

FAO/WFP

SHOCK IMPACT SIMULATION MODEL

USER-MANUAL

FOR FOOD SECURITY ANALYSIS AND MONITORING



2014

A tool to measure the impact of shocks on food security in vulnerable countries

Quantifying the impact of shocks: The Food Security Analysis Service of WFP (OSZA/VAM) and the Trade and Markets Division (EST) of FAO with support from the Irish Government, have jointly developed a modeling system to contextualize the outcome of shocks (market, economic and climate) on food security and needs of assistance across population, livelihood groups and areas in selected low-income and food-deficit countries.

FAO/WFP Shock Impact Simulation Model (SISMod)

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INTRODUCTION

The objective of this guide is to take users through the Shock Impact Simulation Model (SISMod), explaining its purpose, structure and functions. It is a comprehensive tool which brings new possibilities to conduct quantitative analysis in the onset of a shock which impacts market stability and household food access. It can be used to make clear calculations of shock impacts on different population groups, particularly in terms of food security outputs which often require immediate action in times of shock.

BACKGROUND

Project Rationale

- Shocks arise from rapid changes in market, economic or climate conditions, affecting different population groups differently. Many countries are affected by recurring crises and are caught unprepared.
- In response, with support from the Irish Government, the Food Security Analysis Service of WFP (OSZA/VAM) and the Trade and Markets Division (EST) of FAO has jointly developed the Shock Impact Simulation Model (SISMod) to understand and contextualize the impact of various types of shocks on outcomes by different population groups at a nationally representative level to support intervention decisions and for wider policy and planning.
- The initial phase focuses on shock-prone and food-deficit countries, representing different levels of exposure to shocks: Bangladesh, Cambodia, Egypt, Nepal, Niger, Nigeria, Pakistan, the Philippines, Tajikistan, Tanzania and Uganda.

SISMod & SISMod Tool

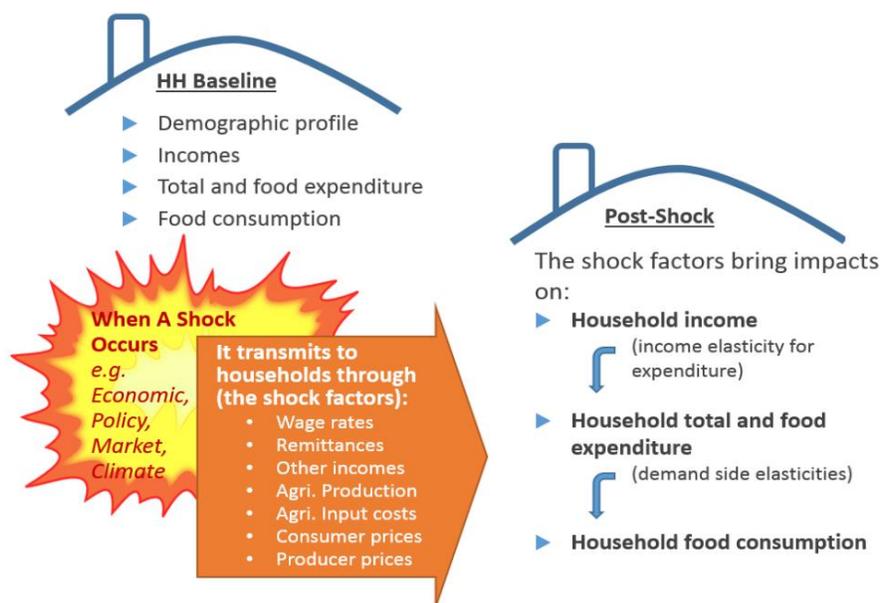
SISMod is an economic modelling system which allows timely quantitative assessment on the impacts of various types of shocks on households' incomes and food security in low-income food-deficit countries. SISMod can be used for estimating the ex-ante, current, and ex-post impact of various types of shocks (e.g. market, economic and climatic) by providing early estimates before field assessments are carried out. It identifies and profiles which people are most affected by shocks, where they are and to what extent.

SISMod is converted from a statistical modelling system to a user-friendly Excel/Access based SISMod Tool for easy use at country level. It can be used to build shock scenario and simulate the impact of shocks on different population groups, particularly in terms of livelihoods and food security.

Approach

SISMod is a country specific model embedded with national household survey data as the baseline. SISMod approach is to incorporate baseline data and shock factors to model the impact of shocks:

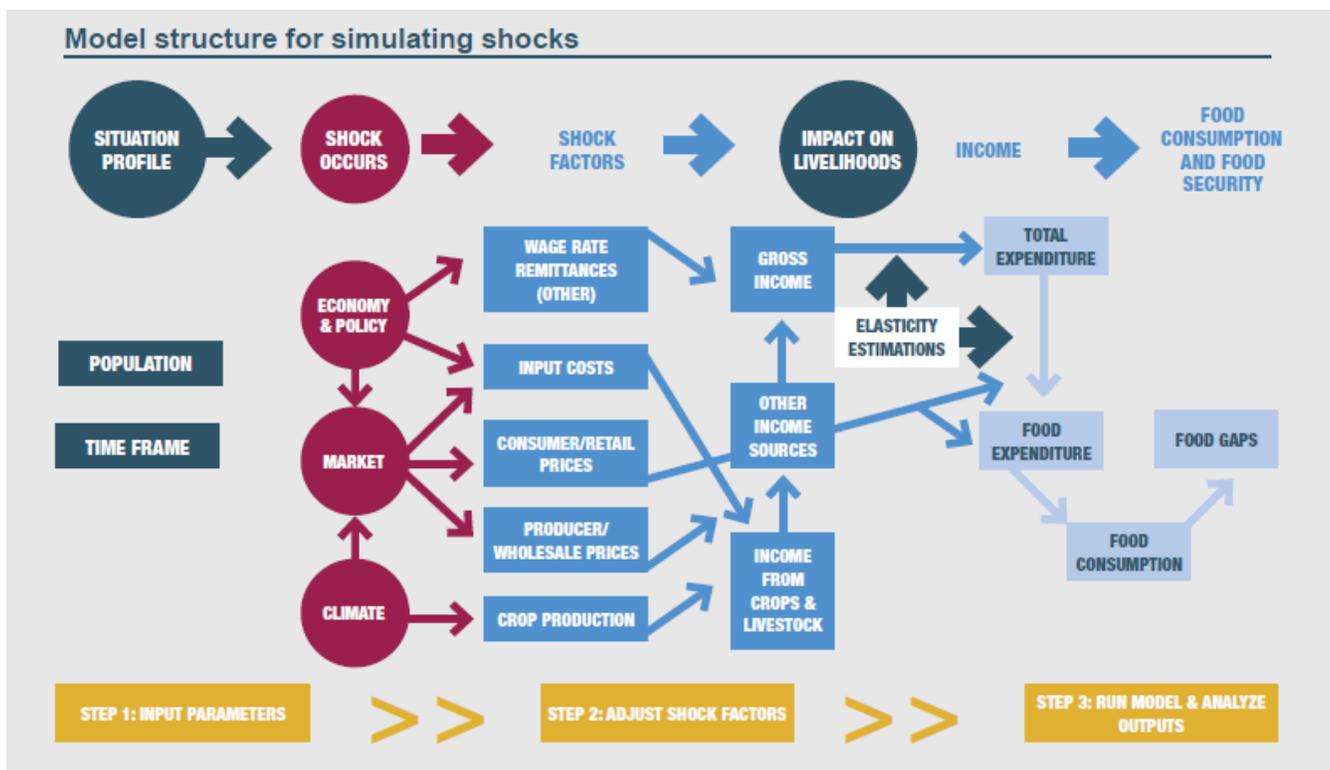
- By applying shock factors which represent quantity change onto the baseline, households' income after shocks is simulated.
- Households' allocation of income to total expenditure to food expenditure, and food expenditure on major food groups are estimated by taking elasticities and demand systems in the model.
- With the food budget and prices, households' food consumption after shocks is modelled.



