Reflections on sectors progress in bringing about necessary changes

Mario Herrero
Not responsive to the fast dynamics of the sector
Win more, lose less: Capturing synergies between SDGs through agricultural research

The demand for livestock products 1990 - 2015

<table>
<thead>
<tr>
<th>Region</th>
<th>Fish, Seafood</th>
<th>Milk - Excluding Butter</th>
<th>Eggs</th>
<th>Meat</th>
<th>Bovine Meat</th>
<th>Mutton &amp; Goat Meat</th>
<th>Pigmeat</th>
<th>Poultry Meat</th>
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</tr>
</tbody>
</table>

Change in kg/person/year between 1990-2015

-60.0 60.0

Herrero et al 2019

CSIRO
Production growth in ruminant meat and milk still driven largely by growth in animal numbers, with a few exceptions

2) Mixed crop-livestock systems

Herrero et al 2019
The reality check
Ethiopian milk yields...
after more than a decade of investment
We cannot put blind faith on data improvements and its link to better policy-making
Data projects: Key considerations

- Decisions not made on a socio-political ‘clean slate’
  - Path dependencies, previous investments
  - Limits ability to change budgetary priorities
- Additional data may not change decision making process (for many reasons)
  - Technical capacity to use info
  - Time available to absorb and internalize it
- Spatial, temporal and geographical dimensions
  - Livestock production highly variable
  - Impacts of interventions operate over different time scales
- Trade-offs exist with any new investment – must be comprehensive to minimize negative impacts
- Data collection considerations:
  - Livestock move
  - Life cycles influenced by biology and production system type
Interview findings: actors map

African Nations – Government with flows and metrics

Tier 1 decision making: Overall budget
- Path dependency & historical allocation dictates allocation

Finance Ministry
Contributing decision maker
Metrics:
- Costs e.g. salaries

Planning Ministry
Top decision maker
- Decision based on ‘unbiased’ metrics from Bureau of Statistics (not Ag ministry)

Central Bureau of Statistics
Metrics collected:
- GDP
- Production and trends (formal markets)
- Consumption / demand
- Commodities that earn foreign revenue

Metrics provided to planning ministry

Budget provided to Ag Ministry

Metrics provided to finance ministry

Data different to Agricultural Ministry data

Tier 2 decision making: Allocation within ministry and regional offices
- Path dependency & historical allocation dictates allocation

Agricultural Ministry - Little power to make budget decisions
Metrics collected:
- GDP
- Production and trends (includes some informal markets)
- Consumption / demand
- Commodities that earn foreign revenue

Data different to Bureau of Statistics data

Regional offices

Regional strategies; Country master plans largely sit in isolation from private sector investments, yet critical for global investments (e.g. world bank loans)

National Agricultural goals

Fight over different data
Interview findings: the circular conundrum

The ‘circular conundrum’ means political decision-making can’t be informed by ‘return on investments’ because the data doesn’t exist to provide those narratives and evidence.
Align with the environmental commitments of countries and a sustainability agenda
The commitment to the Paris Agreement

- Ethiopia intends to limit its GHG emissions in 2030 to no more than 145 MtCO$_2$e including land-use, land-use change and forestry (LULUCF) (185 MtCO$_2$e excluding LULUCF). Compared to a business as usual (BAU) trajectory, limiting emissions to that level equates to a reduction of at least 64% (40% excluding LULUCF). Ethiopia has committed to becoming carbon neutral; however, its Nationally Determined Contribution (NDC) does not specify a target year for the attainment of that goal.

Source: www.climateactiontracker.org
Disruptive innovation: the next frontier of alternatives
Future technologies

C) Top Twenty Technologies on Adopt and Readiness

- Plant based substitutes for livestock and seafood
- Disease & pest resistant crops
- Drying and stabilisation technologies
- Biofortified crops
- Innovative prawn feed eg NovaCQ
- Early warning systems for plant disease and pests
- Drones
- Replacement food/feed source - Insects
- Improved seasonal climate forecasts
- Improved traceability technologies
- Vertical agriculture
- 3D printing
- Replacement food/feed source - Seaweed
- Feeding robots
- Battery technologies
- Internet of Things - Inputs & outputs informed
- Replacement food/feed source - Algae
- Dietary additives for livestock to improve performance
- Microbial biomass for food, animal feed and fuel
- Salmon feed: Omega-3 fatty acid products

D) Top Twenty Technologies Based on Potential

- Circular economy
- Plant based substitutes for livestock and seafood
- Artificial meat and fish
- Replacement food/feed source - Insects
- Micro irrigation, fertiliser, fertigation systems
- Replacement food/feed source - Algae
- Improved seasonal climate forecasts
- Replacement food/feed source - Seaweed
- Nitrogen-fixing crops
- Biologicals replacing artificial inputs - Macroalgae
- Farm-to-fork virtual marketplace
- Early warning systems for plant disease and pests
- Integrating genetic, phenomic and environmental information
- Responsive fertilisers
- Vertical agriculture
- Biologicals replacing artificial inputs - Botanics
- Soil additives that optimise water use or soil productivity
- Battery technologies
- Sensors to measure key biological function
- Novel perennials

Herrero et al. Nature Food (under review)