Greening of Agri-food value chains in the GMS: Challenges and Prospects

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Reducing Rural & increasing urban Population 1961-2050

- Rural population decreasing, urban population increasing
- Urban demand for varietal plate Veg, fruits, milk & meat than just rice which will be produced by fewer people leading to mechanization, over exploitation and exhaustion of land fertility
- New generation would also demand safer and greener food
Agriculture Sector

<table>
<thead>
<tr>
<th>Countries</th>
<th>Rural Population</th>
<th>USD Billions</th>
<th>GDP share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>79%</td>
<td>8.83</td>
<td>26%</td>
</tr>
<tr>
<td>China</td>
<td>42%</td>
<td>1,299.79</td>
<td>10%</td>
</tr>
<tr>
<td>Lao</td>
<td>70%</td>
<td>5.81</td>
<td>26%</td>
</tr>
<tr>
<td>Myanmar</td>
<td>70%</td>
<td>22.0*</td>
<td>32.9%</td>
</tr>
<tr>
<td>Thailand</td>
<td>43.7%</td>
<td>37.106</td>
<td>8.4%</td>
</tr>
<tr>
<td>Vietnam</td>
<td>65.1%</td>
<td>43.311</td>
<td>15.34%</td>
</tr>
</tbody>
</table>
## Emissions from Agriculture - Rice Production systems & Livestock

<table>
<thead>
<tr>
<th></th>
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<th>Myanmar</th>
<th>Thailand</th>
<th>Viet Nam</th>
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<tbody>
<tr>
<td>Agriculture CO2eq (2016)</td>
<td>18,394</td>
<td>690,958</td>
<td>8,613</td>
<td>69,691</td>
<td>57,119</td>
<td>65,224</td>
</tr>
<tr>
<td>Rice</td>
<td>45.5%</td>
<td>17.7%</td>
<td>23.2%</td>
<td>38.9%</td>
<td>55.3%</td>
<td>48.2%</td>
</tr>
<tr>
<td>Enteric fermentation</td>
<td>23.2%</td>
<td>25.3%</td>
<td>41%</td>
<td>29.5%</td>
<td>14.3%</td>
<td>15.3%,7</td>
</tr>
</tbody>
</table>
### Nationally Determined Contributions (NDCs) for UNFCCC

**Low Carbon Economies**
- Laos (P 70% & E 29.9%)
- Cambodia (P 79% & E 26%)
- Myanmar (P 70% & E 32.9%)

**Medium Carbon Economies**
- China (P 42%, E 10%)
- Thailand (P 47.3%, E 8.4%)
- Vietnam (P 65.1%, E 15.34%)

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#### BAU Agri Value chains

<table>
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<tr>
<th>Input systems</th>
<th>Production</th>
<th>Collection</th>
<th>Processing</th>
<th>Marketing (Wholesale &amp; Retail)</th>
<th>Consumption</th>
</tr>
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#### Green Value chain

- Adopting precision farming practices with soil testing, targeted fertilizing, seed replacements, wet & dry methods, IPM
- Solar pumping, micro-irrigation systems, Small Scale Mechanisation, Solar Dryers, smart crop monitoring systems
- Collective Identity creation, Direct market linkage, Waterways transportation, Solar Drying, Infected fruits - best edibility - Categorisation of crops with quality
- Sustainable eco-packaging methods, enabling controlled atmosphere for storage, Scaling up the quality food indicators
- Household & Take Away food chains waste processing facilities
Rice Systems

- Largest crop, & Most consumed, Surplus production & Exported
- Highest Energy fertilizer & Pesticide consumer Biggest emitter in agriculture
- High intensive to highland low production
- High residues from straw, husk etc

- High res mapping to estimate GHG emissions to NDC
- High emission to optimized emission by SRI to System Crop Intensification, Diversification & Rotation for 2+ cropping in water rich areas (Eg Rice +legume + Vegetable with crop rotation)
- Continuous Rice area cultivation advisory based on satellite images of cropped area, yield estimation, international market demand etc.
- Mechanized SRI, Dry and wet paddy, organic paddy, zero tillage etc
- Biomass carbonization through gasification of straw, husk to reduce emissions
Energy (Electricity & Per capita fossil fuel & Agri machinery Data)

https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?type=shaded&view=map
Water & Irrigation

