Integrating spatial analysis in food security strategy development

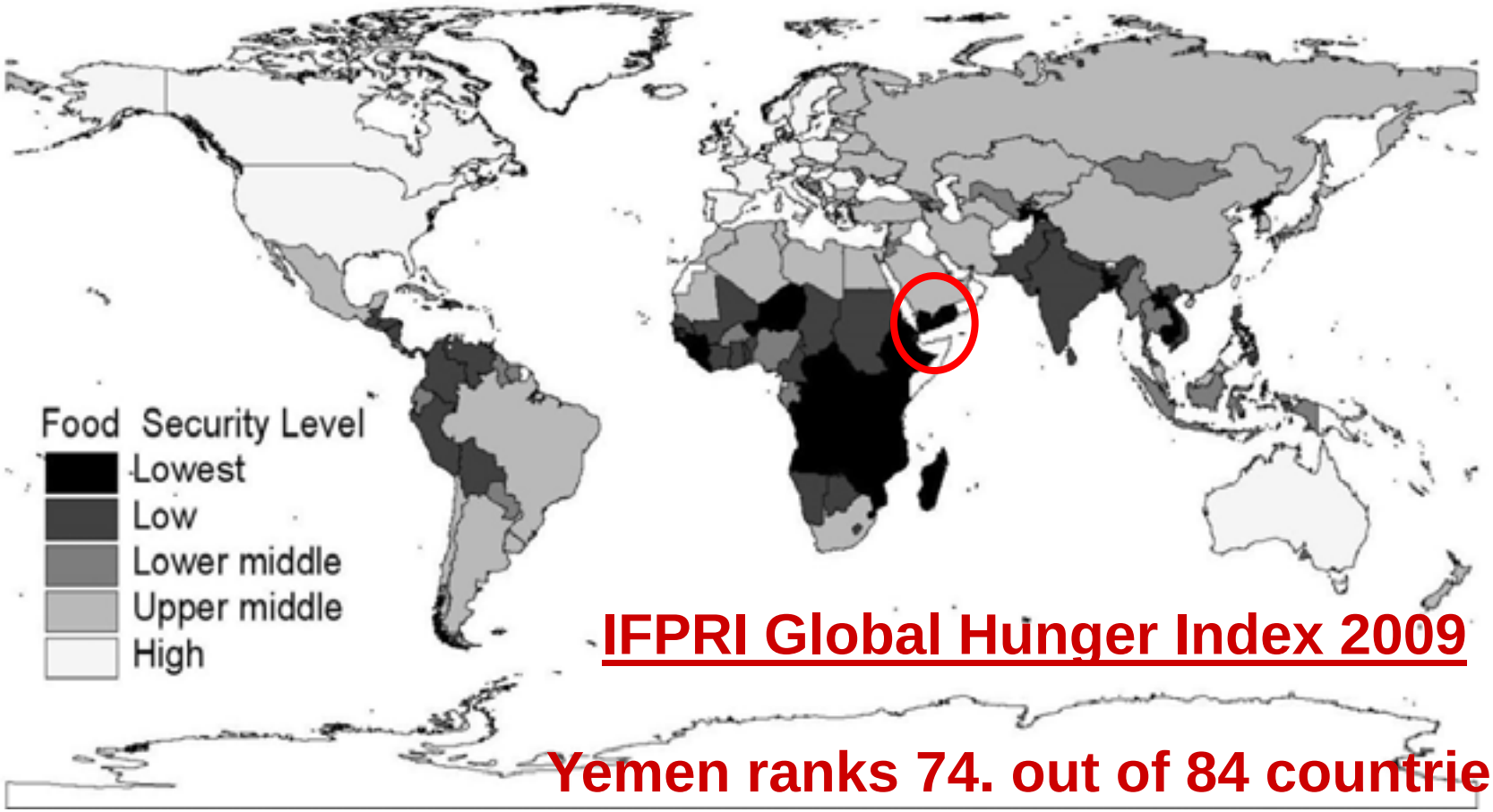
Jose Funes, Clemens Breisinger and Olivier Ecker

International Food Policy Research Institute

Content

- Brief about food security
- Definition of food security and framework
  - *Does geography matter?*
- State of food security macro and micro level
- Spatial modeling and data modeling, *methods*?
  - Spatial determinants of food security
  - Data modeling following international standards
- Remarks

