

Bill Dougherty<sup>1</sup> and Patrick Keys<sup>2</sup>

<sup>1</sup>[billd@ccr-group.org](mailto:billd@ccr-group.org); <sup>2</sup>[patrick@keysconsultinginc.com](mailto:patrick@keysconsultinginc.com)

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## Abstract

This study focused on risks to the UAE's long-term food security under the climate change. As a country heavily dependent on food imports, the UAE may be vulnerable to food trade supply constraints and associated price shocks associated with climate change impacts in food-exporting countries. Food insecurity was quantified at both "Macro" (or national) and "Micro" (or household) levels.

At the macro level, a Food Insecurity Index was calculated for each major imported food item to the UAE, as well as for each major food exporter country to the UAE based on the outputs of IFPRI's IMPACT model under a range of scenarios and GCMs. At the micro-level, a Food Insecurity Index was calculated for each household decile for a range of scenarios of household food expenditures exceeding a certain level.

The study found that most food imports to the UAE will likely be constrained under climate change, with rice and wheat being strongly insecure food items for the UAE under climate change. It also found that climate change will lead to adverse shifts in household food spending patterns, with the number of most vulnerable households nearly doubling as they are forced to spend increasing shares of household income on food.

## Methodology

The analysis relied heavily on data and numerical modeling techniques. Data acquisition was focused on characterizing historical food supply/demand as well as household food expenditure patterns in the UAE.

Macro-level analysis was focused on modeling the linkages between the production of key food commodities at the global level and food demand and security at the UAE national level, all within the context of scenarios of future climate change.

Micro-level analysis was focused on modeling the linkages between the inflation, consumer food prices, and household expenditures within the context of scenarios of future climate change.

Implementing the methodological approach involved the steps below.

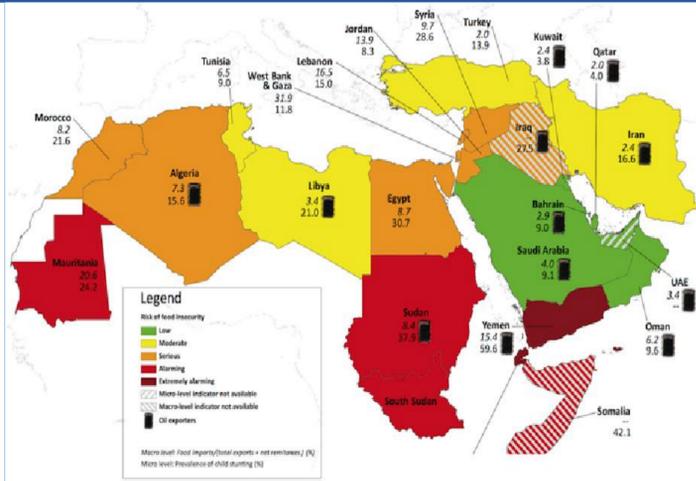
- Step 1: Establish historical and future UAE food demand.
- Step 2: Establish historical and future patterns of food imports.
- Step 3: Project food import gaps and prices with and without climate change.
- Step 4: Characterize household food expenditures with and without climate change.
- Step 5: Calculate macro-level and micro-level indices of food insecurity.

## Results

The results of the **MACRO** analysis show that most food imports will be constrained under climate change. In particular, rice and wheat are strongly insecure food items for the UAE under climate change. Both cereals show a Food Insecurity Index of 10 which indicates that future food import gaps are large and adaptation strategies should be considered to reduce the potential constraints in import supplies. On the other hand, beef, lamb meat, and maize are strongly food secure items suggesting that current food trade flows will not be adversely affected in the future. There are several countries where food exports are projected to be constrained. These countries include Brazil, India, Iran, and South Africa.

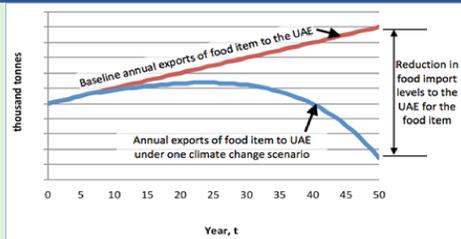
The results of the **MICRO** analysis show that an already precarious food security situation for low-income households in the UAE will worsen with climate change. The number of households that are very highly vulnerable to food price increases rise in the future relative to 2014. In a scenario where there is chronic inflation combined with high levels of food price increases under climate change, food insecurity for all the households in the UAE increases significantly. Climate change introduces serious shifts in food spending patterns: the most vulnerable households increases from 685 thousand to 1.2 million in the low real food price scenario and to 1.4 million in the high real food price scenario.

