

Challenges in intensifying India smallholder dairy production: Health risks and productivity gaps

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Agri4D 2015 conference, Uppsala, Sweden, 23-24 September 2015



RESEARCH PROGRAM ON
Agriculture for
Nutrition
and Health

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Presentation outline

- Background
 - The livestock revolution
 - The white revolution of India
 - Pros and cons
- Our studies
 - Objectives
 - Results
 - Conclusions
- The steps forward



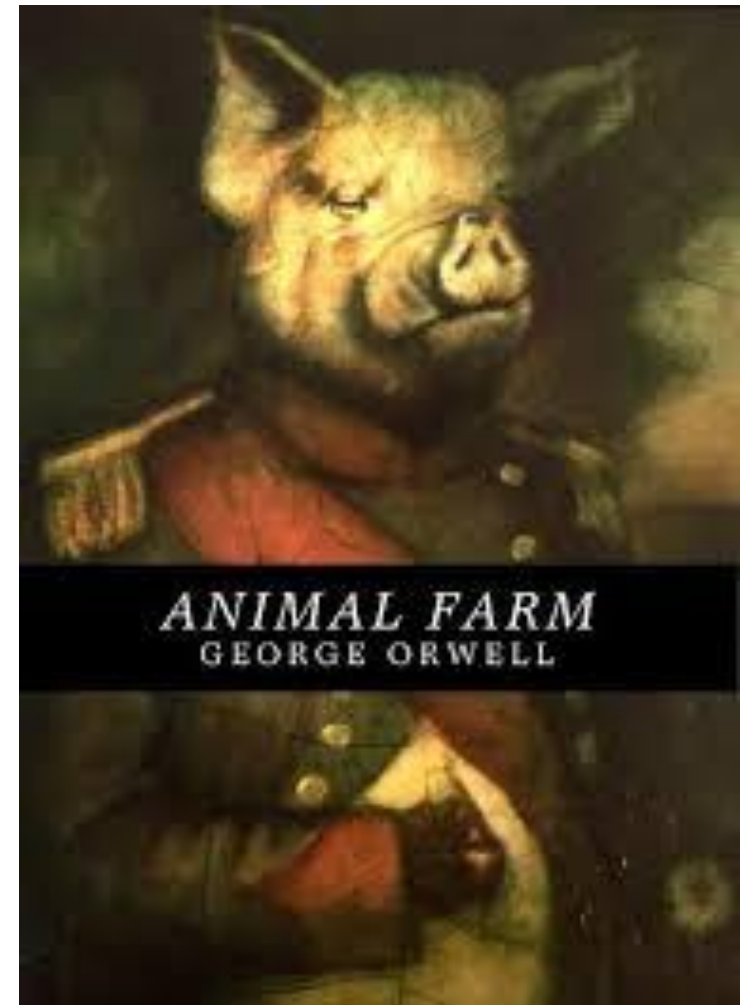
7 billion and counting

- More and more people to feed
- More and more are not producing food
 - The rest need to produce more
- Over 50% urban
 - Production has to move close to urban areas



