Quantitative value chain approaches for animal health and food safety

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Outline

- Motivation: why value chains, why quantitative methods?
- Method: role of system dynamics
- Example: food safety in Viet Nam
- Next steps – areas for future research

Motivation

Context: what role for economics?

- Economic impact assessments – increasingly important in animal health/food safety
- Increased risk (globalization, trade, perceptions)
- Greater demands on scarce resources ("how to get greatest return for money?")
- How to prioritize control efforts?

Motivation

Context: what role for economics?

- Focus of economic impact studies (and policy) generally at farm level.
- But impacts (and risks) exist downstream: think about roles played by traders, processors, retailers, etc.

Perceptions of risk at farm level, but…

Retail Market

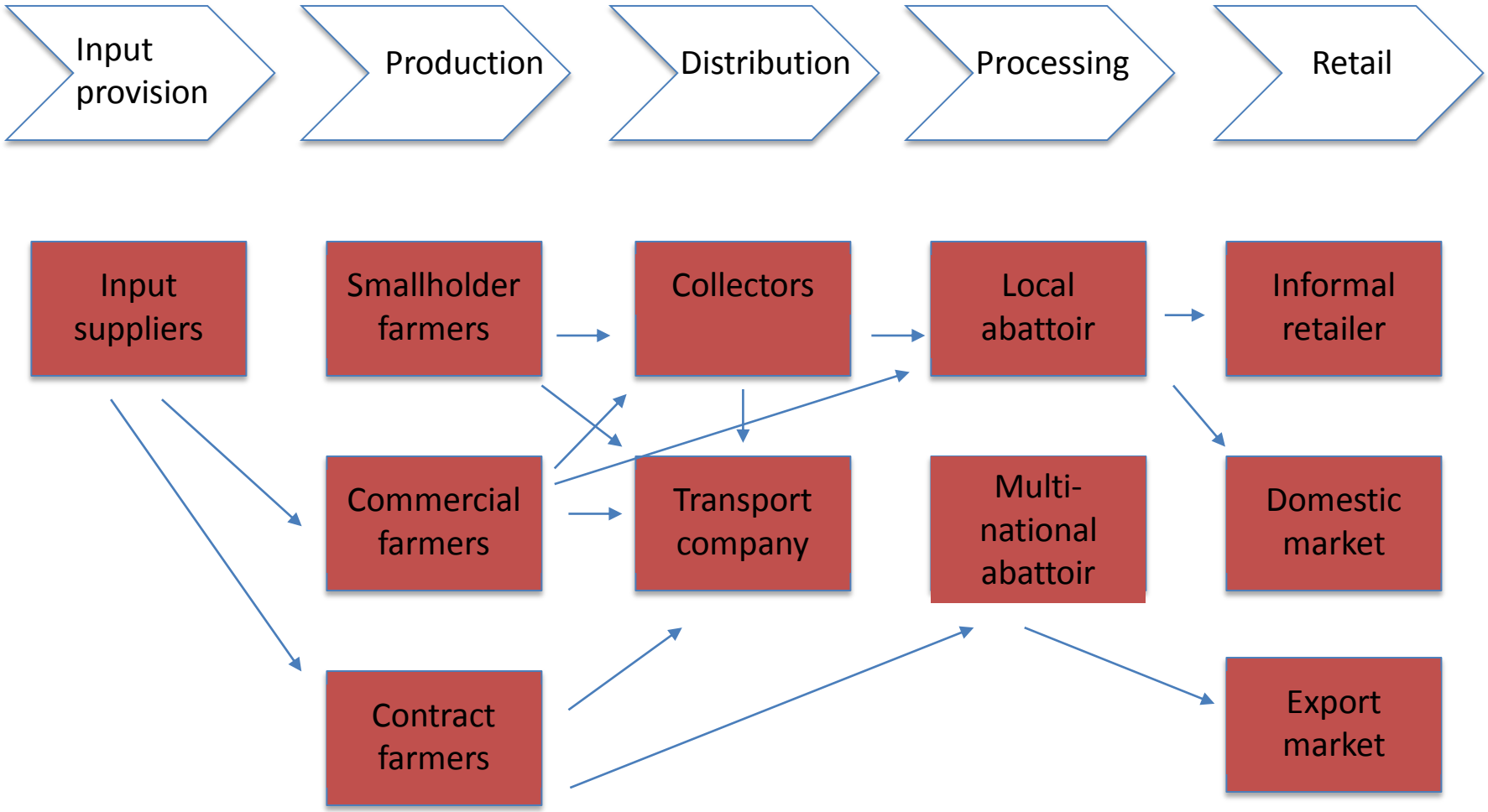
… animal health and food safety risks exist downstream too.

Motivation

Context: why value chains?

- Systems context – actions taken by one affect all
- "Weak links" in the chain may accentuate disease risk
- But need to understand <u>who</u> these stakeholders are, <u>how</u> they interact with others, and <u>why</u> they behave as they do.

A generic livestock value chain



Where are the risks and why do they occur?

Motivation

Context: why value chains in impact assessment?

- Assess impacts on different actors and feedbacks (economic, behavioral)
- Assess constraints to uptake (behavioral, socio-economic, institutional, cultural)
- Identify critical control points: links to risk analysis

Motivation

Gaps with value chain analysis

- Most applications descriptive/qualitative
- How to assess tradeoffs and returns to different options?
- Research need – quantitative approaches with interfaces to epidemiology and risk analysis
- A role for system dynamics

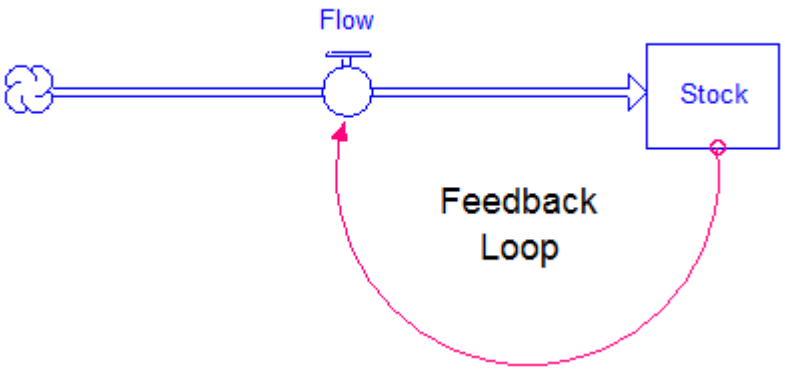
Method

- System dynamics – a computer aided simulation approach to model development and policy analysis
- A method for studying complex dynamic systems that include nonlinearities, delays, and feedback loops.
- Multidisciplinary, holistic, ability to link across disciplines (economics, epidemiology, biology, food science, etc.)

