Food Security Module

1. Background

Food Security exists when all people at all times have **physical** and **economic** access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO 2000). This definition has widely established the four pillars of food security: availability, accessibility, utilization and stability.

In this module, we examine developments in food security in different model scenarios through a food security composite indicators, which is calculated based on the above definition and by using a range of commonly used food and nutrition security indicators. The model scenarios are differentiated by the degree of change in the crops production and yields, which is complemented by the Socio-Economic scenarios. The building blocks of the composite food security indicator are selected to cover as many of the dimensions of food and security as possible.

The advantages of incorporating established food security metrics are twofold, providing continuity by allowing for comparisons between historical, current and future estimates of the same set of FS metrics and increasingly communicability, by structuring the output of the complex long-term modelling systems using metrics familiar to the Bangladesh national and regional policy makers.

2. Developers

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- ... ()
- ...

3. Purpose/Objective of the Module

The main objective of the Network Module is:

Specific objectives are:

4. Regional extent of Food Security Module

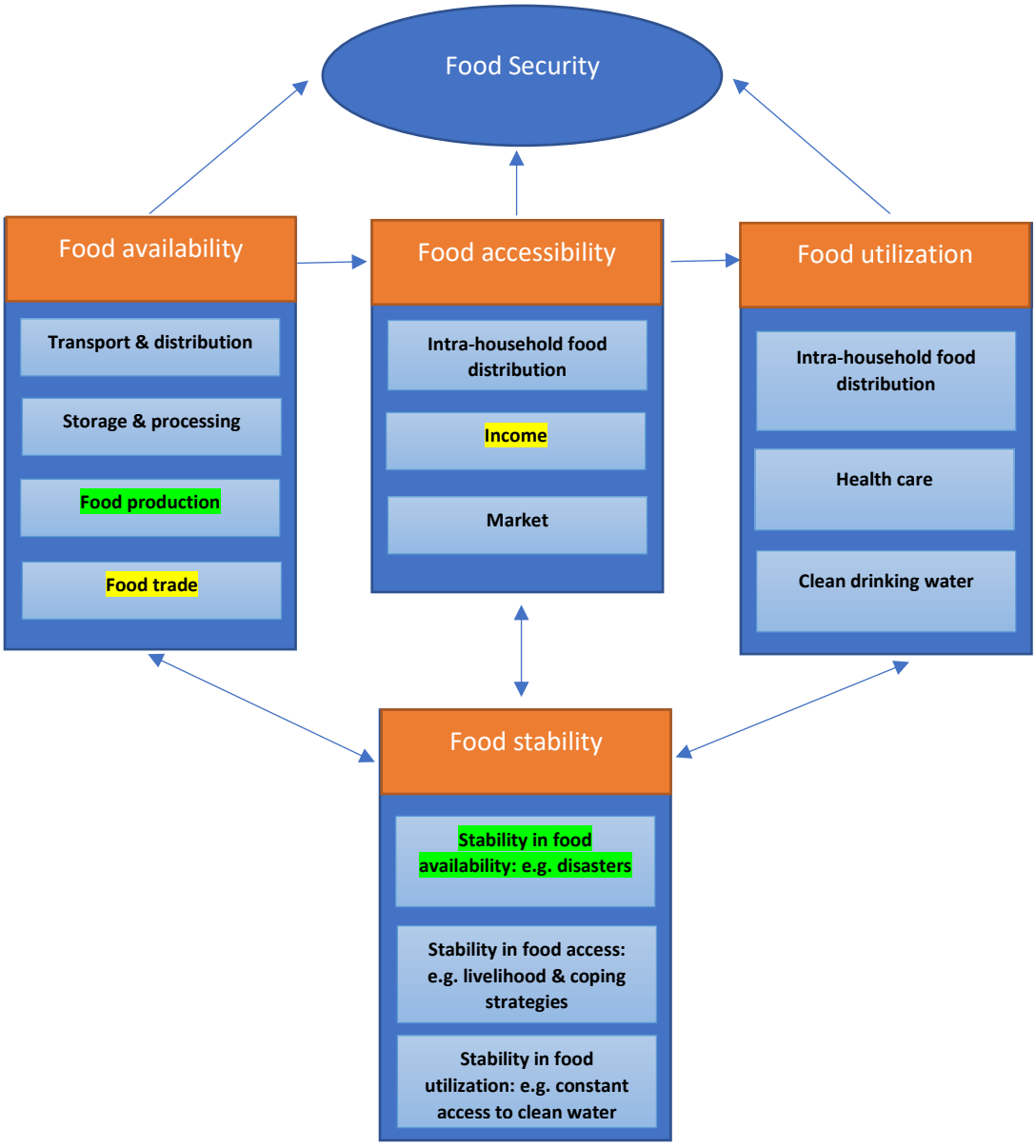
Bangladesh north-west upzalia regions ...

