Pathways to food system transformation and food security

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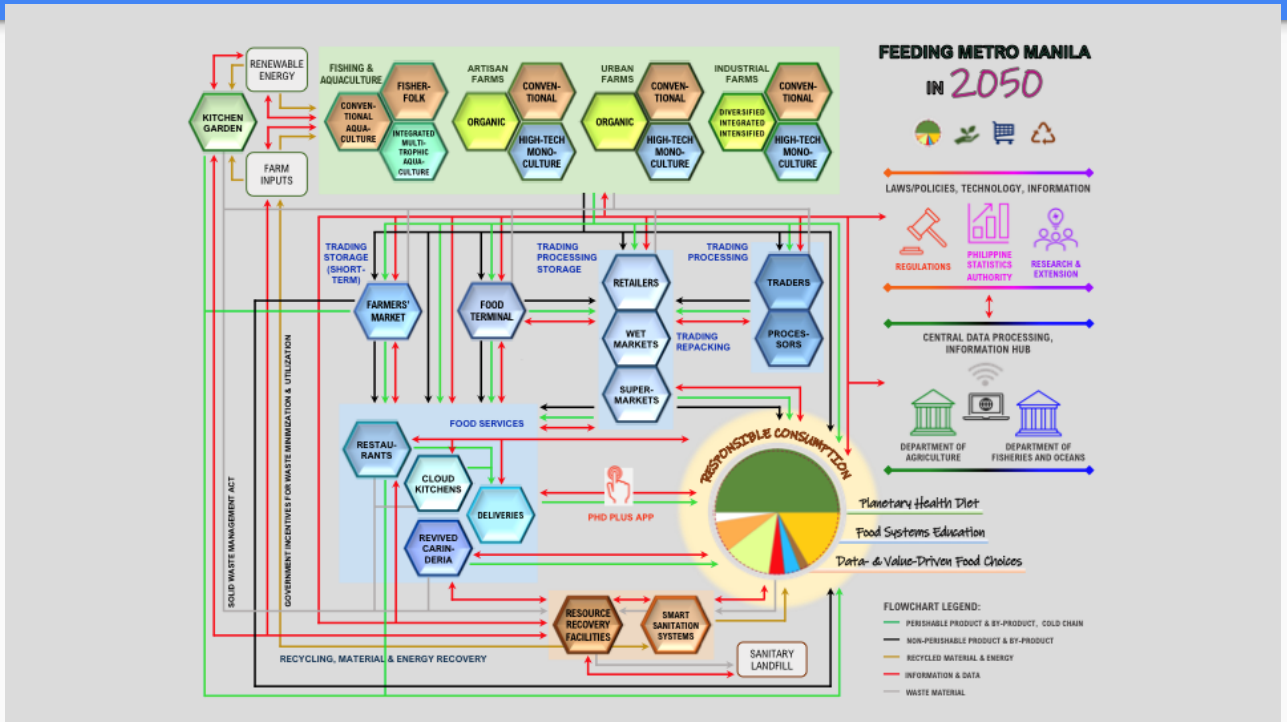
Vision and strategy for food system transformation

2019 - the food system Vision prepared by the Agricultural Sciences Division of the National Academy of Science and Technology recognized that the problems of our agriculture is a systems problem; we started to advocate for a transformation of our food system to solve these problems.

2021 - the NAST Vision was integrated in the National Agri-fishery Modernization and Industrialization Plan (NAFMIP) of DA

2022 - the NAST Vision was integrated in the Philippine Development Plan of NEDA

2022- the NAST Vision was integrated in Pagtanaw 2050 of DOST



Objectives

1) To describe the 7 major features of the transformed food system as imagined in 3 national plans
2) To describe the technological requirements for the features of the transformed food system to materialize, with focus on those that require R and D investments
3) To discuss the two major technological trends leading to food security

The technology continuum

R - Research

D - Development

D - Demonstration

D - Deployment

7 Features of a transformed food system

1. Individual consumption decisions will be data- and values-driven.

2. Connection between food producers and the consumer will be more direct.

3. Food production will be highly diversified, local, and seasonal.

4. Food production from the aquatic environment will grow faster than land-based production.

5. The food system will be circular. Material and energy recovered from wastes, valued as a resource, and returned to the farms and households.

