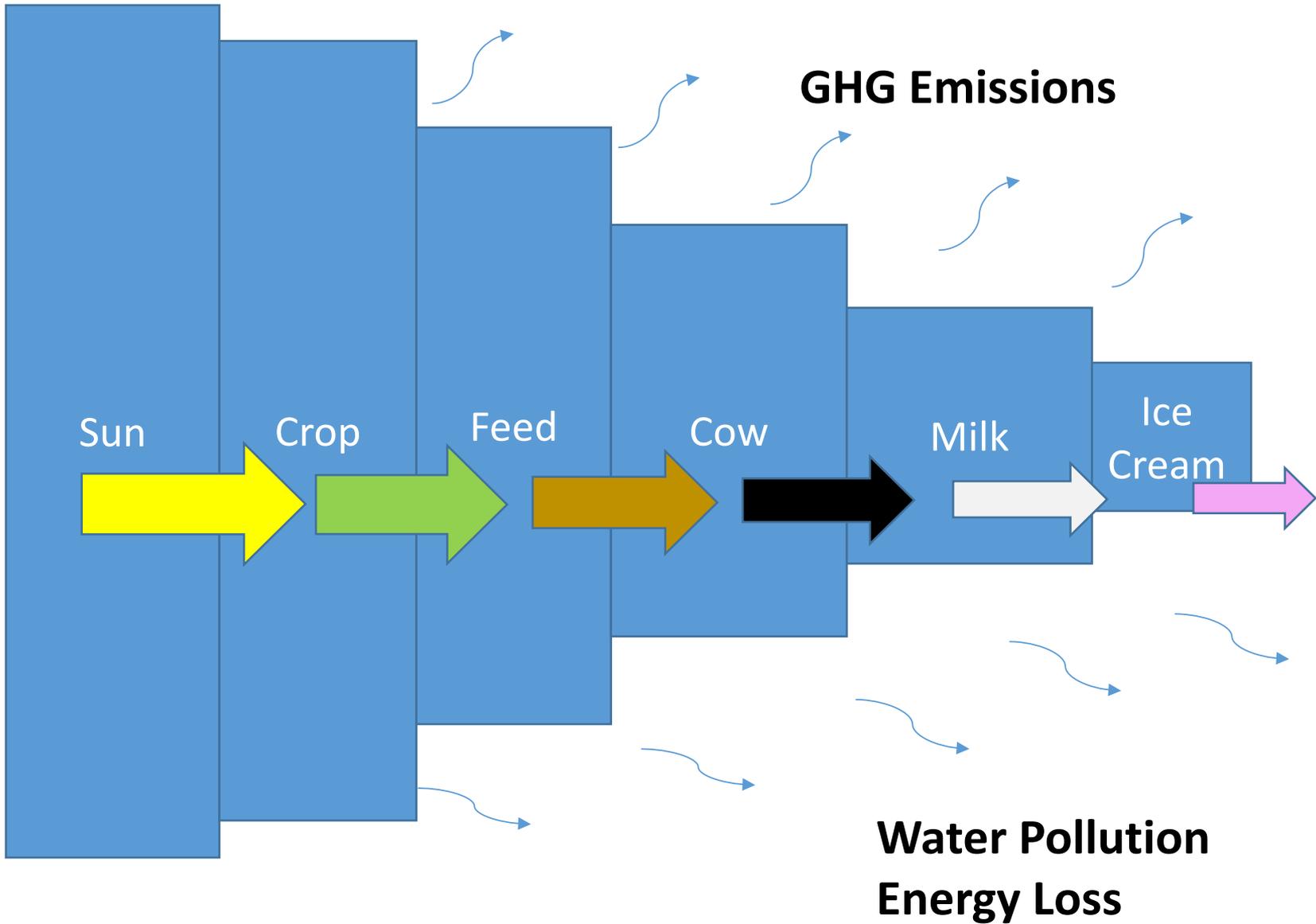
DATA FROM VACLAV SMIL'S *THE EARTH'S BIOSPHERE: EVOLUTION, DYNAMICS, AND CHANGE*, PLUS A FEW OTHER SOURCES.