The livestock revolution

- 1970-Mid 1990s
- Demand-driven, in difference to green revolution



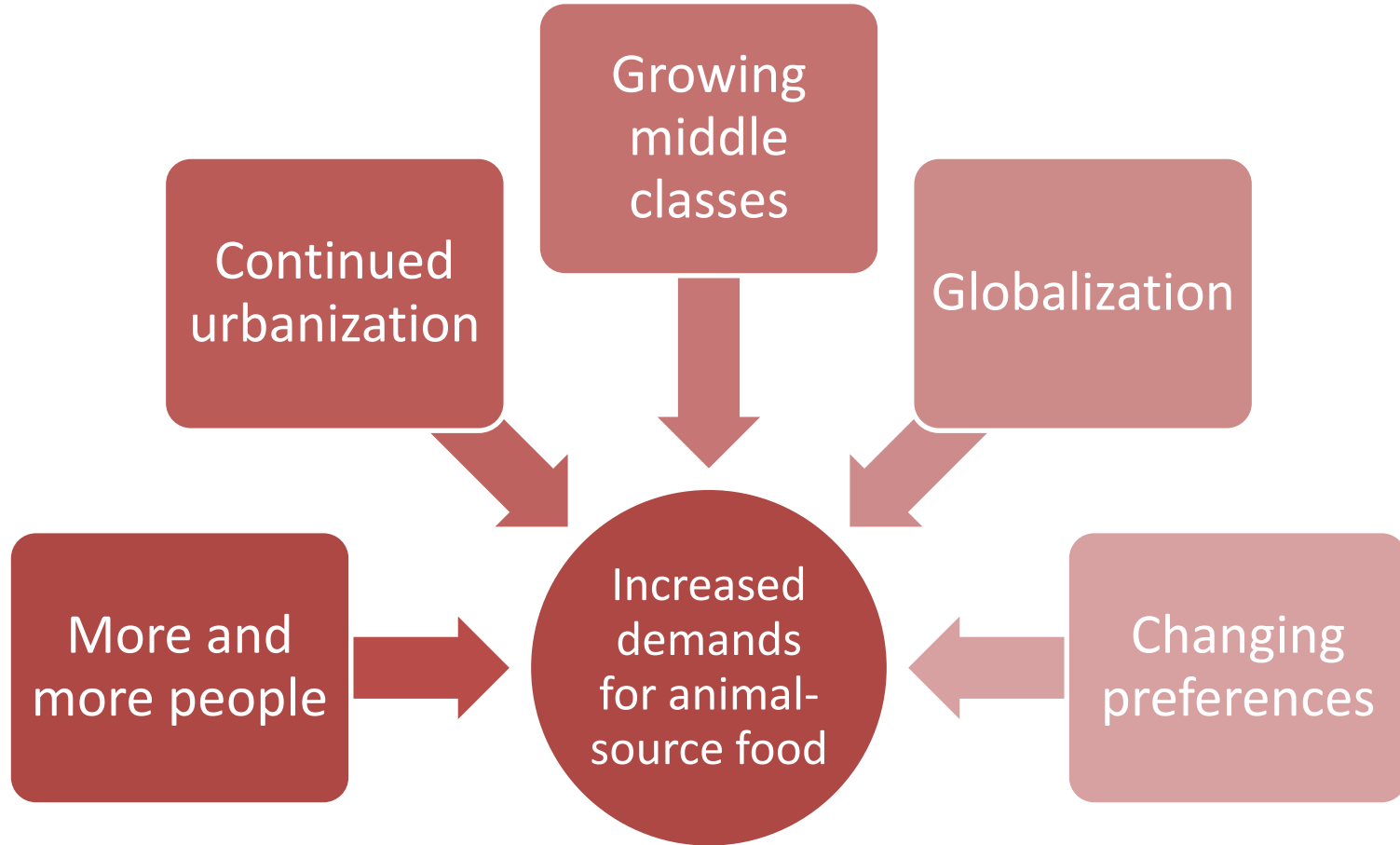
Not only demands

Food security and sustainability

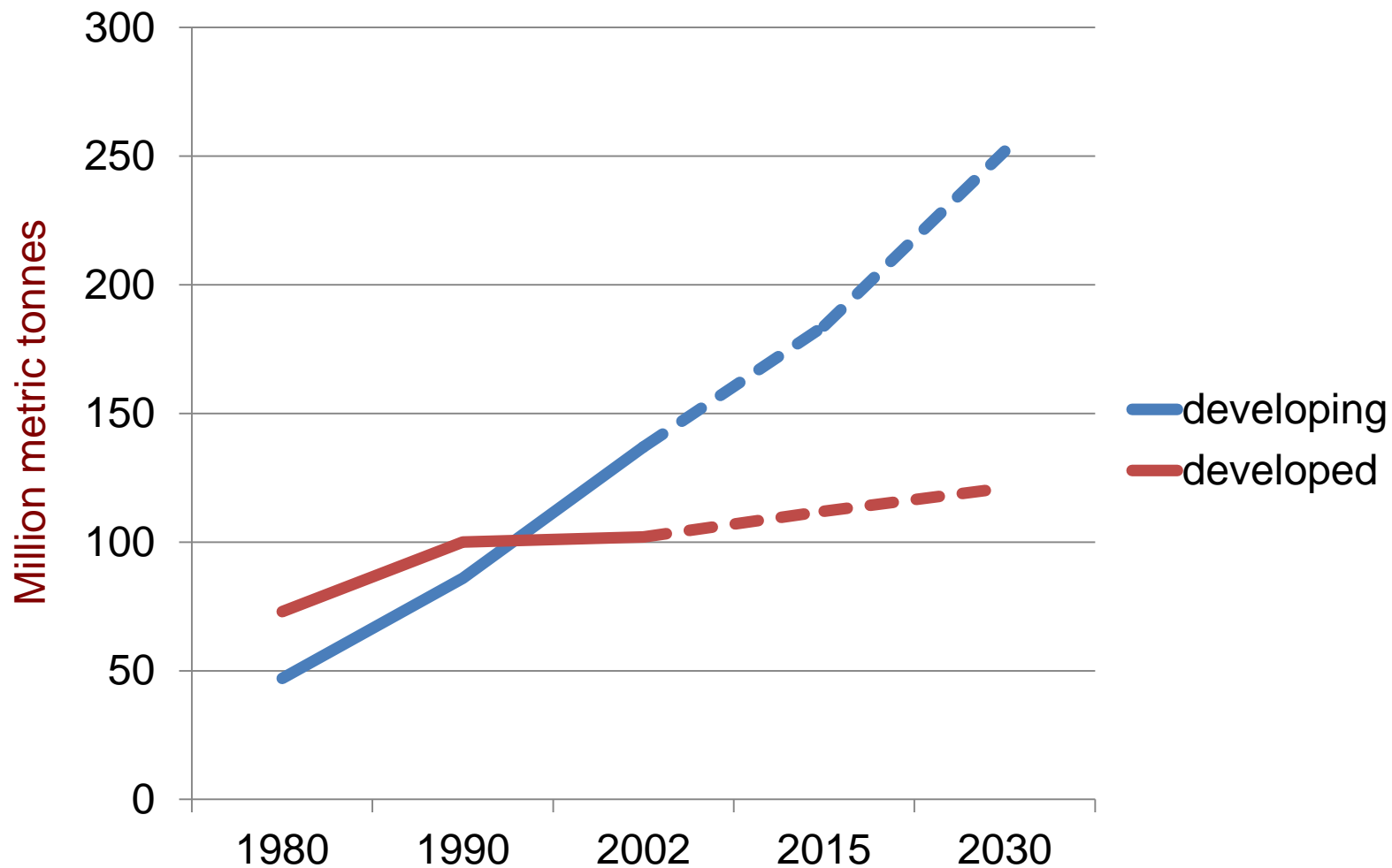
Bridging the gaps between demand and supply – global level

- FAO projections to 2030, demand for meat will increase by 3.7% and milk 2.7%
- 60% more food than is produced now will be needed
- 75% of this must come from producing more food from the same amount of land
- The higher production must be achieved while reducing poverty and addressing environmental, social and health concerns
- This greater production will have to be achieved with temperatures that may be 2–4 degrees warmer than today's

