

What will the Changing Climate mean with Respect to Tropical Animal Production Systems?

Edward Allen

the big-picture message

The impact of the changing climate with respect to tropical animal systems is likely to be primarily seen in terms of increased physiological stress which will increase mortality rates at a time of rapidly increasing demand for meat.

With increased physiological stress virus rates are likely to significantly increase and this poses significant human health issues

1. Author Introduction

- From UK, but in Laos for past 6 years
- BA Geography Oxford
- Dissertation: The impact of El Nino on the Indian ocean trade wind system
- MSc Sustainable Agriculture, Imperial College London.
- Dissertation: Lipogenesis in in-vitro cloned Date Palm embryos produced by Somaclonal Embryogenesis

Animal Experience-general

- Parents smallholding in Suffolk
- Primarily sheep
- Parents previously spent 3 years in Shetland Isles. C.12hrs boat from Aberdeen doing dairy cows
- Wrote a book, available free:
- Small-Scale small scale animal handbook in Cambodia

Author Animal Experience –Laos

- After 1yr language school, moved to a district in “Golden Triangle” c.720 Km north of Vientiane
- Community development project
- Leptospirosis outbreak, also HS disease in nearby village, and general vaccinations

Results after 1 ½ years

- Leptospirosis: previous year 100 dogs died in 1 day in 1 village
- Same disease came but 0 dogs died
- 97.5% of animals treated survived
- Prevented HS outbreak from neighbouring village affecting Water Buffalo in project village
- 80%++ pig vaccination rate
- And 50% increase in pig numbers in project villages

Introducing LIRE

- Lao Institute for Renewable Energy (LIRE) under Prime-Ministers' Office
- Lao Non-Profit Organisation
- Almost 7 years old
- >60 reports, for over 25 clients
- Research done on every Lao-Applicable Renewable Energy sector
- C. 15 staff, 5 foreign
- My current role: Climate Change, CDM, Agronomy, Technical writing and advising

2. How is the climate changing?

- Quickly

:faster than anytime at least since 1300s

: some reports suggesting CO₂ levels now the highest in 800000 years

<http://blogs.scientificamerican.com/observations/2013/05/09/400-ppm-carbon-dioxide-in-the-atmosphere-reaches-prehistoric-levels/>

- Inconsistently

:big differences, high latitudes more strongly than low latitudes

: Bangladesh; 1m sea-level rise will displace 40 Million people and destroy c.25-30% of national land area