- Agriculture 25% of Global GHG Emissions
- Livestock Sector 14.5% of Global GHG Emissions
(44% of Methane, 53% of NO₂, 5% of CO₂)
- Feed Production & Transport 45% of Global livestock GHG emissions
- GHG Intensities
 - Beef Cattle 2495 M ton CO₂ eq
 - Dairy Cattle 2128 M ton CO₂ eq
 - Chicken 612 M ton CO₂ eq

Greenhouse Gases from Food



- Red meat
- Dairy products
- Cereals/carbs
- Fruit/vegetables
- Chicken/fish/eggs
- Other
- Beverages
- Oils/sweets/condiments

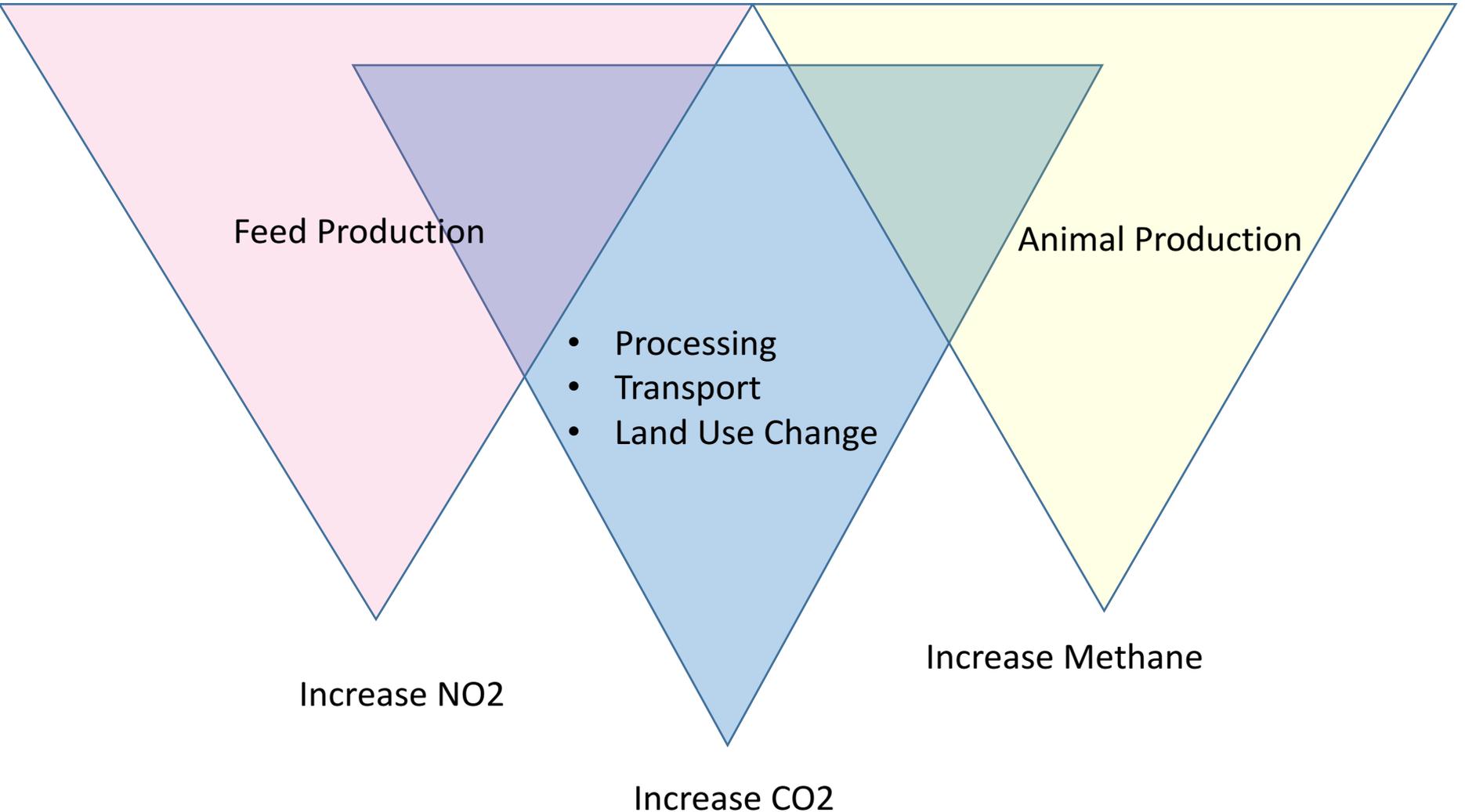


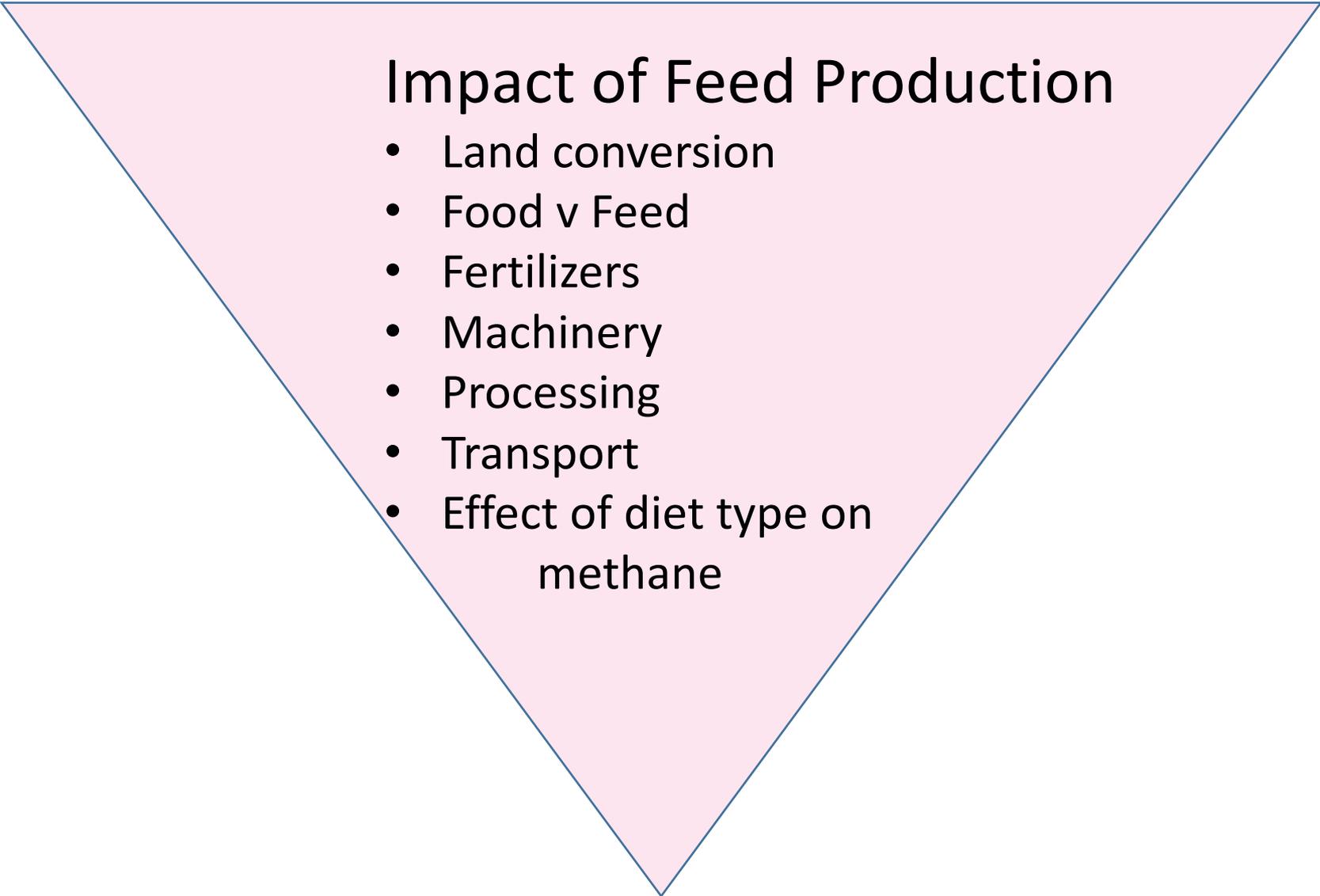


Increases by 2050:

- Human population 33%
- Demand for Ag Products 70%
- Demand for Dairy 60%

Impact of Livestock on Climate Change





Impact of Feed Production

- Land conversion
- Food v Feed
- Fertilizers
- Machinery
- Processing
- Transport
- Effect of diet type on methane