Yemen's food insecurity is among the highest in the world



IFPRI Global Hunger Index 2009

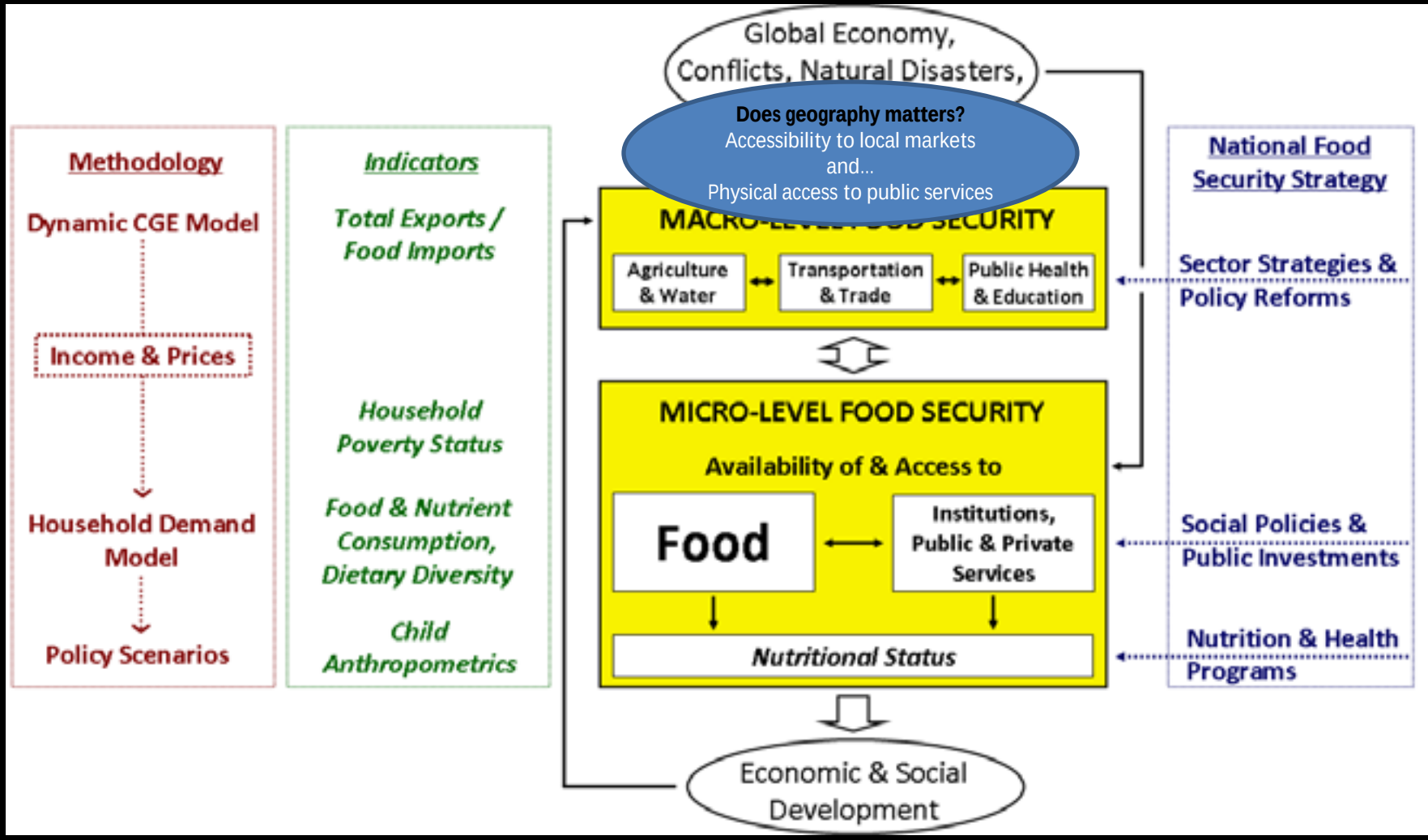
Yemen ranks 74. out of 84 countries

Source: IFPRI

Food security definition

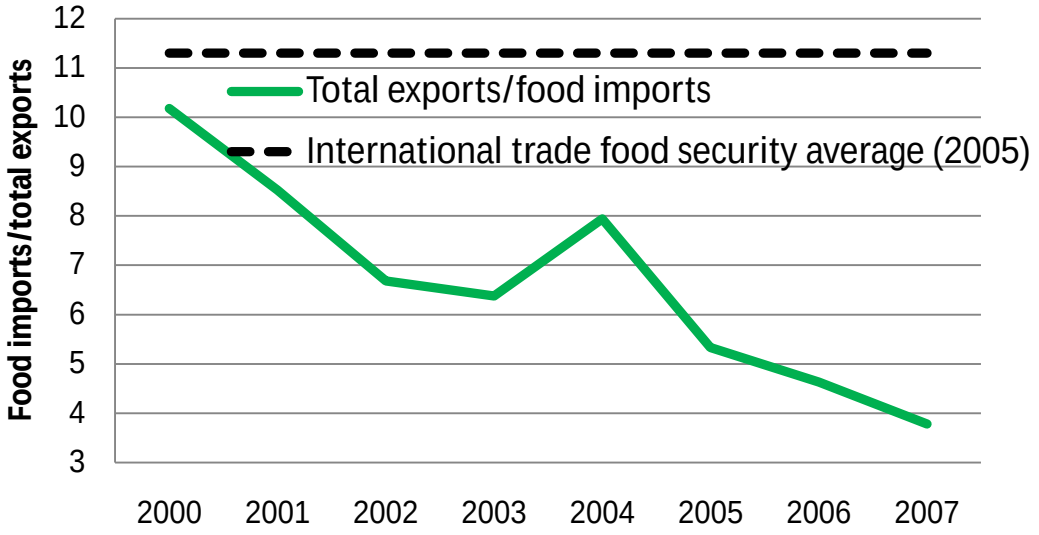
- NFSSP adopts the universally accepted definition for food security:
- “when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life” (FAO 2009a, p. 1).