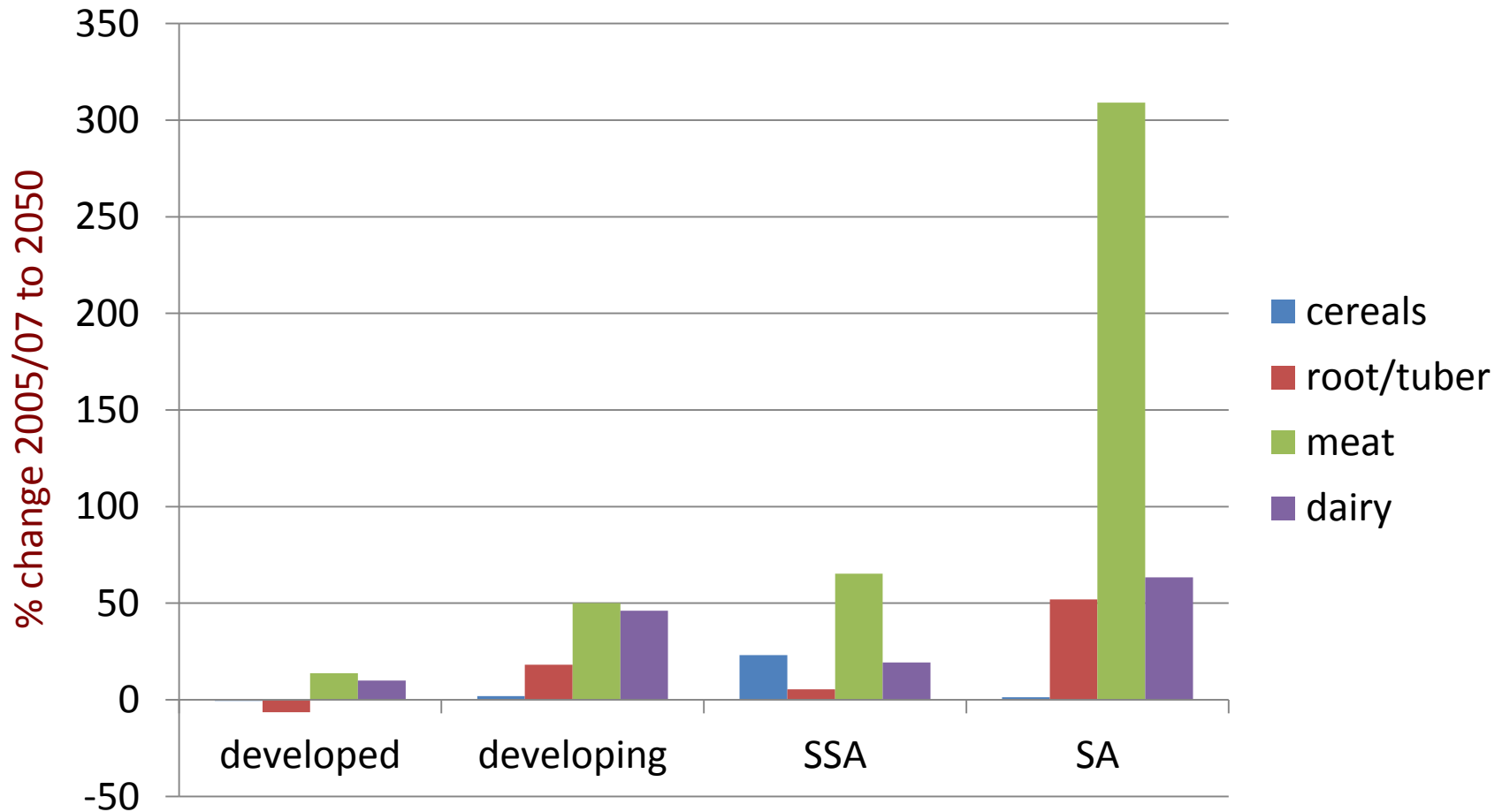
Why increasing demands?



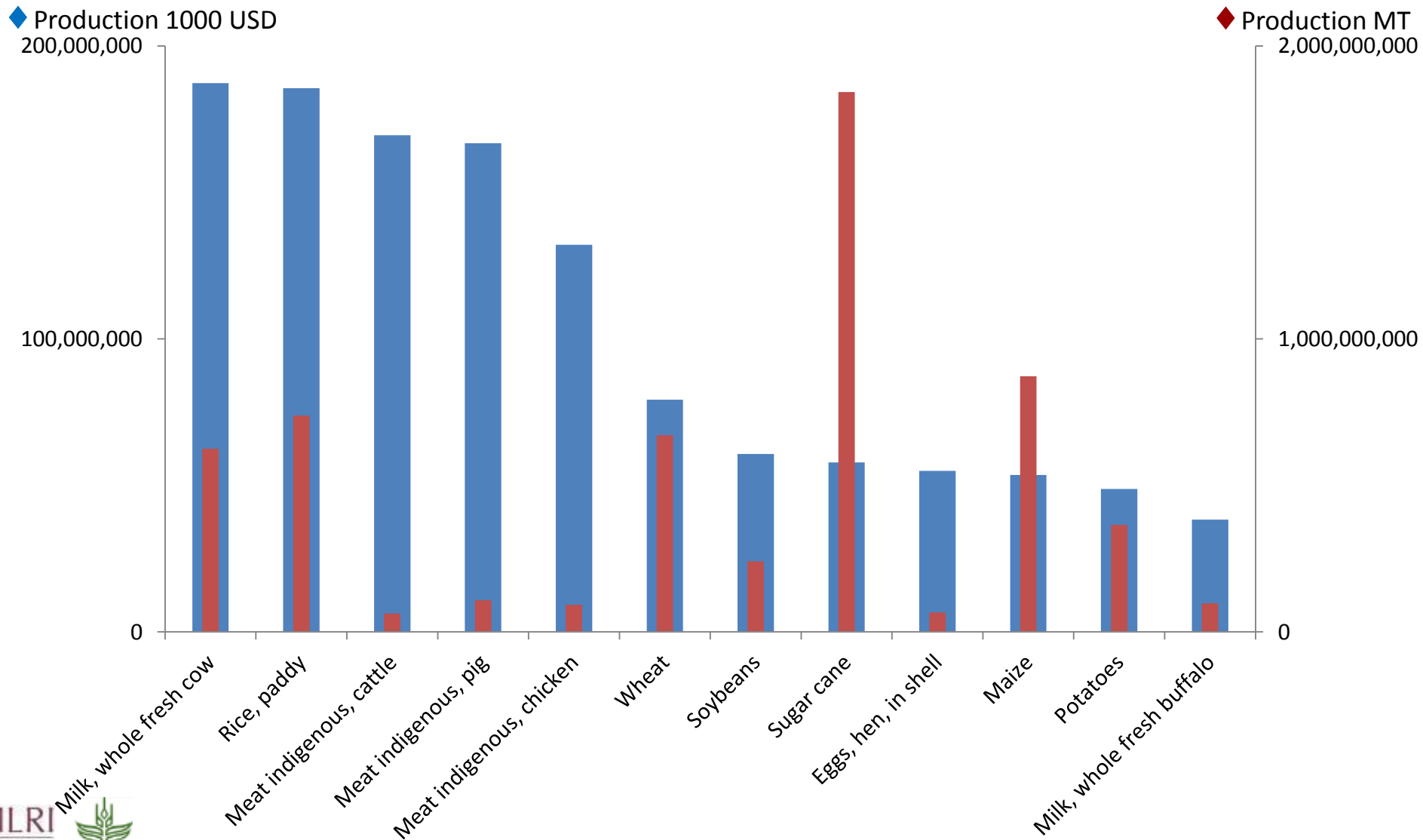
Gains in meat consumption in developing countries are outpacing those of developed