6. Steps in the food system will be digitally interconnected, allowing for a high level of transparency and efficiency.

7. Reduced post-harvest losses with adequate cold chains (temperature-controlled supply chains).

1. Individual consumption decisions will be data- and values-driven.

BAU: Food choices made on the basis of price, convenience and cost

Our vision: Food choices guided by PHD PLUS

The core of this dietary guide is the Planetary Health Diet (PHD), which takes care of human and gut microbiome nutrition and health, as well as the health of the environment. PLUS covers the concern for social justice and traditional food culture.

STI needs:

1. Nutritional genomics leading to personalized nutrition - Can we use the network of DNA labs used during COVID to offer DNA profile services? We need more research on genes affecting individual (and population) response to food.
2. Research connecting gut and soil microbiome
3. Life cycle analyses of various farming technologies
4. Priority: support the development of the FLEX PHD App to encourage consumer preference switch to PHD Plus

2. Connection between food producers and the consumer will be more direct.

BAU: The difference between farm gate and consumer price pushes food prices beyond the reach of the poor

Our Vision: consumers will become prosumers doing most of the production and marketing functions

STI needs:

1. Scale up online marketing to promote direct farmer-consumer transaction
2. Set up community farms in legally required/encouraged spaces, including rooftops and controlled environment facilities
3. Controlled environment production facility in every household
4. Priority: Engage consumers in processing such as the use of household rice mills and food preservation such as fermentation, drying and freezing

3. Food production will be highly diversified, local, and seasonal.

BAU: food production and processing moving overseas (imports) and reduced to a few highly commoditized products

Our Vision: local farmers grow locally and seasonally adapted crops, animals and fish

STI needs:

1. Customized diversified farming and aquaculture systems such as IMTA (Integrated Multitrophic Aquaculture) linked to value adding and marketing facilities
2. Gene banks and long term breeding programs for crops, animals, aquaculture species including seaweeds
3. Priority: low cost small scale irrigation systems to allow rainfed rice farms to engage in multiple cropping

4. Food production from the aquatic environment will grow faster than land-based production.

BAU: Very low investment in fishery and aquaculture compared to terrestrial farming

Our Vision: Reverse the trend in favor of fishery and aquaculture

STI needs:

1. Design and locally manufacture sea going fishing vessels
2. Open ocean aquaculture
3. End product processing of seaweeds and similar products
4. Priority: Operate and provide STI support for the existing aquaculture parks

5. The food system will be circular. Material and energy recovered from wastes, valued as a resource, and returned to the farms and households.

BAU: The food system is linear. By products and wastes pollute

Our Vision: By-products and wastes will be utilized/recycled at the source

STI needs:

1. The Bill Gates toilet: Material and energy recycled in the household or sold as a resource
2. Improved technologies for the use of bamboo, palm leaves, abaca and other local materials for packaging

6. Steps in the food system will be digitally interconnected, allowing for a high level of transparency and efficiency.

BAU: Vital information such as rice production area is not easily accessible. We do not even have a farmer registry.

Our Vision: All the steps and supporting institutions in the food system will be interconnected and information updated in real time

STI needs:

1. A farmer registration system linked to the national ID system
2. Space technology to improve communication, crop monitoring and early warning system
3. Connectivity and security of data across all steps in the circular food system
4. Efficient data generation, collection, processing and sharing

7. Reduced post-harvest losses with adequate cold chains (temperature-controlled supply chains).

BAU: Very high losses of food products

Our Vision: An efficient cold chain established leading to all consumption centers

STI needs:

Cheap energy for the following

1. Farmers' markets with cold storage facilities in consumption centers
2. Refrigerated vans
3. Priority: Establish food terminals in major cities patterned after Food Terminal Inc.

