THE PROTEIN CRUNCH

POPULATION

- Growing world population leading to large scale disaster
  - Exponential population growth has led us to question the planet carrying capacity
  - Advancement in health care has reduced deaths without affecting birth rate
  - Use of non-renewable fossil resources has enabled for large number of people to be fed
  - Population bubble
- Population growth itself does not give the full picture of man's impact
  - Level of their consumption and pollution caused in producing that consumption depicts more realistic environmental impact
    - Consumption-driven lifestyle aspirations
    - Consumption has increasingly defines our human identity
  - Crisis we face is that too many people consuming too many of the natural resources available to us
    - The rich are already consuming the water of the thirsty, eating the food of the hungry, and burning the fuel of the cold
    - The already-rich tend to become wealthier and the poor simply become poorer
- Population increase is not solely a problem
  - People are 'the ultimate resource'
    - More minds to solve man's problems
  - Natural resources are not finite, but are created by man's intellect
    - Continually renewable resource
  - Huge advances in recycling, energy and food production
    - But mainly the rich and those in the Western world have access to the technology required to recycle scarce resources, produce food efficiently, develop sustainable power sources
    - Application of man's intellect is therefore constrained by economics and access to capital
- Poverty vs Affluence
  - Poverty (desperate) people have no alternatives
  - Overconsumption trap - equally devastating impact
    - Optimists: Human ingenuity will triumph
    - Pessimists: no sign of significant pre-emptive action required to restore the environment
- Birth rates
  - Advances in contraceptive techniques, education and sexual revolution (1960s)
    - Create a new dynamic to more sex but less procreation
    - Across the world on an average day, 190 million acts of sexual intercourse - 910k conceptions, 180k abortions, 360k babies born, net increase in 350k per day
  - Birth rates in cities are far below rural areas
    - Children help with livestock and other farming chores
    - Children tend to be an economic liability rather than assets in cities
      - Unable to contribute to the economic activity of their parents
    - Cities may well be the best form of contraception man has invented to date
- Middle class & doers
  - Relatively stable in Western world
  - People are moving rapidly out of poverty in the developing countries
    - Urbanisation has accelerated since 1950, now more than 50% of world population lives in urban environments
    - Total rural populations are set to decline from 2020
  - Overcrowded slum conditions
    - Serious challenges - waste disposal, sanitary arrangements
    - Poor or non-existent sanitation/ waste disposal promotes widespread contamination of water and food
      - Deteriorate health
    - Simply no space for food growing
      - Water scarcity - increase in price
      - Rising food prices will force many urban poor to reduce protein consumptions
      - Food supply, sanitation, healthcare
      - Rural hunger key issues
- We have seen major economic migrations, but nothing will compare with the environmental migrations that will start in the coming decades
  - Carrying capacity of the Earth
    - Depends on human choices and lifestyles
    - Balance growing human needs with limited resources
    - Sustainable development
  - Market use price to balance supply and demand
    - Have yet formulate an economic system that does not depend on growth for its stability
    - Need of consumption by the richer countries to prevent economy going into recessions
    - Rely of capitalism to allocate hunger, starvation and death. Charity simply interrupts this otherwise "frighteningly efficient process.