- High rainfall Cambodia – 1904mm, China Yunnan 1000+mm, Laos – 1834mm, Myanmar – 2091mm, Thailand – 1622 mm, Vietnam - 1821mm
- Lack of multipurpose dams and canals
- Low ground water utilization
- Mostly 1 crops rarely 2 crops / ha/ year

- Micro irrigation of shallow tubewells
- River lifts - Diversion based irrigation systems
- Crop diversification, use of technologies like drip irrigation etc
- Smart village grid Rooftop Solar PV systems for electricity,
Transporting Agri Food

- Road networks are extensive in MCE and Low in LCE, Rail networks are not extensive
- Vehicular population is increasing for both passenger and goods movement
- Aged fleets and cars with high emission
- Mekong has 29 ports and Inland water transportation mainstay degenerating due to advent of road transport.

- create integrated good terminals along the corridors of river, rail, road, air combinations
- Improving fuel efficiency with older trucks, maintenance, low emission engines, hybrid and electric trucks.
- Mapping additional perineal rivers & Canals for connecting them to existing Inland water transportation
Agri Food Waste

- Per capital food loss 120-150 kg / year (26-36% of production) and food waste is 6-11/kg per year

- Fruits and Vegetables constitute about 66%
Co Benefits of Greening

Employment Losses and generation
- BAU Unskilled and semiskilled persons will lose jobs in short terms and reskilling them with technology will generate the lost jobs.

Pollution reduction
- Biggest co benefit from Agriculture emissions especially if rice systems could be greened and intensification can be achieved
- Clean and safe food

Reduced Vulnerability
- Food security will be enhanced due to crop diversification
- Exacerbation of climate change impacts will be stalled
Private sector is greening agri-food value chains

- Consumer desires for clean produce as an individual commitment to reduce global warming and to reduce climate change impact is increasing day by day.
- Social media has created revolution. Eg one short video of Turtle nose getting stuck with plastic straw can rail consumers to avoid plastic straws.
- Already Private sector plays major role in agri food value chains, already investing to adopt labelling, packaging, organic production etc.
- Food delivery companies (Grab, Uber, Food panda, etc) already are bringing efficiencies.
- Agri inputs supply platforms such as seeds, fertilizer, implements, custom hiring companies, e markets, etc are examples of low carbon
Key policy gaps

- Competing Sectoral policies
- Rice intensification vs Sustainable agriculture production
- Natural Forest to Agro Plantation crops
- Varying standards for what constitutes food safety, organic etc
- Forestry vs Expansion of Agriculture, Fisheries
- Different Food safety standards or lack of if
Coarse data cannot support precision farming.

Baidu, Bing, Google earth and Google maps are more used for Tuk Tuk and Taxi than Agriculture.

two decade old remote sensing is what is mostly used today

No holistic high resolution flood / drought mapping despite losing millions of US$ every year

No unified data for cropped areas

RIMES - MRC are still operating at low precision levels

Map GMS at 0.1 ha precision

Cloud Penetrating Radar images at 10m, Hyperspectral at 30m, 3D Stereo images at 1-2m can help the entire region to move to precision farming

Foundation for region wide big data analytics platform not only for Agriculture but for entire landscape level planning
Public-private partnerships

- Weather data (buying data instead of installing them by govt systems with continuous data streaming)
- Digital Agri platforms (Crop advisories, Market linkages entire value chains.)
- Transport (Farm collectives can aggregate)
- Processing (Harmonised Green criteria’s to be implemented to bring uniformity in standards)
- Consumption (Awareness raising, Social media partners under)
Capacity to green agri-food value chains

- Agri food value chain has a low tech production system, a mid tech processing, retailing in LCE and MCE has high tech processing and retail chains.

- However government capacity is very low to moderate to keep up with the pace of Agri food value chains

- They usually work at production side with mostly low tech solutions rather than high tech solutions despite many becoming cheaper and easier to adopt.

- Tertiary education in Agri – food related sectors are also largely outdated in the region.

- Digital solutions to connect last mile to deliver package of packages to all has not been taken up

- Scattered sectoral data across the agri food value chain (Within production to processing, Transport, marketing and consumption) - Digital solutions can be handy
Good practices for replication or scaled up in GMS countries.