Change in global and regional demand for food: Livestock and other commodities

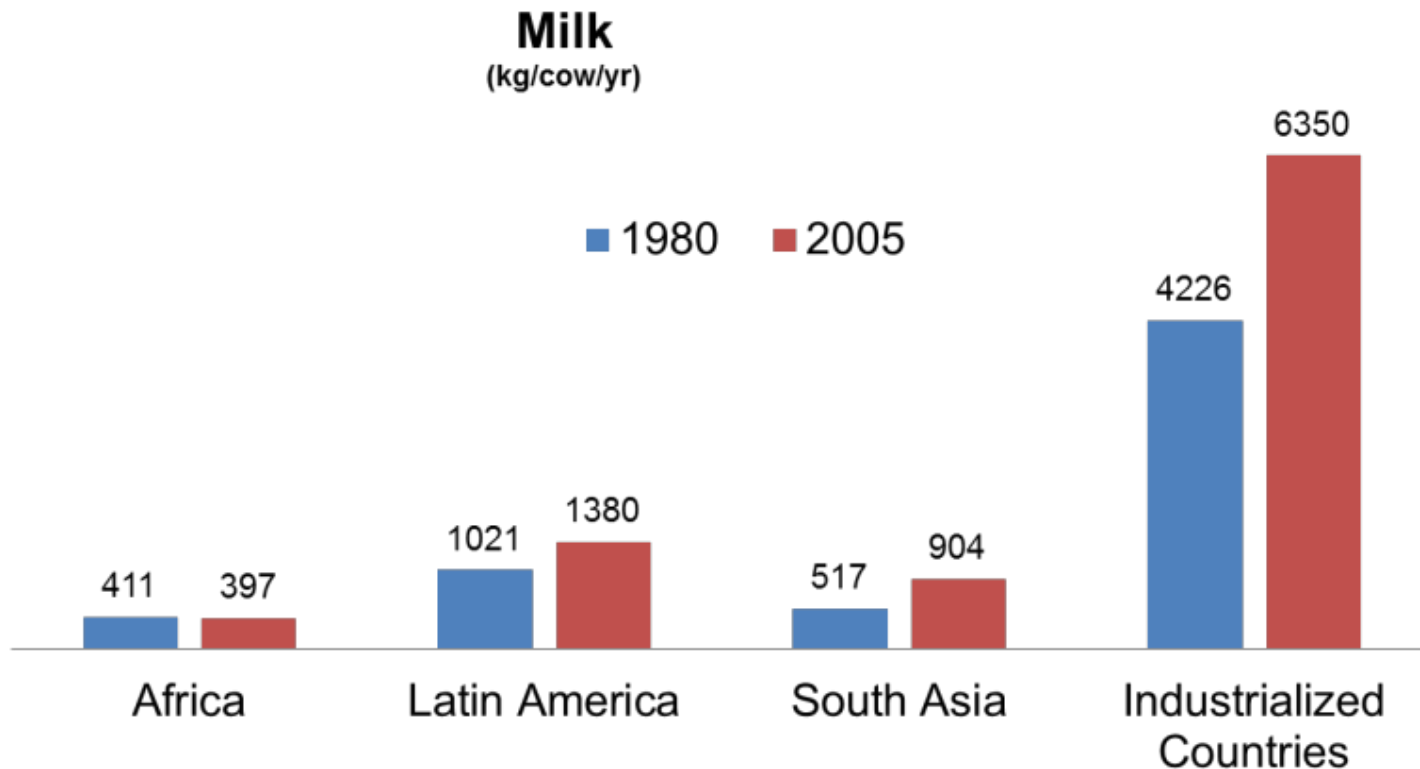


FAO statistics 2012



Big productivity gaps -largely due to poor animal health

Some developing country regions have gaps of up to 430% in milk productivity

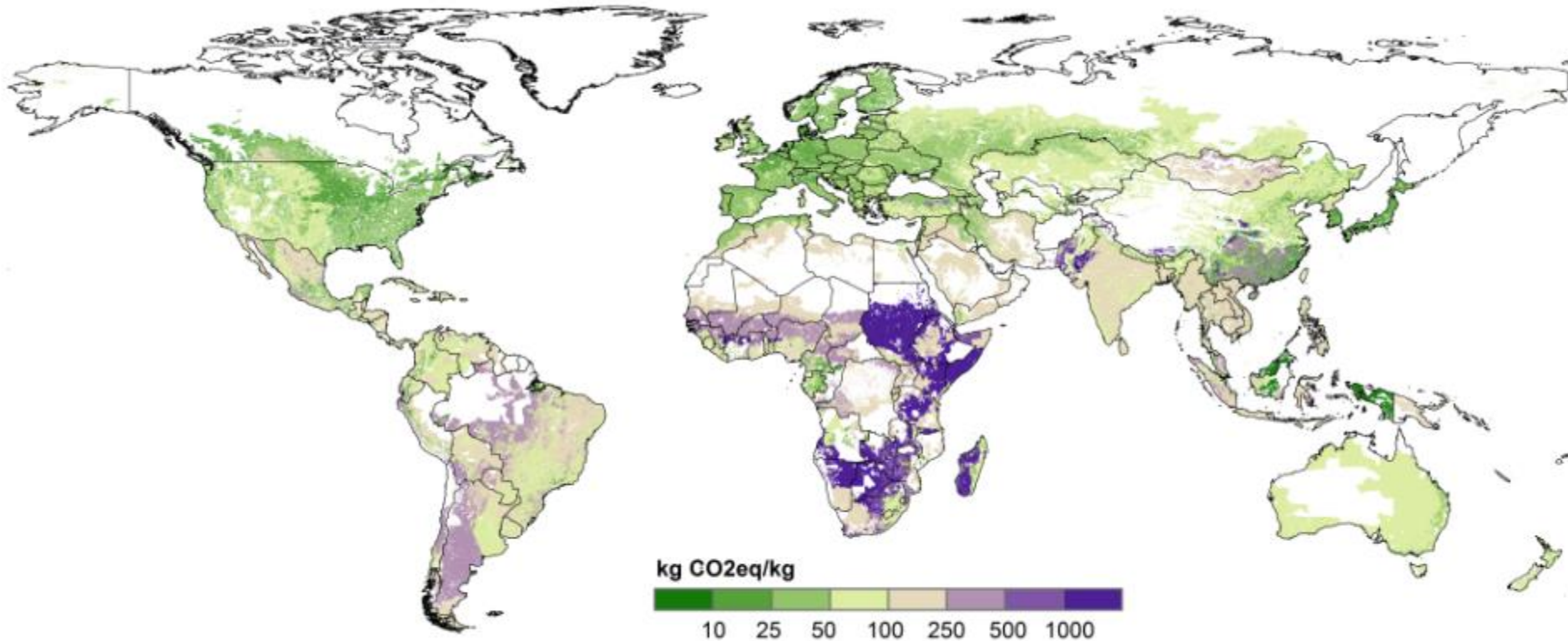


Steinfeld et al. 2006

Industrialization

- Increased profits
- Growth of off-farm income
- Reduction in greenhouse gases per unit of animal-source food produced
