

Evaluating the regional impacts of climate change on women's well-being, domestic burdens and food security in Bolivia

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AUTHORS



**Luis Enrique
ESCALANTE**



**Hélène
MAISONNAVE**

MOTIVATION

The motivation for this work is explained by three facts:

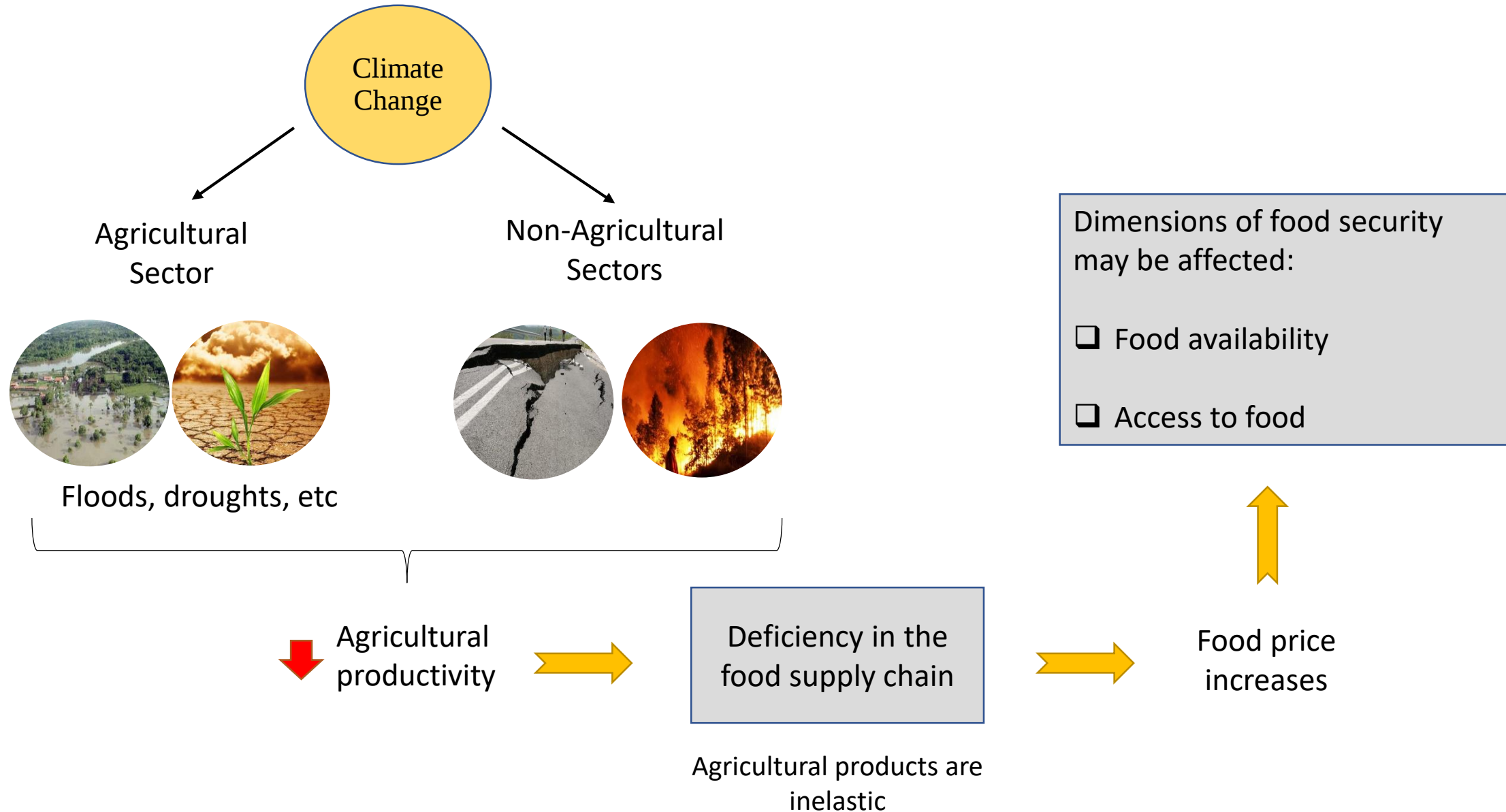
- ❑ Climate change could affect agricultural productivity and threaten the food security of the poorest populations as well as increase future health risks (Field et al., 2014).
- ❑ There is a consensus that the most vulnerable populations will be hardest hit by CC (IPCC, 2007; IPCC, 2014)
- ❑ Gender gaps, which condition the initial situation of men and women, may worsen in a context of climate change (Eastin (2018), Demetriades & Esplen (2010)).