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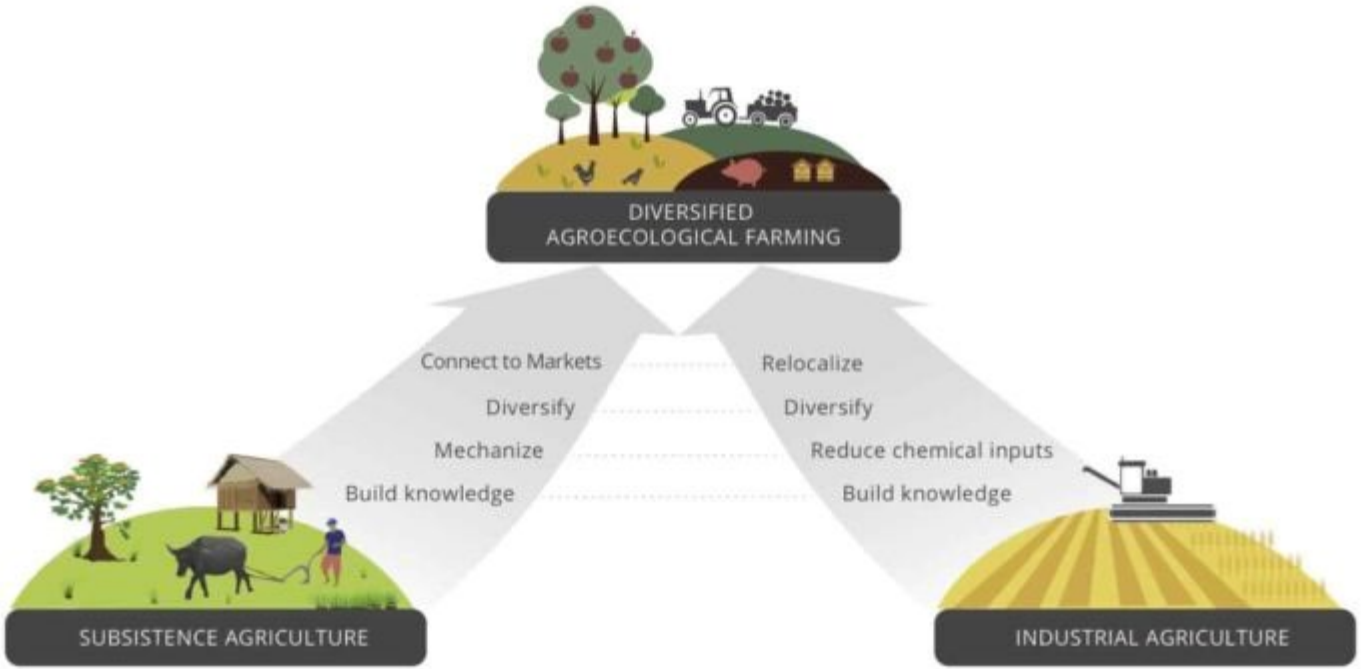
Diverging paths to food security

1. Dominated by physics and chemistry - controlled environment agriculture
2. Dominated by biology
    a. Ecological agriculture
    b. Cellular agriculture

TRANSITIONING FROM DIFFERENT STARTING POINTS



Cellular agriculture: Milestones in commercialization of cultured meat

2013: the first cultured beef burger patty launched in London. Cost: $300,000.00

2020: the first chicken nugget launched in Singapore. Cost: $23.00

Chicken with recado negro tempora served at Bar Crenn Restaurant in San Francisco, California. Cost: $150 per person for a six-course menu that includes this dish. It will be served every first weekend of each month