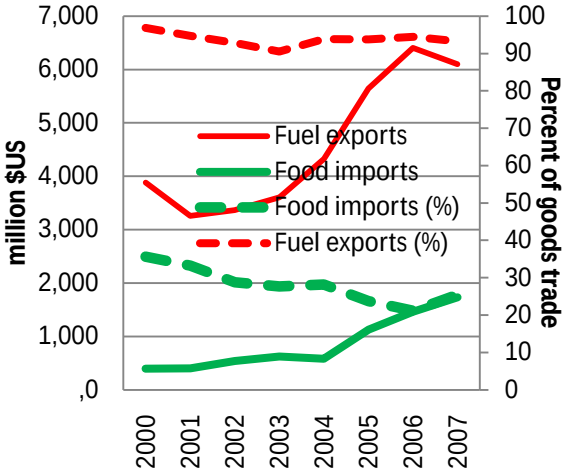
NFSSP: comprehensive conceptual framework

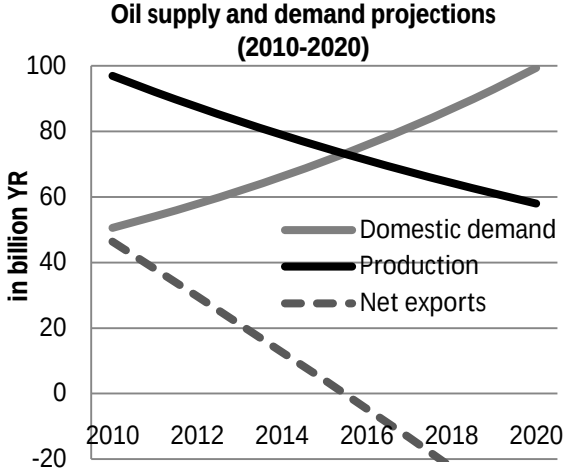


Macro-level food security has reached alarmingly low levels

- Macro-food security is **NOT** equal to self-sufficiency
- Macro-food security is the ratio of **total exports to food imports**
- Macro-food security **dramatically declined** mainly due to falling oil exports and increased food imports