CONTEXT

Although some studies include specific vulnerable population groups, most of them are limited to the formal sector (paid work).

- ❑ Bolivia is one of the most vulnerable countries in South America in a context of climate change (Vulnerability Index, 2015; Kreft et al. 2016).
- ❑ The impact of climate change in Bolivia particularly affects the agricultural sector, which records the most significant economic losses. (Andersen et al. (2014); Aliaga and Aguilar (2009) ; Jemio et al. (2014), UDAPE (2015))
- ❑ According to ILO (2018), 26% of total employment in Bolivia is generated by the agricultural sector, while the Latin American average is (15%). Large presence of rural women in agricultural activities.
- ❑ In Bolivia, gender and regional disparities are visible in the formal labor market (WDI, 2019; ECE, 2018), but also in unpaid activities (Ashwill et al. 2011; CEPAL, 2001).

CLIMATE CHANGE, AGRICULTURE AND FOOD



Traditional
crops

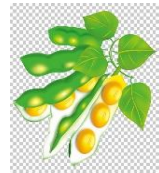


Rice

Modern
crops



Corn

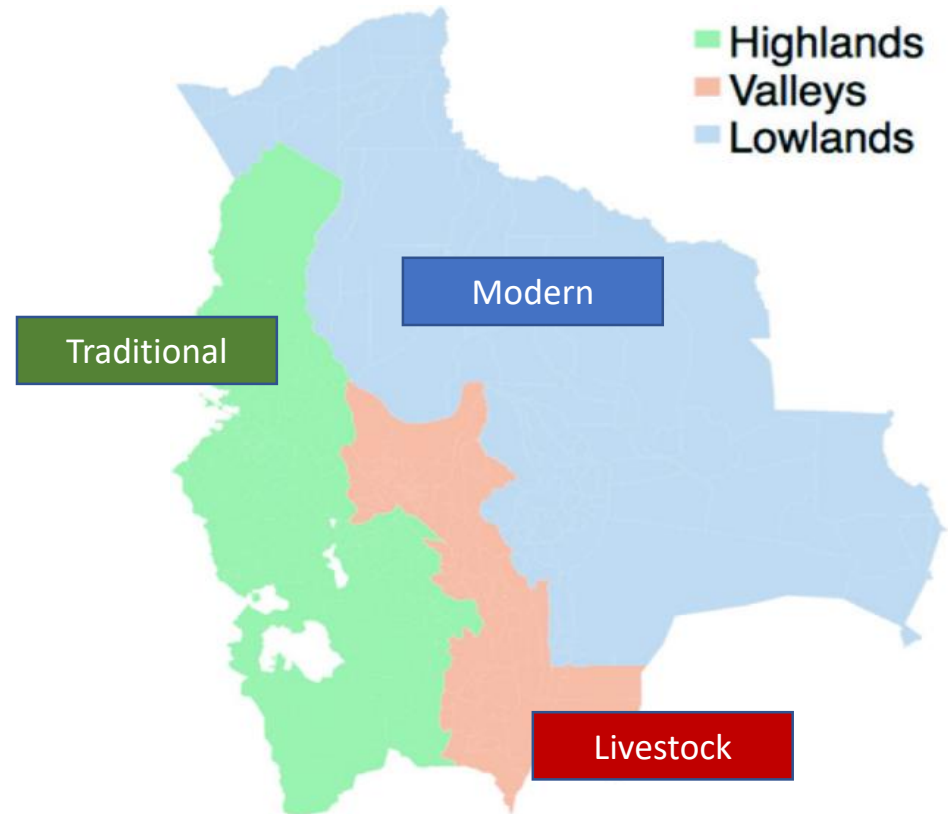


Soybeans

Livestock



Type of agriculture

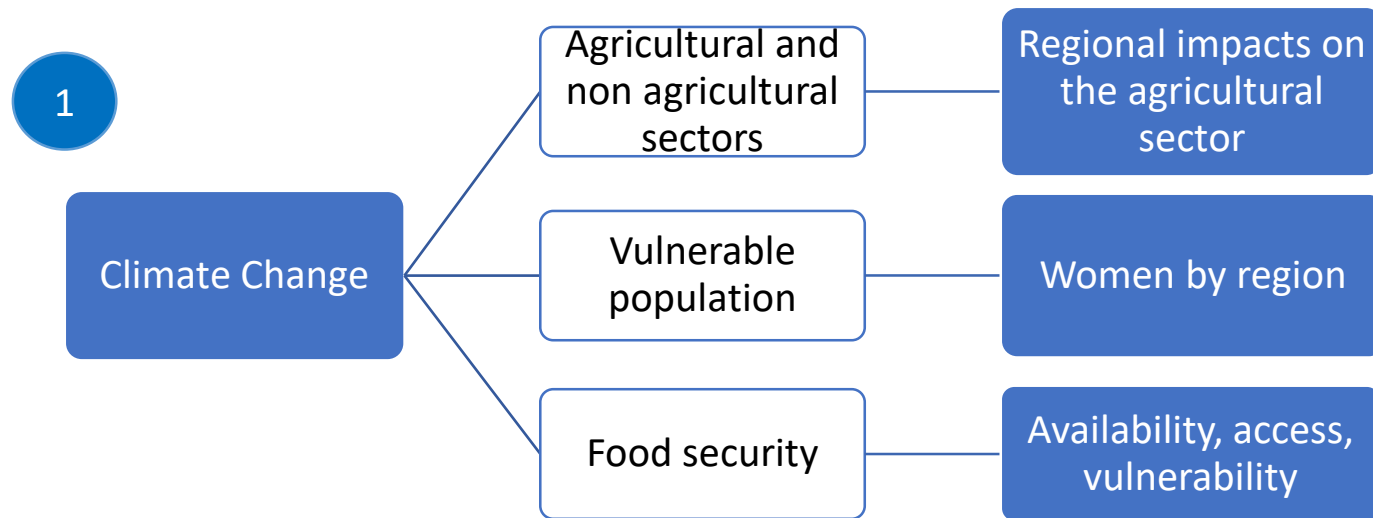


Location

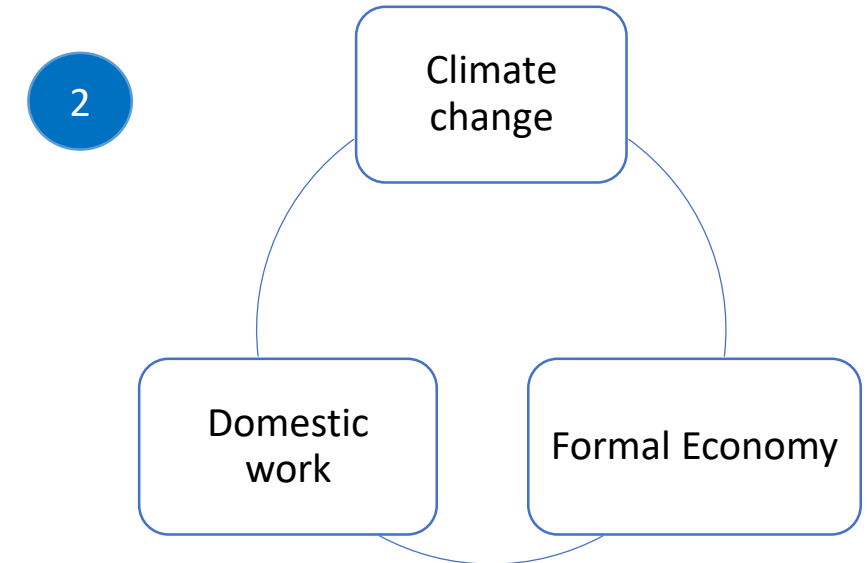
In Bolivia, two
aspects are
important:



Assess the extend of climate change effects on:



Understand the linkages between:



To do this, we use a computable general equilibrium (CGE) model, linked to a microsimulation module.

