AgMIP Regional Integrated Assessment of Agricultural Systems in Nioro, Senegal: Representative Agricultural Pathways, Climate, Crop and Economic Datasets

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Abstract: This paper describes the datasets that were used to implement an AgMIP Regional Integrated Assessment for the Nioro region of Senegal to assess the potential impacts of climate change on the principal agricultural system in the Senegal peanut basin and to assess adaptations of that system to climate change under current as well as future climate and socio-economic conditions. This dataset includes the Representative Agricultural Pathways developed for Nioro from 2000-2050; the climate data that were used to implement crop yield simulations; the data that were used to parameterize the DSSAT and APSIM crop models, including historical climate data and future climate scenarios; and the data that were used to parameterize the Tradeoff Analysis Model for Multi-dimensional Impact Assessment (TOA-MD) economic simulation model, as well as simulated model outputs.

Keywords: AgMIP, model, DSSAT, APSIM, TOA-MD, climate change, impact, assessment, adaptation.

1. OVERVIEW AND CONTEXT: The Agricultural Model Intercomparison and Improvement Project (AgMIP; Rosenzweig et al., 2013) developed protocol-based methods for Regional Integrated Assessment (RIA) of agricultural systems (Antle et al. 2015; Rosenzweig et al. 2016). These methods have been applied by teams of scientists working with regional and national stakeholders across Sub-Saharan Africa and South Asia (Rosenzweig et al. 2015, 2020). This paper describes the datasets that were used to implement the AgMIP RIA methods for the Nioro region of Senegal (MacCarthy et al, 2020). The goal of the RIA is to assess the potential impacts of climate change on the principal agricultural system in the Senegal peanut basin comprised of peanut, millet, maize, and other minor crops and livestock, and to assess adaptations of that system to climate change, under current as well as future climate and socio-economic conditions.

This dataset includes:

- the Representative Agricultural Pathways (RAPs, Valdivia et al., 2015) developed for Nioro from 2000-2050;
- climate data used to implement crop yield simulations (included with crop modeling data);
- data used to parameterize two crop models: Agricultural Production Systems sIMulator (APSIM; www.APSIM.info; Holzworth et al., 2014; Keating et al., 2003) and the Decision Support System for Agrotechnology Transfer (DSSAT; www.DSSAT.net; Hoogenboom et al., 2019a, 2019b, Jones et al., 2003) crop models, including historical climate data and future climate scenarios (Ruane et al., 2015a); and

- the data used to parameterize the Tradeoff Analysis Model for Multi-dimensional Impact Assessment (TOA-MD; Antle et al., 2014; Antle and Valdivia 2020) economic simulation model.

The analysis is structured around four "core questions" of climate impact assessment (Rosenzweig et al. 2016):

- Q1: What is the sensitivity of current agricultural production systems to climate change?
- Q2: What are the benefits of adaptation in current agricultural systems?
- Q3: What is the impact of climate change on future agricultural production systems?
- Q4: What are the benefits of climate change adaptations?

2. REPRESENTATIVE AGRICULTURAL PATHWAYS: The core questions 3 and 4 of the AgMIP RIA methods address climate impacts (Q3) and adaptation (Q4) under future climate and socio-economic conditions. The social-economic component is embodied in Representative Agricultural Pathways (RAPs) that are scenarios co-developed by scientists conducting the assessment and stakeholders who help define narratives for future conditions and quantify the variables needed as "drivers" or "boundary conditions" for the crop, livestock and economic modeling used in the RIA process. An Excel spreadsheet tool called "DevRAP" was used to organize and document the RAPs and the data used to quantify the scenarios. This spreadsheet includes detailed descriptions of the storylines constructed under each pathway describing the magnitude and direction of change of the key institutional and policy, socio-economic, technology and bio-physical drivers. Each driver and its change are supported by a storyline that together characterize plausible future conditions. RAPs were developed for two scenarios, the "Green Road" representing a condition in which agricultural policies are focused on sustainable development, and the "Gray Road" in which agricultural growth has little consideration for agricultural sustainability (Valdivia et al., 2020). DevRAP Excel files for both scenarios are included in this dataset ("NIORO_RAP4_Greening the Road_Final.xls" and "NIORO_RAP5_fossil fuel development_Final.xls" in the RAPs folder). Appendix A describes the contents of each DevRAP file, including a detailed description of the variable names and the sheets included in the Excel file.