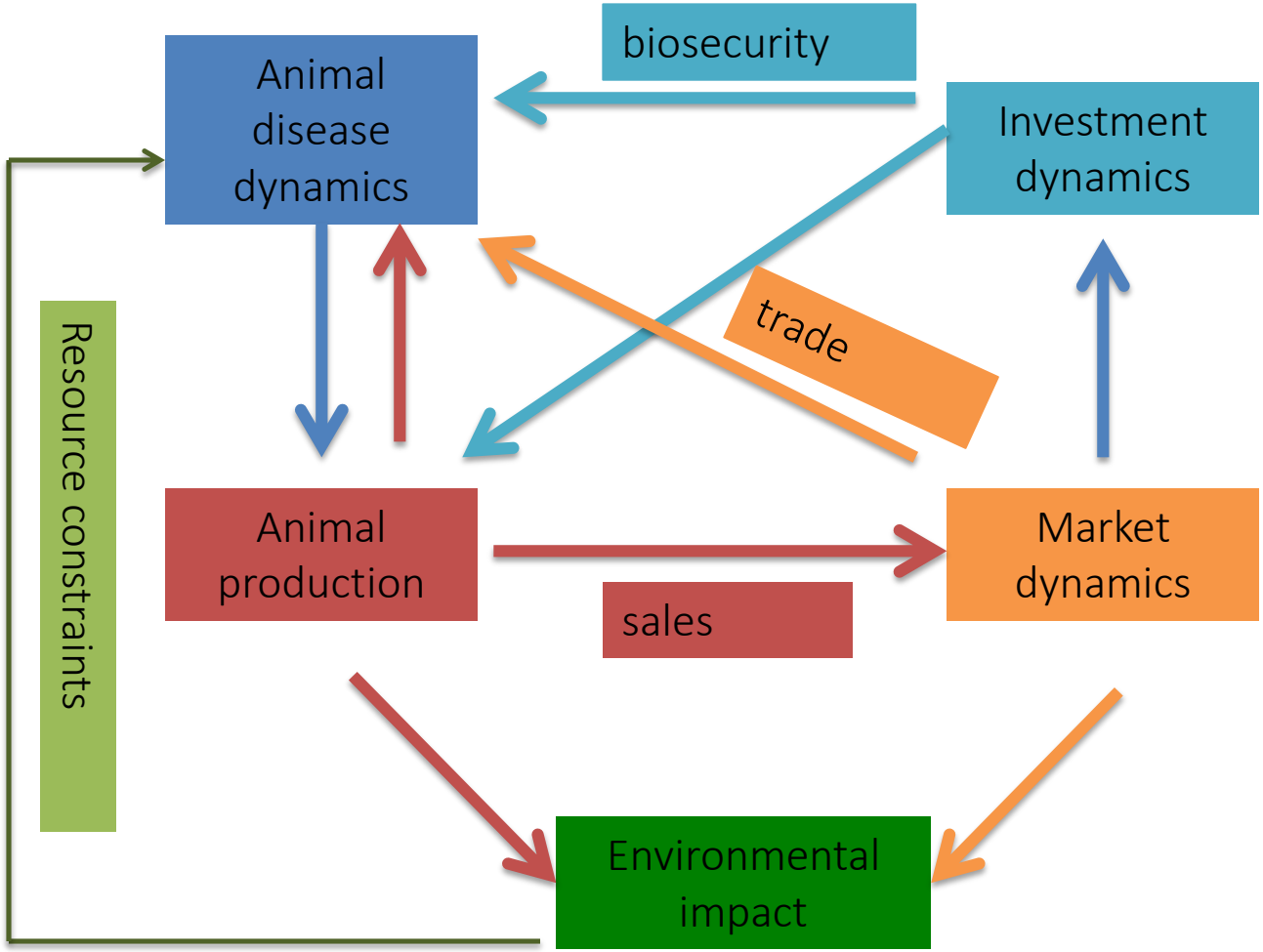
Method

Key concepts

- Stocks (accumulation)
- Flows (change overtime – rate/time unit)
- Feedback loops (circular causality)
- Delays



Modular approach



Method

Why system dynamics?

- Understanding the *impact* of VC investments
  - The general *performance* of a chain
  - The ability to evaluate *ex-ante* between different options

- Conventional value chain analysis: good at stories and description, less good on measurement.

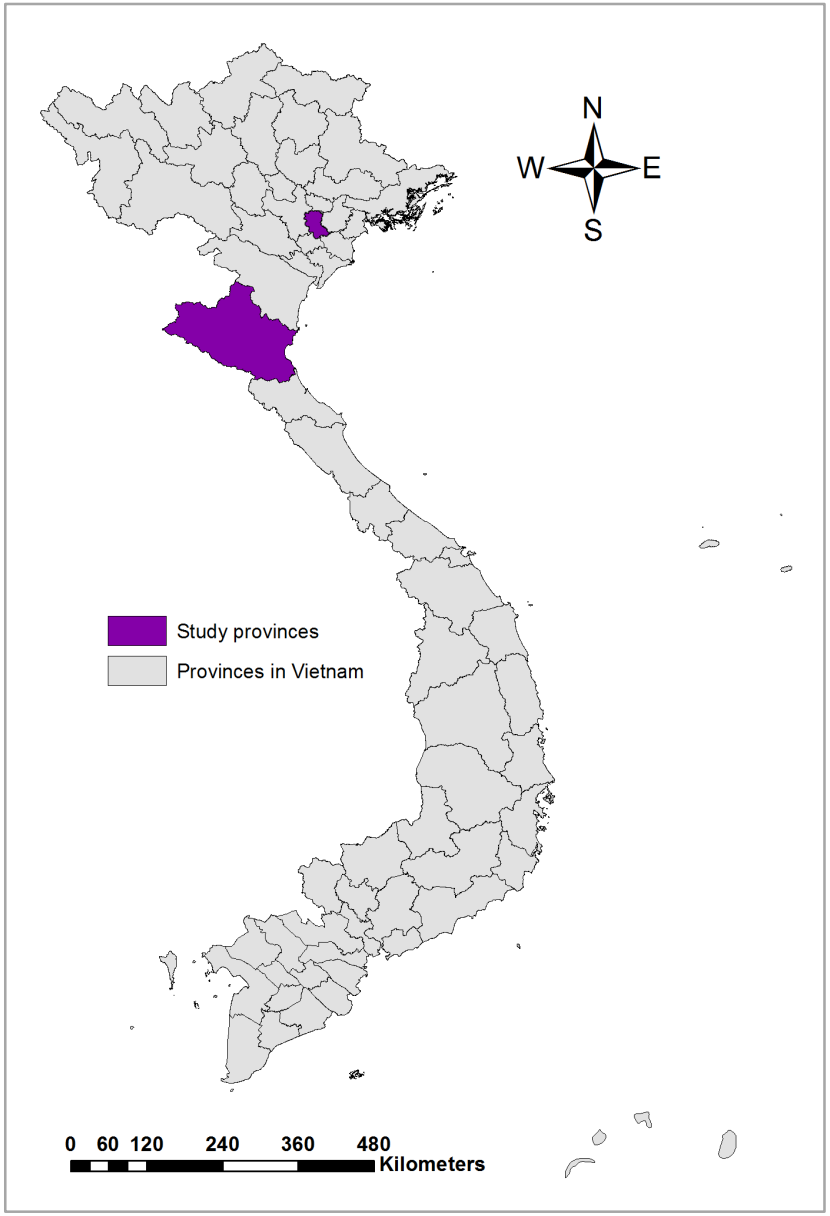
Application

System dynamics applied to food safety and animal health in Viet Nam

- **Food safety and animal health:** important constraints to smallholder pig production in Viet Nam
- High prevalence of animal disease and food-borne pathogens within the Vietnamese pig sector
- Important **negative livelihoods effects** on smallholder pig producers and other value chain actors, as well as important **public health impacts**

Question: where to intervene in the chain to maximize pro-poor returns?

