ApPL: THE AGROPASTORALIST POLICY LAB

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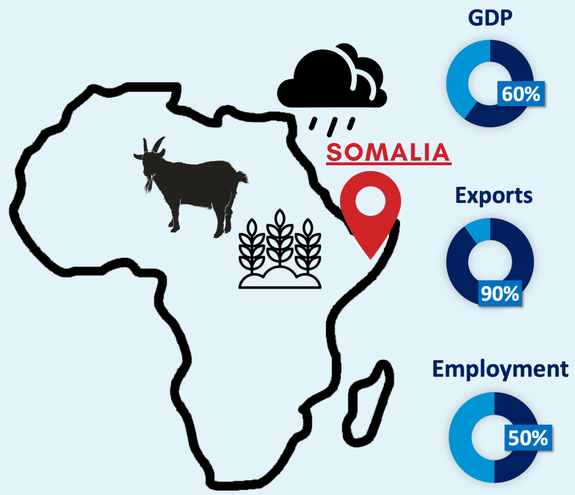
Analyzing the impacts of drought on rural Somalia and its policy implications

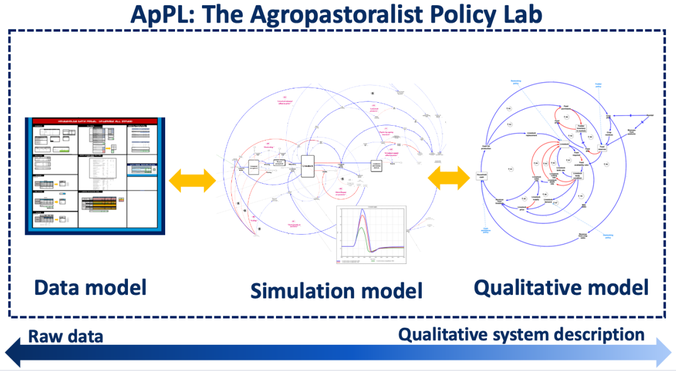
Worst drought in Somalia's history [1]

Agropastoralists are rural populations that engage in rainfed agriculture and pastoral (transhumant livestock raising) activities. In Somalia, they **compose 30-40% of all rural populations**, relying on **farming** to provide **half of their caloric needs**, and on the **sale of livestock and milk** to generate **most of the household income.**

In Somalia, agricultural and livestock activities comprise ~60% of GDP, ~50% of employment opportunities, and ~90% of the country's exports.
Prolonged droughts have devastating impacts on Somali lives and livelihoods. **In 2022 alone**, an estimated **~43,000 people have died** (half of which were children) as a result of the deteriorating food security situation [2].

Humanitarian organizations operating in Somalia need to **deploy humanitarian aid under budgetary constraints and time pressure.** The need to optimize on scarce aid budgets has become a serious practical problem **warranting policy models that can help make allocation decisions under uncertainty.**

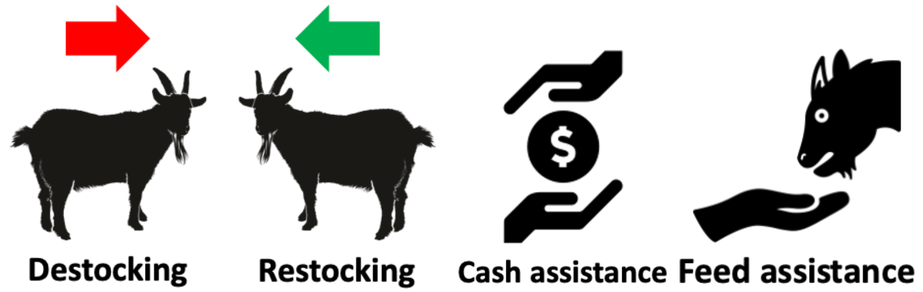




An agile approach to model building, analysis, and validation

We developed a practically-oriented, equilibrium-based agile framework for policy analysis building on an existing model from [3] facilitating quick model development and validation, the Agropastoralist Policy Lab (ApPL). This framework accommodated uncertainty in data and model structure while iterating on the model formulations and conducting multiple rounds of data collection. Its key focus was speed in model development and analysis using the model as a shock-simulator.

