Abstracts

Session 4

Broiler battles: contestations over the increasing impacts of intensive poultry production

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Chicken is the UK's most popular meat and 96% of home-grown supplies are raised in conventional intensive poultry units (IPUs): over a billion chickens a year. As supermarkets and fast food restaurants have sourced more chicken from the UK the pressure to build more IPUs has impacted areas within reach of the meat processing factories. However, the controversies around intensive livestock developments have been little researched in the UK. Local communities and environmental bodies have fought numerous battles over IPU planning applications, concerned about a wide range of 'overflows', particularly from the manure generated. Poultry manure is a valuable fertiliser but also creates ammonia emissions, which destroy sensitive habitats and threaten respiratory health, and excess nitrates and phosphates which pollute rivers. The planning system struggles to handle such complex issues and the polarised contestation which arises, particularly within a policy vacuum (Hajer, 2003; Murdoch, 2006).

This research used a blended relational and pragmatist approach to chart how in one English county, Herefordshire, the local authority approved the building of almost one hundred new 'chicken sheds' within five years. Using mixed methods to analyse planning data, interview key actors and observe planning and environmental meetings, the research has explored how government bodies have not had the capacity, resources or will to resist IPU proliferation. Institutions have resorted to displacement activity and fallen back on deliberate uncertainty and ignorance to excuse their lack of action in tackling the cumulative impacts (Callon, Lascoumes and Barthe, 2001; Proctor and Schiebinger, 2008). This paper gives a brief overview of the situation and analyses the tactics and narratives which act to allow the continuation of intensive livestock agri-business as usual.

Callon, M., Lascoumes, P. and Barthe, Y. (2001) Acting in an uncertain world: an essay on technical democracy. Cambridge Massachusetts: MIT Press.

Hajer, M. (2003) 'Policy without Polity? Policy Analysis and the Institutional Void', Policy Sciences, 36(2), pp. 175–195.

Murdoch, J. (2006) Post-structuralist geography. London: Sage.

Proctor, R. N. and Schiebinger, L. (2008) Agnotology: The Making and Unmaking of Ignorance, The Making and Unmaking of Differences. Stanford: Stanford University Press.

System dynamics modelling of the commercial broiler industry in South Africa; a tool to guide policy towards sustainable and healthy food systems

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Aligning with targets of the Zero Hunger SDG, the Sustainable and Healthy Food Systems (SHEFS) programme aims to provide evidence for policy development that delivers nutritious and healthy diets in an environmentally sustainable, and socially equitable manner. South Africa's food system is challenged with resolving undernutrition, obesity, foodborne diseases, whilst threatened by climate change. Our previous research used a systems approach and identified fundamental structural elements within the complexity of the livestock derived food system, which relate to these challenges, and identified broiler meat as a suitable tracer food for further investigation.

Broiler meat consumption increased by 132% from 1995-2015. It is the most affordable meat option and supports household nutrient and food security, especially for low-income consumers. However, it is also marketed and retailed through fast food outlets and supermarkets, with increasingly wider distribution networks. Whilst broiler meat is considered the least environmentally harmful meat, its indirect impacts relate primarily to those from cereal production for feed, including imported soya. Local cereal production is predominantly rain-fed and is threatened by climate change. Food safety gaps were highlighted by the largest global outbreak of listeriosis, originating in a meat processing factory producing products containing broiler meat.

Our broiler research uses systems thinking, with stakeholder participation (through interviews and an online questionnaire), to develop conceptual system dynamics (SD) models that identify the system's key elements, root causes, vicious cycles, and archetypes, which present barriers to reaching the targets of Zero Hunger. These include power imbalances and inadequate trust between private and public entities, the impact of broiler imports on local production, the environmental feedback of production on climate change, the consumers' prioritisation of price over food safety, and the mixed nutritional outcomes from consumption. These conceptual models form the basis for a quantitative SD model that will simulate policy based scenarios.

Future-proof and sustainable healthy diets based on current eating patterns in the Netherlands

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Background:

To keep global warming below 1.5°C as recommended by the IPCC, eating patterns must change and the place of animal foods in future diets is highly under scrutiny. Future diets should be modelled at a national level and respect cultural acceptability to be realistic.

Objective:

To identify diets among Dutch adults satisfying nutritional and selected environmental requirements deviating minimally from the baseline diet among Dutch adults.

Design:

We calculated per capita food system GHGE targets derived from the IPCC 1.5-degree assessment study. Using individual adult dietary intake from the national food consumption survey in the Netherlands (2007-2010) to form a baseline, we used quadratic optimization to generate diets that followed the baseline Dutch diet as closely as possible, satisfying nutritional goals and remaining below GHGE targets. We considered twelve scenarios in which we varied GHGE targets (2050: 1.11 kg of CO2-equivalent per person per day (kg CO2-eq pppd); 2030: 2.04 kg CO2-eq pppd; less strict 2030: 2.5 kg CO2-eq pppd; no target), modelled eating patterns (food-based dietary guidelines; flexitarian; pescatarian; lacto-ovo-vegetarian; vegan), and conducted exploratory analyses (food diversity; acceptability; food chain interdependency considering the co-production of beef and milk).