Climate Change -Tropics

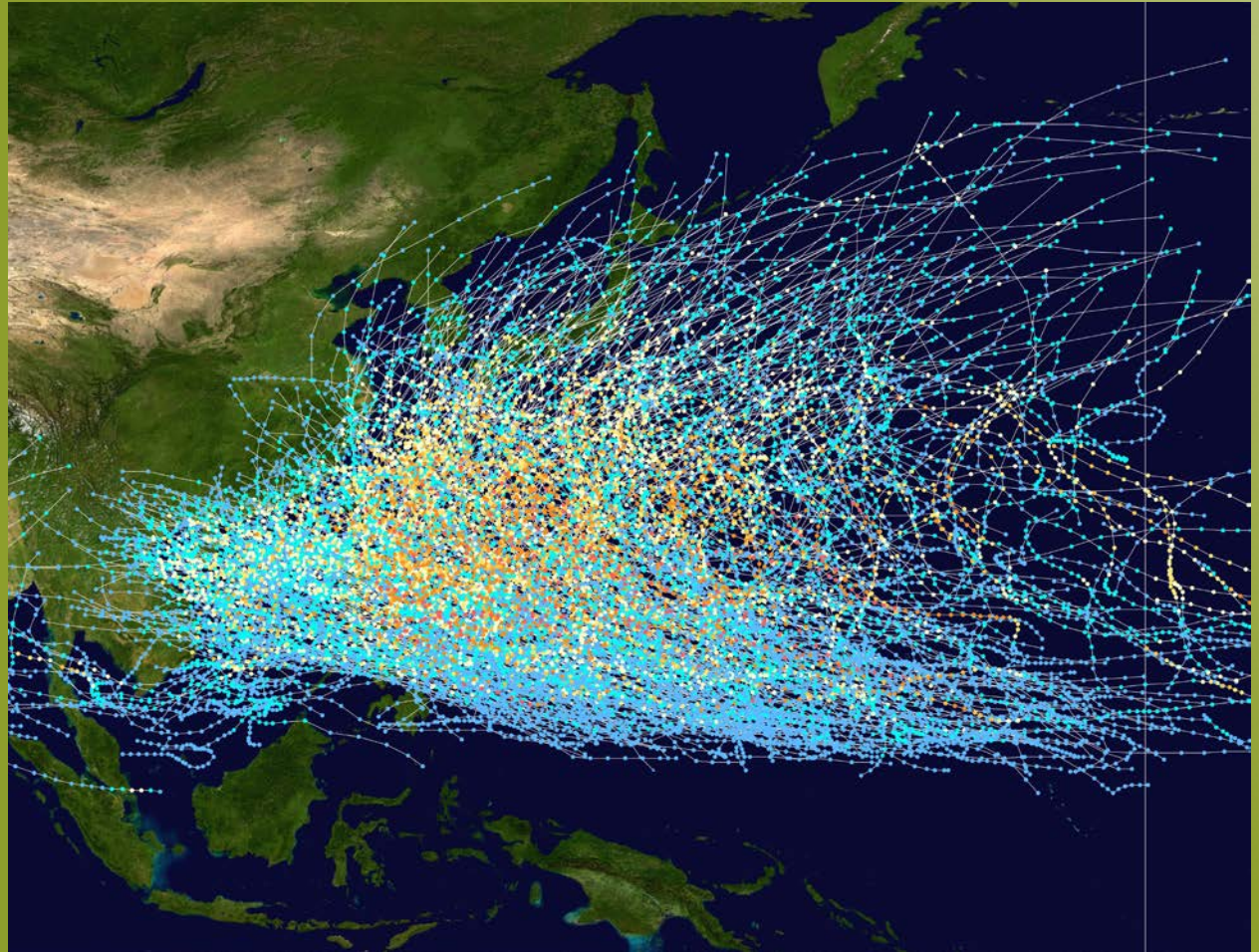
- Temperature increase +2 C in next 20 years and forecast to rise to c. +3.5C by 2100
- Some areas forecast to be drier and other areas forecast increase rain
- SE Asia: longer rainy season eventually finishing in December
- Dry season forecast hotter and drier

Typhoons

- Typhoons and Hurricanes the same thing, only name is different
- :China gets hit the most times per year c.22 per
- BUT more typhoons does not mean more typhoons impact people
- :depends on the tracks that the typhoons take, and that is very difficult to work through



Pacific typhoon tracks 1980-2005.



http://en.wikipedia.org/wiki/File:Pacific_typhoon_tracks_1980-2005.jpg#filelinks

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Temperature changes

- Temperature change from 32 C to 34 C is not a big issue for tropical agriculture
- Our general expectation is that temperature increases up to +2 C will be positive for food production in SE Asia but more than that and we hit food security issues
- Current analysis for Lao PDR c. +1.2 C warming by 2050
- :Climate change is not always bad

Rainfall

- In tropical areas, the total amount of rainfall per year is not a big issue
- But rather that it comes at the right time and is reliable and predictable
- And that sensible watershed/river basin development is adopted
- The El Nino (ENSO) does really mess up tropical rains, not only a monsoon problem

Variability

- Most tropical systems, based around very clearly defined typical temperatures, rainfall, bad storms, low diurnal temperature changes
- Very poor at coping with “stress”
- :African Oil Palm, when transplanted typically takes 6-9 months to grow again because it is so upset

3. Farm Animal categories

- Farm animals are most commonly classified by their digestion systems
- Because animals with the same digestion system tend to have many of the same problems
- Very few diseases cross these categories

Ruminants

- Animals that eat grass and things like grass
- Use bacteria to break down inedible food to edible food in big fermentation stomach , called the Rumen
- Feed the rumen, feed the animal
- Cows, Sheep, Goats, Buffalo, Llamas, Camels

Hind Gut digesters

- Rhinos, Horses, Rabbits, Rhino
- Small stomach, like to regularly eat
- Almost all the action happens post-stomach in big digestion system
- : strange grouping

One Stomach

- Technical term: mono-gastric
- Pigs, Chickens, Humans, Cats, Dogs
- Can eat almost anything, good stomach and good intestine
- Historically strong research links between pigs and chickens
- Heart-valve replacement often pig heart valves

4. How does climate change impact

Ruminants

- Ruminants struggle in tropical areas because of poor quality grasses
- Grains work but are very expensive in tropical places
- 10:1 feed conversion ratio
- Existing food problem made worse