5. Measuring Food Security

5.1 The conceptual framework

Figure 1 illustrates the relationship among the four dimensions of food security: *Accessibility*, *Availability, Utilization*, and *Stability*. There are two main determinants of food security:

Figure 1: Dimensions of food security - based on Burchi et. al. (2011)



1. Physical determinant which is the food flow: *Availability, Accessibility, Utilization*. *Availability* refers to an adequate supply of food which is ready to be consumed by the individuals. *Access* measures if all individuals have sufficient resources to obtain appropriate foods for a nutritious diet. Utilization measures the the fitness of the human body to ingest and metabolize food.
2. Temporal determinant: which refers to Stability of food security and affects all three physical elements. It is important to distinguish between food insecurity caused for example by repeated food shortages before harvest "seasonality" and food insecurity due to natural and man made disasters.

In food security module we calculate a compost indicator which include Availability, Accessibility, and Stability, but leaves out Utilization. The reason is that utilization cannot be directly linked to the Meta Model and the investment projects which will be assessed.

5.2 Methodology

5.2.1 The composite 'Food Security for Low Income'

The composite 'Food Security for Low Income' measures the Average Dietary Energy Supply Adequacy (ADESA) for the lowest income quartile of each Upazila for the lowest rice yield quantile. This indicators is intended to be a smart indicator capturing all food security dimensions as defined by the FAO – availability, accessibility, utilization, and to a lesser extent, stability. The smartness of the ADESA indicator, however, lies not only in its broad coverage, but also in the logical connectivity between these food security dimensions that allows for comprehensive assessments in a single framework. In this framework, availability is connected with utilization as agricultural productions and agri-food imports are converted to nutrients based on distinctive nutrition components across agri-food products; availability is connected with accessibility as relative income is introduced to judge to what extent the available nutrients are accessible to a certain group of people; and stability is also connected with the other dimensions if high-frequency (e.g. seasonal or annual) data can be provided to determine the standard deviation of ADESA. As such, the proposed all-in-one indicator addresses food security concerns in a more comprehensive and consistent way, in contrast with most other food security indicators that generally deal with one of these concerns only.

Apart from the connectivity across food security dimensions, the ADESA indicator also features a connection between the average indicator (at national and district levels) and a tailor-made indicator that is formulated to measure food insecurity for the low income. This connection is made through relative income between the low income group and the district and national averages. Since this connection not only establishes a relation between availability and accessibility, but also puts food insecurity into perspective – what matters more is how insecure the poor will be relative to the average, this would accredit ADESA with more importance. Given this relativity, any shock to the average income (at district or national levels) per se will not affect relative income and thus will not affect food insecurity of the poor unless their purchasing power has changed (e.g. less/more food becomes available).

The focus of the ADESA indicator is to measure food insecurity for the low income. This requires the tailor-made indicator to be applied to a “representative” farmer who is in the lowest income quantile of rural population and in the lowest quantile rice crops yield at the district level in Bangladesh. On one hand, the two constraints for the representative farmer highlight rural population accounting for a major proportion in Bangladesh and rice production being central to maintaining a typical farmer’s livelihood in this country; on the other hand, the two constraints also connect availability/supply side with accessibility/demand side as changes in rice productivity will be reflected through changes in the farmer’s income, and consequently the purchasing power of agri-food products.