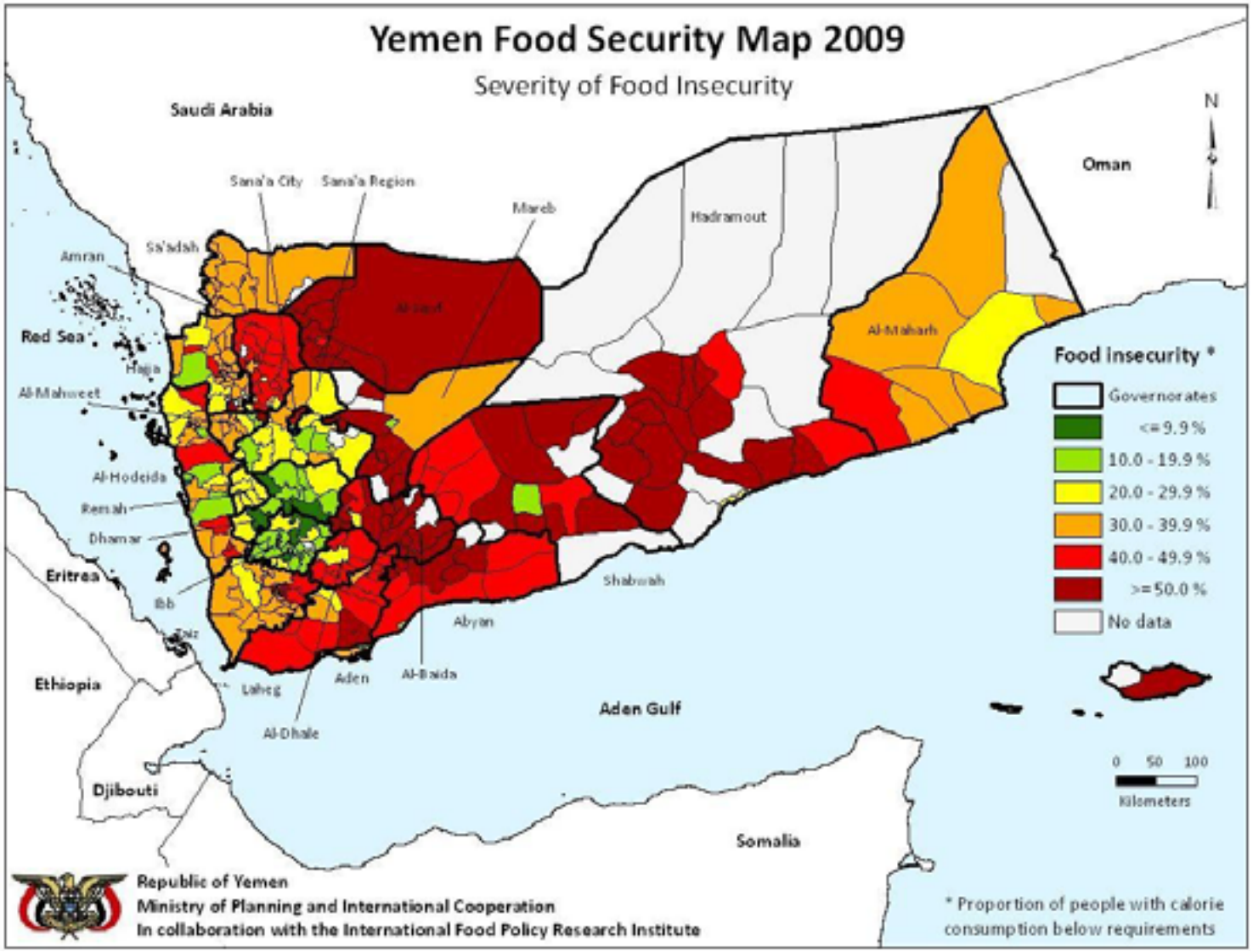
Source: NFSSP, Part 1, based on IFPRI calculations

Household-level food insecurity is very high (a measure of extreme poverty), especially in rural areas

