12. Outdoor Air Pollution and GHGs – Agriculture and Food Systems

Panel: Jess Fanzo, Erin Biehl, Sofia Ryan

Primary Air Care: Setting the agenda

Global action to build sustainable energy systems and reduce emissions of greenhouse gases and hazardous air pollutants

Friday, April 19, 2019 – Olin Hall, Homewood Campus, Johns Hopkins University
Session 12 Objectives

- Present current research being done within the agriculture and food systems sectors as it relates to outdoor air pollution

- Overview of research capabilities within the agriculture and food systems sectors
Global Players, targets and chatter
Where air pollution fits into the global agriculture agenda

Jessica P Fanzo
Bloomberg Distinguished Associate Professor of Global Food & Agriculture Policy & Ethics
Director of the Global Food Policy & Ethics Program
Global players in food security

GLOBAL
- U.N. Secretary-General’s High-level task force on the Global Food Security Crisis (HLTF)
- Committee on World Food Security (CFS)
- A New Vision for Agriculture
- Think Eat Save
- Food Security Cluster
- UN Millenium Development Goals
- CGIAR Fund
- CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)
- Global Agriculture and Food Security Program (GAFSP)
- L’Aquila Food Security Initiative (AFSI)
- Global Crop Diversity Trust
- The Economist Food Security Index
- Global Food Safety Partnership (GFSP)
- Zero Hunger Challenge
- New Alliance for Food Security and Nutrition
- FOODSECURE
- Save Food
- AgResults
- Scaling Up Nutrition (SUN)
- 1,000 Days
- REACH
- Flour Fortification Initiative
- United Nations System Standing Committee on Nutrition (UNSCN)
- The International Council for the Control of Iodine Deficiency Disorders (ICCIDD)

REGIONAL

ASIA
- ASEAN Integrated Food Security Framework (AIFS) and Strategic Plan of Action for Food Security (SPA-FS)
- APEC Food Safety Co-operation Forum
- Cereal Systems Initiative for South Asia (CSISA)

NORTH AMERICA
- Feed The Future (USAID)

AFRICA
- Grow Africa
- Comprehensive Africa Agriculture Development Program (CAADP)

EUROPE
- Amsterdam initiative against Malnutrition (AIM)
- EUR 1 billion European Union Food Facility (EUFF)
- EU Joint Programming Initiative on Agriculture, Food Security and Climate Change (FACCE JPI)

AUSTRALASIA
- Food Security Through Rural Development (AUSAID)

MIDDLE EAST
- The King Abdullah initiative for Saudi Agricultural Investment Abroad (KAISAIA)

LATIN AMERICA & THE CARIBBEAN
- Hunger-Free Latin America and the Caribbean (HFLAC)
UN and Member States

- **FAO and UNEP**, have acknowledged agriculture’s roles in air pollution but neither do much in the topic.


- **WHO** convened the first Global Conference on Air Pollution in 2018 and Health and has a global data base which lists agriculture emissions as a source of AP.

- **USDA** National Institute of Food and Agriculture (NIFA) is doing some work with large-scale farms in the US towards sustainable practices.
Some research for development happening on agroforestry and air pollution (CIFOR and ICRAF)
Committee on World Food Security

- Nothing happening in the CFS
- No HLPE reports have focused on the issue
NGOs

• A lot happening around conservation (particularly with palm oil) links to biodiversity loss (but also knock on effects with air pollution)

• A lot happening with clean cookstoves
WHO is the custodial agency for the Sustainable Development Goal Indicator to substantially reduce the number of deaths and illnesses from air pollution by 2030 (SDG 3.9.1) as well as two other air pollution-related indicators - SDG 7.1.2 Proportion of population with primary reliance on clean fuels and technologies, and SDG 11.6.2.

WHAT ABOUT GOAL 2?
• At COP21, the Climate and Clean Air Coalition (CCAC) – a partnership of governments, nongovernmental organizations (NGOs) and other organizations – was successful in committing action to reduce short-lived climate pollutants (SLCPs) such as gas methane and particles from black carbon.