3. CLIMATE DATA: Historical climate data for Nioro were collected from the Senegal National Meteorology Service, with gaps (notably the 2010 year as well as a small number of short intervals) filled using bias-adjusted values drawn from the Agricultural Modeling version of the NASA Modern Era Retrospective-analysis for Research and Applications (AgMERRA; Ruane et al., 2015b). Following the AgMIP climate methods (Ruane et al., 2015a), the regional distribution of farm locations was estimated by modifying the station dataset to reflect gradients in the WorldClim climatology (www.worldclim.org), and future scenarios were produced according to the AgMIP enhanced Delta approach. Following methods described in Ruane and McDermid (2017), five representative models were selected from 31 CMIP5 earth system models to represent the middle of the temperature and precipitation change distribution, as well as relatively hot/dry, hot/wet, cool/dry, and cool/wet edges of the distribution. Note that "relatively cool" future scenarios are warmer than present conditions but represent those models that project a smaller increase in temperature. Five models were selected independently for a moderate and high emissions scenario (RCP4.5 and RCP8.5, respectively). The result is a historical dataset and 10 future scenarios (5 climate models x 2 RCPs) for each farm in the Nioro household survey. These climate data were used as input to the crop model simulations and are included with the data described in the next section on "Crop Data".

4. CROP DATA: The crop model input and output files contained in this dataset comprise all of the necessary data to replicate simulations described by MacCarthy et al. (2021) using the DSSAT or APSIM crop models and to generate compatible simulations for any crop model that has an AgMIP translator (github.com/orgs/agmip/repositories). The AgMIP data interoperability protocols (Porter et al., 2015) were developed to facilitate ensemble crop modeling exercises. These protocols describe the standardized formats and vocabulary for crop modeling input and output data used in this dataset.

The AgMIP Regional Integrated Assessment included eight Crop Model Simulation Sets (CMSS), as summarized in Table 1. Each of the future climate simulations (i.e., CM2, CM5, and CM6) included simulations for 10 climate scenarios described in Section 3.

Table 1: Crop Model Simulation Sets (CMSS) for the AgMIP Regional Integrated Assessment

CMSS	Description of CMSS	Weather & Climate	RAP	Adaptation	Core Question Addressed
CM0	Survey conditions	Current conditions, 1 year (2007)	--	--	--
CM1	Current climate, current system	Current climate, 30 years (1981 - 2010)	--	--	Q1, Q2
CM2	Future climate, current system	10 future scenarios, 30 years 2041-2070 (5 climate models for RCP4.5 and RCP8.5)	--	--	Q1
CM3	Current climate, adapted system	Current climate, 30 years (1981 - 2010)	--	Yes	Q2
CM4	Current climate, RAP	Current climate, 30 years (1981 - 2010)	Yes	--	Q3
CM5	Future climate, RAP	10 future scenarios, 30 years 2041-2070 (5 climate models for RCP4.5 and RCP8.5)	Yes	--	Q3, Q4
CM6	Future climate, RAP, adaptation	10 future scenarios, 30 years 2041-2070 (5 climate models for RCP4.5 and RCP8.5)	Yes	Yes	Q4
CTWN	Sensitivity analysis on one representative farm	Current climate, 30 years (1981-2010), but perturbed for ranges of CO_2, Temperature, Rainfall, and Nitrogen fertilizer	--	--	--

Table 2 describes the data types and file formats included in the archive of crop modeling data. Each CMSS in Table 1 includes data for these file types. Table 3 summarizes the crop modeling data files archived in this dataset. There are 122 files included for each of the three crops grown in the region: maize, millet, and peanut. These files contain all of the necessary data to generate simulations for any crop model which has an AgMIP translator. See also the Excel file: “List_of_Crop_Files.xlsx” included in the dataset for a more complete description of every file included in the crop modeling dataset.

The survey data files are in AgMIP Crop Experiment Binary (ACEB) format. This format is not directly human readable, but consists of gzip archives (www.gzip.org) of JavaScript Object Notation (JSON, www.json.org/json-en.html) files. Survey data files include weather and soils data. ACEB files can be translated to crop model-ready formats for multiple crop models using the AgMIP utility, QuadUI (github.com/agmip/quadui/releases). The ACEBViewer app allows the ACEB files to be viewed directly (github.com/agmip/AcebViewer/releases). All variables in the survey data are based on the ICASA vocabulary (White et al., 2013 and www.tinyurl.com/icasa-mvl).