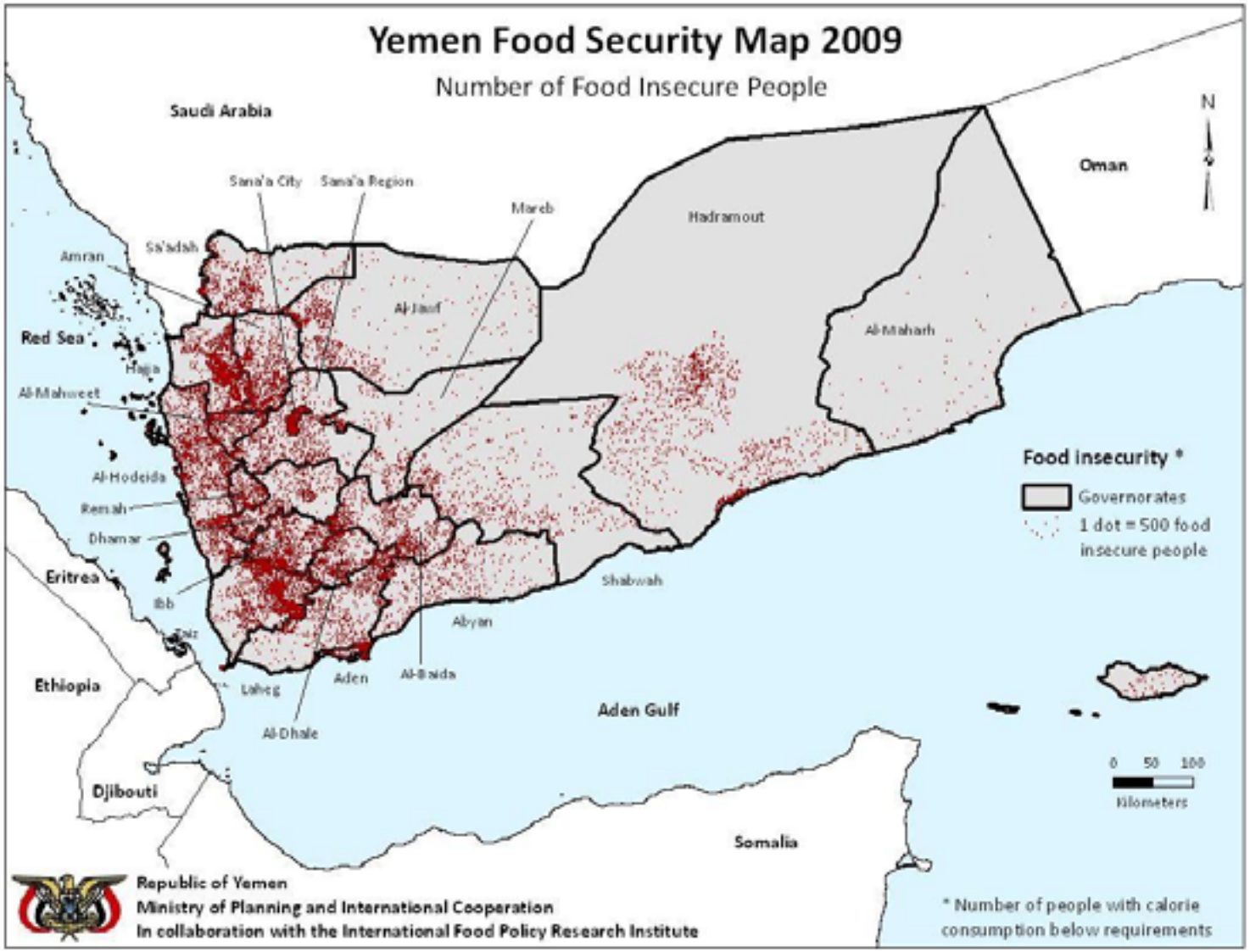
	Food Insecurity (in percent)	Number of food insecure people (in million)
Yemen	**32.1**	**7,492**
Urban	19.9	1,241
Rural	**36.6**	**6,252**
Agro-ecological zones		
Temperate Highlands	25.9	1.60
Dry Highlands	34.2	3.50
Red Sea and Tihama	28.2	0.94
Arabian Sea	26.7	0.43
Internal Plateau	55.0	0.84
Desert	42.3	0.18