THE AGRI-INDUSTRY & ANIMAL CITIES

- Dysfunctional global food system
  - Producing 30% more calories per capita we need to feed for forecast peak population
    - 1/6 of global population is undernourished
    - ~1/6 are overweight or obese
    - 20K people die of malnutrition and starvation, while 25% of all death in EU are recorded with obesity as underlying cause
  - Poor cannot pay for basic foodstuffs, the wealthy are persuaded to consume large quantities of additive junk food products
    - Junk food - too many calories but too few nutrients
    - Overfed yet undernourished
    - Stuffed but in the sense starved
- Capitalist food system - commerce prevails over ecology and growth over sustainability
  - Food sometimes travels huge distance via centralised depot to end up back on shelves near where it originated
  - Modern food supply chain - farmers no longer have the power
    - Narrow profit margin to bring the cost lower for consumers
    - Commodity price goes down, farmers tend to produce even more, creating an oversupply
    - Further price depression, disastrous for farmers
  - Maximise profits by gravitating to more profitable commodities with greater margins
    - Highly processed cereals and snacks
    - Unhealthy junk food with all its additives and chemicals if it is more profitable than producing healthy food
    - Maximising short-term profits over environmental and sustainability considerations
- Diet and health
  - Countries experiencing First/Third World division within their own countries
    - Transition from health issues as wealth increases - diseases that are associated with a lack of nutrition
  - Current strategy tackles obesity symptoms but not the causes
    - Children worldwide might be the first generation to not live longer than their parents
    - Chronic disease of affluence result from eating bad food can only be addressed by eating better food
    - Drugs or treatments are just an antidote to the symptoms, not the causes of unhealthy nutrition and overeating
  - Formula fed babies can develop a sweet tooth from feeds that contain far more sugars than breast milk
    - 30K more calories consumed over the first 8 months - equivalent of 125 chocolate bars
    - Sugar makes up of 20% for American teenagers calories
    - French fries represents 29% of total US vegetable intake
- Green Revolution
  - Many smaller farmers have been bypassed due to the inability to afford the cost of necessary mechanisation, seeds, inputs
  - Next biotechnological Green Revolution
    - Crops will be re-engineered to be more water-truth resistant
    - Perpetuate rural dependency and overborrowing
- Meat consumptions
  - A third of global annual grain output of 2 billion tonnes is fed to farmed animals
    - Most world's productive land is already in agricultural use
    - 80% of extra grain required by 2030 will have to come from intensification of production on existing land
  - Concentrated Animal Feeding Operations (CAFOs)
    - Feed management software for animal rations to ensure quickest weight gain for lowest nutritional input cost
    - Producing maximum edible yield in minimum possible time
      - Little regard for animal welfare, product flavour, consumer health
      - Intensive production involved extensive use of antibiotics, growth hormones
        - Worldwide phenomenon of earlier human puberty
    - Industrial scale of waste production
      - Cost centres, prone to a lack of maintenance and leaks
      - Cocktail of potentially toxic pollutants is not recycled
      - Largely exempted from environmental regulations
  - It takes an average of 3Kg of grain to produce 1kg of beef, 1kg of grain to produce 1kg of pork
    - Mono-gastric animals consume higher protein diet than ruminants
    - Intensive chicken production - convert feed into breast meat
      - Sold as fillets or cuts, as opposed to whole birds
      - Most valuable part being the breast portions
      - Real conversion rate = 4.8kg of grain to make 1kg of chicken meat that we eat
    - Annual chicken slaughter produces 10 billion litres of blood
  - Intense animal production yields danger of infectious diseases transmission
    - Genetically selected for maximum yield, fewer strains (effectively monocultures)
    - Overuse of antibiotics to keep them 'healthy' - rise of drug-resistance bacteria
    - Outbreak of diseases that can be transmitted from animals to humans
      - Diains their genetic vitality and compromises their natural immune system
      - Livestock industry consumes almost half of all antibiotics produced in the world
  - Vital role of public health organisations in regulating food production systems
    - Wealthy societies need to reduce their consumption of meat and dairy products
    - Consumer can play a role in supporting primary producers in developing countries
    - Impact on human and environmental health of modern agriculture
      - Culturally and socially, higher meat and dairy consumption is perceived as a symbol of economic and social progress
      - 'Fair Trade' products
      - A result of failures in free market system
      - Minimum international standards on all aspects of industrial farming should be agreed and implemented

LESS MEETS MORE - THE PROTEIN CRUNCH

- We add more people to our planet every day
  - More demand for protein but finite amount of natural resources
  - Food price increases are running ahead general inflation rate
    - Pressure on commodity prices is coming from reduced supply as well as increased demand from a growing population
    - Cars are now competing with humans and animals for world grain harvest
    - Fuel for the cars of the rich is taking food from the mouths of the poor
- Earth Overshoot Day
  - We are already operating beyond Earth's renewable carrying capacity
  - Economic growth cannot continue indefinitely in its current form
- Protein Crunch
  - Imbalance between supply and demand in our rapidly changing food supply systems
  - Food price inflation hits the poor particularly hard
  - Fossil fuels are key inputs in fertilliser production
- Nothing less than a redesign of the whole food system along sustainable principles is required
  - Sustainable intensification
  - The missing link in the understanding of the underlying cause of the price rises
    - Environmental degradation combined with daily increasing population
    - Raising yields at the same time increasing efficiency