- Intensive units can maintain higher biosecurity
- Separates animals from humans
- Increased incomes may render people less vulnerable to disease.

Example: Green house gases



GHG per kg of animal protein produced

The white revolution of India

Why?

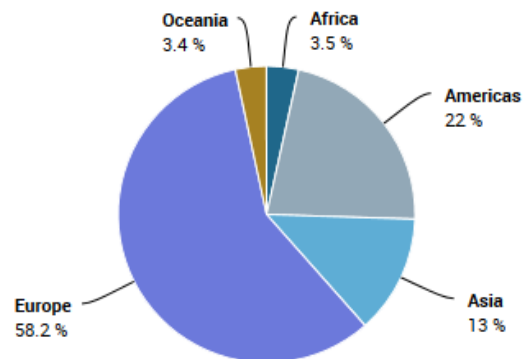
- >1 billion people
- Many vegetarians



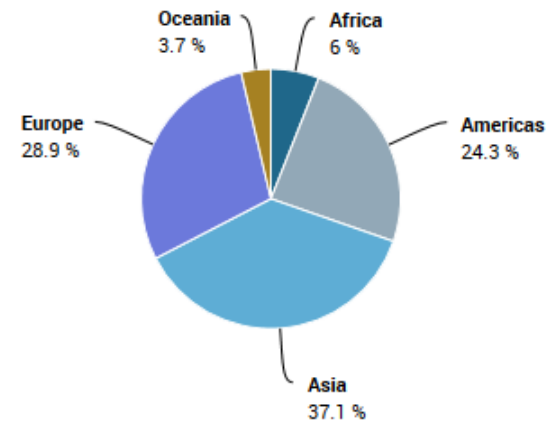
The white revolution of India

- The leading milk producer (since 2001)
- The biggest fleet of cows and buffaloes in the world