PigRISK project (2012-2017)



Funded by ACIAR, implemented by ILRI, VNUA, VSPH

Aim: *To **assess impacts of pork-borne diseases on human health and the livestock** sector and identify control points for risk management.*

Focus on risk based approaches
Qualitative/quantitative risk assessments

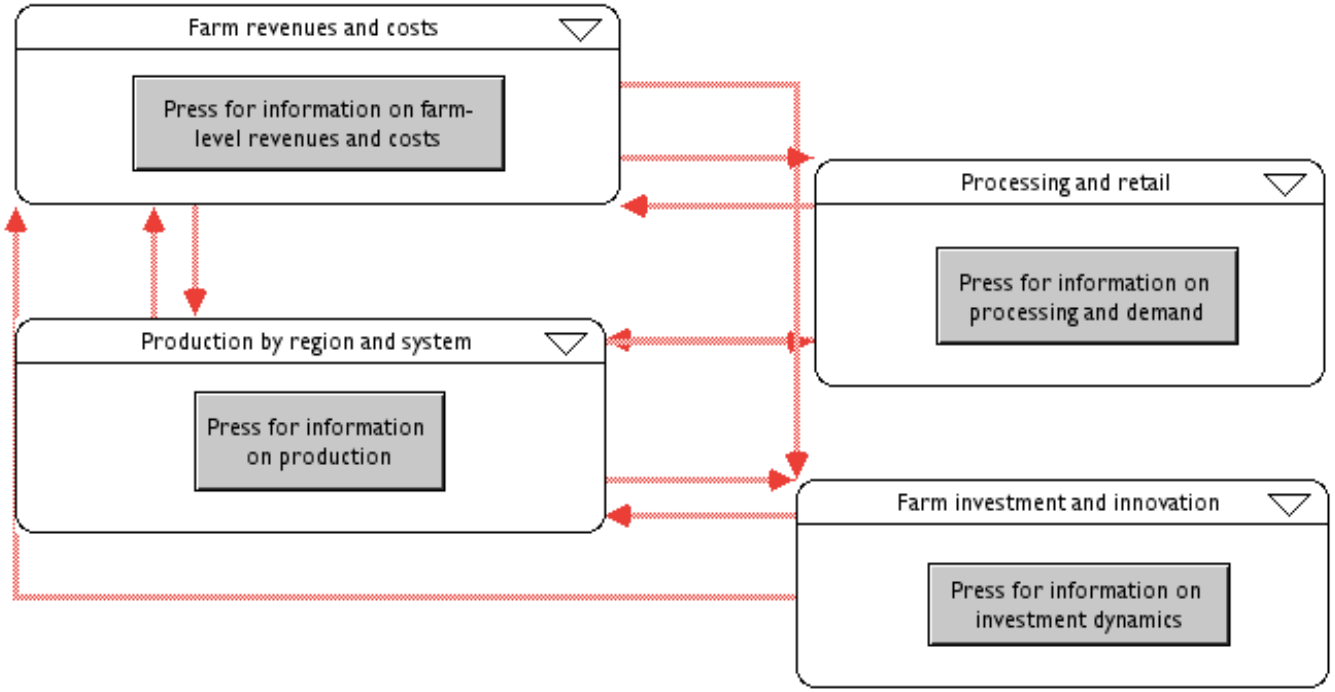
Multi-disciplinary team: Vets, public health, economists, environmental specialists

Data collected: Value chain survey, biological sampling, questionnaires, participatory epidemiological tools