Results:

Optimized solutions for 2030 required major decreases (< 33% of baseline values) in consumption of beef (i.e., no more consumption), pork, cheese, snacks and butter and increased consumption (> 150% of baseline values) of legumes, fish and shellfish, peanuts, tree nuts, vegetables, soy foods and soy drink. Eight food groups were within 33% to 150% of the baseline diet among Dutch adults. The interdependence scenario considered a minimum beef consumption of 8g/day due to a 360g/day liquid dairy (milk, yogurt) optimized consumption. The optimized solution complying to the lowest GHGE target (2050) lacked food diversity, and the (lacto-ovo) vegetarian and vegan optimized diets were prone to nutritional inadequacies.

Conclusions:

Within Dutch eating habits, satisfying optimization constraints required a shift away from beef, cheese, butter and snacks towards plant-based foods and fish and shellfish, questioning acceptability. Satisfying 2050 food system GHGE targets will require research in consumer preferences and breakthrough innovations in food production and processing.

A Data-Driven Modelling Approach to Characterizing the Role of Livestock in Surface Water Quality

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Livestock are known to have significant impacts on surface water quality through runoff of manure and exacerbation of soil erosion. However, whilst these impacts are recognized at small scales (i.e. at field and catchment scales) quantifying these potential environmental impacts in large spatio-temporal scales still appears to be a grand challenge. Although the contamination of water bodies by livestock activities is one of the leading sources of nutrients and organic pollutant contents in surface waters, current approaches to estimate the changes in stream water quality often fail to explicitly account for livestock activities across large scales. To address this issue, we develop a relatively parsimonious data-driven approach based on Bayesian hierarchical model (BHM). The BHM assumes spatial dependency amongst the sampling sites and enables the key drivers of temporal variability in water quality to vary in space, thereby better representing the spatiotemporal dynamics of water quality. We select the key predictors for our model in a process-informed manner based on extensive literature review. As the model outputs, we consider three critical water quality constituents, namely total suspended solids, total phosphorus, and nitrate–nitrite. Our preliminary analysis shows that generally manure contamination appears to significantly dominate in South America and Africa. Furthermore, our results reveal that livestock activities can cause a significant negative impact on water quality in eastern Europe, central Asia, and eastern Australia. The results and insights gained have important implications for improving livestock pollution management. In addition, our proposed data-driven model can be used to evaluate potential impacts of future scenarios (e.g., livestock production, land use change, etc.) on water quality conditions.

Trends in the environmental impacts of unprocessed or minimally processed, processed, and ultra-processed animal products in Brazil over 30 years

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Background:

We aim to assess the trends in the consumption of unprocessed or minimally processed, processed, and ultra-processed animal products, and the environmental impacts associated with them.

Methods:

We have used data from five Brazilian Household Budget Surveys (1987, 1996, 2003, 2009, 2017). Animal products (beef, pork, poultry, eggs, fish, milk, and cheese) were classified into NOVA food groups: unprocessed or minimally processed (G1), processed (G3), and ultra-processed (G4). We estimated the share (%) of each food group to daily kcal per capita, as well as carbon footprint (CF), water footprint (WF) and ecological footprint (EF) per 1000 kcal-day. Trends over the years were tested using linear regression considering the population size as a weighting factor.

Results:

From 1987 to 2017, the dietary share of G1 animal products decreased 2% (15.5-15.2%, p-trend < 0.001), while the share of G3 and G4 products increased by 88% (1.6-3.0%, p-trend < 0.001) and 340% (4.3-1.1%, p-trend < 0.001), respectively. CF in g CO2 eq per 1000 kcal remained the same for G1 products (921.4-946.2, p-trend = 0.278) and increased by 124% (30.9-69.3, p-trend < 0.001) and 319% (50.7-212.5, p-trend < 0.001) for G3 and G4 products, respectively. WF in litres per 1000 kcal decreased by 11% for G1 products (846.7-752.5, p-trend < 0.001), and increased by 130% for G3 (24.3-55.9, p-trend < 0.001) and 323% for G4 products (42.5-179.8, p-trend < 0.001). Similarly, EF in m2 per 1000 kcal decreased by 5% for G1 products (6.06-5.73, p-trend < 0.001), and increased by 67% for G3 (0.24-0.40, p-trend < 0.001) and by 305% for G4 products (0.21-0.85, p-trend < 0.001).

Conclusion:

The consumption of processed and ultra-processed animal products has been increasing along with their environmental impact, suggesting that the reduction of their consumption would be beneficial for both human and planet health.