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Web-based simulation interfaces as decision support tools for livestock systems

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Summary

Tools that can facilitate effective communication of research findings in a simplified and user-friendly manner are essential to support the setting of priorities and implementation of interventions recommended in research. However, the methodologies used in research are often technically complex and may not be easily comprehended by non-technical stakeholders. Hence, there is a need to simplify the complex models, make them readily accessible and use innovative ways to de-jargonize research findings to reach non-technical audiences.

In a bid to support livestock systems stakeholders in making informed decisions based on the findings of research conducted by scientists at the International Livestock Research Institute, three web-based simulation interfaces have been designed from fully calibrated system dynamics (SD) models as prototypes of future decision support tools. The purpose of designing the simulation interfaces is to translate the SD models developed for different livestock systems into simplified, user-friendly tools that non-modellers can use as planning and learning tools to inform their decision-making processes.

This report presents a description of the web-based simulation interfaces developed from the SD models on the backyard poultry production system in Ghana, the inter-country beef trade between Ghana and Burkina Faso, and the small ruminant production system in Somaliland. The how-to-do guide for each interface is also provided to guide potential users. The features of the interfaces were appraised by selected value chain experts from 10 countries. The appraisal will inform the design of future decision support tools for livestock value chain modelling. The developed simulation interfaces can serve as an extension, educational and planning tool within specified jurisdictions and inspire the replication of strategies and results in different geographical contexts.

1 Introduction

Livestock system stakeholders are among the envisioned end users of livestock research findings and recommendations (Kijazi et al. 2021). Hence, effective communication of research findings to these stakeholders is crucial for prioritizing and implementing interventions recommended in the research. There is a need for tools to help stakeholders understand research findings and use these findings to guide and inform their decision-making processes. Such decision support tools should be easy to use by non-technical stakeholders and readily accessible. Methodologies that enhance stakeholders' participation in the research processes also increase stakeholders' acceptance of research findings (Coletta et al. 2021). However, the methodologies used in research are often very technically complex and may not be easily comprehended by non-technical stakeholders.

System dynamics (SD) modelling is a methodology that facilitates stakeholders' participation as an integral part of the modelling process (Coletta et al. 2021). Although stakeholders are involved in the modelling process, the translation of outputs from the modelling process into fully functional SD models is mainly performed by modellers with technical expertise. Thus, the SD models produced are complex and cannot be easily comprehended by non-modellers. With technological advancements, however, complex SD models can be translated into simplified, user-friendly simulation interfaces.

This report presents three web-based simulation interfaces developed from fully calibrated SD models designed by scientists of the Policies and Foresight Team at the International Livestock Research Institute. The purpose of designing the simulation interfaces is to translate the SD models developed for different livestock systems into simplified, user-friendly tools that non-modellers can use as planning and learning tools to inform their decision-making processes. The fully calibrated SD models have resulted in three peer-reviewed journal articles highlighted in this report. These models concern the backyard poultry production system in Ghana; the inter-country beef trade between Ghana and Burkina Faso; and the small ruminant production system in Somaliland.

The interfaces were presented to selected value chain experts from 10 countries for their appraisal of the usefulness of the different features of the interface. The appraisal of the interfaces will inform the design of future decision support tools for livestock value chain modelling. Also, the developed simulation interfaces can serve as an extension, educational and planning tool within specified jurisdictions and inspire the replication of strategies and results in different geographical contexts.

The remaining sections of this report are as follows. The common features of the three web-based simulation interfaces are discussed in section 2, and the synopses of the fully calibrated SD models and the possible scenarios that can be formulated are presented in section 3. Section 4 covers the how-to-do guide, after which the appraisal of the interfaces and the conclusions drawn are presented in section 5.

2 Models in brief

The web-based simulation interfaces designed from fully calibrated SD models serve as the frontend for the backend SD models. These interactive interfaces are designed to answer specific research questions for specific geographical contexts and serve as a real-time platform for conducting ex-ante analysis. Thus, the interfaces can be used as educational, extension and planning tools within the specified jurisdictions.

The simulation interfaces are developed in the STELLA Architect® software and hosted in the isee Exchange™. Therefore, users of the interfaces do not need the software to run the model simulations. The interfaces allow non-modellers to perform sensitivity and scenario analyses by altering key parameters to explore the impact on specific outputs. Also, the simulation interfaces facilitate the comparison of baseline levels of an output of interest (main objective) with the resultant levels of the output after performing different sensitivity and scenario analyses.

2.1 General features

The web-based simulation interfaces consist of two types of pages.

Landing page: A synopsis of the SD model description is presented on the landing page to provide users with an overview of the main module interaction in the SD model. The synopsis highlights the following: objective, main outputs of interest, context (study area), model segmentation (sectors/modules), timesteps (e.g., daily/weekly/monthly/annually) and simulation duration.

The landing page has a navigation button ("Let's go!") that leads to the simulation page(s). An animated video is provided on the landing page to guide potential users in how to use the interface. Links to the published journal articles containing the full model description and the data used for the model parameterization are also available on the landing page.

Simulation page(s): Different scenarios can be formulated on these pages by altering the values of key parameters, and the results of the output(s) of interest are displayed. The simulation page presents key parameters of interest in different alterable widgets. These widgets can be presented as gauges, numeric displays, sliders, knobs and radio buttons.

The simulation page has three action buttons – "**Run**", "**Pause**" and "**Restore outputs**" – as well as the navigation buttons "**Back**" to return to the landing page and "**Next**" to move to another simulation page.

- **Run** – an action button that starts the simulation.
- **Pause** – an action button that halts simulation runs and resets the parameters to their baseline levels.
- **Restore outputs** – an action button that resets the output values and prepares the interface for another simulation.

2.2 Three types of a simulation run

The simulation interfaces are hosted on the isee Exchange™ platform and can be freely accessed via specific links. After accessing an interface, the user can follow three steps to perform a flight simulation.