The key features of ApPL are:
1. **Readily testable** whenever a numerical assumption is changed in the data model
2. **Continuity between CLD and SFD** for communication
3. Layered model supporting **story-telling**
4. Data model checking the **internal consistency of baseline assumptions** from multiple sources
5. Available as an **online app** powered by **SDEvereywhere**



Four policy options

NGOs with livestock programs in Somalia such as **Mercy Corps**, the sponsor of this project, often need to **weight the tradeoffs between multiple response alternatives (policy options)** when deciding where to **allocate their limited aid budgets during and after a drought disaster.**

The objective of Mercy Corps' response is to **improve the resilience of agropastoral households** to a given drought shock by:

1. **Reducing loss in household assets** (livestock, land, and cash)
2. **Reducing the loss in value of livestock during the drought** as a result of market shocks
3. **Improving the food security of households** during and after the drought (crisis and recovery)
4. **Improving the speed at which households rebuild their herds** post drought

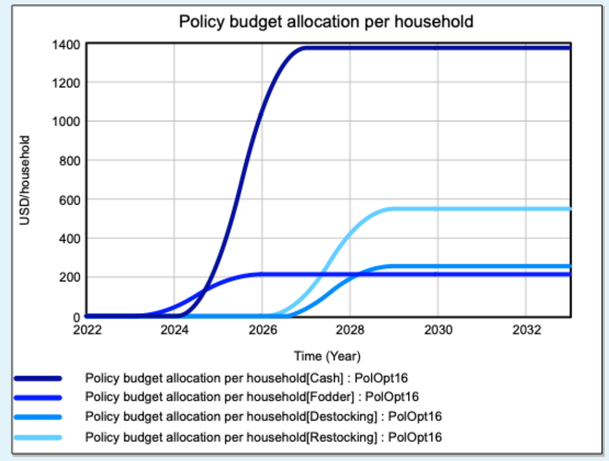
Results

Preliminary results suggest that **cash assistance is the best policy option** to Mercy Corps when providing drought-related aid to Somali agropastoralists during the drought **(>50% of total aid budget allocation), assuming a singular fodder market. Fodder and destocking policies introduce** competition with households for a limited feed market supply which may result in price gouging. Households would thus receive less fodder than they would have absent the interventions (**unintended consequences**).

Cash is flexible and can be used by households to purchase grain or fodder depending on the household priorities. **It is also easier to distribute and monitor, reducing leakages (i.e. misappropriation of funds).** It thus has a higher chance of reaching the vulnerable households targeted by Mercy Corps' aid effort. **Cash assistance can begin with the first missed rainy season**.

The second best policy option is restocking (~25% of total aid budget allocation), where live animals are granted to households post drought to help households rebuild their herds after the first rain. This policy also minimizes unintended consequences of competing with households for fodder in the marketplace.

Fodder and destocking policies seem to be of comparable effectiveness, and our **future analysis will experiment with different scenarios of sourcing of fodder for each policy, in addition to an import option from nearby drought-unaffected regions/ countries.**



Our estimated aid budget was **833 USD/Household/ droughtyear.** Our optimization problem was to determine the allocation of such budget across the four policy options, and their timing, for a typical poor-middle income agropastoralist household subject to a three year drought (2023-2026) of 6 missed rainy seasons. **Our objective,** outlined above, **was improving household resilience to the drought shock.** We used stochastic optimization [4] in Vensim to incorporate uncertainty about model parameters into our analysis.

Notes

[1] United Nations. (2023, February 8). Somalia: $2.6 billion appeal to support millions amid historic drought and famine fears.
[2] The New York Times. (2023, March 20). First Official Estimate of Somalia's Drought Shows 43,000 Dead. The New York Times.
[3] Herrera de Leon, H. J., & Kopainsky, B. (2020). Do you bend or break? System dynamics in resilience planning for food security. System Dynamics Review, 35(4), 287–309.
[4] Moxnes, E. (2015). An introduction to deterministic and stochastic optimization. In Analytical methods for dynamic modelers. MIT Press.