Model Framework

SISMod adopts the approach of Agricultural Household Models (AHM) developed by Singh et al (1986). AHM incorporates both the production and consumption sides, integrates the price effects on different markets, and takes into account the interaction between them. The fundamental difference between an AHM and pure consumer model is that the household budget is generally assumed to be fixed in a pure consumer model, while in AHM, it is endogenous and depends on production decisions that contribute to income through farm profits in AHM. The traditional price effect is comprised by the farm profits effect (as a producer), which adds a positive influence to the negative Slutsky effects on food demand (as a consumer). Similarly, other income factors such as remittance, wage rate, and safety net/transfer, have been modelled through household income equations.

SISMod comprises of series of modules that take into account household incomes and expenditure and estimate demand/supply/price transmission elasticities based on baseline household survey data. It links income generation modules and a two-demand system (stage budget allocation modules) with market and crop production monitoring that tracks price and production shocks. Monitoring data (i.e. VAM and GIEWS monitoring systems) is used to show patterns, and build scenarios to estimate future potential shock impacts. The model structure of SISMod is shown in the following diagram.



Types of Shocks to be Modelled

The model currently focuses on changes in key factors which reflect the impact of shocks on households' livelihoods and food security:

- ✓ Agricultural production (e.g. major crops and major livestock)
- ✓ Agricultural input costs (e.g. fertilizer, seeds and labor)
- ✓ Retail and wholesale prices of major commodities
- ✓ Wage rates (e.g. agriculture wage and non-agriculture wage)
- ✓ Remittances and transfers
- ✓ Other incomes

Key Output Indicators

SISMod outputs for different population groups can be visualized as charts or tables in SISMod Tool. The key indicators are:

- **Proportion of food energy deficient population** – dietary energy consumption below an acceptable dietary energy threshold;
- **Depth of hunger (in kcal/person/day)** – deficit in absolute terms between the average dietary energy consumption and the dietary energy threshold;
- **Food gap (in kg/person/year)** – the cereal equivalent of the depth of hunger;
- **Total food assistance needed to meet the needs (in metric tons/year)**
- **Changes in household income**
- **Change in household expenditure and food consumption**
- (Other indicators when request)

Output Indicators by Group

For better targeting, the impact of shocks at household levels are aggregated by various groupings, and the outputs can be viewed by different population groups, including

Group by geographical and administrative unit

- National total
- by living area (Urban/Rural)
- by province (e.g. Pakistan: Punjab/Sindh/Khyber Pakhtunkhwa/Balochistan)
- by district (e.g. Pakistan: covering 82 out of 102 districts)

Group by production/size of landholdings for smallholder family farming analysis

- by net producer or net consumer
- by index on land size (operated)
- by index on per capita production quantity
- by index on per capita value of production sold

Group by income/income source for poverty analysis

- by income group
- by industry type of household head

Group by gender index for gender analysis

- by gender of household head
- by index on the ratio of female within household; and

Other groupings based on the objectives of intervention program and policy analysis.

RUNNING THE MODEL

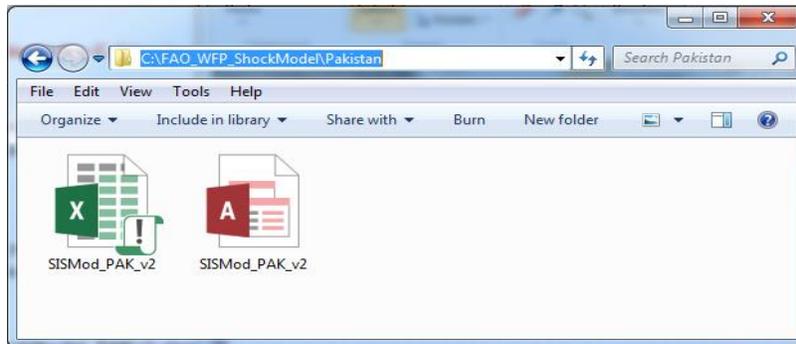
SISMod Tool of Pakistan is used as an example for this section.

SISMod Tool is available upon request to the project team. Microsoft Excel (2007 or above) and Microsoft Access (2007 or above) are required to run the model. It is recommended to close all other MS programs to ensure the model processes properly.

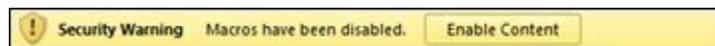
Setting-up

- 0.1 Create a folder named “FAO_WFP_ShockModel” in **C: Drive**, and then create a sub-folder named as the country’s name of the SISMod Tool specified for. (e.g. C:\FAO_WFP_ShockModel\Pakistan).
- 0.2 Download/move the two SISMod files (e.g. Excel: ShockModel_PAKv2.xlsm file and Access: ShockModel_PAK (.accdb) file) to the newly created folder.

Please note: The files must be saved under the specific folder in the C drive to run properly.



- 0.3 Open the Excel file. When it is the first time opening the SISMod excel file, a yellow message bar may appear with a shield icon and the Enable Content button. Click Enable Content to enable the macros embedded in SISMod to complete the setup process.



Starting SISMod from Main Menu

The main menu of SISMod Tool is looking like the picture below.