1. *Baseline definition* – the models are run to determine the baseline levels of the different outputs by clicking on the "**Run**" button to start the simulation run. It is worth noting that these baselines are based on the fully calibrated SD model. During the simulation run, the "**Pause**" button can be used to halt the model and reset the model parameters to their baseline levels.
2. *Scenario alteration* – the baseline values of key parameters can be altered by adjusting scales or directly entering the revised values in the scenario widgets. Possible scenarios that can be developed are described in Section 3. The plausibility of scenarios developed by altering the scenario widgets is within the purview of the user.
3. *Re-simulation* – the model is re-simulated by clicking "**Run**". The comparative graph showing the baseline and the new values generated from the re-simulation displays the impact of the scenario on the baseline. The "**Restore outputs**" button is used to clear all the results and prepare the interface for another scenario alteration. Users must click the "**Pause**" and "**Restore outputs**" buttons before starting a new simulation game.

3 Web-based simulation interfaces

Three web-based simulation interfaces were developed for three fully calibrated SD models: (*i*) Backyard poultry production system; (*ii*) Inter-country beef trade between Ghana and Burkina Faso; and (*iii*) small ruminant production system in Somaliland. The synopses of the SD models and the links to the interfaces are presented in the following subsections.

3.1 Backyard poultry production system

The backend (full model description) of this simulation interface is the work by Aboah and Enahoro (2022). This SD model was developed to examine the impact of different production strategies on on-farm profitability in Ghana[1]. Two types of farm households were considered – good agricultural practices (GAP)-adopting and non-GAP-adopting farm households[2]. The SD model contains an interaction of production, financial, epidemiological and consumption modules that are designed at different levels. The production module, modelled at an individual farm level, captures the effect of production decisions on on-farm productivity (measured as the number of eggs and live chickens produced and sold by farm households).

The production module also highlights the transition of day-old chicks to growers and adults. The production module is compartmentalized into layer and broiler sectors to highlight the primary differences in the rationale for keeping chickens (for eggs or meat). The financial module is modelled at an individual farm level and captures the financial implications of production decisions such as feeding, vaccination costs and sales. The epidemiological module highlights disease transmission and the deaths due to these diseases. The on-farm profitability over time is the reference output. The model simulation runs for 52 weeks (one calendar year) at a weekly timestep.

3.1.1 Scenarios

The interface has a landing page (shown in Figure 1) and two simulation pages. One simulation page is for scenario development, and another simulation page is to assess the impact of external economic shocks on on-farm profitability. For this simulation interface, users can run simulations for two types of scenarios:

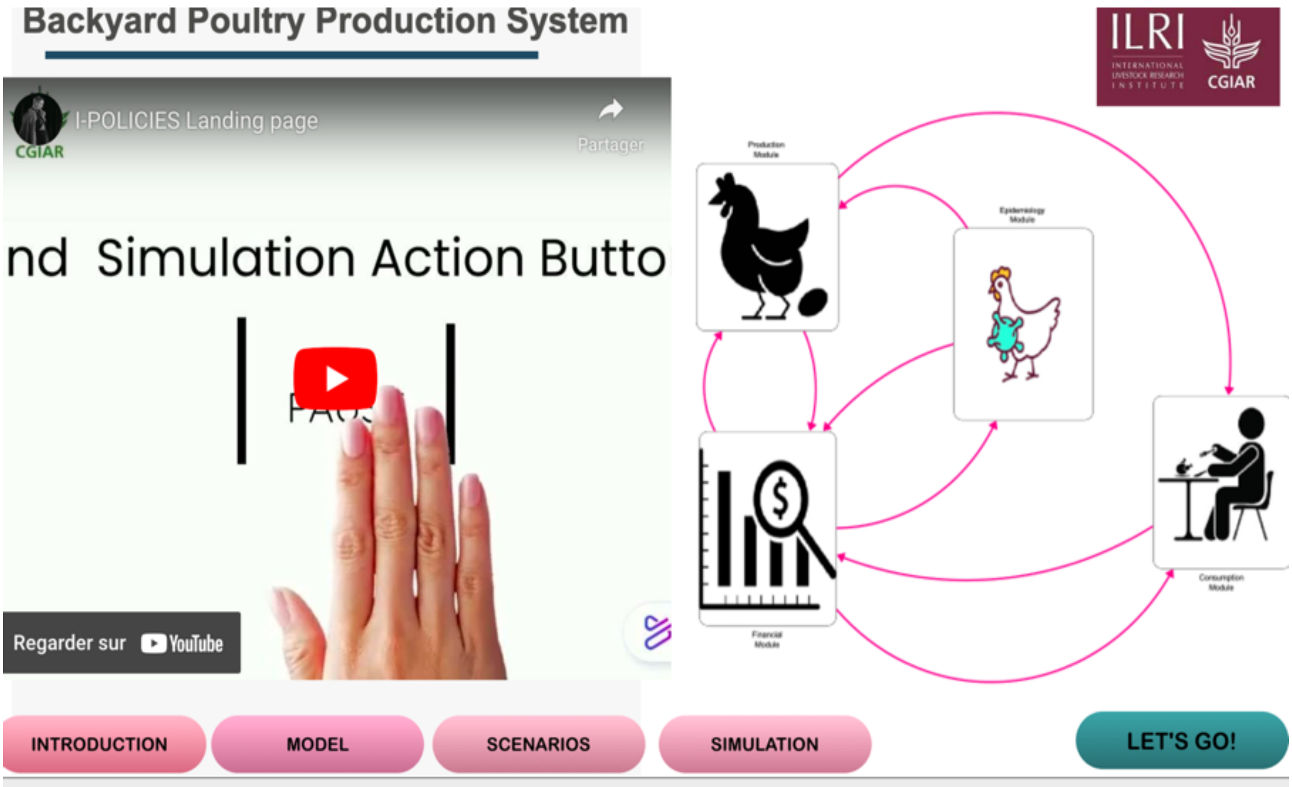
1. comparing the adoption of meat-only, egg-only, and mixed meat and egg production strategies. The production strategies are achieved by altering the proportion of day-old chicks purchased based on sex. For the meat-only production strategy, the ratio of male to female day-old chicks purchased is set to 1:0; for the egg-only production strategy, the ratio is set to 0:1; and for the mixed production strategy, the ratio is set to 0.5:0.5.

1. The full model description is available at https://doi.org/10.1016/j.agsy.2022.103475.

2. Farm households that give the requisite feeding ration and vaccinate birds are classified as GAP-adopting farm households. Those that engage in suboptimal feeding ration and do not vaccinate birds are classified as non-GAP-adopting farm households.