Table 2: Descriptions of crop modeling file types in AgMIP Regional Integrated Assessments

Type of data	Description	File format
Survey data	This is a subset of the original survey data collected from 234 farms in Nioro, Senegal in 2007 (RCPT,2008) which detail the planting and harvest dates, management, and yields for one cropping season and three crops.	*aceb*
Cultivar files	This zip archive contains DSSAT and APSIM genetic parameter files for the calibrated cultivars used in these analyses.	*zip*
Field overlay	Supplemental data required by crop models, but not specifically listed in the survey data. These data are combined with the survey data for translation to crop modeling formats by QuadUI.	*dome*
Seasonal strategy	Instructions for allowing 30 years of simulation from the single-season survey data. These data are combined with surveyed data for translation to crop modeling formats by QuadUI.	*dome*
Linkage	Provides linkage between the survey data, the field overlay data, and the seasonal strategy data.	*alnk*
ACMO	AgMIP Crop Model Output files in csv format. ACMOs contain simulated outputs from crop model simulations with sufficient metadata to identify the CMSS for each simulation.	*csv*

The cultivar files are in crop model-specific formats for DSSAT and APSIM. Refer to the model documentation for definitions of these genetic parameters for the respective models.

Field overlay and seasonal strategy files are two types of AgMIP DOME (Data Overlay for Multi-model Export) files, which allow data recorded in field experiments or farm surveys to be supplemented and modified. These allow incomplete survey data to be used for crop model simulations by providing data that are required by crop models but were not recorded in the survey data. In addition, DOMEs can be used to impose hypothetical scenarios on the data, such as climate change, RAPs, and adaptations. DOMEs are fully described in AgMIP documentation, including syntax and descriptions of built-in functions: agmip.github.io/DOME.html.

Linkage files provide the linkage between survey data and DOME files. The usage and format are described here: agmip.github.io/DOME.html. The ALNK file format is in csv format and can be viewed in any text editor.

For CM0 only, we have included model-ready input files that have been converted from the ACEB, field overlay, and linkage files for both DSSAT and APSIM. These are included in the zip archive files contained in the CM0 folder.

The output (ACMO) files contained herein are for simulations performed with the DSSAT and APSIM crop models. These files are CSV (comma-delimited) format and can be read and interpreted with text editors, spreadsheets, and data analysis software.

In addition to the model input and output files, an Excel file (Variable_definitions.xlsx) is included in the crop model data archive which lists the definition of variables in the ACEB and ACMO files. For additional information on ICASA terms in the ACEB and ACMO files, refer to the full ICASA Data Definitions list here: agmip.github.io/ICASA.html. Additional information on ACMO files can be found at github.com/agmip/agmip.github.io/blob/master/docs/images/ACMO.pdf.

Table 3: List of crop modeling files included in dataset

CMSS [1]	Relative path	Number of files for each file type						
		Survey data (aceb)	Culti-var files (zip)	Field Overlay (dome)[3]	Seasonal strategy (dome)	Link-age (alnk)	ACMO (csv)[2]	Model-ready files (zip)
CM0	<crop>/CM0-Historical	1	1	1		1	2	2
CM1	<crop>/CM1-Current	1	1		1	1	2	
CM2	<crop>/CM2-CC	1	1		1	1		
CM2	<crop>/CM2-CC/RCP4.5<GCM>						10	
CM2	<crop>/CM2-CC/RCP8.5<GCM>						10	
CM3	<crop>/CM3-Current-Adapt1	1	1		1	1	2	
CM3	<crop>/CM3-Current-Adapt2	1	1		1	1	2	
CM4	<crop>/CM4-Current-RAP4	1	1		1	1	2	
CM4	<crop>/CM4-Current-RAP5	1	1		1	1	2	
CM5	<crop>/CM5-Future, RAP4	1	1		1	1		
CM5	<crop>/CM5-Future, RAP4/ RCP4.5<GCM>						10	
CM5	<crop>/CM5-Future, RAP5	1	1		1	1		
CM5	<crop>/CM5-Future, RAP5/ RCP8.5<GCM>						10	
CM6	<crop>/CM6-Future, RAP4,	1	1		1	1		
CM6	<crop>/CM6-Future, RAP4, Adapt/ RCP4.5<GCM>						10	
CM6	<crop>/CM6-Future, RAP5,	1	1		1	1		
CM6	<crop>/CM6-Future, RAP5, Adapt/RCP8.5<GCM>						10	
CTWN	<crop>/CTWN	1	1		1	1	2	