Source: NFSSP, Part 1, based on IFPRI calculations

Relative food insecurity is concentrated in southern and north eastern parts



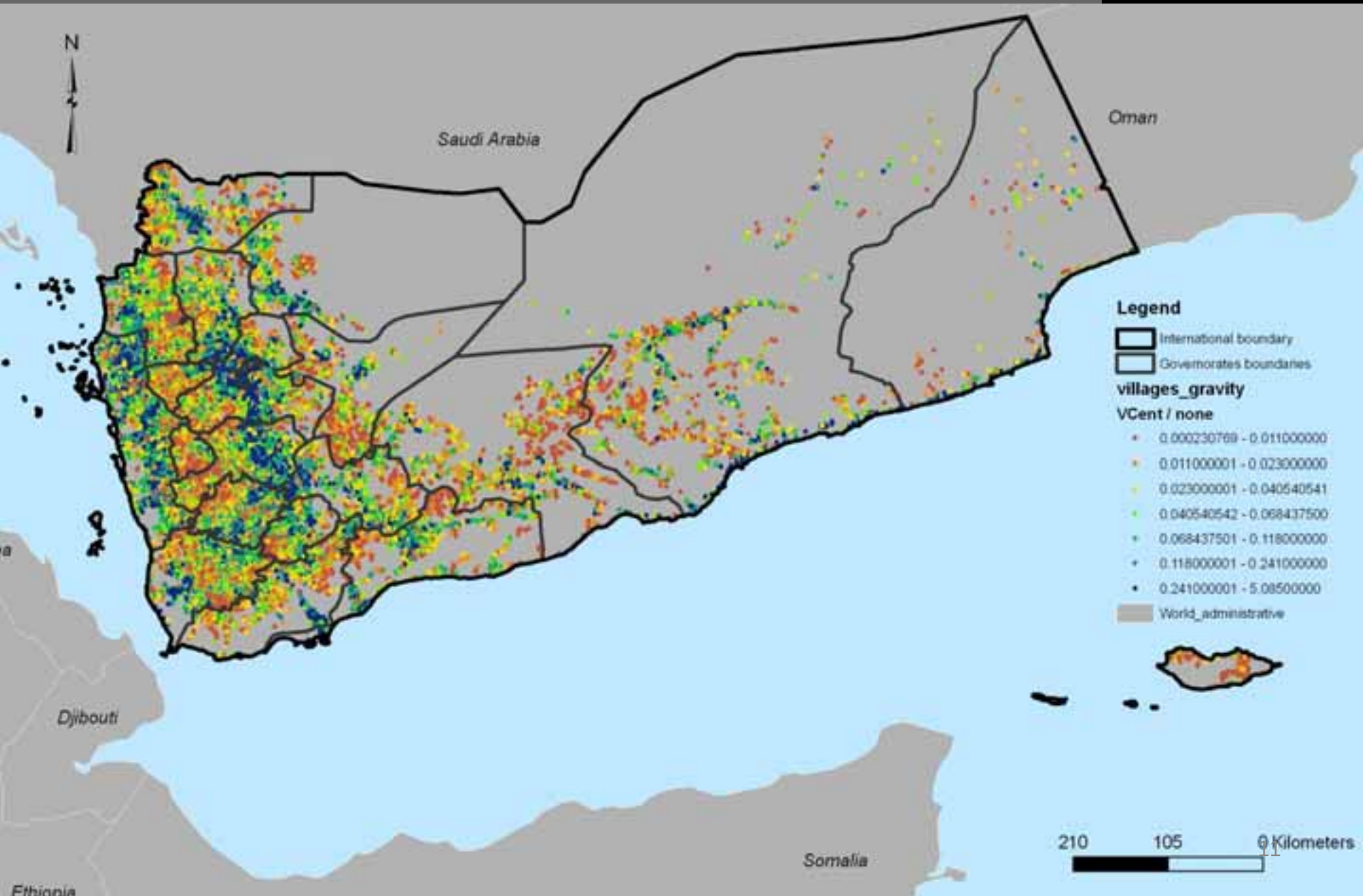
The number of food insecure people is highest in the Highlands