Summary

1	2	3	4
Food system transformation is a requirement for true food security. The Vision and plans for food system transformation are described in 4 national documents produced over the last three years.	Seven major features of the transformed food system were described as envisioned.	Described the needed STI support for each of the seven features, with emphasis on developing technology packages or technology systems and identified priorities. The key intervention is in the area of changing food consumption habits of consumers.	Discussed the two major technological trends leading to food security

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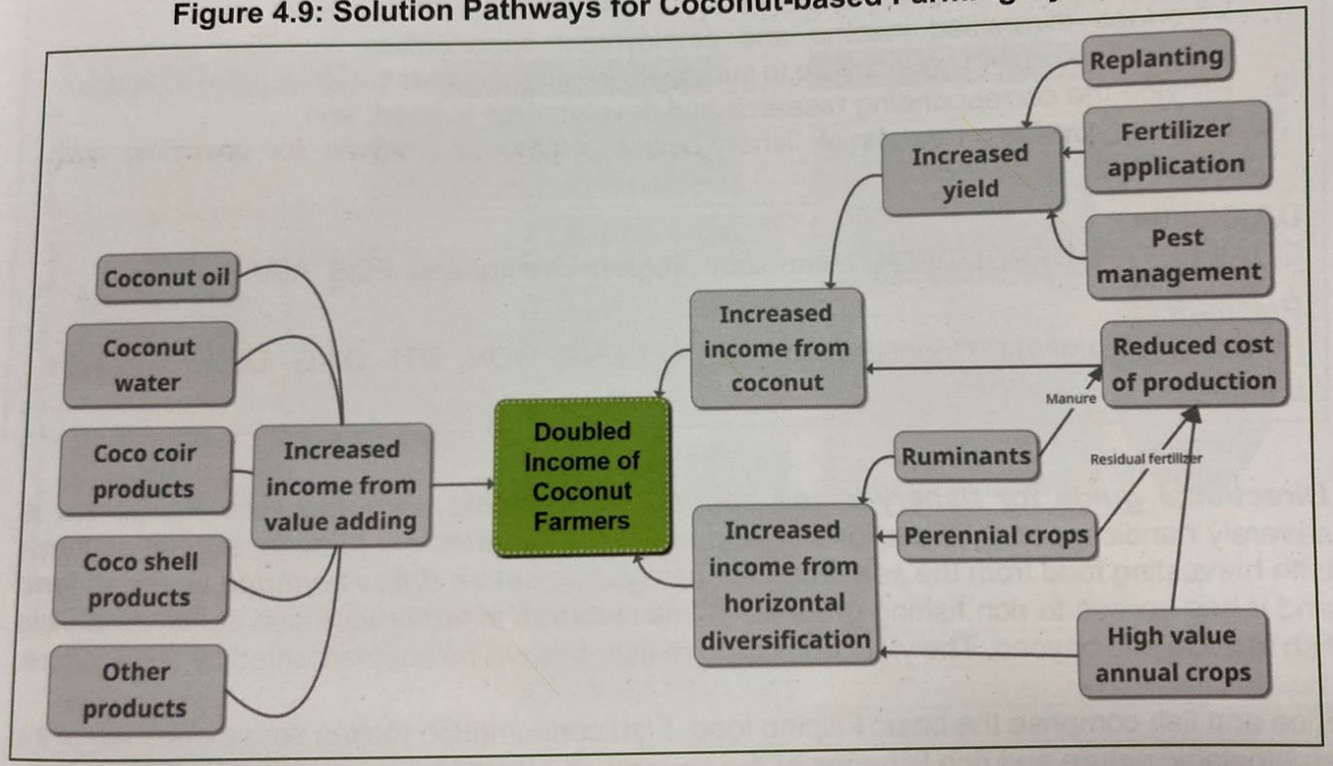
Figure 4.9: Solution Pathways for Coconut-based Farming Systems