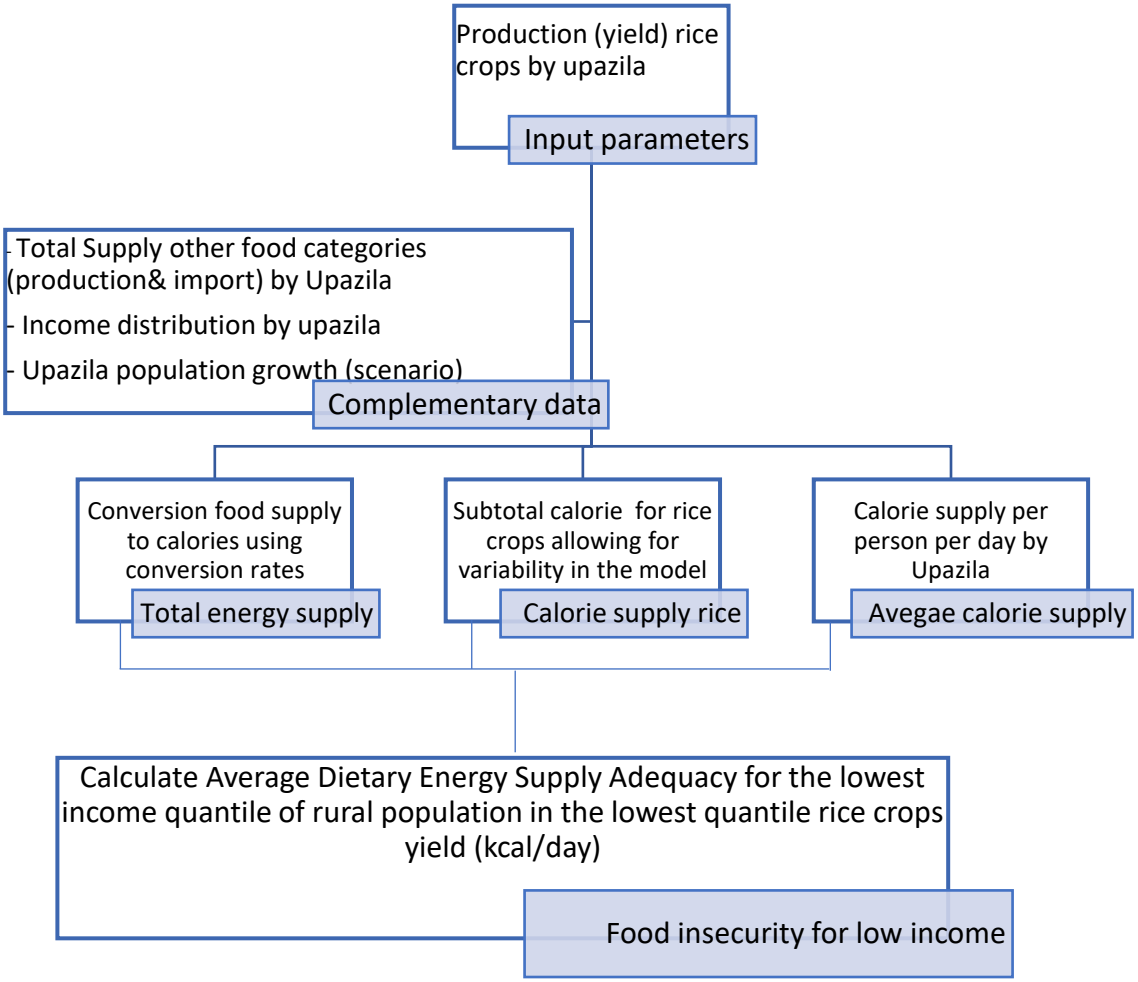
5.2.2 Building blocks of composite ‘Food Security for Low Income’

5.2.3 Setting up the Input Files

The challenge in deriving the ADESA indicator is the collection of relevant data, particularly the income distribution to calculate the lowest income quantile of rural population and rice crops yield at the upazila level, which is an output of the agricultural production module. This requires available field-level data containing farmer’s rice crops yields and income in the same array so the tabular data can be sorted with the two filters to get the income data for the representative farmer.

5.2.4 Calculation steps

The below diagram shows steps to derive the food security indicator:



5.2.5 Developing Necessary Formulas

Calorie supply

Lowest income quantile

Income share (access probability)

Food insecurity for low income

5.2.6 Data Exchange with Agricultural Production Module

5.2.7 Scripting in Python

5.2.8 Validation

6. Output of the Module

This network module produces the below outputs for each time step:

7. Simulation of the test Case