2. a homegrown day-old hatchery scenario is achieved by altering the baseline values of the proportion of eggs sold and the proportion of laying stocks reserved for breeding purposes.

Figure 1. Landing page of the backyard poultry system interface.



Source: Joshua Aboah/ILRI.

Link to Interface: https://exchange.iseesystems.com/public/jaboah/backyard-poultry-system

3.2 Inter-country beef trade (Ghana–Burkina Faso)

The work by Rich and Wane (2021) is the backend for this simulation interface. This SD model was developed to explore the prospective competitiveness and benefits of exporting beef from Burkina Faso to Ghana rather than live animals[3]. The SD model is composed of an integrated herd dynamics module and trade dynamics module (for meat and offal) modelled at an aggregated national level. These model components are built separately for the two countries (Ghana and Burkina Faso). The volume of trade is determined by the herd population growth in the herd dynamics module. The volume of trade influences the demand, supply and prices at which trade occurs in the trade dynamics module.

There is a feedback effect of price movement of production decisions (i.e., farmers' decision to sell) in the herd dynamics module, and the volumes of imports from other countries (in the trade dynamics module). The landed price of offal imported from Burkina Faso to Ghana and the world price of offal are the reference outputs. The model simulation runs for 10 years at a monthly timestep.

3. The full model description is available at https://doi.org/10.3389/fvets.2021.619044.

Figure 2. Landing page of the inter-country beef trade (Ghana–Burkina Faso) interface.

Source: Joshua Aboah/ILRI.

3.2.1 Scenarios

This simulation interface has one landing page (shown in Figure 2) and two simulation pages. Three scenarios can be formulated on the first simulation page: (i) improved pricing flexibility to determine the impact of pursuing a high-value market via different cuts; (ii) improved on-farm productivity by increasing the average weight of animals produced in Burkina Faso from the baseline value of 240 kg; and (iii) reduction of the marginal cost of processing in Burkina Faso. A combination of these three scenarios can also be formulated.

The second simulation page has widgets that can be altered to assess the impact of two macroeconomic shocks: *(i)* the adoption of the eco as a common currency in Ghana and Burkina Faso, meaning there is no depreciation of the Ghanaian cedi against the CFA franc; and *(ii)* increased landed cost of offal exports from another market apart from exports from Burkina Faso.

Link to interface: https://exchange.iseesystems.com/public/jaboah/intercountry-cattle-beef-trade-ghana-and-burkina-faso

3.3 Trade restriction on small ruminant sub-sector (Somaliland)

This simulation interface is based on the work by Mtimet et al. (2021). The fully calibrated SD model, compartmentalized into five modules of pasture production, herd dynamics, breeding, export marketing, and domestic marketing modules, was developed to assess the economic cost and social implications of partial export bans (from Saudi Arabia, the largest importer of sheep and goats) and the COVID-19 pandemic on Somaliland's small ruminant sub-sector[4].

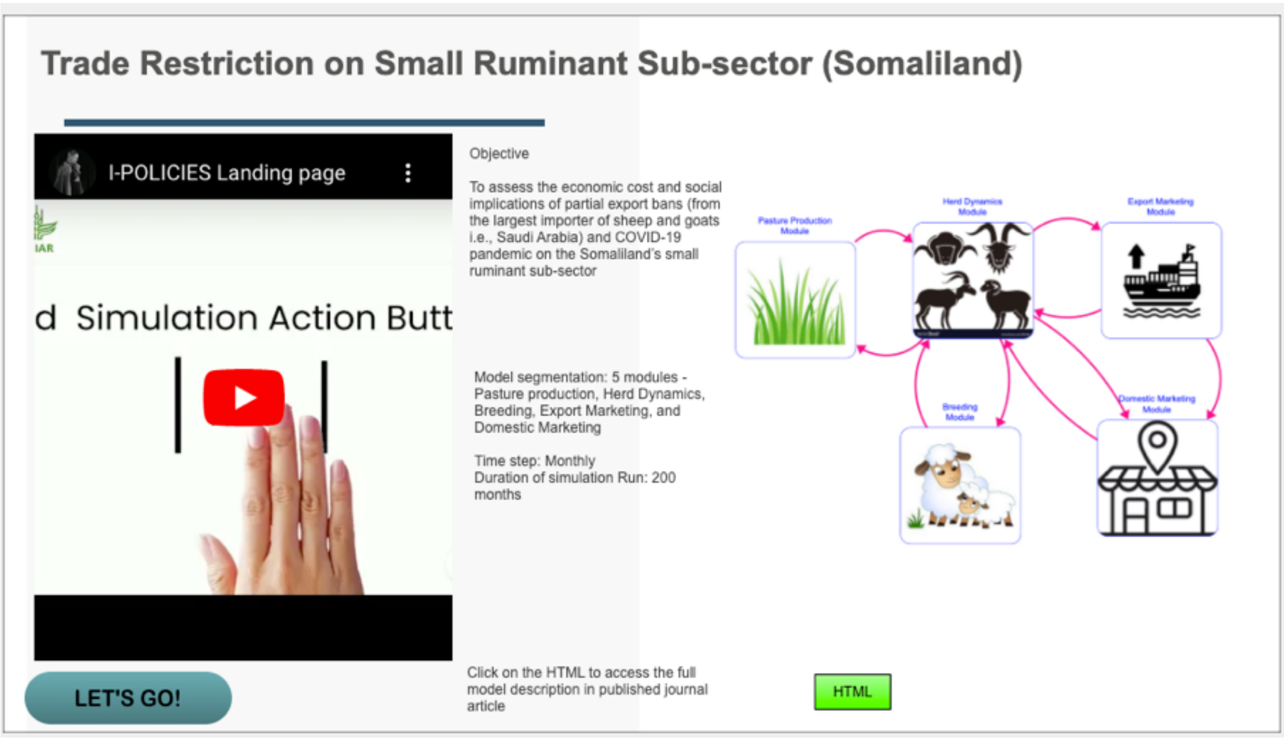
4. The full model description is available at https://doi.org/10.1016/j.gfs.2021.100512.

