RICE IN INDIA: ENVIRONMENT, ECONOMY AND SOCIETY: ‘MESHING’ AND ‘MASHING’ DISCIPLINES

Barbara Harriss-White
Emeritus Fellow, Wolfson College, Oxford

April 2019, TIGR2ESS Symposium
ORIGIN - INDIAN DEBATE about CLIMATE CHANGE RESPONSE

**Majority** view:
- Stock argument: justice
- Flow argument: right to remove poverty (with 70% thermal)

**VERSUS**

**Minority** view / conclusion / starting point:
- FF based development is luxury India can’t afford

  rate of degradation of natural resources

  rate of addition to workforce (jobless growth) requires leapfrogging to clean devt – **low C transition** - TO WHAT?

New development models / new indl revn / AC+DC / BUT **baseline** is needed appropriate to conditions where over 90% of employment is unregistered, where anywhere between 35-70% is estimated **informal** and 25-62 % is estimated black.
How to develop methods to

1. measure the economy as a system of capital and labour using materials to produce commodities and physical – solid, liquid and gaseous - waste

2. in the informal economy with no reliable data
• 3. scope technological alternatives according to several incommensurable criteria (environmental / social / economic) which generate trade-offs between criteria.

• 4. to mainstream social relations of work – quantity and quality of labour
CLIMATE CHANGE AND AGRICULTURE
– WHY AGRICULTURE?

• Agriculture innocent? Small proportion of global GHG emissions? 10-14%

versus

• USDA (2011) estimate that entire food-system production-distribution-(transport-processing-storage)-consumption-waste
PLUS land use change (burning forests for agriculture) = +/- 33 - 45% global GHGs

AND agriculture as an emissions floor is ‘poorly understood’ (Anderson, 2011)
CLIMATE CHANGE AND RICE

• **Vulnerability** – temperature, weeds and pests; rain and crop failure -> yield declines expected -> critical impact on food /feed prices and food security/ availability esp if no change in access and utilisation (S Asian prodn/nutn paradox)

• **Agenda of adaptation in rice**: crop-livestock stress research; irrigation management; biotech innovations (inc. GM and hybrids) ;collective action/farmers’ groups (info – dissemination)

• -> funds in new revolutionary **high-tech** frontier rather than **farming systems**; focus on **adaptation** rather than **mitigation**

• Sources: Nelson et al, IFPRI, 2009; Alagh, 2013
RICE AS A CASE STUDY – HERE -1

• **NOT** because a big polluter [though food system and all land-based activity thought to account for up to 45% GHG] BUT

• Rice is **bio-physically complex** – emitting various GHGs as well as sequestering them – so **scientifically interesting**

• Rice is **socio-technically complex** – 4 production systems 4-5 marketing systems → **social scientific interest**
Resources, employment and poverty are entwined in production-distribution systems — policy interest
Production and distribution weave in and out of the informal economy — theoretical and policy interest
Food is generally exempt from the scenarios lowering emissions (Anderson/Royal Society 2011) i.e. something of a political special case — but how special?
PERSPECTIVES NEEDED FROM SEVERAL DISCIPLINES
DISCIPLINARITY

Choi and Pak 2006 helpful - not systematic review but very large review.


DISCIPLINES = KNOWLEDGE BRANCHES WITH HISTORIES

- **TRANS** - > “Transdisciplinarity integrates the natural, and social sciences in a humanities context, and transcends their traditional boundaries.”

- **MULTI** - > “Multidisciplinarity draws on knowledge from different disciplines but stays within their boundaries.”

- **INTER** - > “Interdisciplinarity analyzes, synthesizes and harmonizes links between disciplines into a coordinated and coherent whole.”
MESHING DISCIPLINES and LEARNING WORKSHOPS
DISCIPLINES VS KNOWLEDGE FIELDS

Selecting knowledge fields

For 1. and 2. – the materiality of the economy - fuse life cycle assessment (LCA) with value / supply chain analysis (SCA) - politicise the frontier between formal regulation/policy and social regulation

For 3. the evaluation of incommensurable dimensions of technological choices - use multi-criteria mapping (MCM) and

For 4. the study of livelihoods and labour – start with Decent Work (DW) / Standard Work of trades unions
Developing practical methods for LCA-SCA-MCM generates cross-cutting themes