[1] CMSS = Crop Model Simulation Set

[2] One ACMO file each for the DSSAT and APSIM models, and for each climate scenario

[3] The same field overlay is used for all simulations

<crop> = Maize, Millet, or Peanut

<GCM> = 10 GCMs, 5 each for RCP4.5 and RCP8.5

5. ECONOMIC DATA: The economic analyses of climate impact and adaptation were implemented using the TOA-MD model. The TOA-MD model input files contain parameters that are statistics (means, standard deviations, coefficients of variation, correlation coefficients) derived from the RAPs, from crop model simulations, and from a farm survey conducted by the World Bank (RPCT, 2008; MacCarthy et al., 2020). Description of the variables in the TOA-MD input files are included in Appendix A.

Input datasets were configured for each of the four "core questions" described in Table 4. TOA-MD Input files have the following filename structure:

TOAin-**Location-CQ-GCM-RAP-Adaptation-CropModel**.xls where:

Location:	Nioro
CQ:	Core Question (1, 2, 3, 4)
GCM:	Climate scenarios (GCMs)
RAP:	4.1 and 4.2 (Green Road RAP, high and low prices); 5.1 and 5.2 (Gray Road Rap, High and Low prices)
Adaptation	No adaptation; 1=Adaptation package 1; 2=Adaptation package 2
Crop Model*:*	APSIM, DSSAT

These input datasets are Excel files with sheets containing metadata and the model parameters estimated from the survey data, the crop model simulations and RAPs. Details of the estimation methods are provided in Rosenzweig et al. (2016).

Key output data from the TOA-MD simulation runs are summarized in a spreadsheet "AgMIP_Nioro-Economic Outputs_04_16_19F.xlsx". This file includes the aggregated results (104 observations corresponding to the total number of simulation sets described in Table 4) and the disaggregated results (416 observations corresponding to the 4 strata times the 104 simulation sets). Table 5 describes the contents of the TOA-MD summary output file.

The output database has 4 sheets**:**

- **README**: This sheet provides a detailed description of the output variables, values and units.
- **Nioro Output Data_ST**: This sheet contains the modeling results disaggregated by strata for all core questions across all scenarios.
- **Nioro Output Data_Ag**: This sheet contains the aggregated modeling results for all core questions across all scenarios.
- **Study Site**: This sheet contains the metadata corresponding to the AgMIP Regional Integrated Assessment of Agricultural Systems in Nioro, Senegal case study.

The file, "List_of_Econ_files.xlsx", lists all TOA input and output files contained within the dataset with a short description of each.

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Table 4: TOA-MD Simulation sets

		Simulation Sets		
Core Question	**Modeling / scenario**	**System 1**	**System 2**	**TOA-MD Simulations**
1. What is the sensitivity of current agricultural production systems to climate	**Scenario**	**Current: Current Climate, Current Production System**	**Climate Change Sensitivity: Future Climate, Current Production System**	5 GCMs x 2 RCPs x 2 Crop Models = 20
	Climate	1980-2009 Climate	2040-2069 Climate	
	Crop-Livestock	Crop/Livestock Simulations, no Adaptation (CMI)	Crop/Livestock Simulations With CC, no Adaptation (CM2)	
	Economic	TOA-MD without Adaptation, without RAP	TOA-MD, with CC without Adaptation, without RAP	
2. What are the benefits of adaptation in current agricultural systems	**Scenario**	**Current without Adaptation: Current Climate, Current Production System**	**Current Climate with Adaptation: Current Climate, Adapted Production System**	2 Crop Models x m Adaptation package(s) = 2 x m. Note: m = number of adaptation packages
	Climate	1980-2009 Climate	1980-2009 Climate	
	Crop-Livestock	Crop/Livestock Simulations, no Adaptation (CM1)	Crop/Livestock Simulations with Adaptation (CM3)	
	Economic	TOA-MD without Adaptation, with RAPs + Sensitivity analysis	TOA-MD, with Adaptation without RAP	
3. What is the impact of climate change on future agricultural systems?	**Scenario**	**Future without climate change: Current Climate, Future Production System**	**Future climate Change: Future Climate, Future Production System**	5 GCMs x 2 RCPs/RAPs x 2 Crop Models x 2 Price Sensitivity = 40. Note: a RAP is associated With a specific RCP
	Climate	1980-2009 Climate	2040-2069 Climate	
	Crop-Livestock	Crop/Livestock Simulations with RAPs, no Adaptation (CM4)	Crop/Livestock Simulations with Climate change, with RAPs, no Adaptation (CM5)	
	Economic	TOA-MD without Adaptation, with RAPS + Sensitivity analysis	TOA-MD, with Climate change, with RAPs, without Adaptation + Sensitivity analysis	
4. What are the benefits of climate change adaptation?	**Scenario**	**Future Climate Change: Future climate, Future Production System**	**Future Climate Change with Adaptation: Future climate, Future climate-adapted System**	5 GCMs x 2 RCPs/RAPs x 2 Crop Models x 2 Price Sensitivity x m 40 x m. Note: m =number of adaptation packages
	Climate	2040-2069	2040-2069 Climate	
	Crop-Livestock	Crop/Livestock Simulations with Climate change, with RAPs, no Adaptation (CM5)	Crop/Livestock Simulations With Climate change, with RAPS, with Adaptation (CM6)	
	Economic	TOA-MD, with Climate change, with RAPs, without Adaptation + Sensitivity analysis	TOA-MD, with Climate change, with RAPS, with Adaptation + Sensitivity analysis	