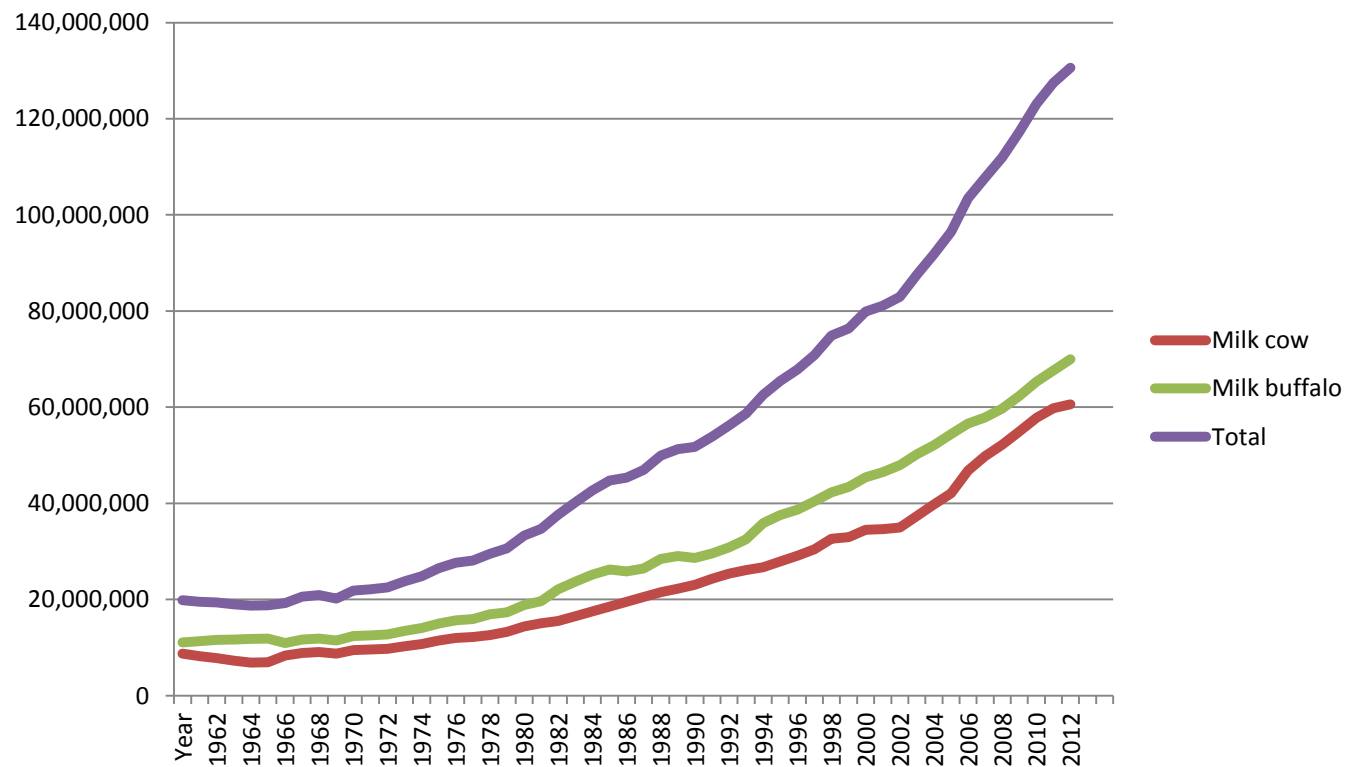
Average 1970 - 1973



Average 2010 - 2013



The white revolution



Milk consumption in India

- Milk consumption 46 kg per capita in 1983 - 62 kg per capita in 1997-106 kg in 2011-12
- Estimated total annual consumption of 60 million megatons
- India consumed 13% of the milk in the world



Food-borne diseases

- Food-borne diseases are very important
- 1.4 million children die every year of diarrhea
- The majority is food and water-associated



Risks and benefits with urban dairy

Good and bad

- Milk is nutritious
- Closeness to the market, farm inputs & services
- Lesser cost & time for transportation
- It is an opportunity to provide food for the family and an income
- Local markets for live/dead animals
- Poor sanitation & inadequate space for farm waste disposal
- Living in close proximity to the animals kept
- High density of people and animals

Risks and benefits with urban dairy

Pathogens from the cow and from the milk

- Anthrax
- Mycobacterium bovis
- Brucella
- Salmonella
- EHEC
- Streptococcus spp
- Staphylococcus aureus
- Clostridium spp
- Listeria spp



Risks and benefits with urban dairy- What more is in the milk

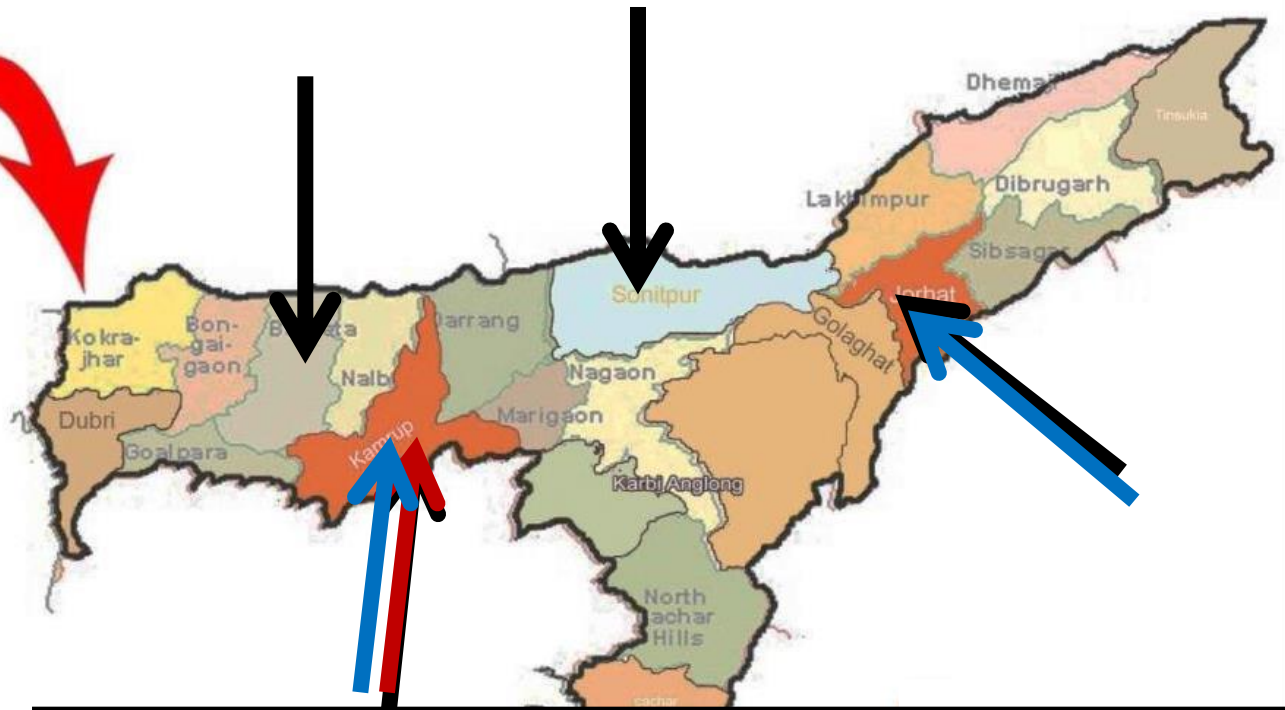
- Microbial load
- Adulterants






Risks and benefits with urban dairy- What more is in the milk

- Antibiotic residues
 - Frequently detected
- Pesticides
 - High percentage of milk samples
- Mycotoxins- aflatoxins
 - Detected in many milk samples, sometimes high levels