This study contributes to the application of CGE models by introducing endogenous labor supply to assess the impact of CC on women's poverty and food security in Bolivia.

MODEL

We assess the impacts of climate change using a static CGE model inspired by the PEP 1-1 model.

MAIN
MODIFICATIONS

Decaluwé, B., Lemelin, A., Robichaud, V., Maisonnave, H., 2013. PEP-1-1 (Single-Country, Static Version). PEP. URL <https://www.pep-net.org/pep-1-1-single-country-static-version>

- ❖ The labour factor is broken down by skill level (skilled and unskilled).
- ❖ In addition, a gender dimension is introduced at each qualification level.



Constant Elasticity of Substitution Functions (CES)

- ❖ We propose an endogenous labour supply to integrate domestic work.



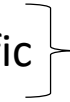
Based on Fontana and Wood (2000) and Fofana et al (2003)

- ❖ Bolivian households, according to gender and region (highlands, valleys and lowlands).



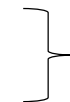
6 categories of households

- ❖ Disaggregation of the agricultural sector, in order to introduce region-specific shocks.



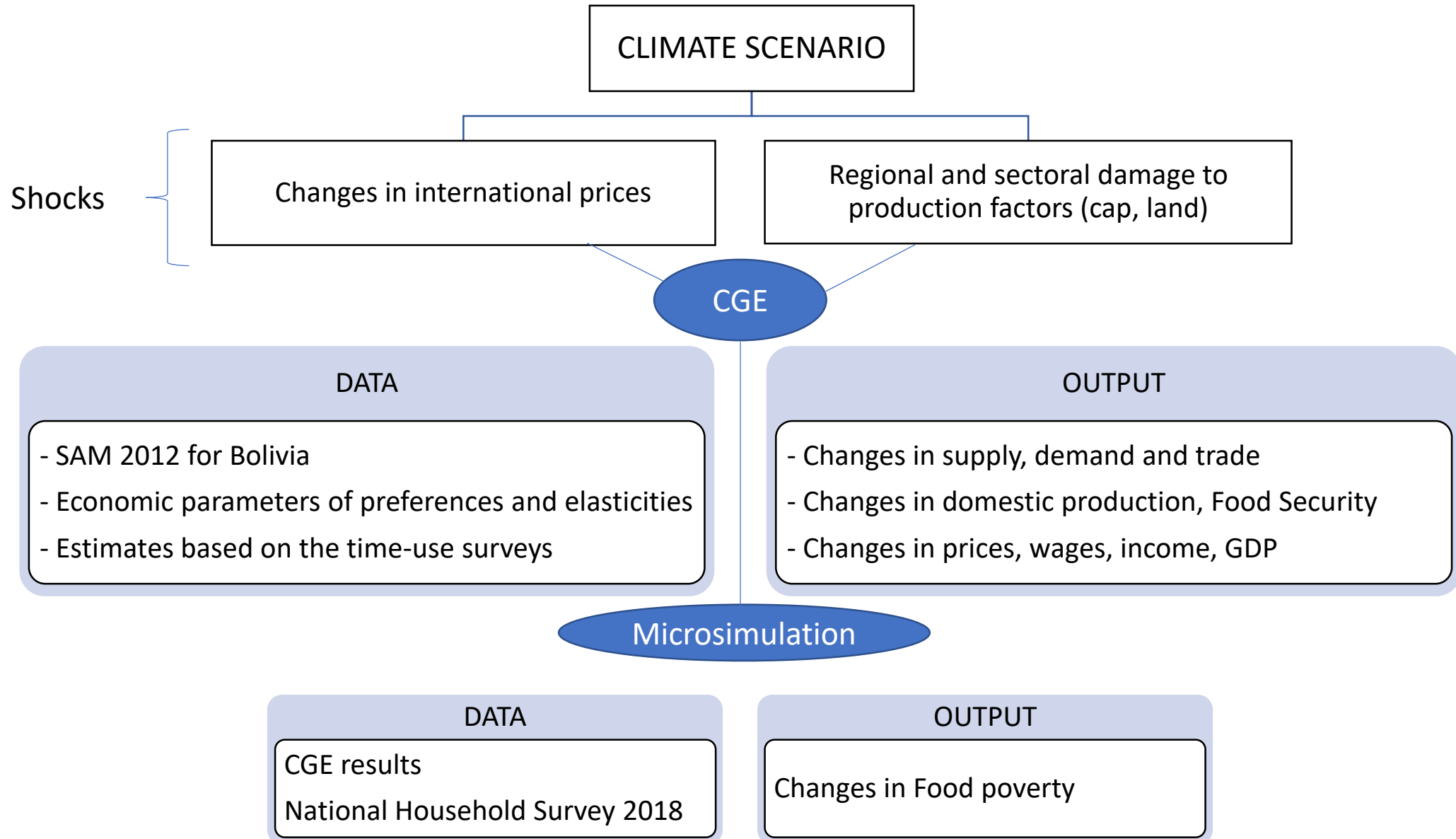
Traditional and modern agriculture by region