Use of SD to look at "best-bet" interventions

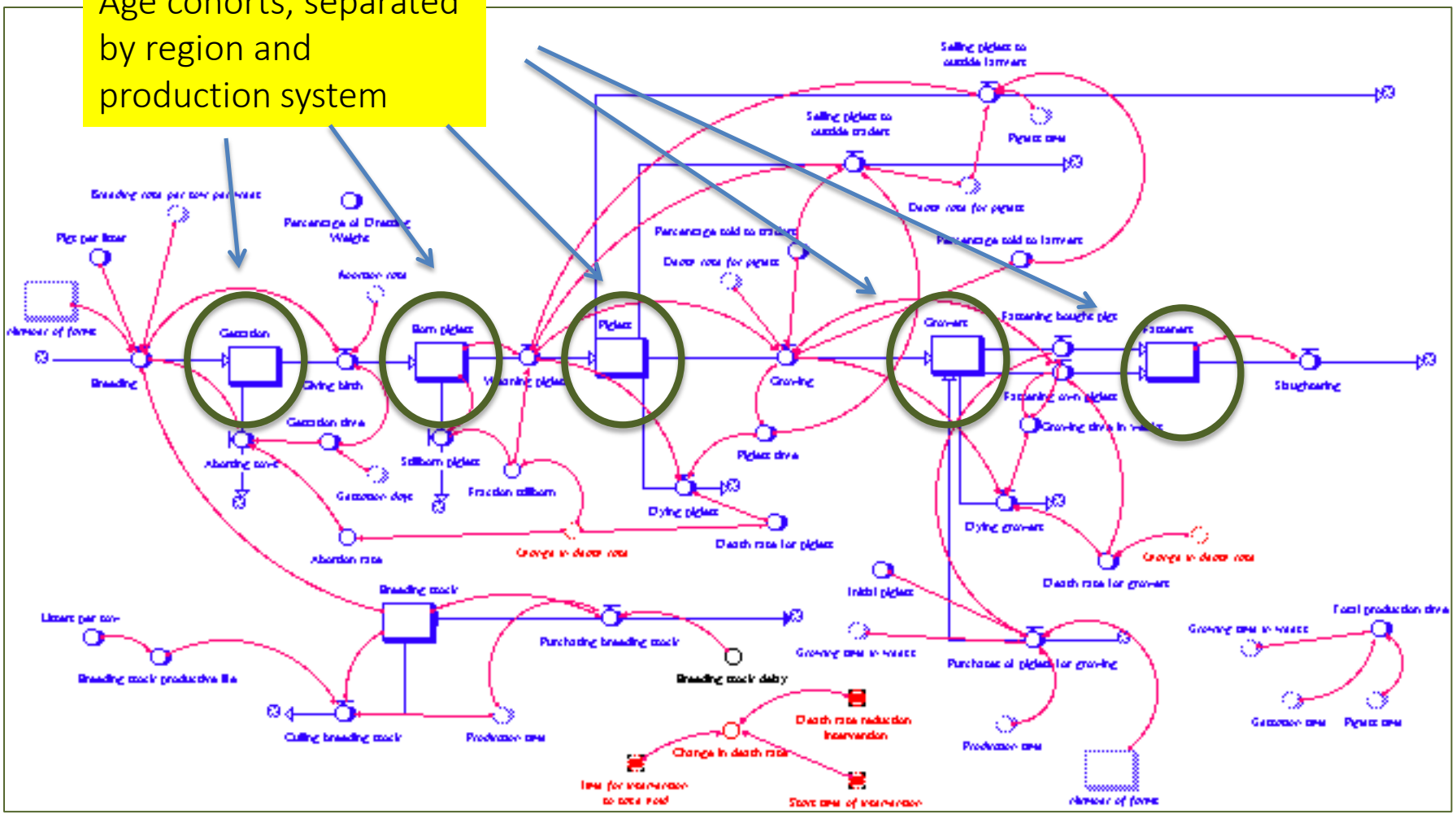
Value chain modules

The structure of the value chain

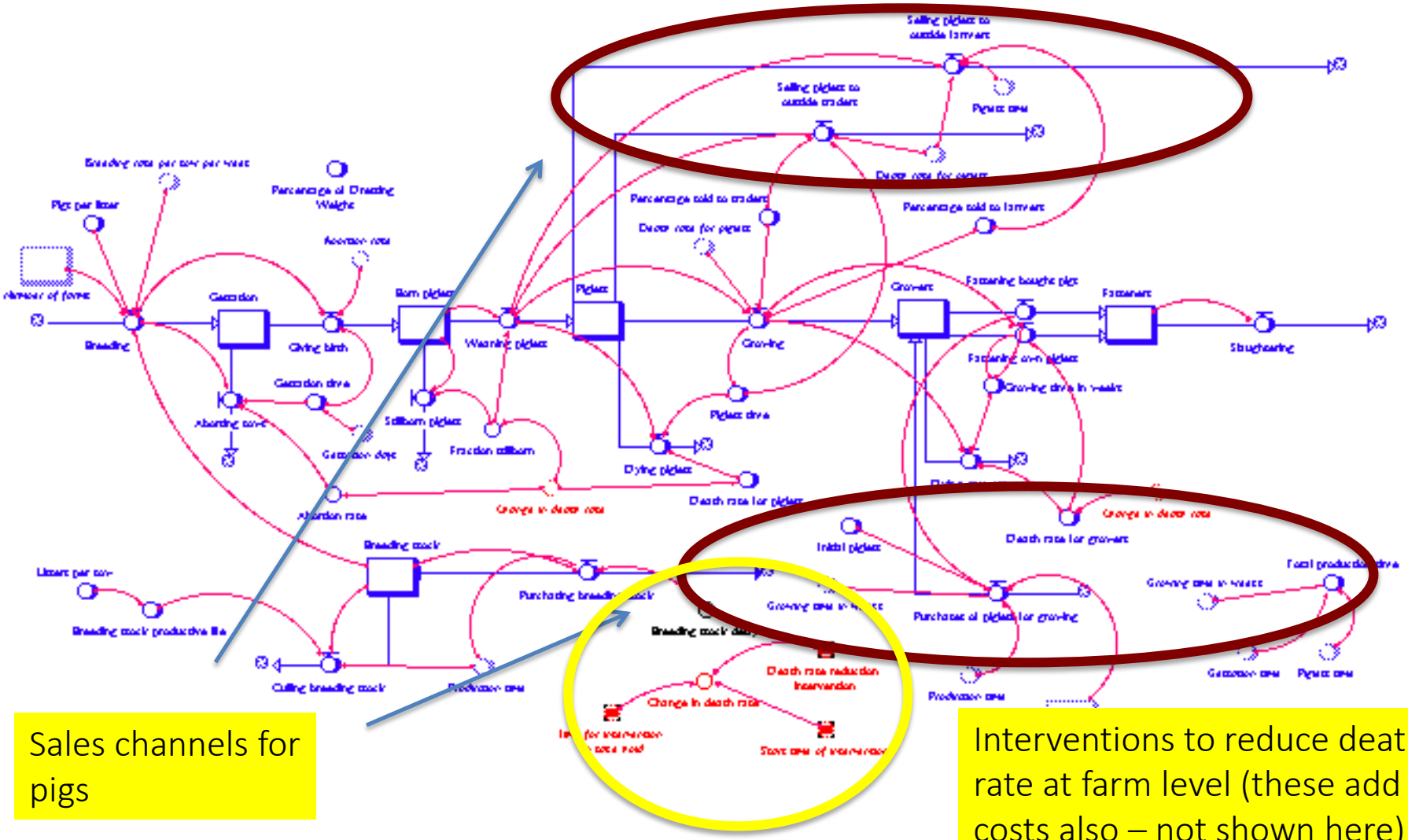


Production module

Age cohorts, separated by region and production system



Production module

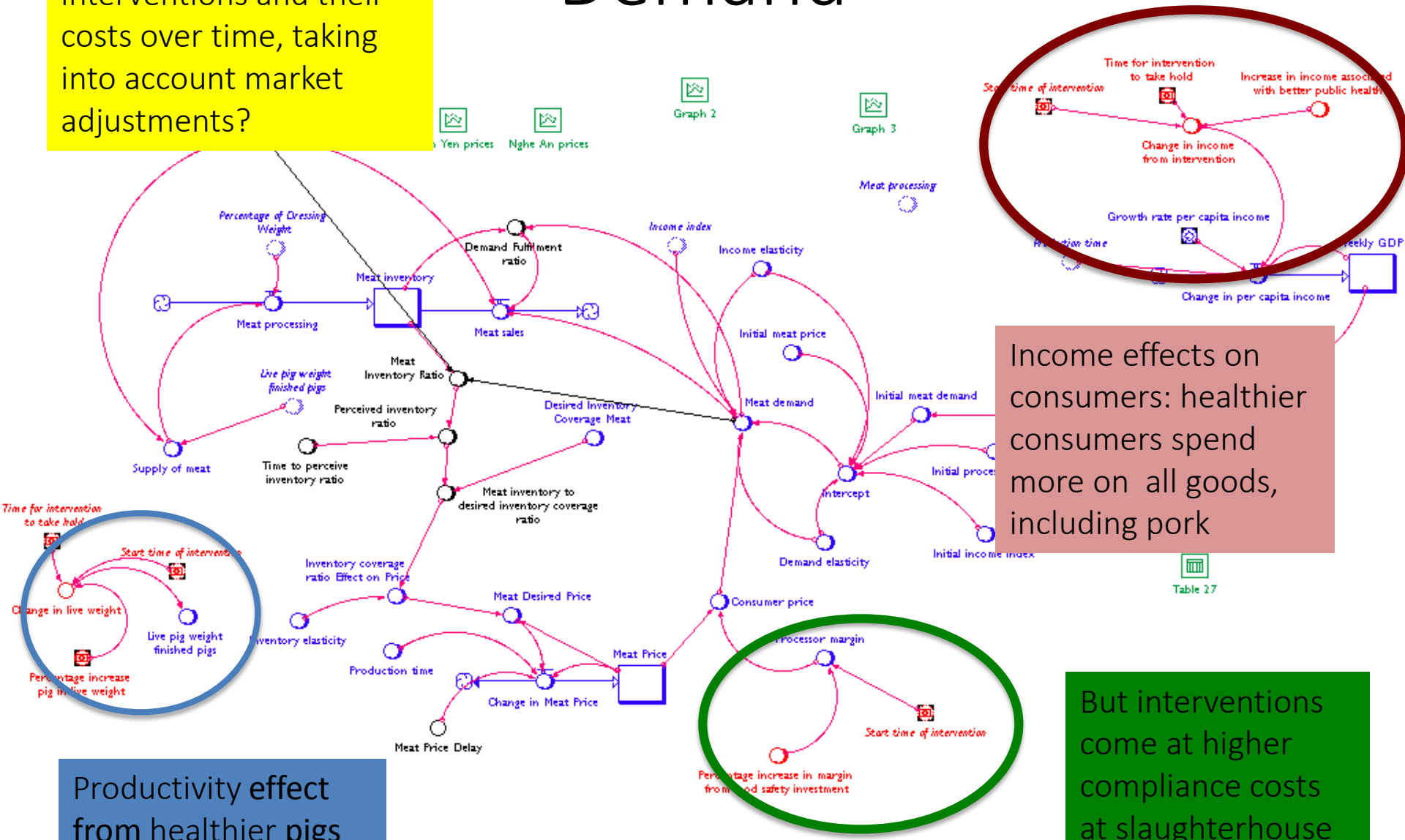


Sales channels for pigs

Interventions to reduce death rate at farm level (these add costs also – not shown here)