- To begin, click on Start
- To close SISMod Tool, click on Exit
- To view the model framework, click on About
- To view the instructions, click on Help

Running the Model from Input Menu

Users have to be sure to familiarize themselves with SISMod methodology to ensure that the data input and interpretation of the model outputs is accurate, and follow straight the user manual throughout the modelling excise. Three main steps are required to run to model:

1. *Input key parameters:*

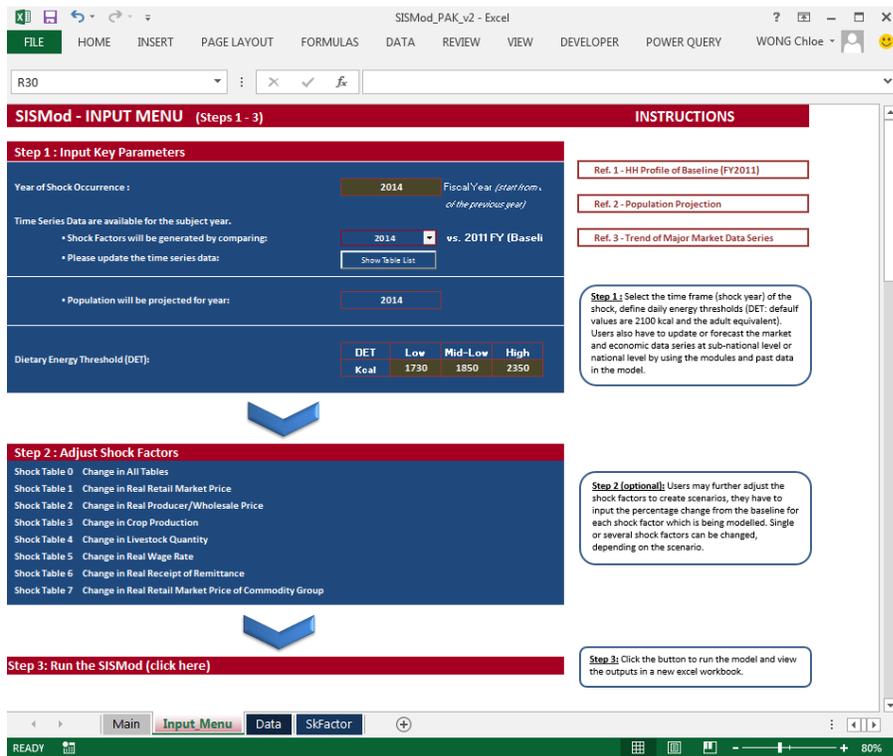
- a. Users select the time frame (shock year) of the shock, define the energy dietary thresholds according to analysis or intervention needs.
- b. Users also have to update or forecast the market and economic data series at sub-national or national levels by using the modules or past data in the model.
- c. SISMod Tool projects the population size for the shock year and computes shock factors based on the data series inputted.

2. *Adjust shock factors (optional):*

- a. If users need to further adjust the shock factors to create scenarios, they have to input the additional percentage change for each shock factor. Single or several shock factors can be changed, depending on the scenario.

3. *Run the model & view outputs:*

- a. Users trigger the running of the model by one-click.
- b. SISMod Tool simulates key livelihood and food security indicators reflecting impact of shocks: household income and expenditure, food consumption and food assistance needs, with options to account for livelihood, gender and geographical differences.



Step 1: Input Key Parameters

This step requires users to input key parameters and update/edit market and production data and economic indicators to suit their analysis or intervention need.

Step 1 : Input Key Parameters

Year of Shock Occurrence : 2014 Fiscal Year (start from July of the previous year)

Time Series Data are available for the subject year.

- Shock Factors will be generated by comparing: 2014 vs. 2011 FY (Baseline)
- Please update the time series data: Hide Table List

Table 0 - All Tables

Table 1 - Gross Domestic Product

Table 2 - Consumer Price Index

Table 3 - WFP Monitoring Food Price

Table 4 - Annual Average Retail Price

Table 5 - Wholesale Price Index

Table 6 - Crop Production

Table 7 - Quantity of Livestock and By-Product Production

Table 8 - Fishery and Forest Production

Table 9 - Consumption Quantity of Fertilizers

Table 10 - Monthly Wage Rate

Table 11 - Receipt of Remittance

▪ Population will be projected for year: 2014

DET	Low	Mid-Low	High
Kcal	1730	1850	2350

1.1 Shock Year

1.2 Update/edit Data

1.3 DET

Step 1.1 Users select the time frame (shock year) of the shock: this can be set to a current year, future year or past year to create, respectively, a scenario of real-time, future or past situation.

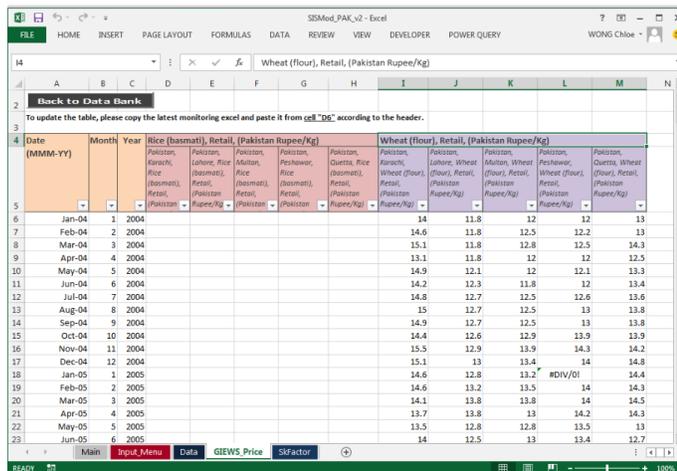
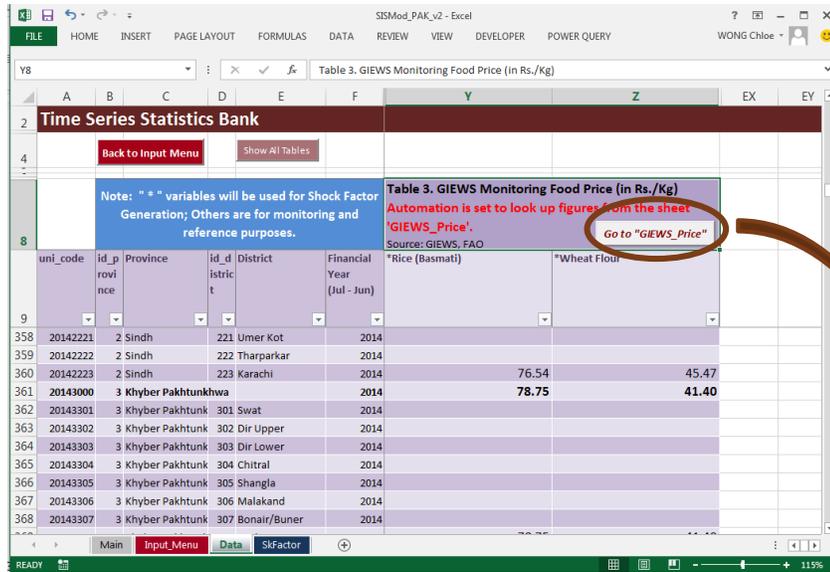
SISMod Tool projects the population size for the shock year and computes shock factors based the time series data that already in the tool.

Step 1.2 In the case of selecting a current year or future year, users have to input the updated or projected the market and economic data series at sub-national or national levels for SISMod to generate new set of shock factors based on the inputted data to build the shock scenario.