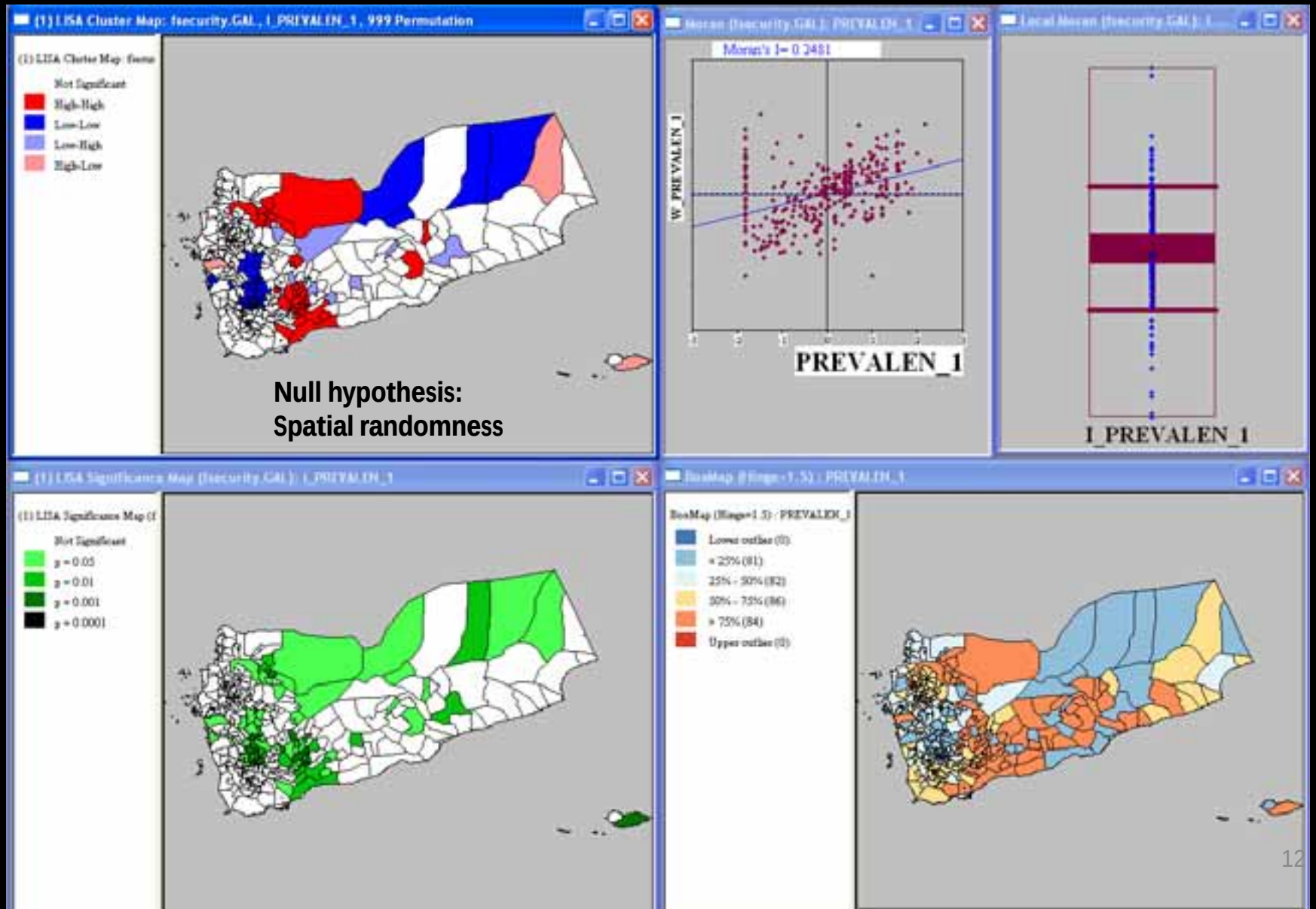
Spatial determinants of food security

- Market access to urban centers and local markets – gravity models
  - Urban centers: Google map, satellite images, ancillary data
  - Identifying local markets using clustering techniques
    - Local Moran's I statistics
- Physical accessibility to health centers/hospitals, *demand behavior*?
  - Gravity models supply adjusted by demand
- So much things to do!!!
  - Can we automates this?
    - Python
      - Lists, dictionaries…
      - Looping techniques
      - Reusable: classes and modules

Spatial determinants



Discovering patterns in our data, is food insecurity randomly spatial distributed?

