WAGENINGEN
UNIVERSITY & RESEARCH

Sustainable food production from aquatic systems

Wageningen Aquatic Food Systems team

Introduction

The aim of United Nations Sustainable Development Goal (SDG) 2 "Zero Hunger" is to end all forms of hunger and malnutrition by 2030. Total food demand is expected to increase by 60% compared to 2015 (SAPEA, 2017). In addition to increasing food production there are the challenges of reducing the pressure on land and on the use of fresh water for food production. Earth's seas and oceans cover 70% of the world's surface and only a fraction of this space is nowadays used for growing crops and animals for food. Currently, only 7% of the proteins consumed by people are marine-based. Most of this is the result of fish species that are often high in the food chain (high trophic levels). The challenge is to increase marine production at low(er) trophic levels. Commercial seaweed combined with shrimp or fish farming offer opportunities to address the worldwide increase in demand for protein and micronutrients in the coming decades.

Overall objective

The overall objective of KB Aquatic Food Systems is to develop knowledge that will improve the contribution of sustainable marine production to global food security, especially for the poor. We plan to concentrate on two aspects:

1) Assess the potential global contribution of seaweed for (in)direct food security. This will be done by a stepwise approach. We will first develop insights into the production options, the socio-economic market potential and the means to achieve that, using Indonesia as the main case study. This will be followed by **global yield gap assessment** of seaweed by making use of models.

2) For the Indonesia case study we will examine the potential of combined cultivation of seaweed with shrimps and/or tilapia by doing a **food system analysis** and (experimental) fieldwork. Application of a food systems approach (Figure 2) ensures that environmental and socio-economic drivers and the consequences for various components of the value chain that follow the production are taken into consideration.

Figure 1. *Seaweed famer bringing the harvest to shore. Photo: C. Laarhuis*

Project Team

An interdisciplinary research team of WR will contribute to Aquatic Food Systems by combining their knowledge in the Agri-Food and Water domains to explore the food potential of multi-cropping systems of seaweeds with shrimp and/or fish like tilapia.

The collaborating Wageningen researchers are::

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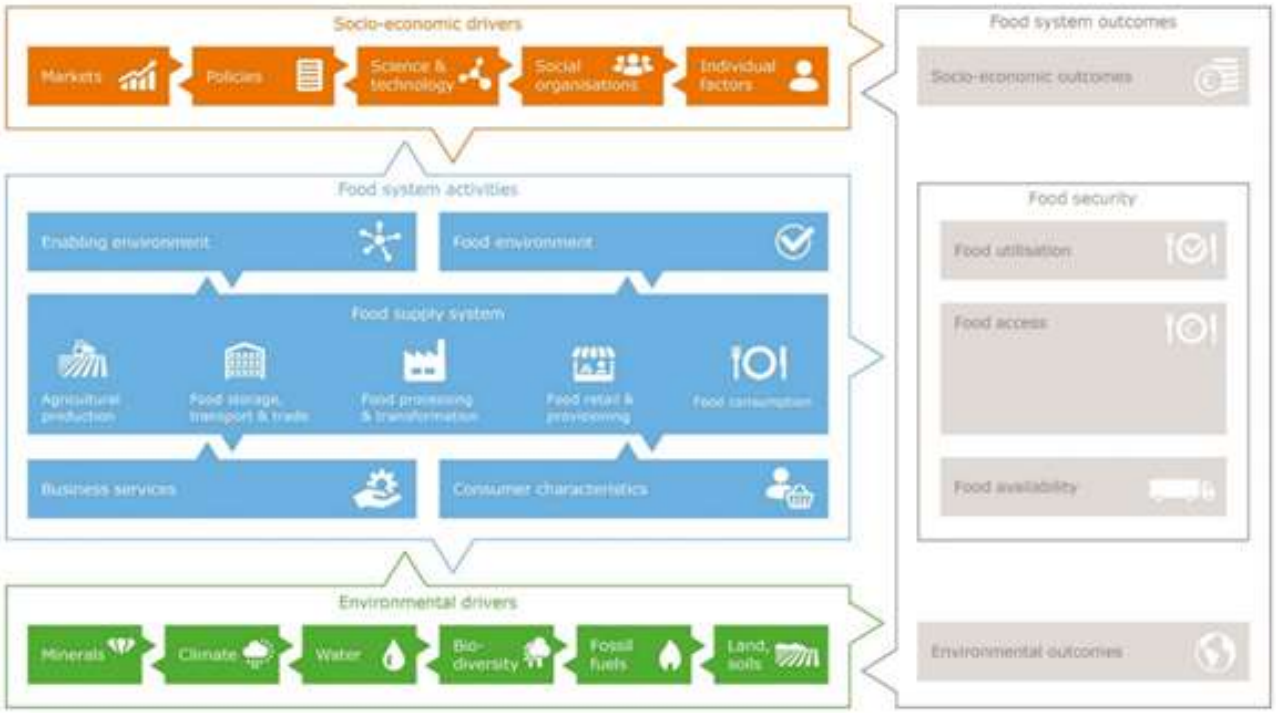

Figure 2. *The Food System Approach (FSA): a way of mapping the relationships of the food system to its drivers. (van Berkum et al, 2018)*

Indonesia is opportune as a case study as it is the world's second larger producer of seaweeds. It represents a highly diverse setting in which to study the multitude of influences of socio-economic, sectoral and environmental factors that may determine seaweed production potential in the rest of the world. Furthermore, Indonesia has a large brackish water aquaculture sector producing shrimp, milkfish and other products. Many brackish water pond farmers are affected by shrimp diseases, water quality issues and land erosion. At present, an improved strain of tilapia is being developed in Indonesia that can resist high and fluctuating salinities. We intend to test the performance of this strain when cultivated in combination with shrimps and/or seaweeds (mixed cropping, rotational cropping, seaweed as fish feed ingredient). Tilapia is a plankton and detritus eater and its presence has a positive impact on shrimp production. Seaweeds can make use of the dissolved nutrients that result from shrimp and tilapia aquaculture. Our research will focus on technical, economic and environmental aspects and will include the fit of seaweed and these marine products in the diet of the local consumers. This study will define options for global perspectives for new aquaculture approaches targeting at efficiency (eco-intensification) by means of lessons learned and by extrapolating from the complex Indonesian setting.

Figure 3. *Drying seaweed. Photo: C. Laarhuis*

Figure 4. *Dr. Sri Rejeki showing* Caulerpa racemosa *grown in brackish water shrimp ponds of Brebes, north coast of Java. Photo: Sri Rejeki.*

References

Van Berkum et al. (2018). The food systems approach: sustainable solutions for a sufficient supply of healthy food. Wageningen Economic research Memorandum 2018-064.

SAPEA (2017) Food from the Oceans. SAPEA evidence report no. 1SAPEA (2017) Food from the Oceans. SAPEA evidence report no. 1