To update/edit the market and production data and economic indicators in SISMod, users have to go to the “Data” worksheet by un-hiding the list of tables of data on the input menu and

clicking on the hyperlinks of the data tables on the list, or by clicking directly on the tab of “Data” worksheet.

The picture below shows time series table contains price data. Since this table is compiled from monthly monitoring data, it is linked to the original template from the data source for easy update. Users can view and edit the original template and data by clicking Go to “GIEWS_Price”.



Step 1.3

Users define the dietary energy thresholds (DET) in kcal: Low, Mid-Low and High. These thresholds will define the food energy deficiency. SISMod also uses the default values of the adult equivalent and 2100 kcal (the commonly used daily energy threshold) for the output indicators.

Step 2: Adjust Shock Factors

Step 2 allows flexibility for users to adjust multiple shock factors based on estimates from their own tools to specify the scenario for simulation. This is optional, but useful when users want to impose additional changes in the shock factors.

Step 2 : Adjust Shock Factors		Status	Reset
Shock Table 0	Change in All Tables	Adjusted	Click to Reset
Shock Table 1	Change in Real Retail Market Price		
Shock Table 2	Change in Real Producer/Wholesale Price		
Shock Table 3	Change in Crop Production	Adjusted	Click to Reset
Shock Table 4	Change in Livestock Quantity		
Shock Table 5	Change in Real Wage Rate	Adjusted	Click to Reset
Shock Table 6	Change in Real Receipt of Remittance		
Shock Table 7	Change in Real Enterprise Income		

Step 2.1 Users go to the shock factor tables by clicking on the titles of shock factor tables listed in step 2 or clicking directly on the “SkFactor” worksheet. The shock factors are generated as an indices of the shock year set in Step 1 against the baseline. The base value of shock factors is 1, if there is no data available, the shock factor will remain as 1, i.e. no change from the baseline.

Step 2.2 The year which is used to compute shock factors against the baseline is open for adjustment in each set of shock factors. To change the year selection, users click on the spin button on the table header. This allows users to select the year of which the latest data is available and input further percentage change on shock factors to create scenario.

Step 2.3 Users input additional percentage change on the shock factors.

Step 2.4 Back to the input menu, when any shock factor is adjusted (change of year selection and/or percentage change on shock factors), the status would update accordingly. To remove all the adjustments, click Click to Reset.

For example, to create a scenario taking into account the projection of crop production in the next year. Users can (a) choose the latest year of which crop production data is available, e.g. 2012; and then (b) input the estimates of percentage change of crop production between 2012 and the next year, e.g. 20% decrease on wheat production in Sindh.

The screenshot shows the 'Shock Factor' input menu in the SISMod_PAK_v2 Excel spreadsheet. The main table is titled 'SHOCK TABLE 3. Change in Crop Production (Ratio over Baseline)'. The table has columns for Province, District, and various crops (Wheat, Rice, Maize, Pulse, Fruit, Sugarcane). Each crop column has sub-columns for 'Ratio' and '+/- %'. The data is organized by Province and District. Annotations include:

- A red box around the '2012' year selection in the 'vs. Baseline 2011 Fiscal Year' dropdown, with an arrow pointing to it labeled '2.2 Year selection'.
- A red box around the '-20%' change for Wheat in Sindh, with an arrow pointing to it labeled '2.3 Additional percentage change'.
- A red box around the '1 (no decimal place) = no data' input field.

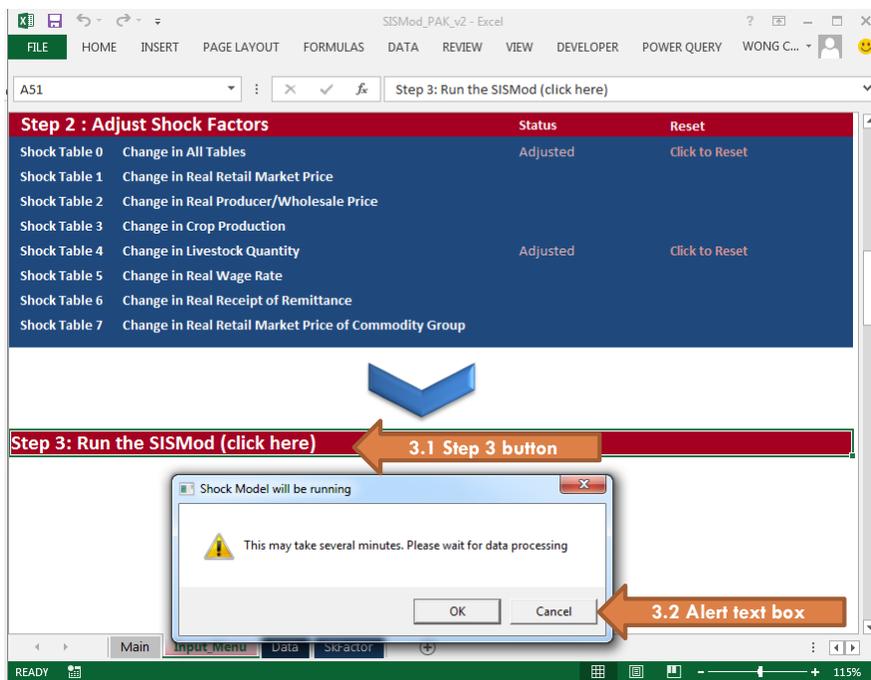
Province	id_province	District	id_district	Wheat		Rice		Maize		Pulse		Fruit		Sugarcane	
				Ratio	+/- %	Ratio	+/- %								
Punjab	1	Rahim Yar Khan	133	0.94		0.89		0.96		1		1		1.11	
Punjab	1	Sahiwal	134	0.92		1.35		0.41		1		1		0.85	
Punjab	1	Pakpattan	135	0.86		1.29		0.52		1		1		0.81	
Punjab	1	Okara	136	0.93		1.19		0.54		1		1		0.81	
Sindh	2	Khairpur	201	0.79	-20%	0.64		0.52		1		1		0.00	
Sindh	2	Sukkar	202	0.76	-20%	0.47		0.52		1		1		1.37	
Sindh	2	Nawabshah	203	0.65	-20%	6.45				1		1		1.62	
Sindh	2	N. Feroze	204	0.74	-20%	1.99				1		1		1.04	
Sindh	2	Ghotki	205	0.75	-20%	0.61		0.52		1		1		0.74	
Sindh	2	Jacobabad	206	0.75	-20%	0.20		0.52		1		1		0.81	
Sindh	2	Kashmore	207	0.68	-20%	1.29		0.52		1		1		0.81	
Sindh	2	Shikarpur	208	0.74	-20%	0.43		0.52		1		1		1.02	
Sindh	2	Larkana	209	0.81	-20%	0.93		0.52		1		1		40.36	
Sindh	2	Shahdaktot	210	0.68	-20%	1.29		0.52		1		1		0.81	
Sindh	2	Dadu	211	0.85	-20%	2.05		0.52		1		1		1.61	

Step 3: Run the model and view outputs

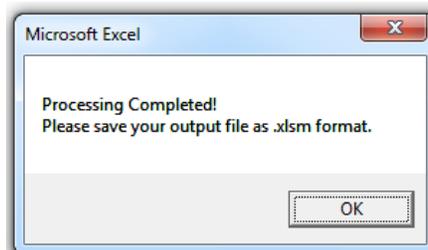
Running SISMod requires just one-click from the users to execute the automated procedures of the simulation modelling. Model outputs are automatically exported to a new excel workbook.