What are the *tradeoffs* between the benefits of interventions and their costs over time, taking into account market adjustments?

Demand

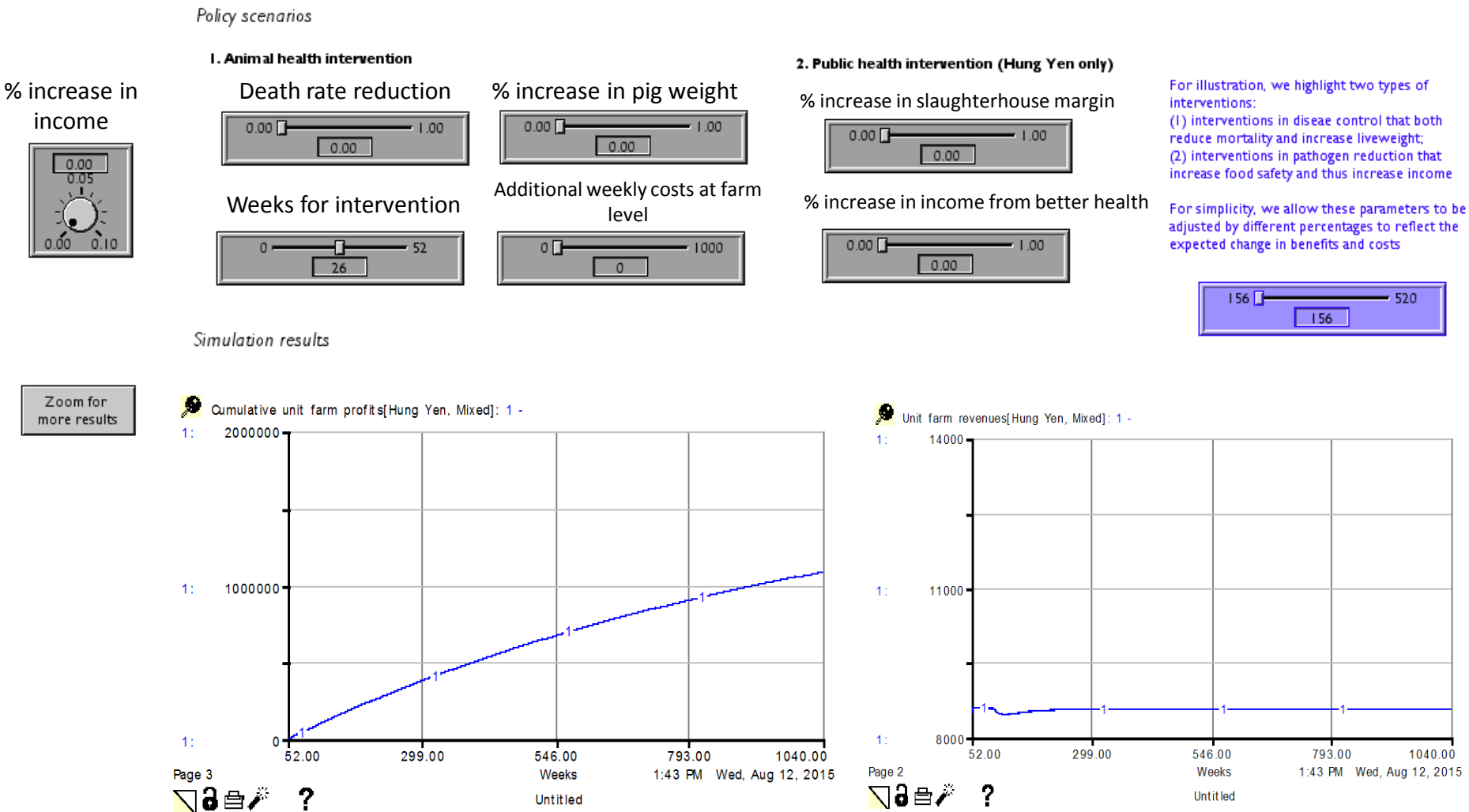


Income effects on consumers: healthier consumers spend more on all goods, including pork

Productivity **effect from** healthier **pigs**

But interventions come at higher compliance costs at slaughterhouse – higher prices