Table 5: Description of the TOA-MD Summary Output File for Nioro, Senegal

Variable name	Description	Possible values	Used in Core Question/Metadata
Phase	AgMIP Phase	1,2	Metadata
REG_ID	Name of region	Teams followed data protocols	Metadata
CoreQuestion	Core Question	1-3 for Phase I, 1-4 For Phase 2	Metadata
CLIM_ID	Climate Model (GCM)	CLIMATE CODES	Metadata
CROP_MODEL	Crop Model	APSIM, DSSAT	Metadata
LIVESTOCK_MODEL	Livestock Model	LIVSIM	Metadata
RAP_ID	RAP identifier	RAP X.Y	Metadata
MAN_ID	Adaptation identifier	A1, A2	Metadata
STRATUM	Stratum ID	1, 2, 3,…	Metadata
Adoptionr	Predicted adoption rate (%)	0-100%	Q2, Q4
Pvulnerable	% of households vulnerable to CC	0-100%	Q1,Q3
Pgains	Gains as a percent of mean net farm returns	>=0	Q1,Q3
Plosses	Losses as a percent of mean net farm returns	<=0	Q1,Q3
PNet_impact	Net economic impact (% of farm income)	-100 -- 100%	Q1,Q3
NR_Base	Base Mean net returns per farm (Currency/farm/time)	numeric	Q1, Q2, Q3 , Q4
NR_CC	Climate change -Mean net returns per farm (Currency/farm/time)	numeric	Q1, Q3
NR_Adap	Adaptation -Mean net returns per farm (Currency/farm/time)	numeric	Q2, Q4
PChg_NR	Percent change in mean net returns (%)	-100 -- 100%	Q1, Q2, Q3 , Q4
PCI_Base	Mean per capita income (currency/person/time)	numeric	Q1, Q2, Q3 , Q4
PCI_CC	Climate change - Mean per capita income (currency/person/time)	numeric	Q1, Q3
PCI_Adapt	Climate change & Adaptation - Mean per capita income (currency/person/time)	numeric	Q2, Q4
PChg_PCI	Percent change in mean per capita income (%)	-100 -- 100%	Q1, Q2, Q3 , Q4
Pov_Base	No climate change - Population poverty rate (%)	0 -100%	Q1, Q2, Q3 , Q4
Pov_CC	Climate change - Population poverty rate (%)	0 -100%	Q1, Q3
Pov_Adap	Climate change & Adaptation - Population poverty rate (%)	0 -100%	Q2, Q4
PChg_Pov	Percent change in population poverty rate (%)	-100 -- 100%	Q1, Q2, Q3 , Q4

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APPENDIX A: Description of DevRAP sheet and variable names

Nioro DevRAPs: Description of sheet and variable names in the "NIORO_RAP4_Greening the Road_Final.xls" and "NIORO_RAP5_fossil fuel development_Final.xls" files.