Step 3.1 To run the model, users click on the Step 3 button. The tool will display a popup message box alerting the process will take several minutes.

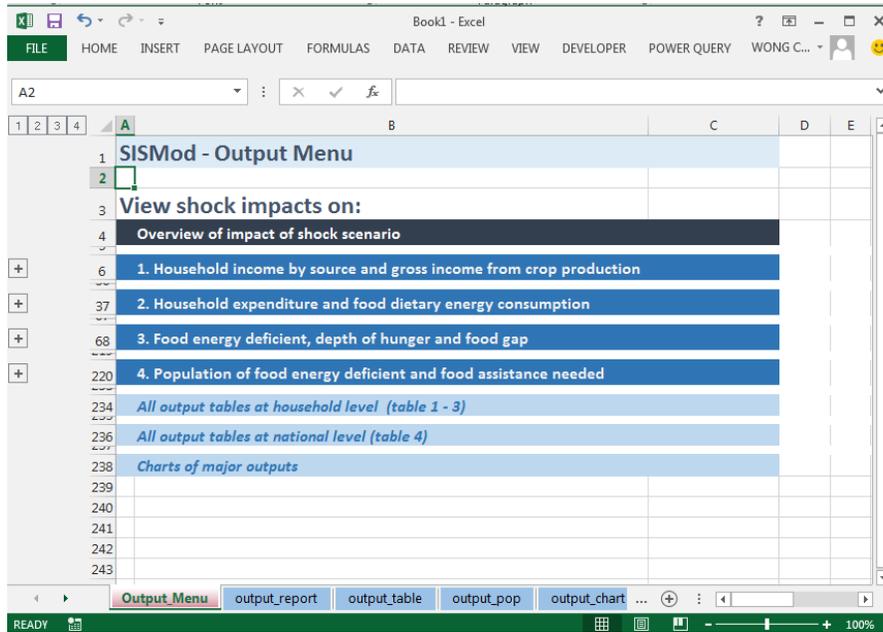
Step 3.2 Users click OK to confirm the running of the model. It takes around 10 minutes to produce the outputs, depending on the computer performance.



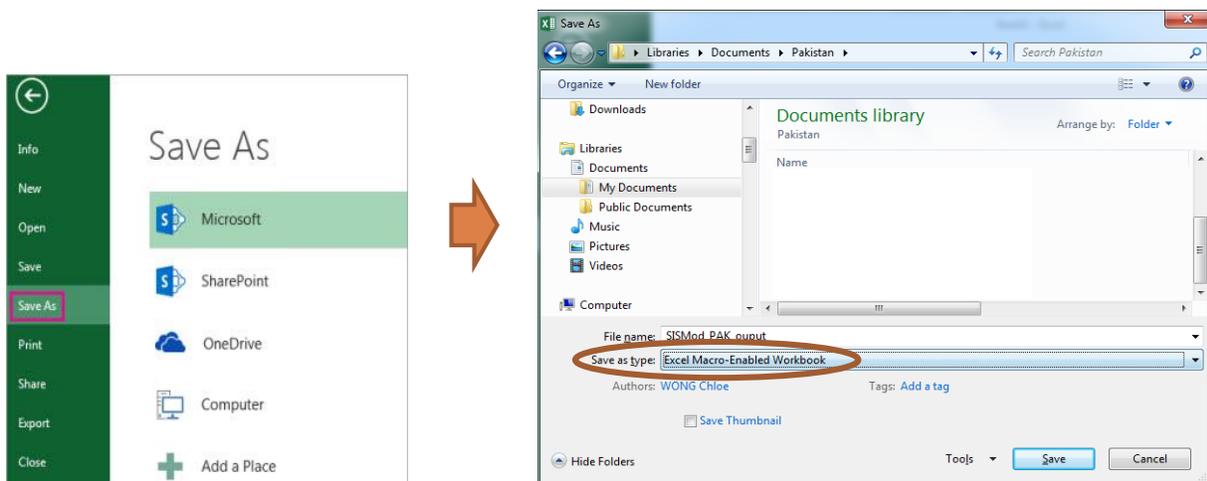
Step 3.3 After the model running, click OK on the message box which advises that the process is completed to display results.



Step 3.4 The model outputs are exported to a new excel workbook with an output menu which contains hyperlinks to all the indicators presented in tables, charts and an overview report.



Step 3.5 Users can save the output excel workbook in Excel Macro-Enabled Workbook format (.xlsm) to keep the hyperlinks on the output menu active. Click File, and then click Save As. In the Save as type list, select the Excel Macro-Enabled Workbook format, and then click Save.

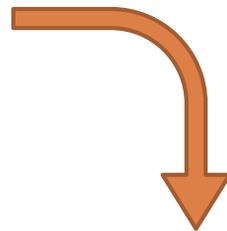
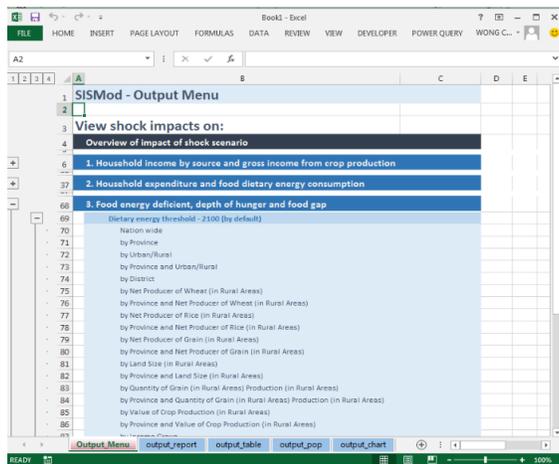


MODEL OUTPUTS

SISMod Tool simulates key livelihood and food security indicators reflecting impact of shocks on household income, expenditure and food consumption, with options to account for livelihood, gender and geographical differences. The baseline household survey data is the point of reference to determine the magnitude of shock impacts for all SISMod's indicators.

