A Holistic Lens on Rice Value Chain Pathways in Senegal: Application of “The Economics of Ecosystems and Biodiversity for Agriculture and Food” Framework
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Rice is a valued crop in Senegal, with increasing importance over the last decades.

Senegal is recognized for having one of the largest production increases, from 2010 to 2017 in West Africa.

Although overall regional rice production increased by 25% from 2010 to 2017, rice consumption was up by 35%, a more rapid increase than expected.

As a consequence, regional self-sufficiency declined from 59% to 54%.
Dimensions of rice beyond yields

Produced around the world by millions of small-scale family farmers, often through complex social relationships.

Rice paddies, sculpting the land, often serve as a form of water storage and supply and erosion control.

When irrigated rice is grown under organic conditions, it creates its own “agricultural ecosystem of unrivaled complexity”

Rice holds unique cultural values for many societies.
Application of the TEEB framework to rice value chains in Senegal

What did we do particularly in alignment with the framework?

▪ Carried out an evaluation across the food chain, from production of both irrigated and rainfed rice, to processing and transportation, to consumption;

▪ Worked to bring in the perspective of multiple stakeholders: farmers, civil society, researchers and a governance think tank, and to solicit their input on the key issues, and the relevant policy questions;

▪ Applied “systems thinking”- translating proposed policy recommendations into policy interventions that change key indicators between “Business as Usual” and an “Agroecological” alternative;
Application of the TEEB framework to rice value chains in Senegal

What did we do that expands the framework in particular directions?

• Structured the policy interventions around FAO’s ten elements of Agroecology

• Did not immediately link to the four forms of capital, and their stocks and flows; rather: used an existing systems dynamics model developed for the Government of Senegal to play out the implications of the proposed policy interventions, and assess their impacts on key indicators within the four forms of capital;

• The form of assessment is not solely or explicitly monetary; rather the assessment is based on the impacts throughout the system of different policy measures, as evaluated by many different means;

• Used the systems dynamics model developed for the Government of Senegal to assess their pathways to attain the Sustainable Development Goals, to assess the relevant changes in indicators and impacts on types of capital and SDGs.
Evaluation across the food chain, from production of both irrigated and rainfed rice, to processing and transportation, to consumption;

- Farming systems
- Land tenure
- Training and education
- Traditional knowledge
- Seeds and genetic diversity
- Water management
- Fertility management
- Residue management;
- GHG emissions;
- Pest and weed management;
- Addressing salinization
- Mechanization;
- Inputs and subsidies
- Agricultural credit
- Diversification
- Integration of fish with rice
- Import vs. domestic production
- Employment
- Equity; fair pricing
Evaluation across the food chain, from production of both irrigated and rainfed rice, to processing and transportation, to consumption;

- Production
- Processing
- Distribution
- Consumption

Processing infrastructure and investment
Ownership of processing facilities
Use of rice by-products
Evaluation across the food chain, from production of both irrigated and rainfed rice, to processing and transportation, to consumption;

- Production
- Processing
- Transportation
- Consumption
- Continuity of supply
- Rice markets, organization of market
- Credit in the value chain
Evaluation across the food chain, from production of both irrigated and rainfed rice, to processing and transportation, to consumption;

- Production
- Processing
- Distribution
- Consumption

Consumption patterns and policies
Local demand vs. imported
Cultural importance
Food security/food sovereignty
Brought in the perspective of multiple stakeholders: farmers, civil society, researchers and a governance think tank, to solicit their input on the key issues, and the relevant policy questions;
Formulation of a consensus set of policy interventions, organized along the framework of FAO’s 10 elements of Agroecology.
Formulation of a consensus set of policy interventions, organized along the framework of FAO’s 10 elements of Agroecology

**Resilience:** Support the construction of dikes and bunds in the lowlands to retain / manage the "surplus" rainwater and control salt

**Human and social values:** Empower people, especially women and young people at household, community levels and beyond by building knowledge, through collective action and creating opportunities for commercialization

**Circular economy:** Support for smaller and medium sized decentralized mills and storage facilities managed by the communities (providing benefits, such as capacity for milling by-products to be allocated to other uses, such as animal feed, field fertilizers, breweries or other sectors, reduction of transportation costs, higher prices for producers, lower prices for consumers, greater market efficiency and availability at the community markets)
Core Sectors of iSDG Model
1. Defining the problem and selecting Policies

Stakeholder Consultation

FAO principles of Agroecology

2. Representing the system

T21-iSDG Model

Causal Loop Diagrams

Stock and Flow System Dynamic Model

3. Measuring the impact, 4 types of Capital and SDGs

Policy interventions

Dynamic simulation Results

- Natural Capital
  - Total water withdrawal per unit of GDP
  - Forest land
  - GEF benefits index for biodiversity
  - Pesticide dispersion in environment

- Human Capital
  - Average adult literacy rate
  - Under five mortality rate
  - Unemployment rate
  - Human development index

- Produced Capital
  - Real per GDP growth rate
  - Interest on public debt
  - Yield
  - Total agriculture production in tons

- Social Capital
  - Prevalence of undernourishment
  - Population below poverty line (%)
  - Conflict-related death rate
  - Women in leadership positions (%)