- ❖ Calculation of food security indicators on food availability, food access, and vulnerability (Before and after climate shocks).



Based on FAO indicators

MODEL AND SIMULATION EXERCISE



Two types of shocks are analyzed:

- ❑ **Internal shock** Based on Regional climate disasters recorded in Bolivia between 2013 and 2014 (UDAPE, 2015).
 - ✓ Agricultural damages have been integrated into the model according to a region-specific approach (highlands, valleys, lowlands), and according to the type of agriculture (traditional, modern, livestock) affecting capital and land factors.
 - ✓ Non-agricultural damages are integrated on a sectoral basis in the sectors that have recorded damages (transport, electricity, water and gas, forestry and fishing, construction, commercial and social services)
- ❑ **External shock** on international agricultural prices.
 - ✓ It takes into account an increase in the international prices of agricultural and livestock products due to climate change (Nelson et al., 2009)

Agricultural sectors

Agricultural production is the most affected, with a drop of 16%.

By type of crops:

Traditional agriculture recorded the largest decline in production (-21.81%), followed by **livestock production** (-10.17% and), to a lesser extent, **modern agricultural production** (-7.31%).

These results are in agreement with other studies that used CGE models to assess climate change in Bolivia (Vizcarra et al. (2018); Jemio et al. (2014))

However, unlike Jemio et al. (2014), who reported the most severe effects on industrial agriculture we found the greatest damage in traditional

At regional level:

- ❑ **Highlands, where traditional agricultural production is predominant, is the most affected region**, with production losses of over 20%.
- ❑ In the valleys, it is livestock and modern production that records the most significant losses (around 8%).
- ❑ In the lowland region, records the smallest losses with modern agricultural production being the least affected.

Non-Agricultural sectors

- ❑ The directly affected sectors also experience significant production losses (transport, electricity, water and gas, forestry and fisheries, construction, commercial and social services).
- ❑ However, the effect spills over to all sectors through indirect channels. In particular to two of them: trade and the food industry, which record losses of 4% to 6%.

Macro Results

- ❑ As production is affected in almost all sectors of the economy, the demand for labour and capital is reduced, leading to a decrease in the employment rate (-0.16.%)
- ❑ The decline in production leads to a shortage of products, particularly those agricultural, leading thus, to an increase in the prices of final goods. Consumer price index (+6.42%)
- ❑ Household real consumption budget decreases, especially in female-headed households (-3,5% vs -3.7%)
- ❑ Real GDP decreased by 3.8%.