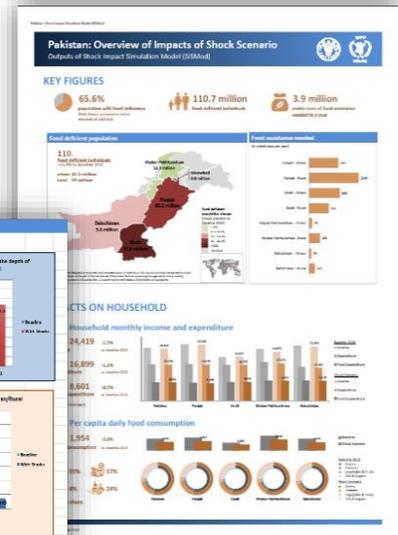
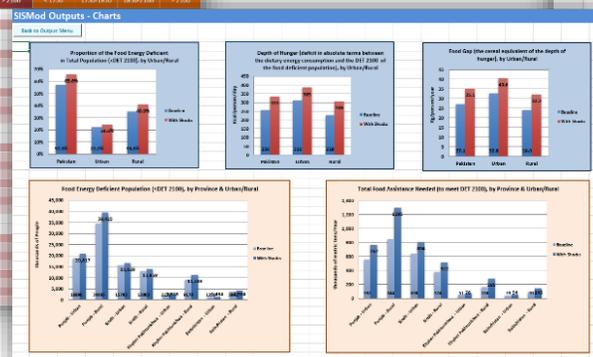
View Options

The output menu displays a list of all indicators and links to the corresponding table or chart or overview report. Outputs are presented in tables, charts and an overview report for quick reference and use. Users can view the outputs either by clicking the hyperlinks on the output menu or directly click on the worksheet tab to view the tables, charts or overview report.



SISMod Outputs - Proportion & Number of Food Energy Deficient, and Food Assistance Needed

Country	Region	Total Population, 2010 (mid year)	Proportion of the Food Energy Deficient in Total Population (%)			Food Energy Deficient Population (No. of persons)		
			DET	DET	DET	DET	DET	DET
Pakistan		194,775,678	8,429,654	80,895,461	41.1%	8.2%	14.3%	
by Urban/Rural								
Urban		54,294,472	29,797,339	39,727,292	55.3%	7.8%	5.9%	
Rural		112,429,232	59,281,492	54,967,972	29.1%	8.4%	12.4%	
by Province								
IS Punjab		95,037,781	49,533,947	42,121,768	22.8%	4.3%	8.7%	
IS Sindh		41,081,155	21,392,159	19,959,268	12.0%	3.9%	4.0%	
IS Balochistan		28,218,718	12,805,896	12,282,782	4.3%	3.8%	2.7%	
IS Islamabad		8,830,855	4,716,132	4,114,744	2.1%	0.5%	0.9%	
by Province & Urban/Rural								
Punjab - Urban		36,238,713	15,889,811	14,971,905	7.8%	1.0%	0.2%	
Punjab - Rural		49,877,968	19,877,886	17,948,688	19.0%	3.9%	5.5%	
Sindh - Urban		20,006,171	10,854,474	9,349,495	6.7%	1.1%	1.0%	
Sindh - Rural		21,074,984	11,851,663	9,985,242	5.1%	1.2%	1.0%	
Balochistan - Urban		3,491,111	2,079,420	1,837,988	0.6%	0.2%	0.3%	
Balochistan - Rural		19,206,607	8,811,933	7,489,204	3.4%	1.1%	1.3%	
Islamabad - Urban		2,106,847	1,142,464	997,452	0.6%	0.1%	0.2%	
Islamabad - Rural		6,723,909	3,575,618	3,147,291	1.5%	0.3%	0.7%	
by District								
ISD Islamabad		1,293,061	661,298	582,129	0.5%	0.1%	0.1%	
ISD Azad Jammu		1,434,220	815,682	818,558	0.4%	0.1%	0.2%	
ISD Rawalpindi		4,311,884	2,207,880	2,004,001	1.2%	0.2%	0.3%	
ISD Faisalabad		1,200,994	600,929	600,929	0.3%	0.1%	0.1%	
ISD Gujranwala		1,985,176	942,295	794,851	0.5%	0.1%	0.2%	
ISD Lahore		5,847,372	2,797,711	1,657,400	0.4%	0.2%	0.3%	
ISD Multan		1,347,764	693,608	650,895	0.4%	0.1%	0.2%	
ISD Sialkot		1,150,691	574,818	547,399	0.5%	0.0%	0.1%	



The indicators are categorized into 4 groups:

- I. Household income by source and gross income from crop production
- II. Household expenditure and food dietary energy consumption
- III. Food energy deficient, depth of hunger and food gap
- IV. Population of food energy deficient and food assistance needed

Each of the indicators is disaggregated by geographical areas and population sub-groups to allow users to understand the disparities within the country, and where to target priority efforts to improve household's livelihoods and food security according to specific national or sub-national conditions and needs. The following types of disaggregation are included in SISMod (the grouping varies between countries due to data availability):

- Geographical and administrative units: provinces, districts and urban/rural
- Production and land holdings: net producer/net consumer, quantity of production, value of production and size of land
- Income and income source: income group, livelihood zone and occupation of household's head
- Gender and vulnerability: gender of household's head, female ratio and dependency ratio
- Additional disaggregation may be added based on analysis needs.

To view the outputs by different geographical areas and population sub-groups, click  on the right of the list to expand the list, and  to collapse.

Household Income and Gross Income from Crop Production

Income level is usually a good indicator of welfare as higher income means household's resilience to shocks. Average of household total income is one of the main indicators in SISMod. Total income is the summation of all values from multiple income sources, including total value of crop production, income from livestock, wage, enterprise income, remittances and in-kind transfers. A combined view of income level and income diversification implies the household's ability to withstand the adverse effects of shocks.

For example, in an envisaged shock scenario, households in Punjab Province of Pakistan experience an economic shock reducing their income from wage and remittance. On the other hand, the favorable weather boosts the crop production and offsets the adverse effects from the decrease of wage and remittance. By disaggregating the population by landholdings, it is clear that the two groups have the most landholdings in rural areas, i.e. the least land constraints, benefit the most from the harvest resulting an increase in total income, whilst other groups suffer from decreasing income with a more diversified income. This implies that increase in agricultural-labor and land productivity of crop production among the poor would reduce poverty.

Grouping		Sampling		Total Income (Rs./HH/month)		Agricultural Income (Rs./HH/month)		Wage (agri.) Income (Rs./HH/month)		Wage (non-agri.) Income (Rs./HH/month)		Enterprise Income (Rs./HH/month)		Remittance Income (Rs./HH/month)		Other Income (Rs./HH/month)	
				Baseline	With Shocks	Baseline	With Shocks	Baseline	With Shocks	Baseline	With Shocks	Baseline	With Shocks	Baseline	With Shocks	Baseline	With Shocks
		% HH	No. HH														
by Province and Land Size (in Rural Areas)																	
Punjab	Urban	18%	2,918	34,542	33,813	1,136	1,166	721	697	18,953	18,330	11,394	11,394	1,961	1,848	378	378
Punjab	Rural - None	15%	2,505	16,185	15,685	338	293	1,283	1,241	7,814	7,558	3,833	3,833	2,721	2,565	195	195
Punjab	Rural - Smallest (20%)	2%	292	20,712	20,139	4,489	4,392	4,838	4,679	6,569	6,353	2,746	2,746	1,781	1,679	290	290
Punjab	Rural - 2nd smallest (20%)	2%	337	25,453	25,174	8,460	8,673	7,932	7,672	4,477	4,330	2,944	2,944	1,480	1,395	159	159
Punjab	Rural - Middle (20%)	2%	292	26,622	26,599	10,126	10,633	9,621	9,305	3,446	3,333	1,520	1,520	1,765	1,664	144	144
Punjab	Rural - 2nd largest (20%)	2%	282	33,520	33,822	14,075	14,981	13,001	12,573	3,656	3,536	1,686	1,686	986	929	116	116
Punjab	Rural - Largest (20%)	2%	291	60,790	63,374	27,648	31,284	26,163	25,304	3,450	3,336	1,931	1,931	1,379	1,300	219	219