The forage produced in the pasture production module is used to feed animals in the herd dynamics module, and the level of consumption in the herd dynamics module influences feed availability. The grazing pressure influences the regeneration of degraded range lands. The feedback effect of land use is also captured in the model. Female animals in the herd dynamics module are inputs for the breeding stock in the breeding module. Male animals in the herd dynamics module are exported; thus, they become inputs for the export marketing module. Culled females and domestic-grade males are sold on the domestic market. The reference outputs for this model are total export earnings and total earnings from local sales. The model simulation runs for 200 months at a monthly timestep.

3.3.1 Scenarios

The simulation interface has a landing page (shown in Figure 3) and two simulation pages. The first simulation page is for two scenarios: (*i*) livestock bans because of animal health concerns in Saudi Arabia, formulated by changing the import ban from zero (no ban) to one (ban is in place); and (*ii*) changes in the sacrificial animal value chain, formulated by altering the fraction of people sacrificing animals.

Figure 3. Landing page of the trade restriction on small ruminant sub-sector (Somaliland) interface.



Source: Joshua Aboah/ILRI.

The second simulation page allows the user to assess the impact of external shocks on the key reference outputs. The shocks that can be introduced include: (*i*) increasing population in Somaliland, simultaneously causing per capita consumption to increase locally; (*ii*) altering per capita consumption in Saudi Arabia; and (*iii*) altering the fraction of exports from Somaliland to Saudi Arabia. Other shocks concern land use and feed availability. These shocks are introduced by altering the average household size, palatable pasture fraction, per capita charcoal demand and fractional birth rate (for population growth in Somaliland).

Link to interface: https://exchange.iseesystems.com/public/jaboah/trade-restriction-on-small-ruminant-sub-sector-somaliland

4 How-to-do guide

The how-to-do guide follows a flight simulation format. Three different flight simulation exercises are presented for the developed interfaces. The instructions provided will guide users in performing the flight simulation. Users are expected to answer questions after a series of simulation steps. The output from the simulation run can be saved by right-clicking the graph generated on the simulation page and selecting "Save as image" from the drop-down menu.

4.1 Flight simulation for backyard poultry production system

Instructions

1. Load the web-based simulation interface for backyard poultry at https://exchange.iseesystems.com/public/jaboah/backyard-poultry-system.
2. Click on the YouTube video to view an animation that provides an overview of the simulation interface. Read the synopsis to understand key aspects of the backend model.
3. For a detailed understanding of the backend model, you can click on the green action button labelled "HTML" to read the published journal article.
4. Click the "Let's go!" navigation button to move to the simulation page.

You are now on the simulation page[5].

1. Click on the "Run" action button to generate the baseline results (labelled "Run 1").

Question 1

What are the similarities and differences between the profit obtained by GAP farmers and non-GAP farmers for Run 1?

Start a new scenario. You want to advise farmers to adopt a higher-meat production strategy.

1. Change the widget for "bird gender proportion (external purchase) Male" from 0.5 to 0.7 and the corresponding "bird gender proportion (external purchase) Female" from 0.5 to 0.3. Perform the same changes for both GAP (black widget) and non-GAP adopters (green widget).
2. Click on the "Run" action button to generate the new results (labelled "Run 2").

5. Note that the key output indicator is the poultry farmers' profit over time. Two farmer types are considered. GAP farmers are those that follow the prescribed production management practices, and non-GAP farmers are those that do not follow the prescribed production management practices.

Question 2

What are the similarities and differences between the profit obtained by GAP farmers and non-GAP farmers for Run 2? Compare the results for Runs 1 and 2.

You want to advise farmers to adopt a meat-only production strategy.

1. Click on the “Pause” action button to return to the baseline.
2. Change the widget for “bird gender proportion (external purchase) Male” from 0.5 to 1 and the corresponding “bird gender proportion (external purchase) Female” from 0.5 to 0.
3. Perform the same changes for both GAP (black widget) and non-GAP adopters (green widget).
4. Click on the “Run” action button to generate the new results (labelled “Run 3”).

Question 3

What are the similarities and differences between the profit obtained by GAP farmers and non-GAP farmers for Run 3? Compare the results for Runs 1, 2 and 3.

You want to advise farmers to adopt an egg-only production strategy.

1. Click on the “Pause” action button to reset the variables to the original (baseline) values.
2. Change the widget for “bird gender proportion (external purchase) Male” from 0.5 to 0 and the corresponding “bird gender proportion (external purchase) Female” from 0.5 to 1.

Perform the same changes for both GAP (black widget) and non-GAP adopters (green widget).

1. Click on the “Run” action button to generate the new results (labelled “Run 4”).

Question 4

What are the similarities and differences between the profit obtained by GAP farmers and non-GAP farmers for Run 4? Compare the results for Runs 1, 2, 3 and 4.

Question 5

After performing these simulations, what can you say about the production strategy that the farmers were adopting in the baseline scenario?

Question 6

Which production strategy will you recommend to farmers and why?

Now, perform a new scenario. You want to advise farmers to adopt a homegrown day-old chick production strategy.

1. Click on the “Pause” and the “Restore outputs” action buttons to clear the results canvas and reset the variables to their baseline values.
2. Click on the “Run” action button to generate the baseline results (labelled “Run 1”).
3. Change the slider “breeding stock reserve rate” from 0 to 0.5 and change the widget “proportion egg sold” from 0.8 to 0.5. Perform the same changes for both GAP (black-coloured widgets) and non-GAP adopters (green-coloured widgets).

4. Click on the “Run” action button to generate the new results (labelled “Run 2”).

Question 7

What are the similarities and differences between the profit obtained by GAP farmers and non-GAP farmers for Run 2? Compare the results of Runs 1 and 2.

Question 8

Compare your answers for Questions 7 and 4. What can you say about the results?

Explore the impact of external shocks.

1. Click on the “Next” navigation button to go to a new simulation page.
2. Click on the “Pause” and the “Restore outputs” action buttons to clear the results canvas and reset the variables to their baseline values.
3. Click on the “Run” action button to generate the baseline results (labelled “Run 1”).
4. Change the unit price of an egg from 0.6 to 0.9 (i.e., a 50% increase) and click on the “Run” action button to generate results (labelled “Run 2”).
5. Repeat the procedure by increasing the unit price of an egg from 0.9 to 1.2 (representing a 100% increase) and click on the “Run” action button to generate results (labelled “Run 3”).