- UK supermarkets use 800,000 tons of plastic and TESCO UK has removed 45 vegetable and fruit items to be sold as loose packs instead of consumer packs and will remove all hard to recycle plastics by 2025.

- Eco friendly packaging

- GEF Project
  - Village level Soil testing labs
  - Agriculture Apps
  - E markets
What needs to be done?

i) enabling environment, policies, standards, regulations, etc.
   • GMS should create a harmonized policies, standards and regulations defining what is green agri food
   • Meta data sharing from farms to supermarkets with privacy & security for big data analytics.

ii) institutional and technical capacity building;
   i) Hands on short training on various technologies that are available that can be used by them with no investment or low investment
   ii) Updating and integrating these into Secondary and Tertiary Education

iii) demonstrations on greening with respect to
   i) reduction of energy consumption – Diesel irrigation to solar irrigation, Solar Cold storage/CA stores, inland water transportation,
   ii) promotion of renewable energy - Smart Solar farming (Farmer sells energy to grid – eg can non cropped areas or seasons be covered with solar panels )
   iii) reducing water consumption - Water budgeting, Smart starters, Crop Wat Moisture sensors, Sensor controlled gatevalves, irrigation scheduling etc)
   iv) reducing waste generation – Crop advisory for planting to harvesting, Drying, Warehousing, Pest management, agri waste management
   v) improving energy efficiency –
   vi) Transportation,
   vii) reducing fertilizer consumption etc. – soil testing, crop advisory,
What can be done in 5 years

1. Smart Solar roof top irrigation & mini smart grids (100 - 500 KW systems) to villages in LCEs for micro irrigation, electrification, pumping, agro processing etc
2. Social Media and Advert Campaigns for Reduction of food waste
3. Update GMS Region wide Climate Change Remote sensed information Platform
4. GMS Digital Green agri value chain smartphone App & web platform for farm to fork (with food safety, traceability, precision farming, PoPs, IoTs, market intelligence etc)
5. Green Thermometer Meter (A composite index of existing labels )
6. Policy and Implementation Biodegradable Smart packing
7. Model Inland River Transportation with integrated terminals of River, Rail, Road and market, CA warehouses
8. Increasing Sustainable Crop intensity and diversification to 2+ crops in water rich areas
9. Solar Controlled Atmosphere (CA) for fresh food storage with private sector in every agriculture cluster to increase shelf life of fresh vegetables and fruits for lean season.
10. Mobile Solar PV based / Thermal driers for grain drying systems.
11. Introduce Smartphone based crop advisory, PoPs, esmarkets, CHC for low carbon production for farmers with multi media content. low investment high returns

Develop a composite green Agrifood label integrating existing labels to enable consumers to take part in greening.
Decreasing Rural vs Increasing Urban population - demand for diversified food plate. Increasing meat, milk, fruits and vegetables consumption in urban areas leading to high cost imports, while Governments promoting low value rice production.

Increasing Rice production, fertilizer, pesticide, energy intensive mechanization and leading to very high emissions and unsustainable production levels exhausting land fertility.

Despite abundant water, lack of irrigation systems for second and third crops in Cambodia, Lao and Myanmar, while over irrigation in Vietnam and Thailand.

Low skill, low tech Agriculture and absence of adherence to POPs.

Lack of post harvest storage, processing trading High post harvest losses of fresh vegetables and fruits.

Many intermediaries, multiple handling, inefficient transportation in LCE creating more food waste. Decreasing inland water transportation And increasing polluting fleets

Lack of adequate and safe processing facilities near production clusters.

Excessive use of plastic package in retail, hotels and consumers.

Green Agrifood Digital highway - Smartphone driven inclusive smart Erp where all stakeholders are connected by various private sector entities

Policy instruments reviewed based on future food security demand to move to more low carbon production systems with financial incentives for validatable greening efforts using Geo tagged photo video modes. Harmonization of trade codes to strengthen existing free movement of fast track fresh food.

Build technical capacities in high tech- low carbon green Agrifood Technologies.

Pilot low carbon Rice value chains using mechanised SRI, Precision farming, targeted irrigation, fertilizing, pesticide spray, increasing solar PV irrigation and energy for agro processing creating more skilled jobs. Greenery poly house based aquaponics production Systems.

Developed integrated inland water transportation with mini markets terminals with solar CA storage to move, store, bulky fresh food production with low carbon footprint.