## Starting premises

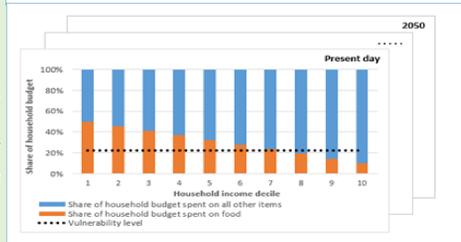


## Analytical framework

"MACRO" analysis: national food imports to the UAE from top traditional trading partners



"MICRO" analysis: UAE household food purchase shares by decile

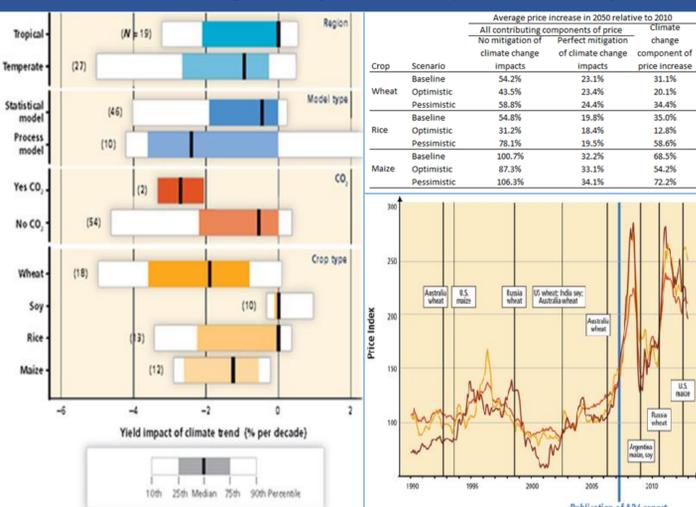


## Modeling tool

A user-friendly analytical tool has been developed in Excel to explore the outputs, prepare food import report summaries and conduct sensitivity analyses. The tool is available at <http://www.ccr-group.org/food-inspector-tool-full>

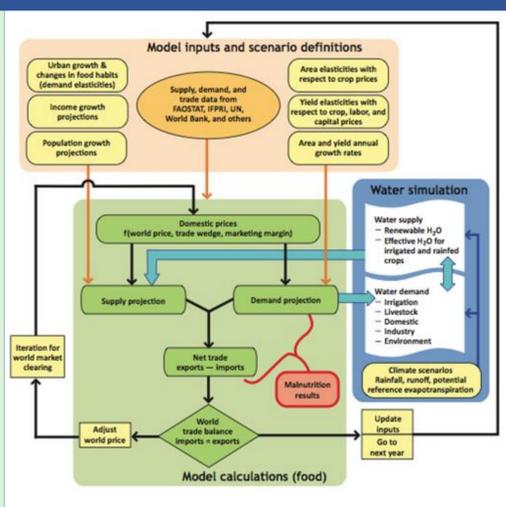
**Food Security Inspector**  
AGEDI's visualization tool to explore the impacts of climate change on the food security of the UAE

## Climate change impact on yield and price



## Modeling framework: Macro level (food imports)

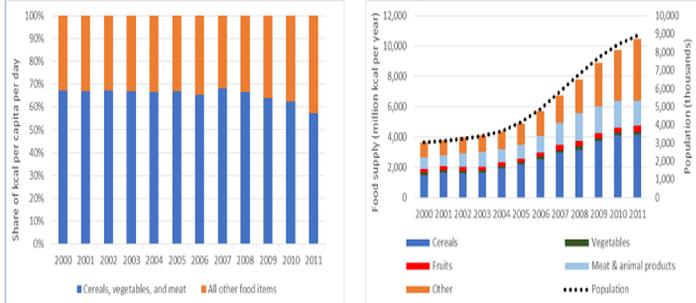
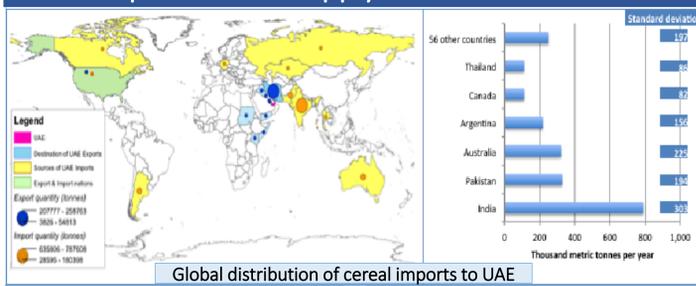
The IMPACT model is a computable global equilibrium model developed by the International Food Policy Research Institute (IFPRI) to examine alternative futures for global food supply, demand, trade, prices, and food security. It is capable of providing global projections of agricultural commodity supply, demand, trade, and food prices within the context of climate change.