CHALLENGES & CHOICES

- Limited time to react, act and make meaningful and sustainable difference
  - We spend trillions of dollars on human healthcare, but invest in almost nothing in caring for the Earth on which we all depend.
  - Global environmental degradation we are facing is avoidable
    - We have the knowledge, ability, technology
    - What we lack right now is will, leadership and commitment
    - We will now live long enough to see how stupid we were
- Our new thinking processes need to be tamed on Nature rather than technology
  - Importance of distinguishing growth and development
    - We don't grow physically past our 20s
    - There is no limit to our intellectual and personal development
  - Begin to understand the complex web of life rather than better with parts of an imaginary machine that we consider Nature
- Three kinds of people
  - Individualists
    - Optimists: human ingenuity and Nature's resilience
  - Egalitarians
    - Pessimists and 'green' by nature
  - Hierarchs
    - Human history has shown that we can master Nature through the brilliance of our minds and inventiveness of our technology
    - More people, more consumption, more disruption of natural systems
    - More developmental policies and practices
    - Plans, policies, stewardship and appropriate regulations move civilisation forward
- Ecological life cycle assessment (LCA)
  - Cradle to grave information
    - Sustainability of choices for specific products
    - Radical transparency linking to business ethics
- Specific measures required to address the outlined challenges
  - WATER
    - 'More crop per drop' technology
    - Raise awareness of water use and footprints
    - Developing 'water ethic'
  - LAND
    - Tell order to ban subsidised groundwater irrigation
    - Restore soil quality by reducing nitrogen-based fertilliser
    - Institute a compulsory carbon offset programme
  - SEAS
    - Stop overfishing and ban dispoal of by-catch
    - Create marine reserve that would cover 10% of world's oceans
    - Recycling waste protein into useable protein for sustainable fish farming
  - POPULATIONS
    - Detach economic growth from environmental impact
    - Devise a new and stable measures of well-being and government leadership
    - Universal availability of family planning services
- Redefine the concept of intelligence
  - Data is not knowledge, intelligence is more than cleverness
  - Extrapolating current trends, we can predict future demand and commodity prices
  - We can individually or collectively make a difference
    - Change our consumption habits towards buying sustainable food and consumer products
    - Just because we can do only a little to make our planet better, it is not an excuse to do nothing
    - We react not now and start to repair our future

WATER

- We can only have as much water on the Earth now as when time begin
  - Endless recycled from the beginning
  - Only compound existing in Nature with three states
- When we waste water, we waste energy
  - Resulting in pollution that could be avoided
  - 'Waterless' technologies would save both water & energy
    - Governments support by taxing out old technologies and subsidising the new ones
    - Waterless composting toilets - provide sanitation to developing world
- Virtual water we consume indirectly underlies world economy from agriculture to consumer goods
  - Meat & Oil industries scarce & non-renewable resources
    - US export condensed ancient underground water as beef
    - Middle East export ancient condensed sunlight and carbon-source
  - Everything we eat or use, in fact, is a form of condensed or virtual water
    - Does the water we drink takes water to produce and clean it
- Relationship between water circulation and forestation
  - Tropical forests help to create and recycle rain.
    - Terpenes, released by tree during photosynthesis, provide the basis for any of cloud seeding for rain
  - Monoculture plantations of forests or crops
    - Susceptible to disease
    - Do not provide a natural habitat for diverse wildlife
- Water - life & death
  - More than 1 billion people still struggle to have safe supply of fresh, clean water
    - Outbreak of infectious diseases
      - Cholera, typhoid, polio
      - Diarrhoea, can kill through dehydration
  - Only small amount of wastewater from sewage systems is properly treated in developing countries
    - Much of the rest were being discharged straight into rivers, lakes and seas
  - Water scarcity exacerbated by climate change is expected to affect more population by 200 million humans a year (2025)
    - 40% of world's food supply comes from irrigated land
    - water scarcity means food insecurity
- Blue Revolution
  - We react to crises as they arise - without taking the necessary action to avoid them