Gender impacts on the labor market (Formal and Domestic markets)

Impact of climate change on formal and domestic employment by gender (percentage change from base)

Gender	Formal Work	Domestic Work
Male	-0.15	1.05
Female	-0.15	1.30

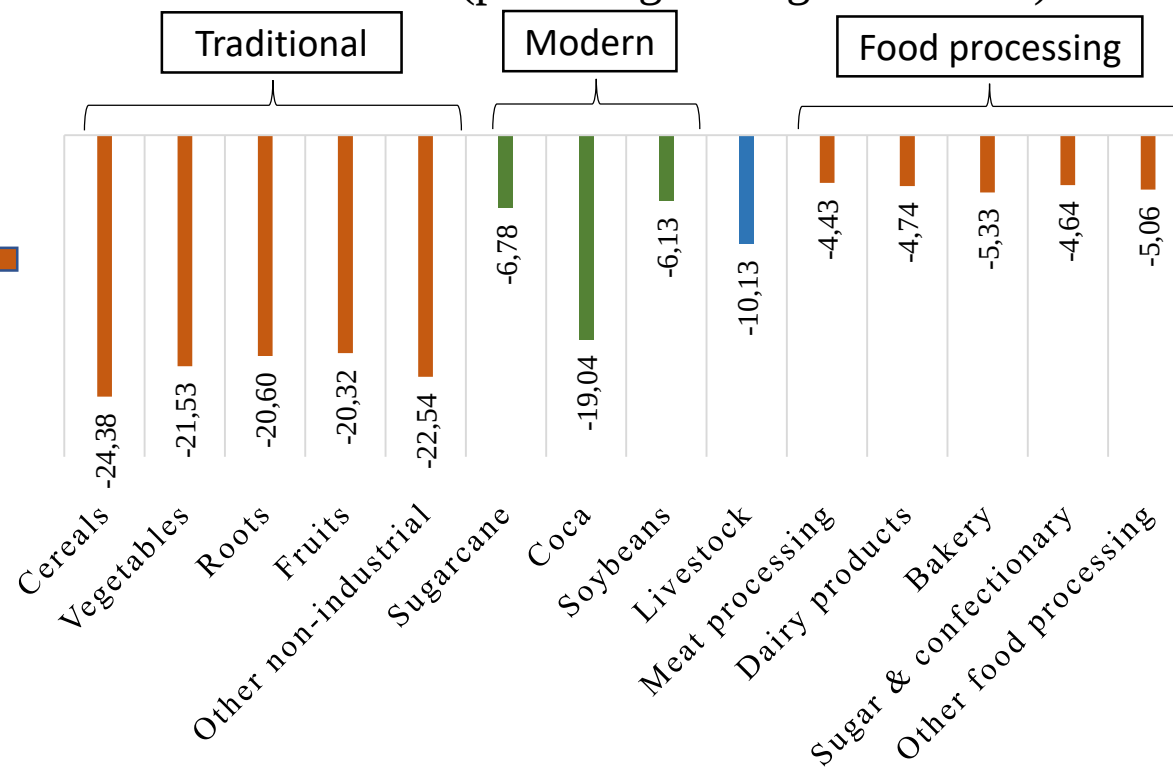
Impact of climate change on the female labour market by region and skills (percentage change from base)

Location	Skilled female labour		Unskilled female labour	
	Formal work	Domestic work	Formal work	Domestic work
Highlands	-0.50	2.00	-2.92	2.73
Valleys	-0.54	2.17	-2.99	2.74
Lowlands	-0.75	2.97	-3.32	1.98
Total	-0.61	2.42	-3.07	2.44

Effects on food security

Given that the results reveal particularly negative effects on the agricultural sector, food security is affected in multiple dimensions:

Supply of agricultural and food production for the domestic market (percentage change from base)