Sheet name	Variable name	Description	Used in model or RAPs
Instructions		This sheet contains instructions on how to complete the DevRAP matrix	RAPs
Background		This sheet is used to enter background information such as SSPs or global RAPs narratives or other important information about the case study	RAPs
DevRAP matrix		This is the Representative Agricultural Pathways Development Tool. The first section of the DevRAP matrix contains information on location, time horizon, SSP ID, RAP title, RAP ID and RAP Narrative. The second section present a list of variables with direction of change, magnitude of change, rationale for direction and magnitude of change, percent change over period, rationale for percent change over period, level of agreement and confidence	RAPs
$SCEN\_ST_n$[1]		Quantifying scenarios for TOA-MD input files for stratum n	
	HH_Size	Average Household size (persons)	TOA-MD
	CVHH	Coefficient of variation of household size (%)	TOA-MD
	INC_MEAN2	Mean Non-agricultural Income for system 2 ($/Farm/Time)	TOA-MD
	INC_CV2	Coefficient of variation of Non-Ag income for system 2 (%)	TOA-MD
	FCOST	Farm Fixed Cost ($/Farm) that applies to switching to system 2	TOA-MD
	CVFC	Coefficient of variation of farm fixed cost (%)	TOA-MD
	FARM_SIZE2	Average farm size for system 2 (Ha)	TOA-MD
	CVFS2	Coefficient of variation of farm size for system 2	TOA-MD
	HERD_SIZE2	Average herd size for system 2 (head or livestock units)	TOA-MD
	CVHS2	Coefficient of variation of herd size for system 2	TOA-MD
	POND_SIZE2	Average farm area in Ponds in system 2 (Ha)	TOA-MD
	CVPS2	Coefficient of variation of pond area for system 2	TOA-MD
	YC_{hg}	Crop Yield for system h, Activity g (Kg/Unit/Time)	TOA-MD
	SC_{hg}	Standard deviation of net returns for system h, activity g ($/Unit/Time)	TOA-MD
	CC_{hg}	Variable production cost per unit for system h, Activity g ($/Unit/Time)	TOA-MD

Sheet name	Variable name	Description	Used in model or RAPs
	FC_{hg}	Fixed production cost per unit for system h, Activity g ($/Unit/Time)	TOA-MD
	YL_{hg}	Livestock output for system h, Activity g ($/Unit/Time)	TOA-MD
	SL_{hg}	Standard deviation of net returns for system h, activity g ($/Unit/Time)	TOA-MD
	CL_{hg}	Variable livestock production cost per unit for system h, Activity g ($/Unit/Time)	TOA-MD
	FL_{hg}	Fixed livestock production cost per unit for system h, Activity g ($/Unit/Time)	TOA-MD
	YP_{hg}	Aquaculture yield for system h, Activity g (Kg/Unit/Time)	TOA-MD
	SP_{hg}	Standard deviation of net returns for system h, activity g ($/Unit/Time)	TOA-MD
	CP_{hg}	Variable aquaculture production cost per unit for system h, Activity g ($/Unit/Time)	TOA-MD
	FP_{hg}	Fixed aquaculture production cost per unit for system h, Activity g ($/Unit/Time)	TOA-MD
	OM_{hk}	Mean of outcome variable k, system h	TOA-MD
	OCV_{hk}	Coefficient of variation of outcome of variable k, system h	TOA-MD
	K_{hk}	Correlation of net returns with outcome variable k, for system h	TOA-MD
	RH_{hk}	Correlation of outcome variable k (1), with outcome variable k(2)	TOA-MD
SCEN_CROPSM		Variables/parameters to be set up for crop simulation. These include: N fertilization, Sowing density, and genetic yield potential	DSSAT, APSIM
Yield_trend		Yield trend growth factors 2005-2050 (values are growth rates)	
	B1Ytrend	Yield trends under RAP4, no climate change	RAPs
	B2Ytrend	Yield trends under RAP5, no climate change	RAPs
Price_trend		Price trend growth factors 2005-2050 (values are growth rates)	RAPs
	B1trend50m	Price trend with no climate change under RAP4	RAPs
	F1trend50m	Price trend with climate change under RAP4	RAPs
	B2trend50m	Price trend with no climate change under RAP5	RAPs
	F2trend50m	Price trend with climate change under RAP5	RAPs

[1] Values in these sheets include only variables that need to be changed to represent the specific scenario for each stratum.