Lessons Learned on Climate Resilient Agriculture: Kingdom of Saudi Arabia

August 2022
Poultry Sector: Kingdom of Saudi Arabia

Poultry Sector Status

- Poultry production in Saudi Arabia in 2020: 900,000 metric tons
- Poultry production in Saudi Arabia in 2021: 970,000 metric tons
- Domestic production self-sufficiency level 2020: 65% self-sufficiency
- 2030 Vision self-sufficiency level: 85% self-sufficiency
- 2030 Vision Domestic Production target: 2.21 million metric tons

Poultry Sector Highlights

Poultry Production (tonnes)/Self-Sufficiency (%)

- Eggs Production:
  - 2020: 350,000 (116%)
  - 2021: 352,364 (116%)
  - 2030: 465,000 (118%)

- Chicken Production:
  - 2020: 900,000 (65%)
  - 2021: 970,000 (70%)
  - 2030: 2,212,000 (85%)
Poultry Sector Challenges: Kingdom of Saudi Arabia

- Harsh environmental condition prevailing in the country
- Disease Control, and Antibiotic Resistance
- Increased production costs for poultry meat and eggs
- Carbon footprint, in terms of Greenhouse gas (GHG) emissions
- Increasing amounts of waste generated by poultry farms contribute to emission of Greenhouse gas (GHG)

### Greenhouse gas Emission

#### Food: greenhouse gas emissions across the supply chain

- **Beef (beef, chicken)**: 24 kg CO₂-equivalents/kg product
- **Lamb & Mutton**: 17 kg CO₂-equivalents/kg product
- **Cheese**: 15 kg CO₂-equivalents/kg product
- **Beef (beef, chicken)**: 21 kg CO₂-equivalents/kg product
- **Chocolate**: 12 kg CO₂-equivalents/kg product
- **Coffee**: 12 kg CO₂-equivalents/kg product
- **Shrimp (fresh)**: 12 kg CO₂-equivalents/kg product
- **Breakfast cereals**: 11 kg CO₂-equivalents/kg product
- **Poultry meat**: 6 kg CO₂-equivalents/kg product
- **Other oils**: 5 kg CO₂-equivalents/kg product
- **Fish (farmed)**: 3 kg CO₂-equivalents/kg product
- **Flour (bread)**: 2 kg CO₂-equivalents/kg product
- **Rice**: 1.5 kg CO₂-equivalents/kg product
- **Wheat (flour)**: 1.4 kg CO₂-equivalents/kg product
- **Milk (raw)**: 1.0 kg CO₂-equivalents/kg product
- **Soybean oil**: 0.9 kg CO₂-equivalents/kg product
- **Tomatoes**: 0.7 kg CO₂-equivalents/kg product
- **Groundnuts**: 0.6 kg CO₂-equivalents/kg product
- **Carrots**: 0.4 kg CO₂-equivalents/kg product
- **Romaine lettuce**: 0.6 kg CO₂-equivalents/kg product

#### Carbon footprint of poultry

- Approximately 6 kg CO₂-equivalents/kg product
Traditional Poultry Waste disposal methods & Implications

Storage and disposal of raw poultry manure has become an environmental problem because of the associated air, water and soil pollution.

Poultry manure begins to decompose immediately after excretion giving off ammonia which, in high concentrations, can have adverse effects on the health and productivity of birds as well as the health of the farm workers.

Landfilling the poultry litter leads to greenhouse gas emissions and loss of valuable resources.

Pollution of soil and water with nutrients, pathogens and heavy metals is generally caused by poor manure-management and occurs where manure is stored.

Odor is mainly emitted from manure & is caused by ammonia (NH3), volatile organic compounds (VOC), & Hydrogen Sulfides (H2S).
Poultry Waste management in KSA: Two Case Lessons

Almarai Company

Poultry Sector

Tanmiah Food Company
Poultry Waste Management Case of Almarai Company

- Almarai Company is a Saudi multinational food company
- Poultry farms generated huge amount of waste (142,800 tonnes/year).
- There was a need to find an environmentally compatible poultry waste management / utilization solution

Process mainly comprised of:
- Drying of wet manure
- Gasifying the dried litter
- Thermal Oxidizer

The process lead to the production of 5 valuable products
# Poultry Waste Products & their Applications

<table>
<thead>
<tr>
<th>Products</th>
<th>Applications</th>
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<tbody>
<tr>
<td>Poultry Fat/Oil</td>
<td><em>Ingredients for Pet Food manufacturing,</em></td>
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<tr>
<td></td>
<td><em>Fuel for oil burners</em></td>
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<tr>
<td></td>
<td><em>raw materials for biofuels</em></td>
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<tr>
<td>Poultry Meal</td>
<td><em>Ingredients for Pet Food manufacturing,</em></td>
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<tr>
<td></td>
<td><em>Organic Fertilizer,</em></td>
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<td></td>
<td><em>not suitable for human consumption &amp; animal feed</em></td>
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<tr>
<td>Feather Meal</td>
<td><em>Raw material for pet food,</em></td>
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<tr>
<td></td>
<td><em>feeds additive</em></td>
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<td></td>
<td><em>(“not for ruminant animals” and as organic fertilizer,</em></td>
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<tr>
<td></td>
<td><em>(“not suitable for human consumption</em></td>
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<tr>
<td>Blood Meal</td>
<td><em>Raw material for pet food,</em></td>
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<tr>
<td></td>
<td><em>feeds additive</em></td>
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<td><em>organic fertilizer,</em></td>
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<td><em>not suitable for human consumption</em></td>
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<tr>
<td>EcoChar (Charcoal) (14,400 tons/year) production</td>
<td><em>EcoChar mainly comprised of 12.8% C, 21.6% Ash,</em></td>
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<td></td>
<td><em>it can hold 1,1-2,5 times its own volume in water</em></td>
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<td><em>Release nutrients and moisture gradually</em></td>
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Poultry Waste: Case Study of Tanmiah Food Company (TFC)

- Amount of wastewater is currently around 579 million liters per annum, with the potential to grow towards 2.3 billion liters per annum.

- Tanmiah Food Company collectively generate about 109,460 tons of solid waste annually.
- This is expected to increase by up to 437,840 ton annually.

- Cost to dispose of all of TFC’s waste reach up to SAR 10 million on a yearly basis.

- Proportionate to the amount of waste, these disposal costs are also expected to grow by four times as much.

- Amount of wastewater is currently around 579 million liters per annum, with the potential to grow towards 2.3 billion liters per annum.
Eco-friendly Poultry Waste Management: Vision and Mission

- Ambition to collectively go beyond reducing harm and to deliver positive outcomes for the society and the ecosystem
- Create a value chain which, ultimately, has a net positive impact on the environment
- Technologies and their applications should mitigate the harmful impact of poultry production by for example leading to a net carbon negative value chain

**Waste management Technology Insight: Poultry Waste Management**

- **Insect farming**: Converting poultry waste to renewable energy to organic lubricant through black solder fly farming
- **Pyrolysis**: Converting poultry waste to renewable energy and biochar through microwave pyrolysis
- **Hydrolysis**: Converting poultry waste to amino acids fertilizer through hydrolysis technology
- **Proteinia**: Converting poultry waste to enzymes through black solder fly farming
Lessons Learned on Climate Resilient Agriculture in KSA: Poultry Sector

Technology help to reduce 500-600 Kg of CO2 in every ton of chicken manure process as per technology

Conclusion

- Zero waste
- Zero emission for landfills
- Carbon positive process
- Climate Resilient: Poultry sector
THANK YOU