Use of modeling interfaces



Application

Four scenarios

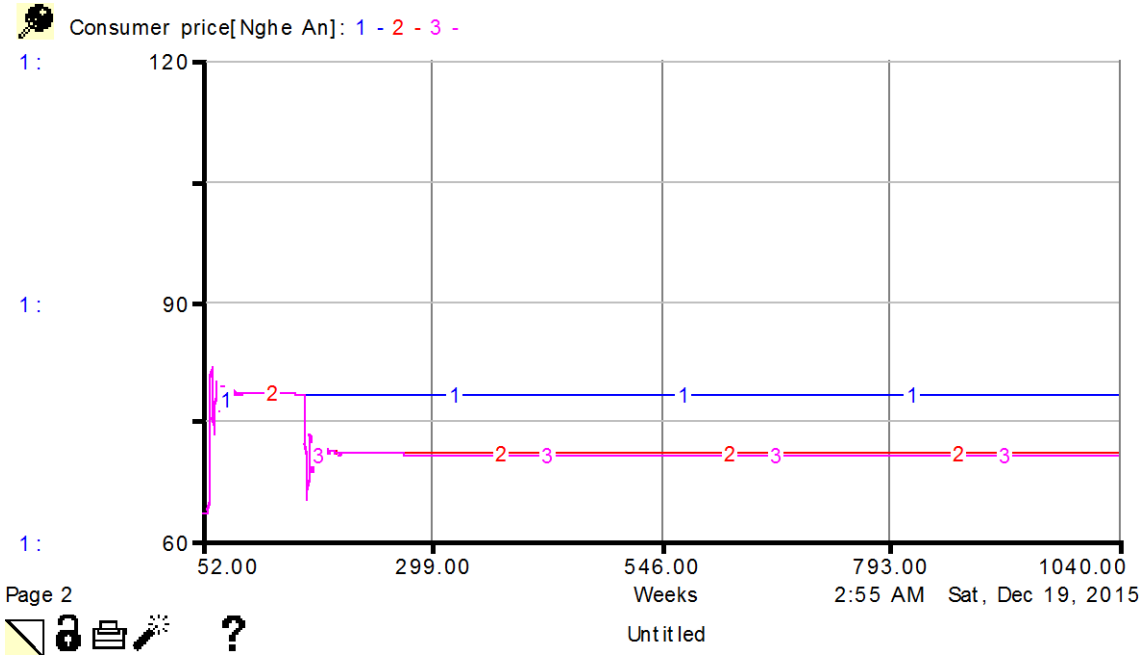
1. An animal health scenario to reflect the adoption of GAHP as a means of promoting better animal health. Assumes an increase of costs of 10%, against an increase in productivity of 20% and a reduction of animal mortality of 50%;

2. Scenario (1) under a scenario in which costs rise by 5% instead of 10%

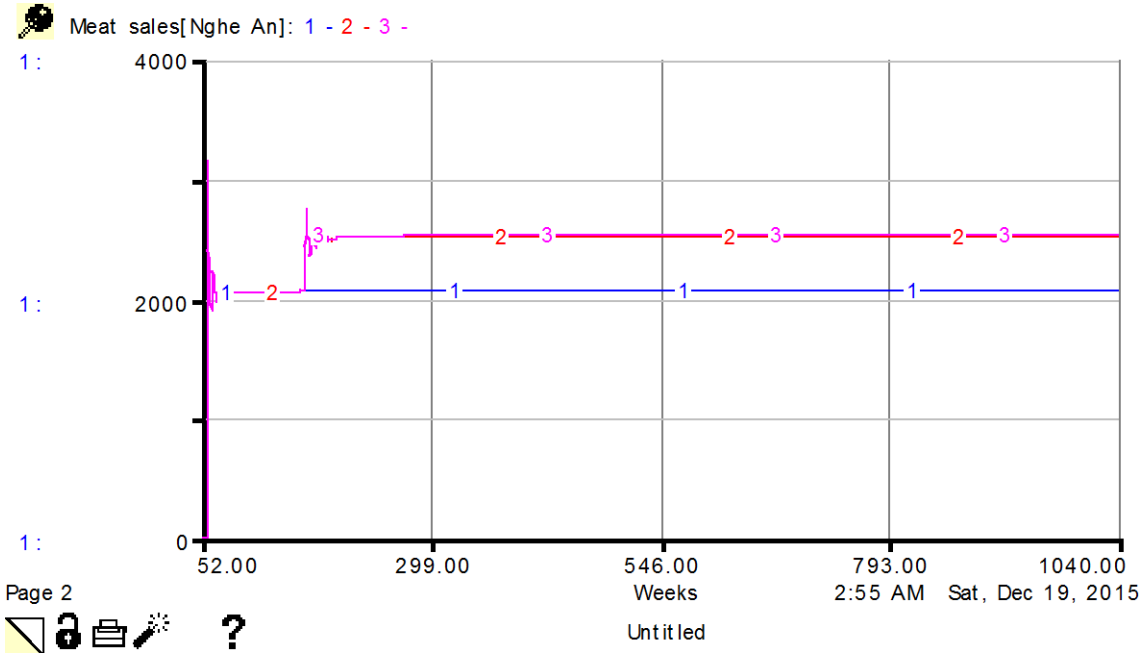
3. Impacts of a 20% rise in slaughterhouse margins against a 20% in increase in income associated with public health.

4. Scenario (3) under a scenario in which incomes rise 10% instead of 20%

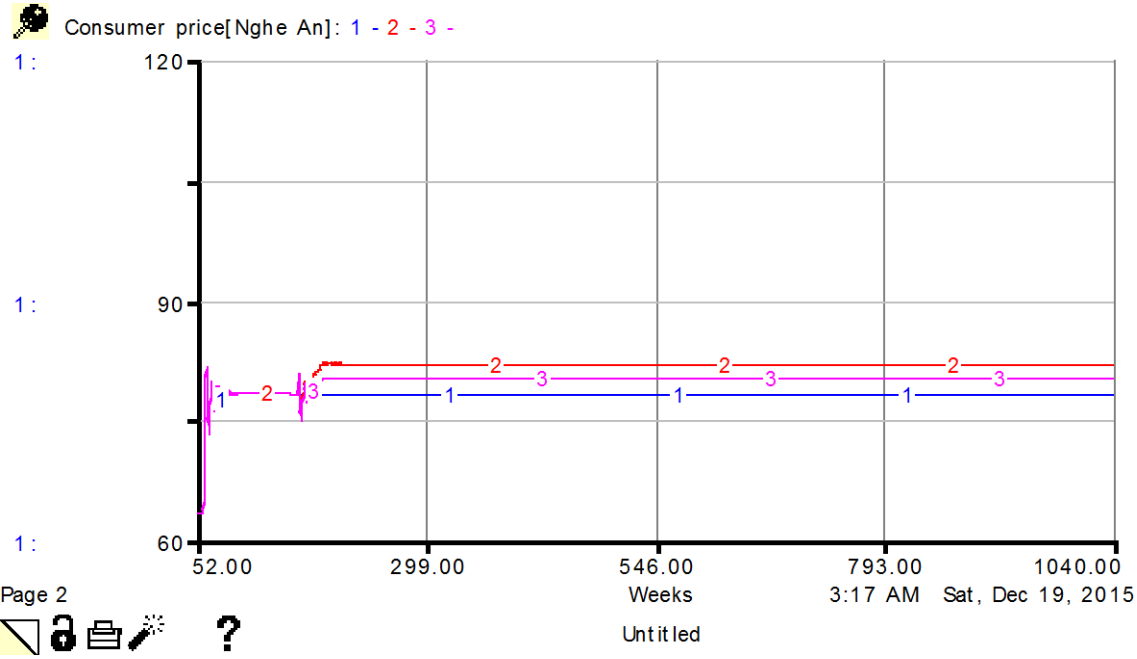
Scenarios run over 20 years, with interventions taking place in year 3.