Question 9

What are the similarities and differences between the profit obtained by GAP farmers and non-GAP farmers for Run 2? Compare the results for Runs 1, 2 and 3.

1. Click on the “Pause” action button to reset the variables to their baseline values.
2. Change the unit price of poultry from 50 to 75 (representing a 50% increase) and click on the “Run” action button to generate results (labelled “Run 4”).

Question 10

What are the similarities and differences between the profit obtained by GAP farmers and non-GAP farmers for Run 4? Compare the results for Runs 1, 2, 3 and 4.

4.2 Flight simulation for trade restrictions on small ruminant sub-sector (Somaliland)

Instructions

1. Load the web-based simulation interface for trade restrictions on the small ruminant sub-sector at https://exchange.iseesystems.com/public/jaboah/trade-restriction-on-small-ruminant-sub-sector-somaliland.
2. Click on the YouTube video to view an animation that provides an overview of the simulation interface. Read the synopsis to understand key aspects of the backend model.
3. For a detailed understanding of the backend model, you can click on the green action button labelled “HTML” to read the published journal article.

4. Click the "Let's go!" navigation button to move to the simulation page.

You are now on the simulation page[6].

1. Click on the "Run" action button to generate the baseline results (labelled "Run 1").

Question 1

What are the differences between the two indicators?

Start a new scenario. You have decided to explore the potential impact of a ban on livestock from Somaliland in Saudi Arabia, and a partial ban on export from Somaliland.

1. Change the slider for "import ban" from 0 to 1.
2. Click on the "Run" action button to generate the new results (labelled "Run 2").

Question 2

What are the differences between the key indicators for Run 2? Compare the results for Runs 1 and 2.

1. Click on the "Pause" action button to reset the variables to the baseline values.
2. Change the slider for "partial export ban" from 0 to 0.5.
3. Click on the "Run" action button to generate the new results (labelled "Run 3").
4. Change the slider for "partial export ban" from 0.5 to 1.
5. Click on the "Run" action button to generate the new results (labelled "Run 4").

Question 3

What are the differences between the key indicators for Run 4? Compare the results for Runs 1, 2, 3 and 4.

Now, perform a new scenario. You want to explore the impact of changes in the number of animals sacrificed in Saudi Arabia during Hajj.

1. Click on the "Pause" and "Restore outputs" action buttons to reset the variables to the original (baseline) values and clear the results canvas.
2. Click on the "Run" action button to generate the baseline results (labelled "Run 1").
3. Change the widget for "Fraction of pilgrims sacrificing shoats" from 0.57 to 0.6.
4. Click on the "Run" action button to generate the new results (labelled "Run 2").
5. Change the widget for "Fraction of pilgrims sacrificing shoats" from 0.6 to 0.8.
6. Click on the "Run" action button to generate the new results (labelled "Run 3").
7. Change the widget for "Fraction of pilgrims sacrificing shoats" from 0.8 to 0.3.
8. Click on the "Run" action button to generate the new results (labelled "Run 4").

Question 4

Compare the results for Runs 1, 2, 3 and 4. What can you say about the results?

6. Note that the key output indicators are the earnings through local sales and the total earnings from exports. These indicators are measured in US dollars.

Explore the impact of economic and biological shocks.

1. Click the "Next" navigation button to go to a new simulation page.
2. Click on the "Pause" and the "Restore outputs" action buttons to clear the results canvas and reset the variables to their baseline values.
3. Click on the "Run" action button to generate the baseline results (labelled "Run 1").
4. Change the widget for "per capita consumption" from 15 to 20.
5. Click on the "Run" action button to generate the new results (labelled "Run 2").
6. Click on the "Pause" action button to return to the baseline.
7. Change the widget for "per capita demand for charcoal" from 0.13 to 0.2.
8. Click on the "Run" action button to generate the new results (labelled "Run 3").
9. Click on the "Pause" action button to return to the baseline.
10. Change the widget for "average household size" from 4 to 2.
11. Click on the "Run" action button to generate the new results (labelled "Run 4").

Question 5

What are the differences between the key indicators for Run 4? Compare the results for Runs 1, 2, 3 and 4.

4.3 Flight simulation for inter-country beef trade (Ghana–Burkina Faso)

Instructions

1. Load the web-based simulation interface for inter-country beef trade at https://exchange.iseesystems.com/public/jaboah/intercountry-cattle-beef-trade-ghana-and-burkina-faso.
2. Click on the YouTube video to view an animation that provides an overview of the simulation interface. Read the synopsis to understand key aspects of the backend model.
3. For a detailed understanding of the backend model, you can click on the green action button labelled "HTML" to read the published journal article.
4. Click the "Let's go!" navigation button to move to the simulation page.

You are now on the simulation page[7].

1. Click on the "Run" action button to generate the baseline results (labelled "Run 1").

Question 1

What are the differences among the four indicators?

Start a new scenario. You want to advise the Ministry of Agriculture to export live cattle to other West African countries.

7. Note that the key output indicators are the landed price of offal to northern Ghana, the world price of offal, world price of offal to northern Ghana (from other countries), and the landed price of Burkina Faso offal. The indicators are measured in Ghanaian cedis per kilogram.

2. Change the widget for "percentage of offtakes to other West African countries" from 0 to 0.2.
3. Click on the "Run" action button to generate the new results (labelled "Run 2").

Question 2

What are the differences among the key indicators for Run 2? Compare the results for Runs 1 and 2.

1. Change the widget for "percentage of offtakes to other West African countries" from 0.2 to 0.5.
2. Click on the "Run" action button to generate the new results (labelled "Run 3").

Question 3

What are the differences among the key indicators for Run 3? Compare the results for Runs 1, 2 and 3.

Now, perform a new scenario. You want to explore the impact of changes in farm productivity in Burkina Faso.