Impact of Climate Change on Livestock Production

Increased Temperature

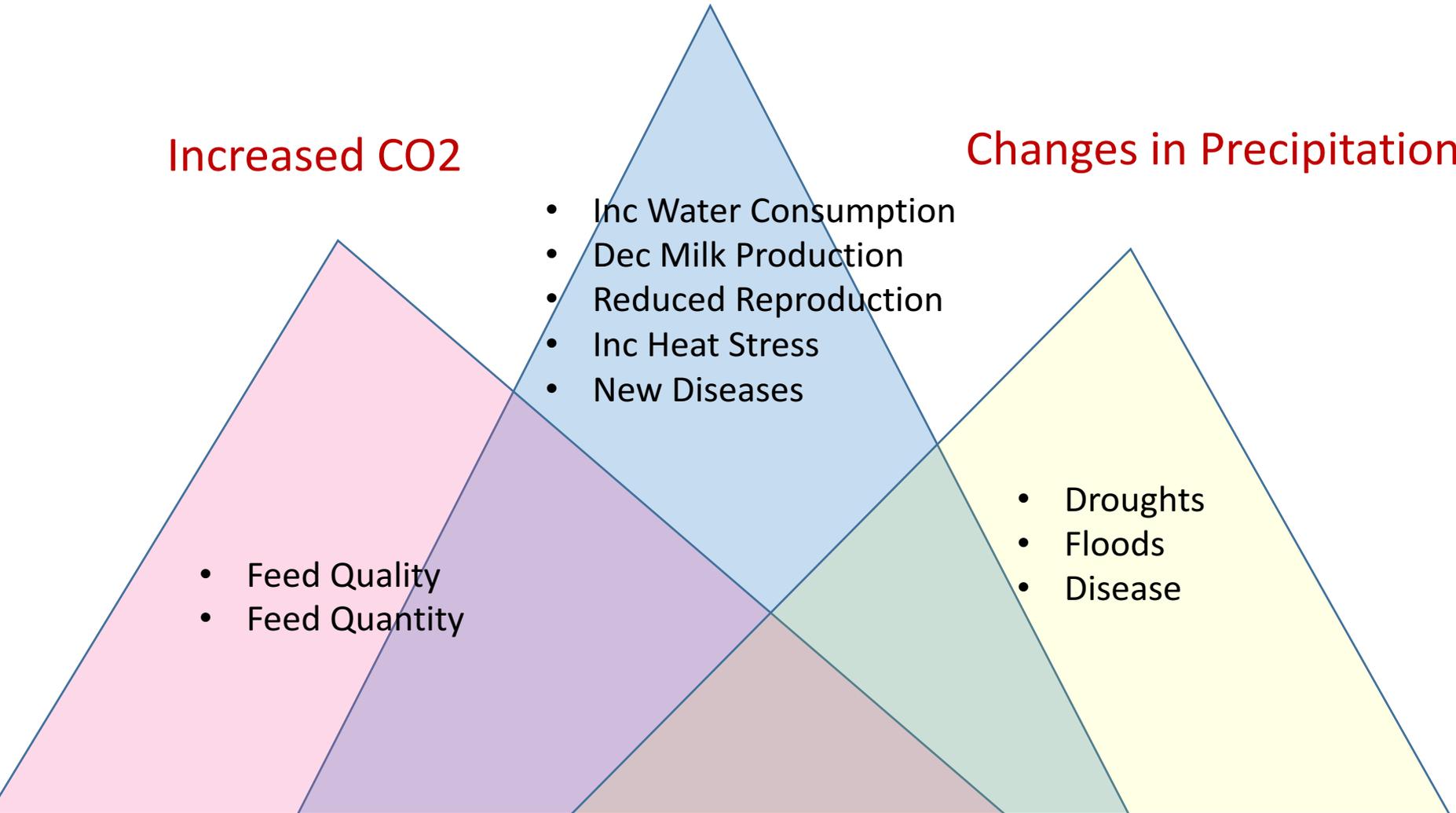
Increased CO₂

Changes in Precipitation

- Inc Water Consumption
- Dec Milk Production
- Reduced Reproduction
- Inc Heat Stress
- New Diseases

- Feed Quality
- Feed Quantity

- Droughts
- Floods
- Disease



Improving Mitigation and Adaptation

Diversity

- Crop Types
 - Crop Varieties
 - Planting patterns
 - Intercropping
 - Crop Rotation
 - Cover Crops
 - Refugia
- Creates Resilience
 - Reduces Need for Fertilizers and Pesticides
 - Carbon Sequestration
 - Reduces transportation and Processing energy use

Healthy Soils

Grazing

Laws that Discourage Resilient and Climate-Smart Agriculture

Farm Bill Commodity Subsidies

- Go to large producers of commodity crops
- Promote monocultures
- Promote high fossil fuel inputs

Farm Bill Crop Insurance

- Masks incentives for adaptive practices
- Discourages diversity

Environmental Laws

- Agricultural exempt from most environmental laws
- Environmental laws do not promote resilient forms of agriculture

Building A More Resilient Agricultural System

“Climate-Smart” best farming practices

- Existing practices for dairy could reduce GHGs by 30%

Shift of subsidies and crop insurance benefits to encourage more resilient practices

- Diversity instead of large monocultures
- Encourage crop rotation, etc.
- Improved nutrient and water management
- Encourage grazing and less methane-producing feeds