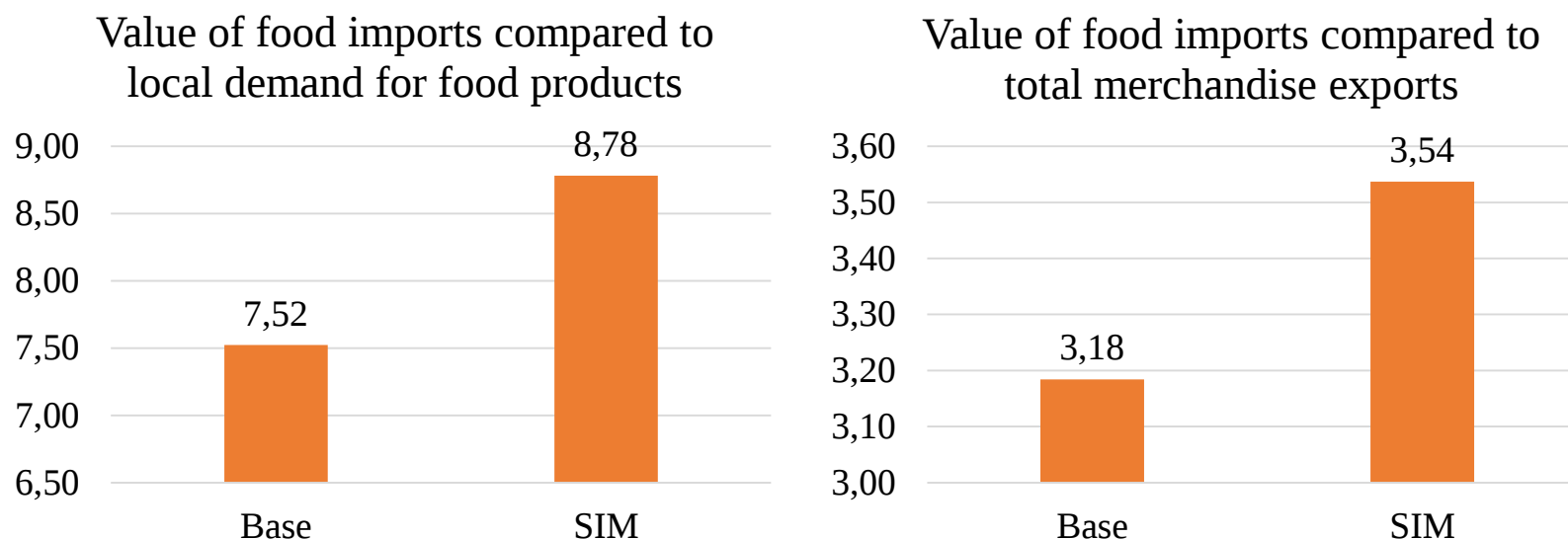


Food availability in the highlands region shows the largest declines

**Food security
In terms of food
availability**

Effects on food security

- Declining food production for the local market creates a shortage of local food supply which is covered by an increase in imports, increasing the risk of food insecurity as measured by dependence on foreign imports