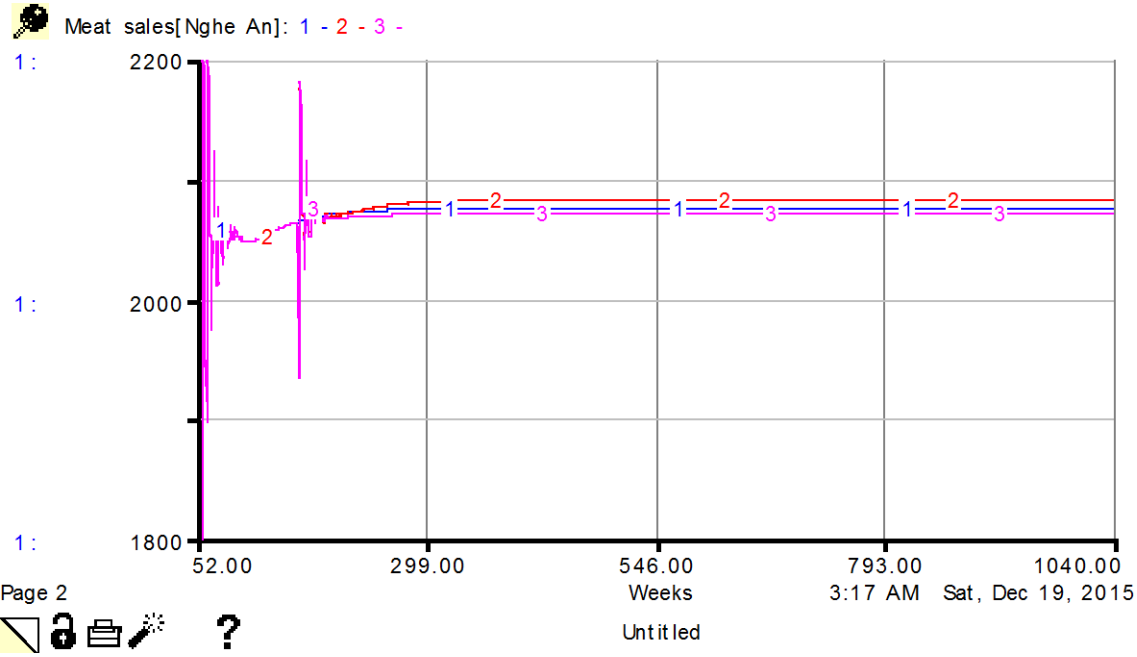
Consumer prices under GAHP scenarios



Meat sales under GAHP scenarios



Consumer prices under food safety scenarios



Meat sales under food safety scenarios

Extensions

Next steps

- Mainstreaming systems approaches and systems thinking
- Improved modeling platforms and community of practice
- Improved data collection platforms – the role of participatory processes and group model building

Extensions

Group model building (GMB)

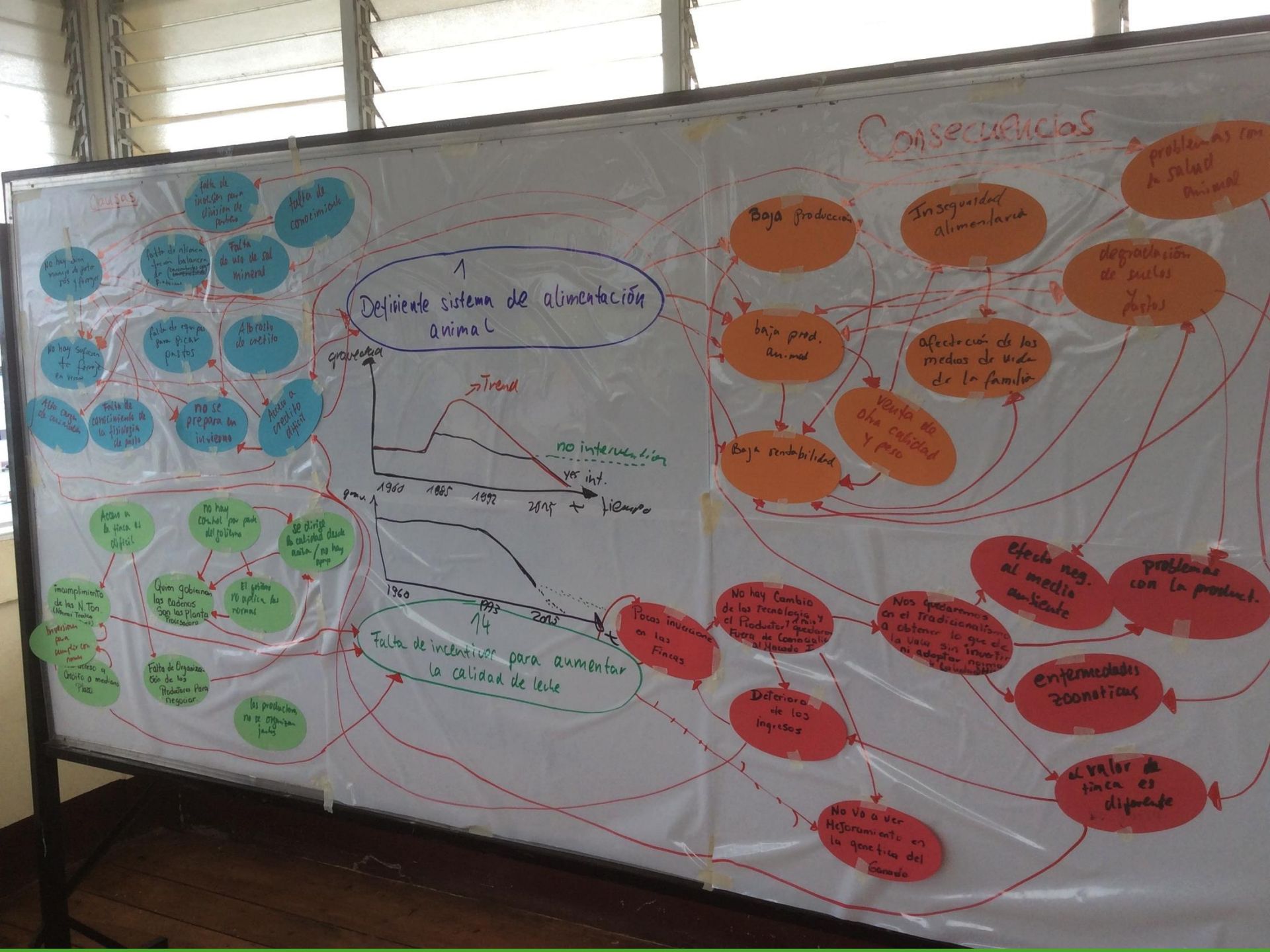
- A participatory process aimed at:
  - Identifying and prioritizing the key problems in the system
  - The causes of these problems
  - The consequences of these problems