Grouping		Sampling		Gross Income from Crop Production (Rs./HH/month)		Gross Income from Wheat Production (Rs./HH/month)		Gross Income from Rice Production (Rs./HH/month)		Gross Income from Maize Production (Rs./HH/month)		Gross Income from Cotton Production (Rs./HH/month)		Gross Income from Sugarcane Production (Rs./HH/month)	
				Baseline	With Shocks	Baseline	With Shocks	Baseline	With Shocks	Baseline	With Shocks	Baseline	With Shocks	Baseline	With Shocks
		% HH	No. HH												
by Province and Land Size (in Rural Areas)															
Punjab	Urban	18%	2,918	16,000	16,746	7,661	7,746	2,107	2,171	175	172	2,650	2,897	759	1,035
Punjab	Rural - None	15%	2,505	164	144	97	95	45	29	0	0	0	0	4	4
Punjab	Rural - Smallest (20%)	2%	292	51,268	52,931	20,271	20,182	5,242	5,574	802	759	4,828	5,278	1,543	2,142
Punjab	Rural - 2nd smallest (20%)	2%	337	120,381	126,767	48,012	48,036	18,255	19,257	628	482	17,557	19,195	10,879	14,517
Punjab	Rural - Middle (20%)	2%	292	181,871	192,106	75,008	75,902	28,182	30,190	4,118	3,370	27,799	30,393	15,842	20,968
Punjab	Rural - 2nd largest (20%)	2%	282	280,999	296,796	113,257	114,402	38,483	39,362	5,329	4,795	50,702	55,434	31,817	41,420
Punjab	Rural - Largest (20%)	2%	291	620,834	670,665	249,432	262,110	91,916	96,205	14,716	12,514	114,297	124,965	80,173	104,870

Household Expenditure and Food Dietary Energy Consumption

Household total expenditure is closely related to household income. It is a reliable indicator of household purchasing power. The difference between household expenditures before and after shock events reveals household vulnerability to income shocks. In SISMod, food expenditure is equivalent to value of food consumption. It takes into account food from all sources, including from self-production. SISMod allocates budget from the household total expenditure to food expenditure, and then to food groups through the two-stage demand system. Average of household total expenditure and food expenditure are the indicators of SISMod.

With the new budget allocation, the daily food dietary energy consumption per capita is obtained. It is calculated as the summation of the multiplications of expenditure, unit value and caloric density of each food group. Average of dietary energy consumption and shares of food groups are displayed in SISMod outputs.

For example, in an envisaged shock scenario, households in both urban and rural areas of Punjab and the rural areas of Sindh suffer from income loss that results in deterioration of their purchasing power, i.e. household total expenditure. Since food is a necessity, household food expenditure is expected to fall with household total expenditure, but less than proportionately since households would take different cropping strategies for their basic needs. Households in these areas would have around 1 percent decrease in food expenditure, but a larger decrease in food dietary energy consumption which would be more than 5 percent. This implies the shock of higher food prices bring negative impact on household food consumption. For households in rural areas of Sindh, even they would have an increase in total and food expenditure, their consumption would decrease, but to a lesser extent of a 2 percent decrease.

Grouping		Sampling		Household Total Expenditure (Rs./HH/month)		Household Food Expenditure (Rs./HH/month)		Food Dietary Energy Consumption (kcal/person/day)		Share of Dietary Energy Consumption from Grain (%)		Share of Dietary Energy Consumption from Protein (%)		Share of Dietary Energy Consumption from Vegetable and Fruit (%)		Share of Dietary Energy Consumption from Oil, Sugar and Other (%)	
				Baseline	With Shocks	Baseline	With Shocks	Baseline	With Shocks	Baseline	With Shocks	Baseline	With Shocks	Baseline	With Shocks	Baseline	With Shocks
by Province and Urban/Rural																	
Punjab	Urban	18%	2,918	20,750	20,484	8,890	8,807	2,000	1,886	50.5%	50.8%	20.1%	19.8%	4.4%	4.7%	25.0%	24.7%
Punjab	Rural	25%	3,999	15,518	15,292	8,157	8,078	2,172	2,025	55.2%	55.5%	18.6%	18.5%	3.4%	3.6%	22.7%	22.4%
Sindh	Urban	11%	1,798	18,584	18,287	8,633	8,526	1,785	1,690	50.5%	51.3%	18.6%	18.2%	4.2%	4.4%	26.7%	26.2%
Sindh	Rural	14%	2,294	14,537	15,166	8,864	9,111	2,046	2,009	55.9%	57.1%	16.1%	15.9%	2.7%	2.8%	25.3%	24.3%

Food Energy Deficient, Depth of Hunger and Food Gap

SISMod estimates the proportion of food energy deficient population, depth of hunger and food gap with users DET (dietary energy thresholds: low, mid-low and high) and the default values of the adult equivalent and then commonly used requirement of 2100 kcal. These indicators can be used to assess and monitor the country's food security at national and sub-national levels.

The proportion of food energy deficient population refers to the percentage of people with dietary energy consumption less than the DET. Depth of hunger indicates how many calories would be needed to meet the DET. The depth of hunger is calculated as the product of the average of food dietary energy consumption of the food deficient population and the number of food deficient people, which is then normalized by the total population. Food gap is the depth of hunger presented in cereal equivalent terms.

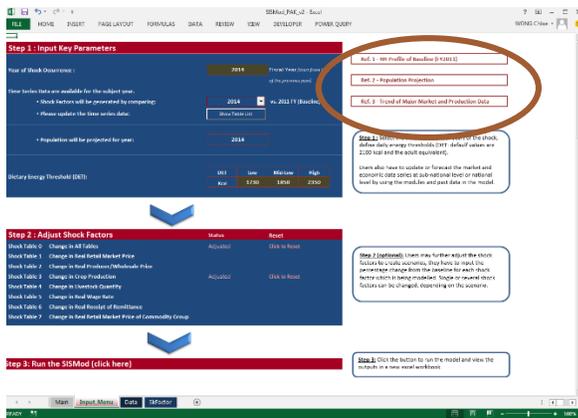
Population of Food Energy Deficient and Food Assistance Needed

When project the proportion of food deficient on population figures, and take into account the population growth, the size of food energy deficient population can be estimated. The total food gap for all food deficient people in a year would be converted from kcal to cereal equivalent to estimate the food assistance needed.