LAND

- Farmland - thin layer of soil
  - What is soil?
    - Weathering of rocks into rock particles
    - Organic matter from decaying plants
    - Retains water and promotes plant growth
      - Prevent erosion
  - Three aspects
    - Physical structure
      - Size, composition
    - Chemical context
      - Nutritional quality
    - Biological activity
      - Pattern of life it sustains
  - Soil and mankind
    - Non-renewable, finite resource that we must maintain and preserve
    - Transformation of agriculture to agri-business
      - Specialisation works well in industry, but not in farming and Nature.
      - Interaction of a wide variety of plants and animals maintains Nature's balance
    - Monocultures imbalance results in disease or predation to restore balance
      - Continual application of pesticides, antibiotics
      - Instead of promoting health, immune system responses, we call in sprayers, vaccines, serums
- Man's obsession with the science of agriculture
  - Soil analysis - 'NPK'
    - Less vital or secondary macro- and micronutrients are often ignored
  - Protecting crops from pests
    - Pesticides and insecticides merely preserves until plants
  - Cost of environmental degradation or damage is not accounted
    - Soil can be made to increase yields
      - But soil fertility does not last forever
    - Mechanisation of agriculture has freed once land-linked labour
      - Small players have given way to larger, more uniform retail chains through business efficiency and competition
    - Food production has kept pace with the rapid increase in world population
      - Conversely, agriculture yields have created our global population explosion
- Agro-ecology
  - Assessment of new technology can be used in conjunction with natural resources to ensure productivity, sustainability, and equitable outcomes
    - Effective design can help integrate agricultural production
      - Overall biological efficiency is improved
      - Biodiversity is preserved
      - Productivity and self-sustaining capacities can be maintained
    - Optimisation of agro-ecological processes will strengthen agricultural yields against pests and disease
      - Decrease environmental toxicity by reducing the need for man-made chemicals and pesticides
      - Recycling initiatives reduce landfill and create valuable products
  - There's an inescapable connection between fertile soil and healthy crops, therefore healthy animals and healthy human beings
    - Problems created by a particular way of thinking cannot be solved by the same kind of thinking (Einstein)
      - Cost of working against Nature will be too high
      - Agro-ecological farming operations will survive
        - Expensive and ineffective industrial solutions are required to overcome Nature
        - Natural systems will end up with better quality produce
- Disappearing farmland
  - Soil Erosion
    - Driving more agricultural land permanently out of production
      - Hard to maintain global food production levels
    - Soil erosion - rates of soil creation is lower than soil depletion
      - Predominantly man-made
        - Mechanised ploughing
        - Overgrazing
        - Deforestation and land-clearing
      - Rapidly become barren or desertified, permanent load of agricultural production
      - Side-effects of grasslands degradation
        - Floods, mudslides
        - Both water and wind can erode unprotected or degraded soil from our land
    - Prize for global livestock population growth - goal
      - Survive on land where many other animals cannot
      - Eat almost anything
      - Harbingers of environmental devastation
  - Soil salinisation
    - 1. Groundwater levels rise and bring saline water to root table
      - Water sinks into the ground when no groundcover is planted, raises the saline water table
    - 2. Salinisation can be caused by repeated application of mineral-rich water
      - 20% of all irrigated land is already salt-affected
      - Engineering food crops to require less irrigation and salt-tolerant
      - High mineral salt concentration makes it harder for roots of plants to absorb water
  - Biofuel production
    - 'Ecologically sound' means for substituting fossil fuels
      - Ethanol - derived from sugar cane
      - Agri-diesel - derived from palm oil
      - Taking land out for alternative uses
    - Food crisis meets energy crisis
      - If true cost, includes the environmental damage of the fuel, there will be a material price shock
  - Man settlements
    - Industrialisation, urbanisation and rising populations
      - Demand for land takes prime cropland out of production
        - Leads to direct decline in production levels
- Farmland, climate change, global food supply insecurity
  - Food insecurity - rising populations unable to be sustained on the land and water resources within country's borders
  - Offshore land investments in agriculture production
    - Establish and ensure semi-reliable physical supply of agricultural produce
    - Vital political priority as the practice will continue to expand - wealthy countries seek to ensure their food security
  - People are now eating more prepared foods than ever before
    - Devoid of micronutrients and packed with chemical additives
      - Significant contribution to rising levels of diet-induced ill health
      - Eating too much wrong food, but do not get an adequate supply of basic nutrients
      - Overconsumptive underutilition
  - Ways to feed our growing populations
    - Develop agro-ecological initiatives to restore our croplands
    - Restore our hills and river systems, stop wasting the produce of our land
    - Recycle nutrients that we throw away as landfill back into our soil