1. Click on the "Pause" and "Restore outputs" action buttons to reset the variables to the original (baseline) values and clear the results canvas.
2. Click on the "Run" action button to generate the baseline results (labelled "Run 1").
3. After implementing a farm-level intervention, the live weight of animals sold from Burkina Faso increases. Change the widget for "live weight of sold animals BF" from 240 to 300.
4. Click on the "Run" action button to generate the new results (labelled "Run 2").
5. Change the widget for "live weight of sold animals BF" from 300 to 200.
6. Click on the "Run" action button to generate the new results (labelled "Run 3").

Question 4

Compare the results for Runs 1, 2 and 3. What can you say about the results?

Now, perform a new scenario. You want to examine the impact of changes in the processing cost for live cattle.

1. Click on the "Pause" and the "Restore outputs" action buttons to clear the results canvas and reset the variables to their baseline values.
2. Click on the "Run" action button to generate the baseline results (labelled "Run 1").
3. Change the slider "marginal cost shocks" from 0.8 to 0.5.
4. Click on the "Run" action button to generate the new results (labelled "Run 2").
5. Change the slider "marginal cost shocks" from 0.5 to 0.2.
6. Click on the "Run" action button to generate the new results (labelled "Run 3").
7. Change the slider "marginal cost shocks" from 0.2 to 1.
8. Click on the "Run" action button to generate the new results (labelled "Run 4").

Question 5

Compare the results of Runs 1, 2, 3 and 4. What can you say about the results?

Explore the impact of common currency implementation.

1. Click on the "Next" navigation button to go to a new simulation page.
2. Click on the "Pause" and the "Restore outputs" action buttons to clear the results canvas and reset the variables to their baseline values.
3. Click on the "Run" action button to generate the baseline results (labelled "Run 1").
4. Change the "GHS depreciation rate" from 0.05 to 0 (representing the implementation of the eco currency across West Africa) and click on the "Run" action button to generate results (labelled "Run 2").
5. Change the "GHS depreciation rate" from 0.05 to 0.1 and click on the "Run" action button to generate results (labelled "Run 3").

Question 6

Compare the results of Runs 1, 2 and 3. What can you say about the results?

Explore the impact of increased transport margins.

1. Click on the "Pause" and the "Restore outputs" action buttons to clear the results canvas and reset the variables to their baseline values.
2. Click on the "Run" action button to generate the baseline results (labelled "Run 1").
3. Change the "transport margins BF-GH" (i.e., the transportation margin from Burkina Faso to Ghana) from 1.1 to 2.2 and click on the "Run" action button to generate results (labelled "Run 2").
4. Change the "transport margins BF-GH" from 2.2 to 4 and click on the "Run" action button to generate results (labelled "Run 3").

Question 7

Compare the results of Runs 1, 2 and 3. What can you say about the results?

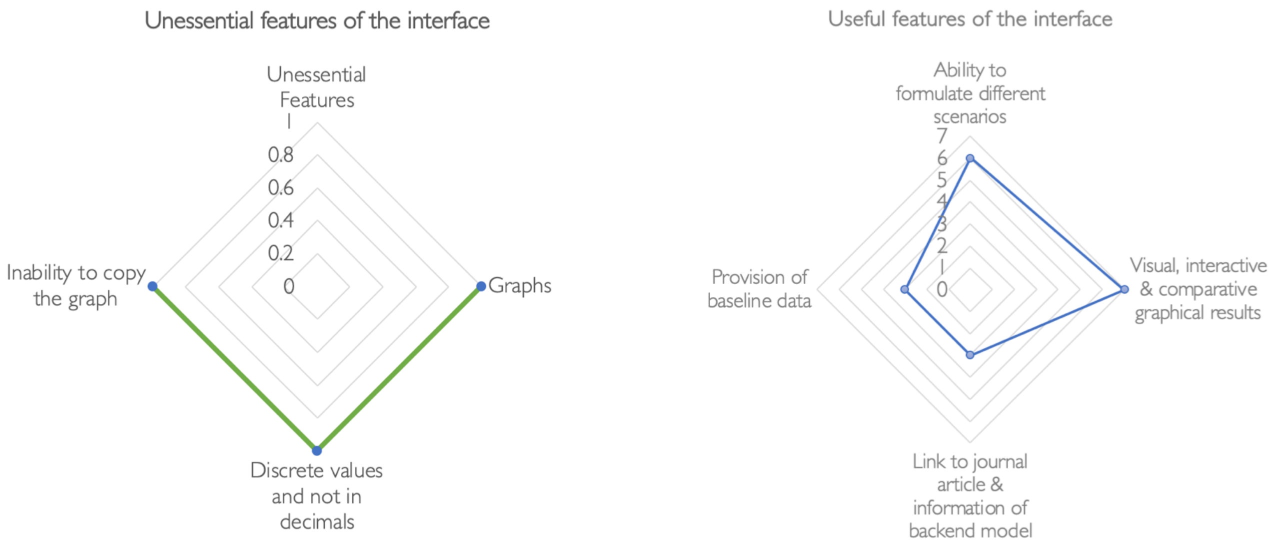
4.4 Appraisal of the simulation interfaces

The three simulation interfaces in this report are presented as prototypes of future decision support tools that can be developed for livestock value chains using the SD modelling approach. Therefore, to improve the usability of future interfaces, 17 users with technical knowledge of livestock value chain modelling were selected from 10 countries (Kenya, Tanzania, Egypt, Botswana, Zimbabwe, Gambia, Cameroon, India, Nepal and France) to appraise the developed interfaces. Figure 4 shows the geographical distribution of the selected users that appraised the developed prototypes.

Following the how-to-do guide, the appraisers performed different flight simulation exercises in two groups. The appraisal of the interfaces focused on identifying the useful and unessential features of the interfaces. Also, the appraisers proposed additional features that can be included in future interface designs. These suggestions are categorized as doable and not applicable features due to the restrictions of the platform for developing the interface. The appraisal process was anonymously conducted by the appraisers using Mentimeter polls. Figure 5 shows a synthesis of the outcome of the appraisal process. The appraisers indicated that the ability to compare results from different simulation runs graphically and interactively is a useful feature of the interface.