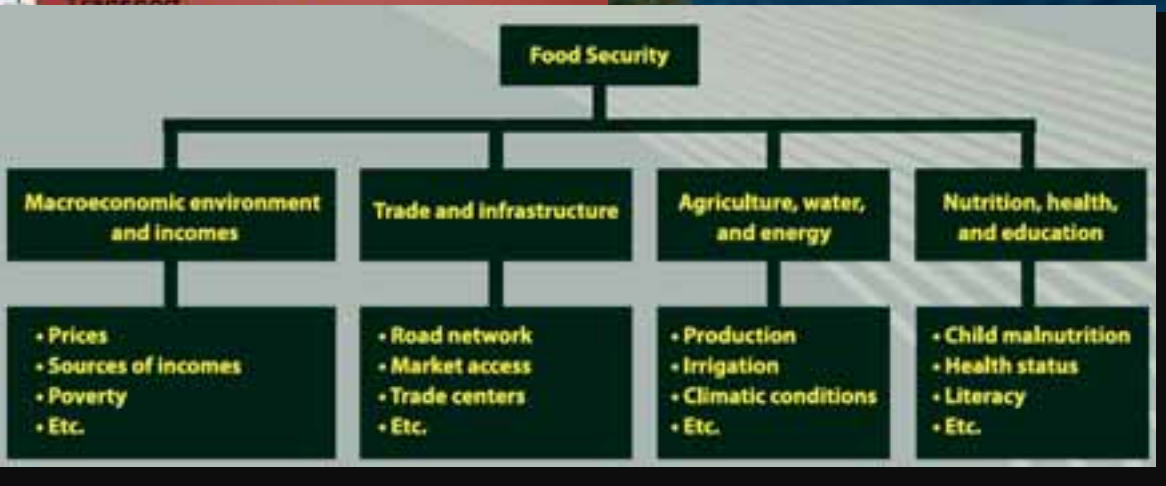


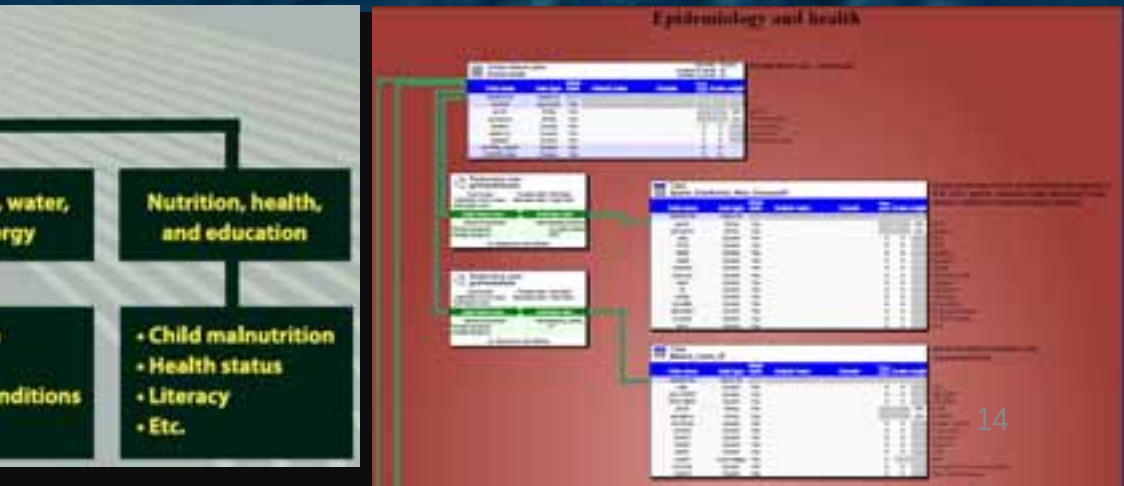
Data modeling

- Implementing geodatabases using feature cataloguing –common and shareable semantics
  - an International policy for creating understandable and accessible data *ISO-19110*
  - *Food security Atlas for Yemen*

- How do we do data modeling??
  - UML modeling ? Does ArcGIS will still allow import it from Microsoft Visio?
  - ArcGIS diagrammer
  - ArcCatalog

Food security model to map agricultural potential, food security and other relevant indicators for Yemen





Remarks

- An alarming situation of food insecurity at both macro and household levels.
- Yemen's food security has deteriorated in recent years below international standards and projected to be very low
- Yemen is among the 10 most food insecure countries in the world, with 32 percent of people suffering from insufficient access to food and 58 percent of the children malnourished
- Digital food security Atlas for Yemen version 2 is available
  - ArcReader 9.3
  - Relational file Geodatabase

Thanks

- The project is supported by the EC, GTZ, WFP, World Bank

- Consultative process with all relevant ministries/ agencies (National Food Security Committee)