4. *Fishery-based Commodity Systems: the Future of Fish*

Figure 4.8: Solution Pathways for Corn-based Systems

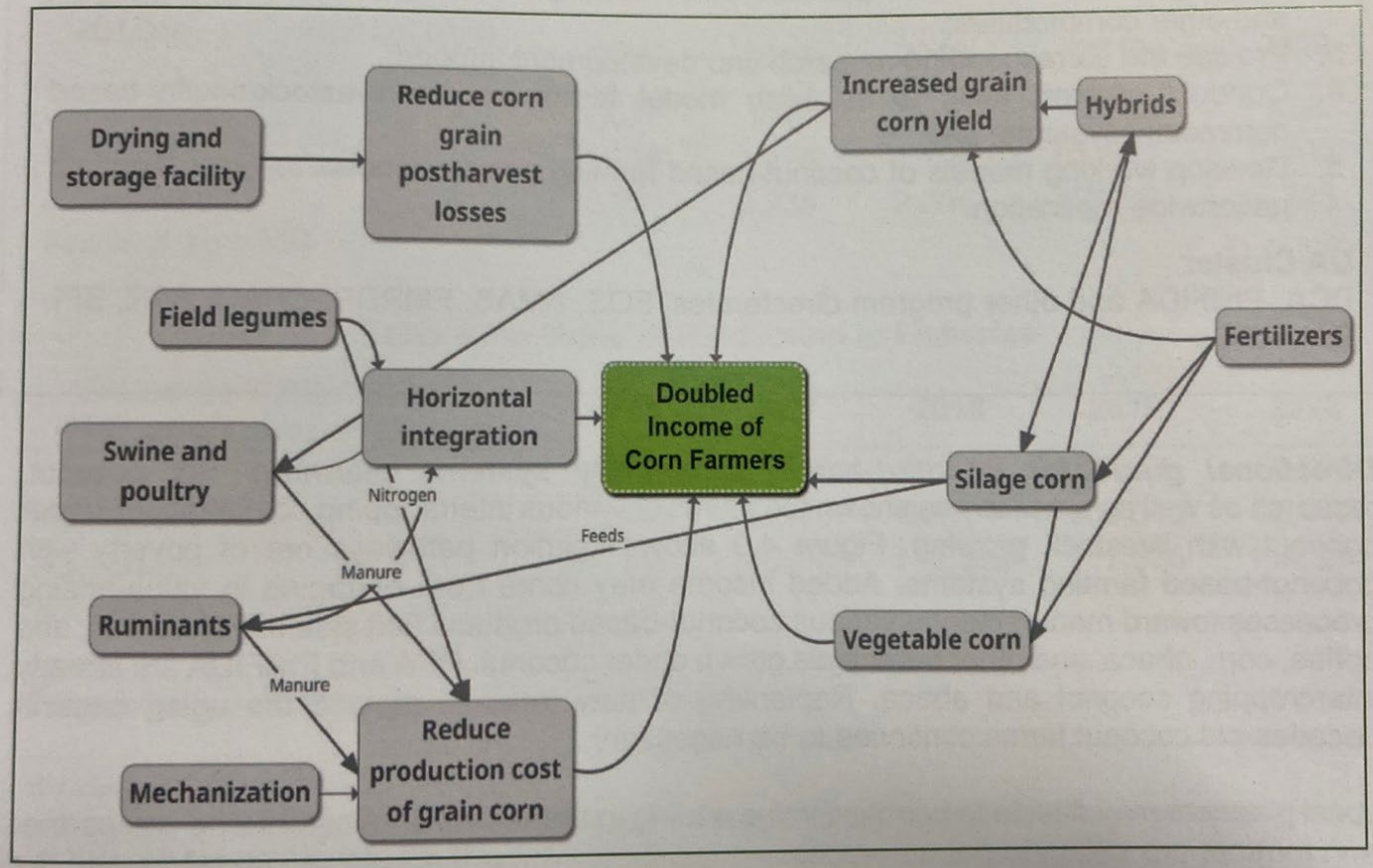


Figure 4.7: Solution Pathways for Rice-based Systems