Ruminants

- Adding Urea/Nitrogen fertiliser to food can help
- Range of husbandry options, cut-and-carry etc
- Need quality grass/grains
- BUT good quality grass often does not exist in tropical region
- Facing comparison from areas with 1000+ of years of experience

Hind Gut digesters

- As long as they are fed with food that they like, seem to be no big issue
- In certain regions, dogs are big part of culture/diet
- Probably the easiest tropical animal category
- :but do need to be looked after well

One stomach/Monogastrics

- “Chickens and ducks wandering around farm-yard”
- Do in well tropical places because of wide range of foods acceptable to them.
- C. 49% of all the pigs in the world are in China
- About 3:1 feed conversion ratio
- High percent of live-weight edible c.85% +

5. The demand for meat

- China meat consumption went from 1961 3.6kg per person, per year, to 52.4kg per person in 2002
 - <http://www.theguardian.com/environment/datablog/2009/sep/02/meat-consumption-per-capita-climate-change>
- When people get richer in Asia they eat much more meat, drink more beer, and increased percentage of men over weight and increased percentage of women obese
- :huge demand increase for meat

Meat dynamics

- Theory: that pig eating part of Asia increasingly looking to import cows but raise their own pigs
- Because feed conversion ratio high with pigs compared to cows
- Pigs 3:1, Cows 10:1
- BUT it is actually very difficult indeed to produce good tasting beef in Asia because of feed quality issues

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Pigs are easier

- However, raising pigs indoors hugely successful.
- Further pushing to get finished (ready-to-eat) pigs at c.50-60kg mark to 100 days from 150-120 days
- And little variation in taste of meat :compared to cows

Pig meat commonly processed

Feed grain at what price?

- Substantial uncertainty as to what percentage of grains (:cereals) society will allow to be fed to animals
- :Political science/sociology
- :affordable food for poor people
- :and 100% grain-fed production of livestock still permitted in 20 years from now?

New places to raise cows?

- Temperature rises due to Climate Change forecast to be largest at high latitudes
- Areas such as northern Russia and Northern Canada may change to being range-lands viable for extensive grazing systems

6. Diseases and Death

- Very few diseases can spread to humans from farm animals
- : Foot-and-Mouth Disease (FMD) as a very mild disease
- Salmonella sp from poultry
- Arguably Leptospirosis
- Rabies
- Pigs are a super-vector for Japanese Encephalitis (JE)

And viruses....

- Animal vaccinations in Lao PDR and elsewhere needed to be done in time for immunity to be strong when the seasons changed from dust season to mud season and back again
- Huge peak in animal diseases at that transition
- :Physiological strain

Humans included

- When it turned colder than normal, human deaths went up very rapidly
- “Death Season”
- UK in 2012 went from 32000 deaths in September to 40000 in October
- : Physiological stress opened door to viruses, such as chest infections, influenza, viral Meningitis

Strange?

- Deaths peak at START of rainy season?
- :NOT tired old people dying after long time being cold
- Indeed it is, for humans and animals, arguably age and condition independent to some degree
- More people died in Spanish flu in 1919 than World War 1, including many young people

But smallholder systems?

- Putting chickens, ducks, and even pigs around us, we feel that we are living the authentic smallholder life
- And yet those are the animals most closely linked to viruses going to humans
- And climate change is bringing increased levels of physiological stress

Bird 'flu

- Around 2004-2005 H5N1 Bird 'flu in SE Asia
- Spread usually attributed to wild birds
- Very high bird mortality rates
- :and so killed its own vectors
- :therefore in viral terms. Amazingly unsuccessful

Swine 'Flu

- 2009-2010
- H1N1
- Confusing situation
- Suggestion that millions of cases
- But amazingly low mortality rates
- Significantly probably the first global use of antiviral medications to slow/stop a pandemic

7. Humans spreading diseases to animals?

- The same mechanisms that spread diseases to humans from animals could also spread to animals from humans
- Indeed jet travel leading to ultra-high speed globalised diseases
- More specifically globalised viruses

8. Back to climate change

- Very rapid climate changes bringing more Physiological Stress to more animals and humans
- :creating open door for viruses and other diseases
- And force a re-shaping of our understanding of mixed agriculture
- And have a profound impact on urban agriculture

LIRE

The largest Renewable Energy and Resources institute in Lao PDR with the largest Bio-energy research team in Laos and perhaps the most diverse CDM Program and leading RE Policy expertise.

Unrivalled research, R&D, CDM, data collection and local partner services in Lao PDR

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