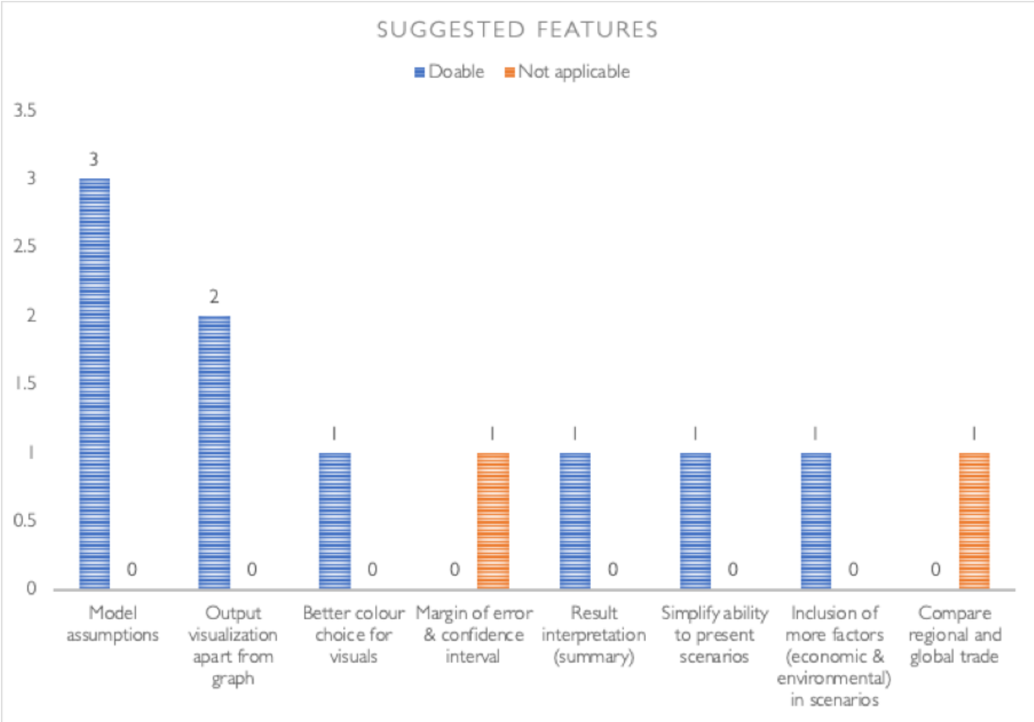
Figure 4. Geographical distribution of appraisers of the interfaces.

Figure 5. Frequency of mentions by appraisers of unessential and useful features.



Other valuable features of the interfaces include the ability to formulate different scenarios; the link that leads to the journal articles providing background information on the backend models; and the provision of baseline data. The provision of discrete result values was deemed an unessential feature. The appraisers suggested the presentation of results with decimals as a better option. Although the graphs can be downloaded and saved as images, the inability to copy graphs directly was also mentioned as a missing feature. Including model assumptions in the interface was the most suggested feature to improve the interpretation of results from the simulation interface (see Figure 6). Other suggestions were not applicable due to the restrictions of the platform for designing the interface. Details of the appraisal outcomes are presented in the Appendix.

Figure 6. Suggested features for future interface designs.



5 Conclusions

This report sought to present three web-based simulation interfaces developed from fully calibrated SD models as prototypes for future decision support tools that can be designed as by-products of the SD modelling process for livestock value chains. The interfaces can support the shortening of the research communication chain between researchers and stakeholders by transforming complex SD models into user-friendly tools and placing research outputs as tools in the hands of decision-makers.

The simulation interface allows livestock stakeholders to perform their own “what-if” analyses in real-time, thereby facilitating a proactive decision-making process. The user-friendly nature of the simulation interface encourages users’ understanding of fundamental SD modelling concepts that shape the backend SD model. This knowledge can help users to define the limitations of how results from the simulation interface can be applied.

The caveat for users of the three simulation interfaces presented in this report is that the plausibility of the scenarios formulated is crucial for harnessing the utility of the simulation interfaces. Consequently, a capacity-building exercise for key livestock stakeholders who can use the developed simulation interfaces in their work is highly encouraged. Although the system dynamics model controlling the frontend simulation interface is developed for specific geographical jurisdictions, the system behaviour emanating from different scenarios and sensitivity analyses can inspire learning for other jurisdictions.