SEAS

- Destruction of our fresh water and sea fish stock is imminent
  - When you are eating your breeding stock, you are in deep trouble
  - Industrialisation of small-scale fishing
    - Fishing was banned on the Sea of Galilee (2010) as there are almost no fish left
    - Battle to maximise profit per harvest as much 'tons' fish as possible
  - Poor fish in human history
    - salmon, tuna, bass, cod
      - eg. Cod
        - Store oil in liver, makes them a better fish to preserve
        - Fishermen then thought that supply of fish was inexhaustible
  - Overfishing & Depleting stocks
    - It was believed that number of sea fish caught by fishermen was insignificant to Nature stocks
    - Fishing sustains local economy along many countries of the world
      - Fluctuation in the profitability of fishing impacts local community
- Passionate individuals vs governments and their scientific advisers
  - It is often the lone individuals that can see through the noise of vested business interests
    - Remember: a lone amateur built the Ark, a large group of professionals built the Titanic
  - As long as the economics work, greed will prevail
    - Fishermen will travel for the last fish in the sea
    - Most of the world's ocean are open seas, indivisible and unregulated
  - Once fish stock of a species dip below minimum diversity level, scientists believe that stocks may never recover
    - Entire ecosystem shift
    - Fishing now directed to profits rather than sustainable yields by the depleted species
- Too many fishermen, taking out too many fish from sea
  - Each of the species play important role in marine food chain
    - Overfishing of one species can lead to Scarcity or decline of another
  - Damaging environmental impacts of modern fishing technology
    - Trawling techniques that scape the ocean floor
    - Removal of large predatorial fish results in jellyfish boom
    - Decrease in sea fauna --> Killer whales eat sea otters --> Explosion of sea urchins --> Damage on coral reefs (eating productive layers of algae)
  - Most valuable species are being overfished first
    - Underage stock is being consumed and numbers will therefore continue to decline
    - Absurd fishing legislation also promotes huge amounts of waste
      - Discards are wasteful and damaging
      - Best end up as food for deep-sea crabs
    - 'High grading'
      - Poor-value fish are discarded to make room for more profitable fish
- Sea fish vs Farmed fish - industry destruction
  - You are better off eating the best fish in the sea than farmed fish but as fishmeal
    - Increasing number of marine catch will be used in industry or agriculture rather than direct consumption
    - Fishmeal is not used only in fish farms, but also for pigs and poultry
    - 3kgs of marine-caught fish is required to produce 1kg of farmed fish
  - Nitrogen fertilliser run off
    - Nutrient enrichment in the estuary seawaters
      - Promote algal blooms and oxygen depletion
      - Create dead zones around river mouths - no marine life can exist
    - Hardwater augmented seawater mining process
      - Bringing an early end of seasonal dead zone
    - Floods could wash fertilliser into rivers
      - Accelerating the formation of dead zone
- Save our sea
  - Creation of marine reserves or marine protection areas
  - Consumer guidance (e.g. MSC) to look for what fish they should eat
  - Increase in government competencies for regulations and legislative changes