Project 1: The Assam study:



-  2009
-  2009-2011
-  2012

	Producer	Traders	Total
2009	405	175	580
2012	161	226	387
Total	566	401	967

Training on hygiene

- Training & **monitoring** on hygienic milk production and handling
- Producers and trainers involved
- Local partners: District Development Department (DDD), Assam Agricultural University (AAU), Greater Guwahati Cattle Feeders Association and a local NGO
- Media and information campaigns

Transdisciplinary approach



Can diseases be transmitted from dung?

Believe diseases can be transmitted from dung

Producers

2009	2.7% (11/404)
2012	37.2% (60/161)***
Trained (2012)	69.8% (37/53)***
Untrained (2012)	21.3% (23/108)

Traders

2009	1.1% (2/175)
2012	47.1% (106/225)***
Trained (2012)	63.9% (78/122)***
Untrained (2012)	27.2% (28/103)

Comparison between 2009 and 2012 survey
Comparison between trained and untrained 2012
Comparison between 2009 and untrained 2012



Can diseases be transmitted by milk?

Believe diseases can be transmitted from milk

Producers

2009	13.0% (52/401)
2012	35.4% (57/161)***
Trained (2012)	64.2% (34/53)***
Untrained (2012)	21.3% (23/108)

Traders

2009	9.1% (16/175)
2012	41.5% (93/224)***
Trained (2012)	64.8% (79/122)***
Untrained (2012)	13.7% (14/102)

Comparison between 2009 and 2012 survey
Comparison between trained and untrained 2012
Comparison between 2009 and untrained 2012



Is the milk completely safe after boiling?

Believe milk is completely safe
after boiling

Producers

2009 96.0% (380/396)

2012 93.1% (148/159)

Trained (2012) 86.8% (46/53)*

Untrained (2012) 96.2% (102/106)

Traders

2009 89.1% (156/175)

2012 93.8% (212/226)

Trained (2012) 91.8% (112/122)

Untrained (2012) 96.2% (100/104)*



Comparison between 2009 and 2012 survey
Comparison between trained and untrained 2012
Comparison between 2009 and untrained 2012

Which diseases can be transmitted?

	Tuberculosis	Food poisoning/ gastrointestinal disease	General disease symptoms (fever, cough, cold)	Worms
Producers				
2009	3.5% (14/405)	18.3% (74/405)	0.3% (1/405)	4.7% (19/405)
2012	8.7% (14/161)**	36.0% (58/161)***	11.2% (18/161)***	9.3% (15/161)*
Trained (2012)	18.9% (10/53)***	64.2% (34/53)***	20.8% (11/53)**	9.4% (5/53)
Untrained (2012)	3.7% (4/108)	22.2% (24/108)	6.5% (7/108)***	9.3% (10/108)
Traders				
2009	4.0% (7/175)	9.7% (17/175)	0% (0/175)	2.9% (5/175)
2012	13.7% (31/226)***	42.9% (97/226)***	11.5% (26/226)***	4.0% (9/226)
Trained (2012)	23.8% (29/122)***	61.5% (75/122)***	20.5% (25/122)***	6.6% (8/122)*
Untrained (2012)	1.9% (2/104)	21.2% (22/104)**	1.0% (1/104)	1.0% (1/104)

Comparison between 2009 and 2012 survey
 Comparison between trained and untrained 2012
 Comparison between 2009 and untrained 2012

What do you use most often to wash your hands?

- Traders
 - Untrained- 74% answered soap
 - Trained – 92% answered soap ($p < 0.001$)
- Producers
 - Untrained- 53% answered soap
 - Trained – 92% answered soap ($p < 0.001$)



Some specks of dirt in the milk is not harmful

- Traders
 - Untrained – 37.5% agree
 - Trained – 28% agree
- Producers
 - Untrained – 58% agree
 - Trained – 77% agree (p=0.046)



You can tell if milk is safe to drink

- Traders
 - Untrained – 96% agree
 - Trained – 89% agree
- Producers
 - Untrained – 96% agree
 - Trained – 77% agree ($p < 0.001$)



It is good for the cow if you add water to the milk

- Traders
 - Untrained – 72% agree
 - Trained – 53% agree ($p < 0.001$)
- Producers
 - Untrained – 76% agree
 - Trained – 64% agree ($p = 0.052$)



In practice

- Traders

- No difference in if milk was free from dirt (3.5% were not)
- 82% of trained traders had clean clothes, compared to 50% of untrained ($p < 0.001$)

- Producers

- No difference in the number of milk containers were free from dirt (92% were not)
- No difference in if milk was free from dirt (2.5% were not)
- 79% of trained producers had clean clothes, compared to 68% of untrained ($p < 0.001$)



Improving production- not always rocket science

- Follow up in 2014
- Trained farmers reported less diseases and higher milk production ($p < 0.001$)



	Average milk production in liters per cow and day 2 years ago/before ILRI training	Average milk production in liters per cow and day now
Trained farmers	7.0 (range 2.5-10)	7.8 (range 3-15)
Untrained farmers	7.3 (range 2.5-14)	6.8 (range 2.5-14)

- No difference in Brucella prevalence

Moving forward

- Continue monitoring
- Continue evaluation of the training
 - Mastitis frequency
 - Antibiotic use, residues and resistance
 - Animal health, welfare and productivity



Project 2: Peri-urban milk production

- Can we affect the incidence of bovine tuberculosis?
- Can we affect the prevalence of antibiotic residues?