6 References

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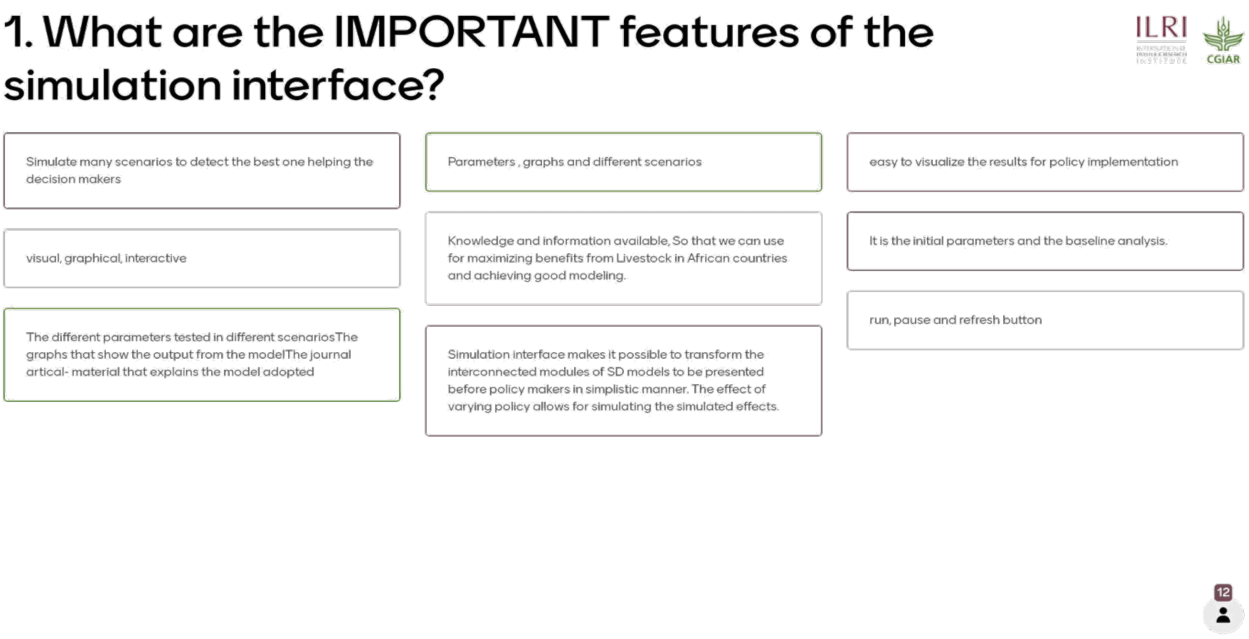
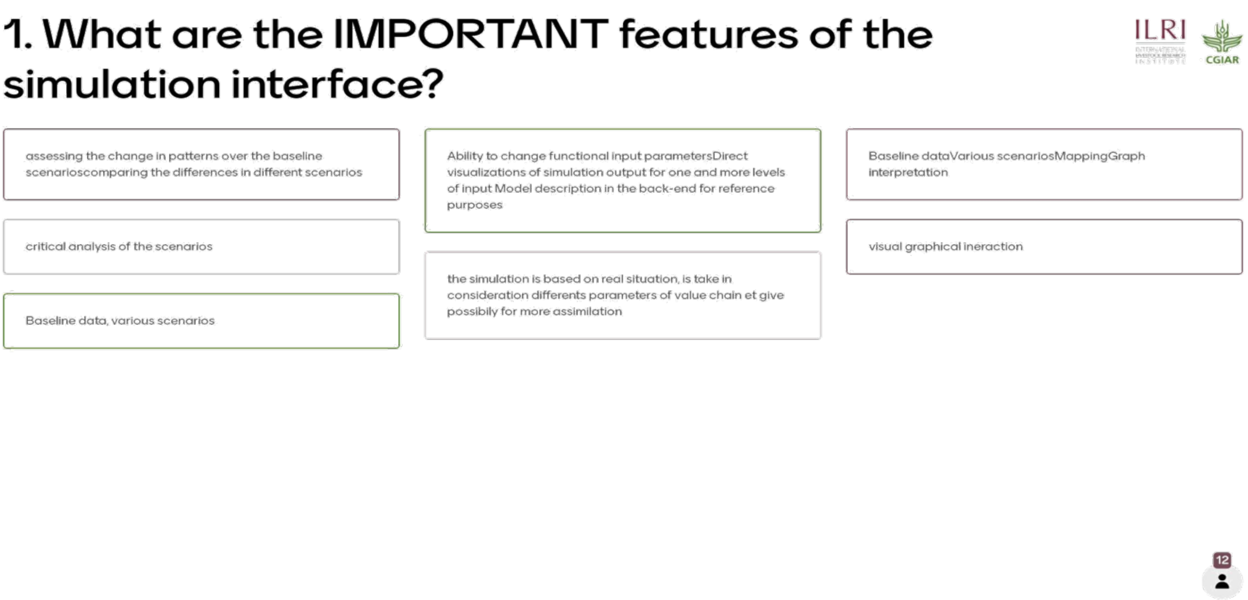
7 Appendix


1. What are the IMPORTANT features of the simulation interface?
ILRI
CGIAR
Simulate many scenarios to detect the best one helping the decision makers
visual, graphical, interactive
The different parameters tested in different scenariosThe graphs that show the output from the modelThe journal artical- material that explains the model adopted
Parameters , graphs and different scenarios
Knowledge and information available, So that we can use for maximizing benefits from Livestock in African countries and achieving good modeling.
Simulation interface makes it possible to transform the interconnected modules of SD models to be presented before policy makers in simplistic manner. The effect of varying policy allows for simulating the simulated effects.
easy to visualize the results for policy implementation
It is the initial parameters and the baseline analysis.
run, pause and refresh button
12


1. What are the IMPORTANT features of the simulation interface?
ILRI
CGIAR
assessing the change in patterns over the baseline scenarioscomparing the differences in different scenarios
critical analysis of the scenarios
Baseline data, various scenarios
Ability to change functional input parametersDirect visualizations of simulation output for one and more levels of input Model description in the back-end for reference purposes
the simulation is based on real situation, is take in consideration differents parameters of value chain et give possibily for more assimilation
Baseline dataVarious scenariosMappingGraph interpretation
visual graphical ineraction
12

2. What are the UNESSENTIAL features of the simulation interfaces?

- Not unessential. But the inherent assumptions behind the SD models SOMETIMES makes inference from results BIT difficult .
- Graphs are not importants it is possible to generate graphs it we have only the prévisionnel datas or the function. On the one hand Graphs are unessential but on the other hand inputs ans parameters are very important (what we see previous question)
- the assumption of the simulation modelling is that people will react the same in given a scenario, which is not practical coz people react differently
- values may few discrete and not in decimals
- Good to have more reproductive and demographic parameters
- Economic impact and effect on benefit from simulation interaction with other tools, to be more applicable.
- All features were essential
- Inability to copy the graph directly without having to download it.More output visualization options besides the line graphs
- The current features are important . What is missing is feature to change parameters

2. What are the UNESSENTIAL features of the simulation interfaces?

- Socio -economic activities
- Margin of error could be an added parameter
- 0.5 in the parameter scale should be don away with
- for me all are essential
- Good to design interface AFTER a discussion with end users of the data not ONLY with users of the interface.

3. What OTHER FEATURES would you like to see in future simulation interfaces?

- Possibility to see the embedded parameters/values when we change the values in the wedges/bars.
- interpretation
- Simple ability to present different scenarios. Again, think of the end user of the data/information and not the users of the interfaces.
- outcome tables with confidence interval
- the different assumptions defining the various scenarios should be clear.
- In fure simulation i would like to see diiferents factors than can influence transaction towards value chain
- reproduction and demographic parameters to describe and characterize the productivity of the animals
- Additional comparison between regional trade vis-a-vis global trade
- - More options for presenting output- Better colour choices that are distinct from each other-Different translations(french) of the video showing the ovrview of simulation interface

12

3. What OTHER FEATURES would you like to see in future simulation interfaces?

- Weather/ Climate, / Environmental factors, disease situation.
- features to allow trade comparison between two or more contries
- Referring to more economic aspects (breeding requirements, feeding, ... etc)

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