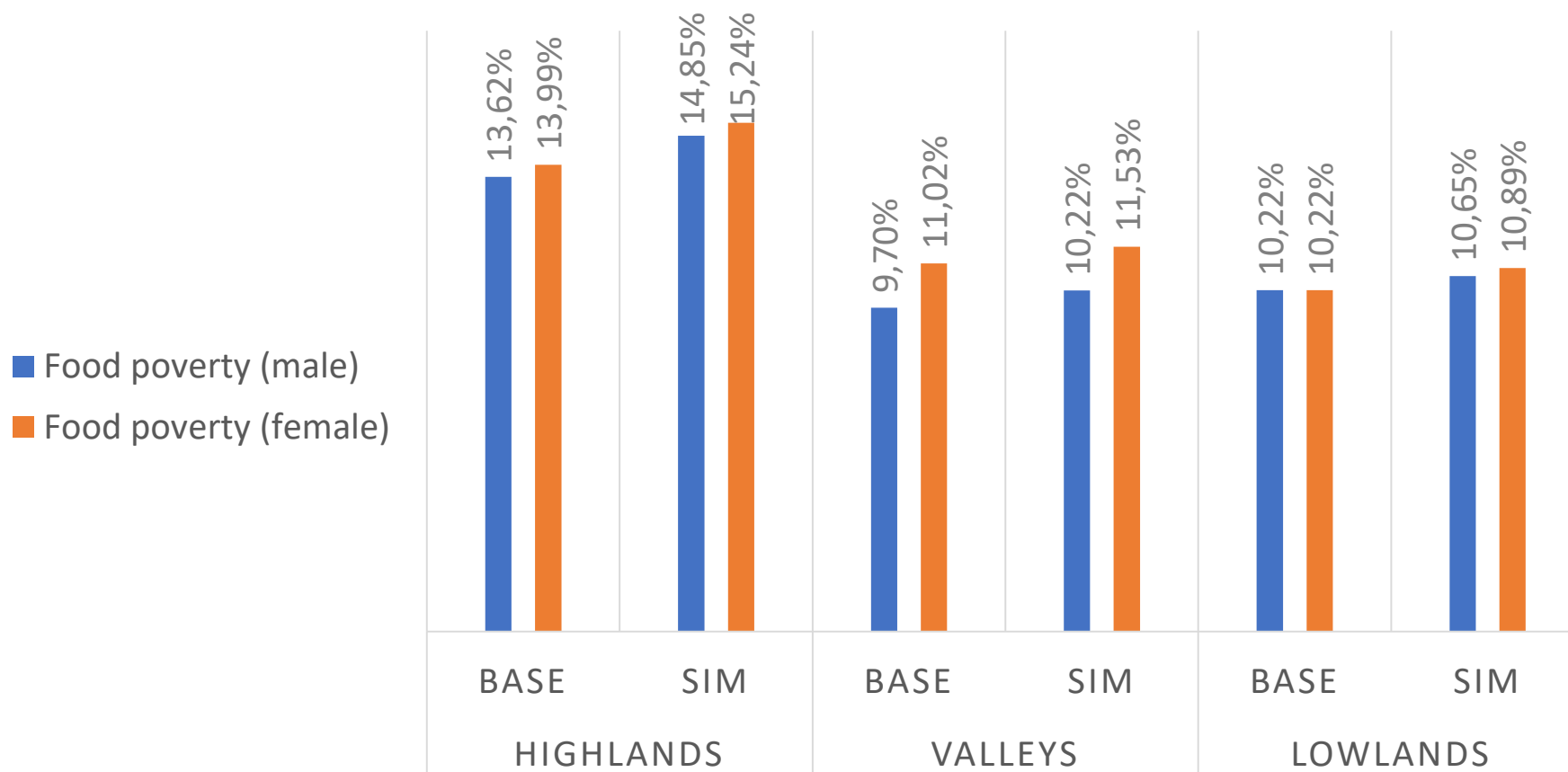
Food security
In terms of food
vulnerability

- Increase in local prices and increase in international agricultural prices (CC shock), lead to a reduction in food consumption.
- Female-headed households experience greater decreases in food consumption than men, especially in the highlands and in traditional products such as cereals, fruits and vegetables.

Food security
In terms of food
access

Effects on food poverty

Effects of the climate scenario on food poverty by region and gender type (in percentage)



- ❑ This study provides some ideas on the effects that climate change may have on the labour market, food security and food poverty levels in Bolivia.
- ❑ In the labor market, women are more affected than men, due to greater reductions in the formal market and increases in their domestic work, especially when they are unskilled.
- ❑ Climate change reduces local agricultural supply, affects food prices and negatively impacts multiple dimensions of food security.
- ❑ Food insecurity and food poverty among women, and men to a lesser extent, are increased by food commodity inflation that leads to reductions in consumption of staple foods (cereals, vegetables, root crops).

- ❑ Our results suggests that agricultural products are very sensitive for the Bolivian population, especially for women in the highlands.
- ❑ Our results also suggests that gender and regional gaps (formal and domestic market), and food insecurity may worsen in a context of climate change.
- ❑ These last 2 aspects should be taken into account in the adoption of climate mitigation measures that are at the same time aimed at reducing regional and gender gaps in Bolivia (An integrated policy approach is required).
- ❑ Priority should be given to protecting and investing in climate adaptation of traditional basic crops to ensure food security (cereals, vegetables, root crops).

**Thanks for your
attention**