- Evaluate the risks
- Identify risk practices
- Pilot interventions



Risk mitigation at the human-livestock interface

- It is possible to change people's perceptions and habits- but difficult to assess the effect
- Farmers at high risk for zoonoses
- Milk is a risk product
- Assess the risks- mitigate the risks- increase the profits

Mycobacterium bovis

- Tuberculosis can be caused by 2 bacteria, Mycobacterium tuberculosis and Mycobacterium bovis
- Chronic disease in both humans and animals
- Fatal
- Difficult to treat
- Best method is to stop the spread

Antibiotic residues

- Unregulated antibiotic
- Risk for antibiotic residues in the milk- there is no testing, and no control
- The problem- residues or resistance



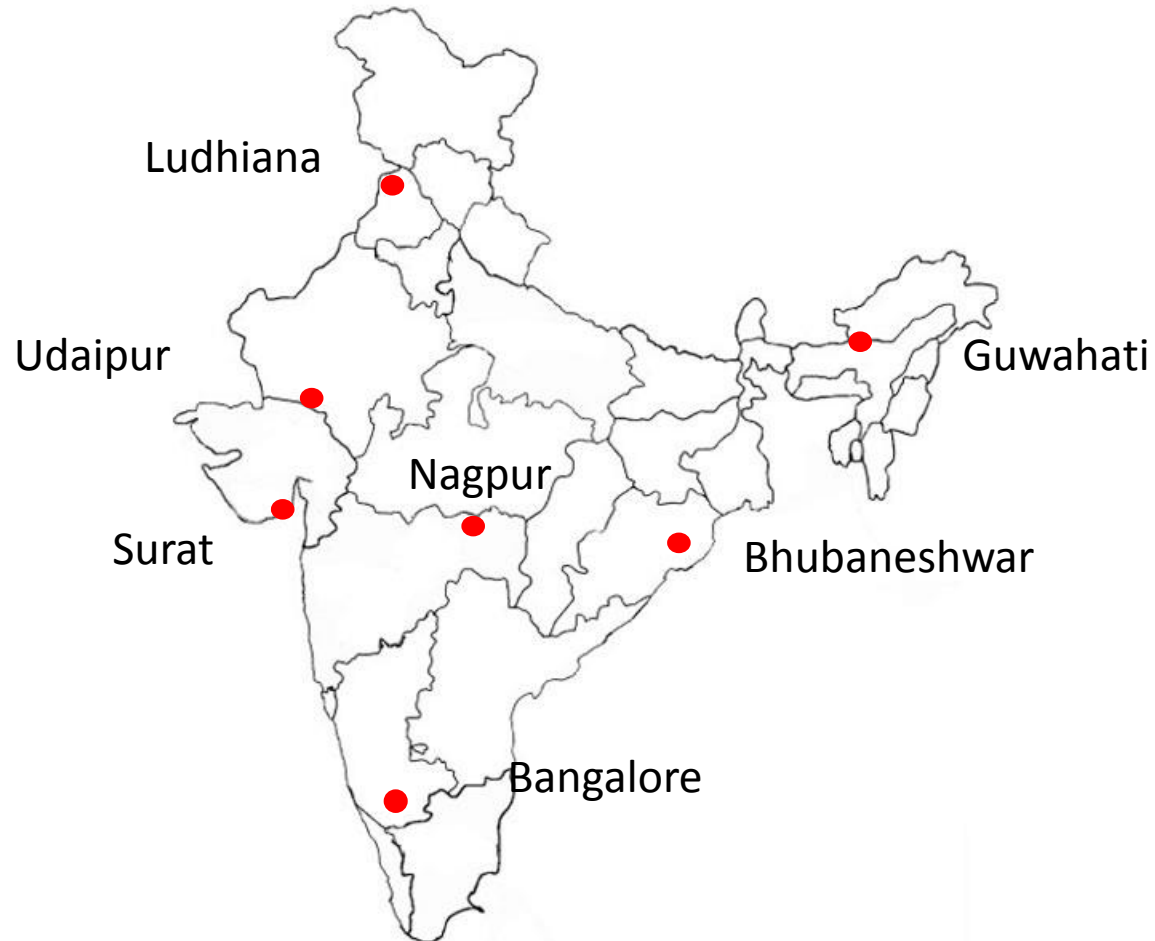
Study design

1. Estimate the burden

- ❑ Estimate the prevalence of *Mycobacterium bovis*, *Brucella abortus*, *Coxiella burnetii*, *Listeria monocytogenes* infection among livestock in small holder dairy farms in peri-urban areas
- ❑ Describe and quantify antibiotic use and associated levels of milk production, including testing of pooled milk samples for antibiotic residues

2. Design an intervention and pilot it!

Study Sites



Project 3: Animal health in Bihar

- Bihar is one of the poorest and least developed states
- Common farm size: 1-3 dairy cows or buffaloes
- 3-5 litres of milk
- Little known about the limitations to the dairy production

Scoping study about the animal health problems

- Collecting morbidity and mortality data
 - Including mastitis and antibiotic resistance
- Production and cost estimates
- Serology for selected diseases
 - Brucella, leptospira, q-fever, haemorrhagic septicemia
- Special focus on Brucellosis
 - Evaluation of rapid tests
 - Molecular testing

Finding the best bet interventions

- Identifying the limitations
 - Risk factors
- Identifying what is feasible
- Pilot
- Evaluate sustainability and long term effects



Conclusions!

- Dairy very important in India and in spite of large efforts, productivity is suboptimal
- Milk products contribute to human morbidity
- Still much to do and a need for a one health perspective!

Thank you for your attention

Any questions?



Acknowledgements

- Partners: Dairy Development Department (DDD), Assam Agricultural University (AAU), Greater Guwahati Cattle Farmers Association, Health & Family Welfare Department, Guwahati Municipal Corporation (GMC) and Animal Husbandry & Veterinary Department
- All members of the research team in the field
- The participants in Assam



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