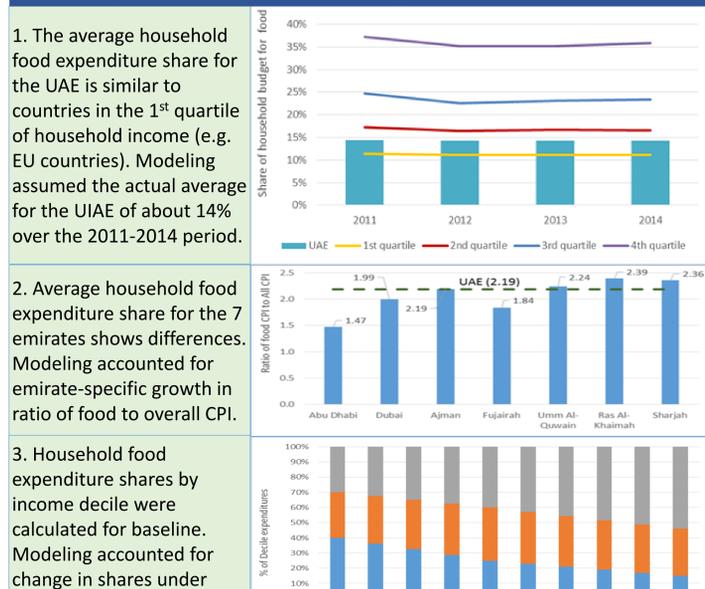
## Macro results: Food insecurity index under climate change

Food Item	Food Import Status	Food Security Index	By major food exporter to UAE		
			Country name	Share of Imports	Climate Change Impact
BEFF (i.e., Bovine Meat)	UNCONSTRAINED	1	Argentina	4	2
CASS (i.e., Cassava and	CONSTRAINED	6	Australia	4	2
CHKP (i.e., Pulses, and	PARTIALLY CONSTRAINED	3	Brazil	7	3
EGGS (i.e., Eggs)	PARTIALLY CONSTRAINED	2	Canada	2	1
GRND (i.e., Groundnuts)	CONSTRAINED	6	China	2	3
LAMB (i.e., Mutton & Goat	UNCONSTRAINED	1	Egypt	1	3
MAIZ (i.e., Maize and	UNCONSTRAINED	1	Ethiopia	1	2
MILK (i.e., Milk - Excluding	PARTIALLY CONSTRAINED	3	France	1	3
MILL (i.e., Millet and	CONSTRAINED	6	Germany	2	5
OGRN (i.e., Barley and	CONSTRAINED	6	Gulf countries	2	2
PKOL (i.e., Oil - Palm and	PARTIALLY CONSTRAINED	3	India	9	3
PKRM (i.e., Pigmeat)	CONSTRAINED	6	Indonesia	1	4
POTA (i.e., Potatoes and	PARTIALLY CONSTRAINED	5	Iran (Islamic Republic of)	3	8
POUL (i.e., Poultry Meat)	PARTIALLY CONSTRAINED	3	Jordan	2	2
RICE (i.e., Rice (Milled)	CONSTRAINED	10	Lebanon	1	2
RPOP (i.e., Rape and	CONSTRAINED	6	Malaysia	2	4
RPSD (i.e., Rape and	CONSTRAINED	6	Netherlands	2	2
SBOL (i.e., Soybean Oil)	CONSTRAINED	6	New Zealand	1	2
SFOL (i.e., Sunflowerseed	CONSTRAINED	6	Pakistan	3	4
SNFL (i.e., Sunflower seed)	CONSTRAINED	6	Paraguay	2	3
SOYB (i.e., Soybeans)	CONSTRAINED	7	Philippines	2	5
SUBF (i.e., Fruit -	CONSTRAINED	8	South Africa	2	10
SUGC (i.e., Sugar (raw))	PARTIALLY CONSTRAINED	2	Spain	1	2
SUGR (i.e., Sugar (Refined))	CONSTRAINED	7	Thailand	2	4
SUVP (i.e., Sweet potatoes)	CONSTRAINED	6	Ukraine	2	2
TEMF (i.e., Fruit -	CONSTRAINED	7	United States of America	2	4
TOOL (i.e., Oil - Other)	CONSTRAINED	4	All other countries	10	3
VEGE (i.e., Vegetables - All)	CONSTRAINED	8			
WHEA (i.e., Wheat and	CONSTRAINED	10			

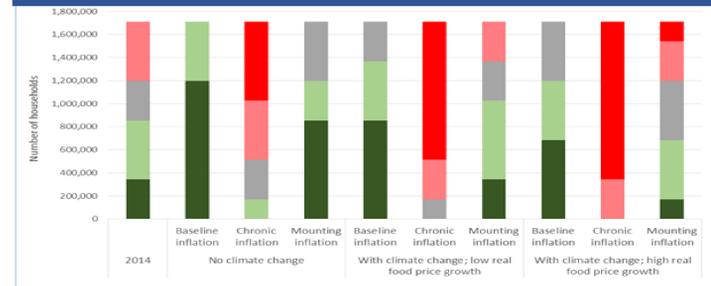
## Imported food supply trends in the UAE



## Modeling framework: Micro level (household food purchases)



## Micro results: Household food insecurity index under climate change



## Micro results: Change in household food insecurity index due to climate change