• The adoption of the Koronivia Joint Work on Agriculture at COP23 in 2017 re-emphasized the importance of agriculture and food security in the climate change agenda.
Greenhouse gas emissions from food systems

Erin Biehl
Center for a Livable Future
Department of Environmental Health and Engineering
Bloomberg School of Public Health
Per serving GHG footprints

>4,300 unique observations
>150 countries

Preliminary results
please do not distribute
Importance of Dietary Shifts for Agricultural GHG Mitigation


Direct Emissions from Concentrated Animal Feeding Operations

What comes out:

- Particulate matter
- Gases (ammonia, hydrogen sulfide, VOCs)
- Animal dander
- Endotoxin
- Pathogens (bacteria, viruses)

Associated with respiratory diseases, stress/mood alteration, infection – for people who live nearby

But which pollutants are to blame, and at what levels?
Food and Climate Solutions

- Tailor diet shifts to country, cultural contexts
- Include indirect (consumption-based) emissions in inventories
- Support local government & institutional procurement policies
- Connect & coordinate
Scoping review on Interventions to Address Outdoor Air Pollution from Agriculture

Sofia Ryan
Krieger School of Arts and Sciences and Bloomberg School of Public Health
Purposes of the scoping review

- Large amounts of emissions originate from the agriculture sector, both in high- and low/middle-income countries
- **Goal:** Characterize current interventions being implemented in the agriculture sector to reduce greenhouse gas emissions
  - Develop a package of possible actions and policies to be used by farmers, NGOs, and policymakers to promote emissions reduction
Articles not matching inclusion criteria excluded (N=70)

Agriculture-related articles identified through first and second-round screening (N=366)

Cursory screen of articles (N=366)

Articles screened for relevance to agriculture (N=310)

Literature reviews excluded (N=56)

Articles not primarily related to agriculture excluded (N=32)

Title/abstract screening to further categorize articles (N=278)

Articles not matching inclusion criteria excluded (N=70)

Articles included for full-text review (N=208)
Categories of interventions to reduce emissions

- **Top four categories:**
  - Fertilization & soil management: 28.8% (60/208)
  - Farming techniques, land use changes: 17.8% (37/208)
  - Waste & manure management: 14.4% (30/208)
  - Technology: 14.4% (30/208)

- **Other categories:**
  - Livestock diet & housing management
  - Taxes/market incentives
  - Policy
  - Irrigation techniques
Study designs and settings

- Most studies occurred on experimental farms
  - Controlled conditions
  - Mostly experimental sites owned by agricultural universities
- Some modeling studies and laboratory studies, especially for the technology sector
- Most studies conducted by agricultural universities, very few by agricultural corporations
Common GHGs measured as outcomes

- Methane (CH$_4$)
- Ammonia (NH$_3$)
- Nitrous Oxide (N$_2$O)
- Criteria air pollutants (PM$_{2.5}$) measured in studies on livestock housing
- Outcomes typically are greenhouse gas emissions, rather than criteria air pollutants and human health
Countries where studies conducted

- Mostly high-income countries
  - USA, Canada, UK and other European countries, China
- Very few conducted in low and middle-income countries
  - India is the most represented LMIC
Examples of interventions evaluated

- Biogas/biofuel production
  - South Asia (Bangladesh, India)
  - Use of anaerobic digestors
- Silvopastoral systems
  - Latin America
- Very few proposed interventions for rural areas in the sample
Implementation science: Little discussed in articles reviewed

- Methods to promote integration of research findings into actual agricultural practice
- Assessment of local context and feasibility of adoption by farmers
- Using knowledge from implementation research to make interventions more feasible and improve human and/or climate health
- **Not** discussed in the current articles

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<tr>
<th>Implementation Outcome</th>
<th>Definition</th>
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<tr>
<td>Acceptability</td>
<td>The level of satisfaction with various parts of an intervention, as perceived by an individual provider and/or consumer</td>
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<td>Adoption</td>
<td>The spectrum of uptake, from intention to action, to try an intervention</td>
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<td>Appropriateness</td>
<td>The perceived relevance or fit of an intervention to an individual, organization, or setting</td>
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<td>Cost</td>
<td>A quantified measure of cost, cost-effectiveness, or cost/benefit ratio for an individual provider or service-providing institution</td>
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<td>Feasibility</td>
<td>The extent to which an intervention can be successfully carried out in a particular setting or organization</td>
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<td>Fidelity</td>
<td>The degree to which an intervention is implemented as it was designed in an original study, plan, or policy</td>
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<td>Penetration</td>
<td>The extent to which the intervention is actually used or delivered within an organization or setting</td>
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Questions for Discussion

1. How does a comprehensive research agenda for emissions from agriculture and food systems differ for LMICs and HICs?
2. What opportunities or needs are there within food systems research for those from outside the food systems sphere?