• How is the informal economy ordered? Socio-political limits to the reach of state regulative policy, the interface and forms of regulation of the informal economy (Aseem Prakash)  
  [https://www.mids.ac.in/rdcxxii_1.pdf](https://www.mids.ac.in/rdcxxii_1.pdf)

• The means whereby UNorganised labour makes gains in the informal economy (BHW/ trade union researchers (NTUI/CWM))

• Does innovation and technical change happen in the informal economy? Could it gear to adaptive/mitigative innovations ? (BHW with Gilbert Rodrigo)
MASHING DISCIPLINES

• PRIMACY OF SCIENCE – T.I.N.A. TO BOLTING APPROPRIATE SOCIAL SCIENCE TO SCIENCE

• 1. LCA (environmental science) and SCA (operations) (NB VCA (Business) -SCA (operations) versus ‘systems’ (political economy) distinctions)

• 2. MCA (engineering/S&T studies), micro-economics, agrarian sociology.
Figure 7.2 Elements of the system of Rice Markets, 2002

[Diagram showing the flow of rice through various stages, including traders, wholesalers, millers, and consumers, with annotations for each stage.]
A stylised model

- Farm
  - Paddy
    - Transport
      - Paddy
        - Mill
          - Rice
            - Transport
              - Rice
                - Retail
SCA uses firms as analytical units while LCA measures finest grain of tasks in agricultural production
### Stages measured in agricultural production

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed</td>
<td>Embodied and transport</td>
</tr>
<tr>
<td>Seedbed cultivation</td>
<td>Tractors, diesel, bullocks,</td>
</tr>
<tr>
<td>Bund repair</td>
<td>Zero – all human</td>
</tr>
<tr>
<td>Cultivation</td>
<td>Tractors, diesel, bullocks,</td>
</tr>
<tr>
<td>Synthetic fertiliser</td>
<td>Embodied energy, transport</td>
</tr>
<tr>
<td>Manure</td>
<td>Transport and embodied</td>
</tr>
<tr>
<td>Pesticides</td>
<td>Embodied energy</td>
</tr>
<tr>
<td>Pumping</td>
<td>Electricity/diesel</td>
</tr>
<tr>
<td>Soil methane</td>
<td>Obligate anaerobic bacteria</td>
</tr>
<tr>
<td>Nitrous oxide</td>
<td>Soil bacteria, ~aerobic</td>
</tr>
<tr>
<td>Harvest</td>
<td>Tractors, diesel, bullocks</td>
</tr>
</tbody>
</table>
RESULTS – INTENSIVE RICE – production-distribution
Approximate constituent emissions

- Methane from HYV, SRI and Organic from soils. Rainfed methane from draught animals.
- Very little CO2 from rainfed as no irrigation and minimal use of tractors (some tractors were used for manure transport in rainfed, but most cultivation and harvesting did not use tractors/harvesters)
Does not include management

small samples – treat with caution
IN A SINGLE DIAGRAM - HYV RICE

GHG emissions 1kg rice\(^{-1}\)

- Irrigated HYV agriculture
- Tractor 15km\(\times\)2
- Large mill
- Transport 300km
- Retail

GHG

Labour

Minutes labour 1kg rice\(^{-1}\)
Interaction of rainfed labour and GHGs
Interaction of HYV labour and GHGs
LABOURIST APPROACH TO SUPPLY CHAIN (Labour studies /economics)

Mohan Mani, Gautam Mody and Meghna Sukumar with BHW ‘Provisioning Chennai: Labour in the Rice Supply Chain’.

Labour process in processing overwhelmingly unregistered

Capital biased tech change with logistical limits -> rates of return that could accommodate higher wages

Labour process in retail

Informal retail labour earns more than supermarket labour

in (ed) A. Narayanamoorthy and V. Bhavani Agriculture and Rural India after the Economic Reforms (New Delhi, Tulika Pub)
MULTICRITERIA MAPPING -
http://wwwsussex.ac.uk/spru/impact/mcm

i) Options – from LCA and technology scoping
- pro-poor, rain-fed rice
- SRI
- solar pumping
- halving T and D losses
- respondents’ own

ii) Criteria – from project
- GHGs
- costs
- labour/livelihoods
- respondents’ own

iii) Stakeholders – theory? inclusivity? language? literacy?
RANGES AND RANKINGS – ALL 40 STAKEHOLDERS, SITUATED KNOWLEDGE, EXPERT KNOWLEDGE
SEE OUR WEBSITE