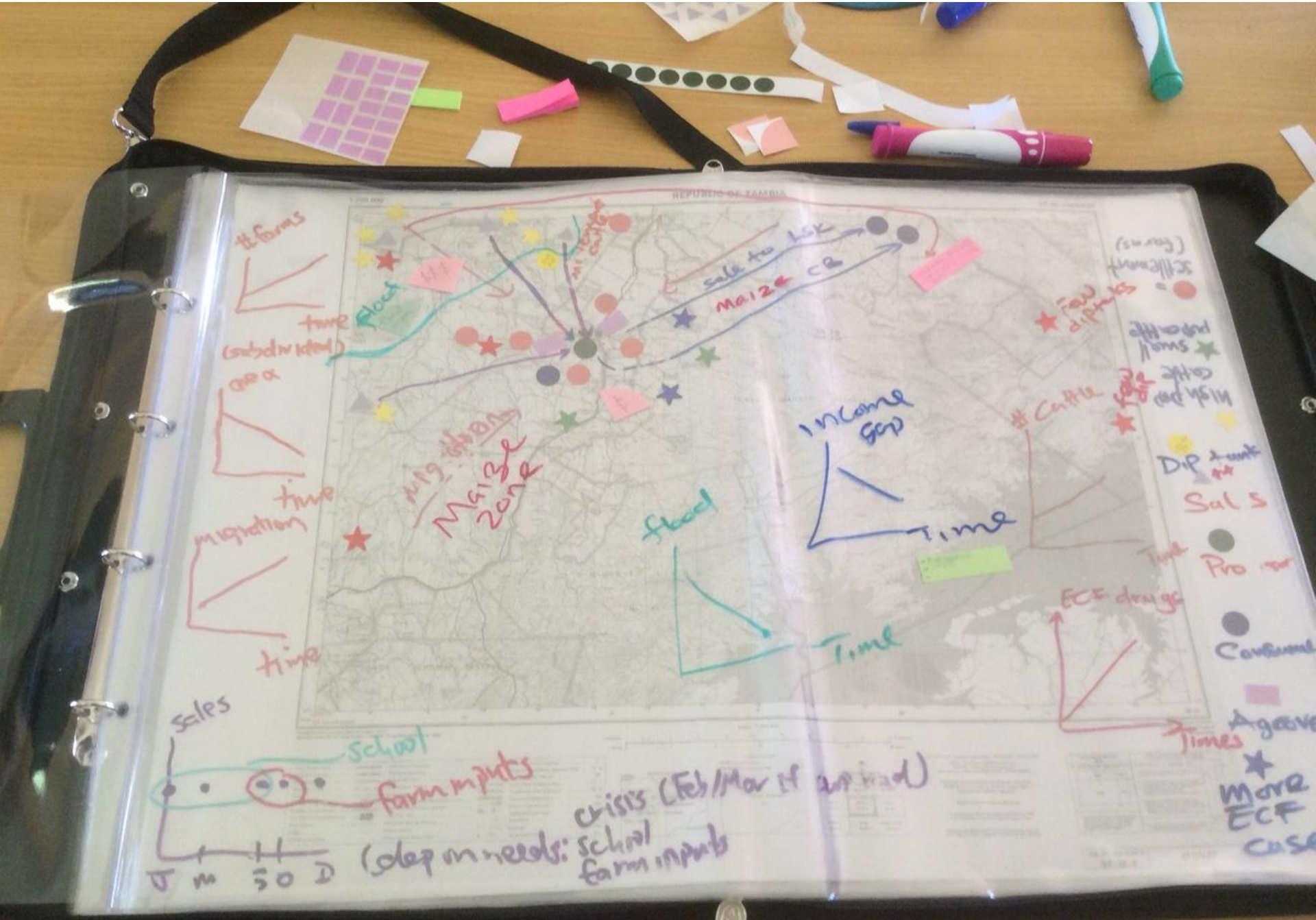
- SD principles and language (stocks/flows/feedbacks) are used to facilitate this discussion

- Model development and construction based on this process

- New extensions (spatial GMB): see Rich, Rich, and Dizyee (2016)


April 13th 2015.
1 Deficiente sistema de alimentación animal
2 Costo de producción muy altos
3 Falta de infraestructura para el ordeño y ordeño limpio
4 ↓ ingresos a nivel de la finca
Deficiencia en el manejo del hato y de los recursos forrajeros
6 Intereses muy altos
7 Bajo precio para la leche => baja inversión en la finca
8 No hay registro de control de animales
9 No hay financiamiento para compra de semillas de pasto
10 No hay estricto manejo sanitario
11 No hay programa de mejoramiento genético
12 Falta de control y seguimiento del transporte de leche
13 ↑ intermediarios
14 Falta incentivo de aumento calidad


Causas
falta de inversión para división de potreros
falta de conocimiento
No hay buen manejo de potreros y forraje
Falta de alimento frente balanceado (carbohidratos y proteínas)
Falta de uso de sal mineral
Falta de equipo para picar pastos
Alto costo de crédito
No hay suficiente forraje en verano
Alto carga de ganado
Falta de conocimiento de la fisiología de pasto
no se prepara en invierno
Acceso a crédito difícil
1
Deficiente sistema de alimentación animal
gravedad
Trend
no intervención
ver int.
1960
1985
1992
2015
tiempo
gran.
1960
1993
2015
Acceso a la finca es difícil
no hay control por parte del gobierno
se dirige la calidad desde arriba / no hay apoyo
Incumplimiento de las N. Tec. (Normas Técnicas)
Quien gobiernan las cadenas Son las Planta Procesadora
El gobierno no aplica las normas
Inversiones para cumplir con normas
Acceso a Crédito o mediante Plazo
Falta de Organización de los Productores Para negociar
los productores no se organizan juntos
4
Falta de incentivos para aumentar la calidad de leche
Consecuencias
problemas con la salud Animal
Baja producción
Inseguridad alimentaria
degradación de suelos y pastos
baja prod. animal
afectación de los medios de vida de la familia
venta de otra calidad y peso
Baja rentabilidad
Pocas inversiones en las Fincas
No hay Cambio de las Tecnologías y el Productor Quedaron Fuera de Competitividad al Mercado
Nos quedaremos en el Tradicionalismo a obtener lo que da la vaca sin invertir ni adoptar nuevas tecnologías
efecto neg. al medio ambiente
problemas con la product.
enfermedades zoonóticas
Deterioro de los ingresos
el valor de finca es diferente
No Vo a ver Mejoramiento en la genética del Ganado


REPUBLIC OF ZAMBIA
farms
time
(subsidized)
flood
sale to LCK
maize CB
Maize zone
migration
time
income
GDP
Time
cattle
Time
flood
Time
ECF drugs
Times
Sales
School
farm inputs
J M S O D
crisis (Feb/Mar if arrived)
(dep on needs: school
farm inputs
Sal s
Pro
Consume
Agrove
More
ECF
case

Conclusions

Added value from systems approaches to animal health and food safety

- Improved information on the chain to improve the effectiveness of interventions and their sustainability
- A planning tool for future policy development
- A way to develop shared solutions in a participatory manner and a platform for joint learning
- A means to communicate chain-level needs to government, donors, etc. more effectively.