These indicators capture different aspects of hungers, presenting a comprehensive picture. The number of food energy deficient people is simply a headcount. The depth of hunger and food gap capture the degree of inequality among the food deficient. Only joint consideration of these indices can give an adequate description of food insecurity.

REFERENCE TABLES AND CHARTS

SISMod is a system contain rich data and information. The processed and standardized data can be visualized as reference tables and charts in the SISMod Tool. The hyperlinks of reference tables and charts can be found on the right of the input menu.



- Ref. 1 - HH Profile of Baseline (FY2011)
- Ref. 2 - Population Projection
- Ref. 3 - Trend of Major Market and Production Data

Ref. 1 - Baseline Household Profile

For Pakistan, SISMod uses *Pakistan Social and Living Standards Measurement Survey (PSLM) Round VI 2010-11* as the baseline. Huge amount of data were processed to build the baseline. The major variables are the households’ demographic information, income by income source, and agricultural production by crop type, expenditure by commodity and food consumption by food items. These data are organized in table format.

To view the baseline household profile, users can go the right of the input menu and click “Ref.1 – HH Profile of Baseline” to see and select the desired tables.

Baseline Menu	
Household Vulnerability Profile Variables (2011)	
Back to the Input Menu	
Table 0	All Tables
Table 1	Household Demographic Characteristics
Table 2	Household Agricultural Asset
Table 3	Household Monthly Income by Income Source
Table 4	Share of Household Monthly Income by Income Source
Table 5	Share of Household Monthly Gross Income from Crop Production by Crop Type
Table 6	Household Monthly Expenditure by Commodity Group
Table 7	Share of Household Monthly Expenditure by Commodity Group
Table 8	Per Capita Daily Food Expenditure by Food Item
Table 9	Share of Per Capita Daily Food Expenditure by Food Item
Table 10	Per Capita Daily Caloric Intake by Food Item
Table 11	Share of Per Capita Daily Caloric Intake by Food Item

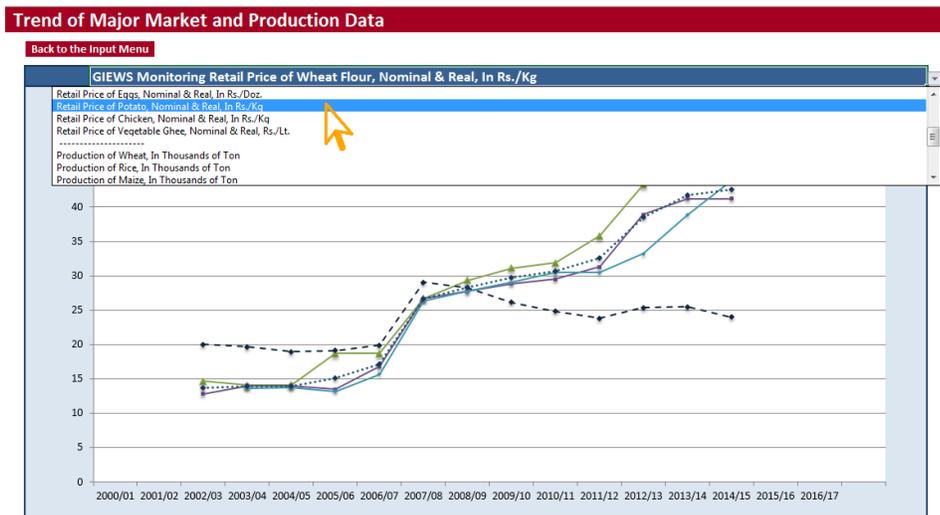
Ref. 2 – Population Projection

SISMod includes a population projection module to calculate the population size of different groups according to the shock year users selected. Projections are based on the growth rates derived from the previous national population censuses in 1998 and 2010, and therefore are reliable in the short-medium term. Caution must be taken when using the projections estimate in the long term.

Ref. 2 - Population Projection (mid-year) for Food Assistance Intervention									
id_district	District	2011 Total (Baseline)	2011 Male (Baseline)	2011 Female (Baseline)	2014 Total	2014 Male	2014 Female	Annual Growth Rate (%)	Sex Ratio (males per 100 females)
100	Islamabad	1,311,817	707,423	604,394	1,468,199	791,755	676,443	3.75	117
101	Attock	1,668,383	832,714	835,670	1,775,217	886,036	889,181	2.07	100
102	Rawalpindi	4,402,023	2,254,038	2,147,985	4,683,904	2,398,374	2,285,530	2.07	105
103	Jhelum	1,226,104	612,573	613,532	1,304,617	651,798	652,819	2.07	100
104	Chakwal	1,418,165	678,182	739,983	1,508,977	721,609	787,368	2.07	92
105	Sargodha	3,488,707	1,796,558	1,692,149	3,712,104	1,911,600	1,800,505	2.07	106

Ref. 3 – Trend of Major Market and Production Data

Trend of major market and production data in SISMod's database can be visualized as line charts. This provides users a quick reference to understand the trend patterns and track shocks. By clicking on the graph title, the selection of market and production data series can be customized by users to plot the graph. Only one item can be selected at a time.



APPLICATIONS OF SISMOD

SISMod allows timely assessment of the impact of emerging issues on household livelihood and food security at both national and sub-national levels. SISMod can be used for comprehensive situation analysis, simulation and monitoring of the impact of shocks on household livelihood and food security. It provides early estimates in times of shock to support the initial development of emergency response scenarios. The quantitative estimates provided by SISMod can also be used to support market, economic or climate analysis into impact assessments.

Similar shocks in different parts of the country or groups of people may lead to similar or different outcomes, depending on the type of shocks, its magnitude and the profile of the household. The model can be run and compared the results from various groupings within the country to better understand the vulnerability at sub-national level to tailor interventions and policy.

SISMod can be used to track changes in condition and show patterns by maintaining updated market/production/economic monitoring data in the model. Regular updates of these data would enable SISMod to be applied in emergency and crisis situations.

This will be valuable to a wide range of the potential users including:

- institutional users that are mainly humanitarian aid bodies providing food aid and assistance
- institutional and scientific users that are mainly public or local government organisations carrying out food security, market, economic or policy analysis

CONCLUSIONS

SISMod contributes immensely to strengthen institutional capacity in terms of vulnerability analysis and early warning systems in both FAO and WFP. The baseline information and modelling system of SISMod support assessment missions and food security monitoring systems. The SISMod Tool, a user-friendly version of SISMod, links with FAO/GIEWS information system and VAM food security monitoring system at country level for monitoring impacts of market and climate shocks on household food security. Both FAO and WFP are committed to continue working on the project and mainstream SISMod as a key component in corporate activities of food security monitoring, assessment, analysis and response planning.