



Evaluation of technology and policy impact models on smallholder pig farmers in Vietnam and Uganda

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The rapid expansion of the pig subsectors in Uganda and Vietnam (8% and 6% growth per annum) is being driven by a myriad of factors, notably rising demand for pork. These changes in pork consumption are likely to continue as increasing urbanization, rapid population growth and rising incomes are driving shifts in dietary patterns from mainly starch-based foods towards higher proportions of animal-sourced proteins. Rising demand, if sustained, would signal a bright future for the pig subsectors in both countries. However, the growth trajectories of each country may differ due to varying socio-economic and policy contexts, particularly in how each subsector responds to the emerging transformation of its agri-food system.

With the 'supermarket revolution' (Reardon et al. 2003, 2010) gaining pace in developing countries, smallholders in Uganda and Vietnam may struggle to continue supplying pork at competitive prices on their respective domestic markets. For instance, while the formalization of regional economic and trade agreements opens up opportunities to expand pork markets, it also exposes the subsector to pressures arising from more efficient production systems and markets.

Smallholders, by virtue of their size and levels of organizations, may be more prone to risks related to production capacity, efficiency and animal and public health. These risks could constrain their capacity to respond to external stressors in ways which promote inclusive

growth. Robust evidence on the evolution and resilience of smallholder pig systems under varying technology and policy scenarios needs to be generated to guide livestock policy and investments.

Approach

Researchers conducted two country case studies comparing the impact of different technology and policy changes on smallholder pig production and market shares using a multi-market model framework. The case studies showcase the contribution and competitiveness of smallholder pig production systems and their growth trajectories. By applying a multi-market model framework in the pig subsector of both countries, scientists generated evidence to answer the following research questions:

1. How would rising income and urbanization affect total pork demand and its composition?
2. How would shifts in pork demand influence pig producers, particularly small-scale producers, i.e. would small-scale pig producers be squeezed out of the market?
3. How would the growth of pig production affect maize markets? Would imports grow?
4. How would alternative policies, institutions and technologies influence the evolution of the pig subsector?

Data and methods

The model has the following characteristics:

- Partial equilibrium: The model focused only on the maize and pig subsectors; it does not capture other sectors in the economy;
- Spatial: It simulates market dynamics and interregional trade in eight regions in Vietnam and five in Uganda;
- Recursive and dynamic: It simulates impacts over a 10-year period based on changes in income, population and production technology; and
- Disaggregation of chosen commodities: In addition to maize as a feed product, the model covers specific pork products, namely, (1) fresh pork sold in rural wet (traditional) markets produced by traditional

producers, (2) fresh pork sold in urban/peri-urban wet markets produced by commercially-oriented producers, and (3) processed pork sold in formal market outlets, including supermarkets produced by large modern producers.

Scientists ran nine scenarios including a baseline scenario showing the most plausible assumptions for each country, highlighting the differences in context and the current status of the respective subsectors. They designed several scenarios with different assumptions to see how the supply, consumption and trade would change over the next decade in response to changes in pig and feed production technology, per capita income growth and income elasticities. Table 1 presents the details of the various scenarios in comparison with the base scenario.

Table 1. Summary of assumptions used in the base scenario and alternative scenarios simulated in the model

Scenario	Vietnam	Uganda
1. Base scenario	Per capita income growth: 5% Population growth: 1.05% Nominal exchange rate growth: 2% Maize technology growth: 2% Traditional pig technology growth: 2% Commercial pig technology growth: 2.5% Modern pig technology growth: 3.0% World price growth for maize: -0.13%* World price growth for pig: 1.75%* Income elasticity of maize: 0.393 Income elasticity of traditional pig products: 1.247 Income elasticity of commercial pig products: 1.375 Income elasticity of modern pig products: 1.513 Own price elasticity of supply for traditional pig: 0.60 Own price elasticity of supply for commercial pig: 0.65 Own price elasticity of supply for modern pig: 0.75.	Per capita income growth = 5% Population growth = 1% Maize technology growth = 5% Traditional pig technology growth = 5% Modern pig technology growth = 5% Income elasticity of maize = 0.25 Income elasticity of traditional pork products = 0.90 Income elasticity of modern pork products = 1.80
2. Higher income growth	Same as base scenario except that per capita income growth is increased to 10%	
3. No productivity growth in traditional pig subsector	Same as base scenario except that technological growth in traditional pig subsector is reduced to 0%	
4. Higher productivity growth in traditional pig subsector	Same as base scenario except that technological growth in traditional pig subsector is increased to 10%	
5. Higher productivity growth in commercial and modern pig subsector	Same as base scenario except that technological growth in commercial and modern pig subsector is increased to 10%	Same as base scenario except that technological growth in modern pig subsector is increased to 10%
6. No productivity growth in maize subsector	Same as base scenario except that technological growth in maize subsector is reduced to 0%	
7. Higher income elasticity in commercial & modern pig products	Same as base scenario except that income elasticity for commercial and modern pig products is increased to 2.7	Same as base scenario except that income elasticity for modern pork products is increased to 2.7
8. Higher income elasticity and higher productivity growth in commercial and modern pig subsector	Same as base scenario except that income elasticity for commercial & modern pig products is increased to 2.7 and technological growth in commercial and modern pig subsector is increased to 10%	Same as base scenario except that income elasticity for modern pork products is increased to 2.7 and technological growth in modern pig subsector is increased to 10%

Scenario	Vietnam	Uganda
9. Worst-case scenario for traditional pig subsector	Same as in base scenario except that Per capita income growth increased to 10% Income elasticity of traditional pig reduced to 0.5 Technology growth in traditional pig subsector reduced to 0% Income elasticity of commercial and modern pig subsector increased to 2.7 Tech growth in commercial and modern pig subsector increased to 10%	Same as in base scenario except that Per capita income growth increased to 10% Income elasticity of traditional pork subsector reduced to 0.5 Income elasticity of modern pork subsector increased to 2.7 Technology growth in traditional pig subsector reduced to 0% Technology growth in modern pig subsector increased to 10%
10. No tariffs for pig products between member states of Association of Southeast Asian Nations and the Trans-Pacific Partnership	World price of pig increase by 1%.	Not applicable

* Authors' calculation from the FAO (Food and Agriculture Organization of the United Nations). 2013. Crop and livestock production database. Food and Agriculture Organization, Rome, Italy. Accessed at <http://faostat.fao.org/site/339/default.aspx>

Note: percentage changes are annual

Key findings and policy implications

In Uganda, the model results highlight that the traditional pig subsector would retain its dominant market share (about three-quarters of total market supply) in fresh pork markets, except under the worst-case scenario of zero technical growth for the traditional pig subsector where its market share would be reduced to about one third of total market supply (Figure 1).

In Vietnam, the model results also indicate that the traditional pig subsector would maintain its dominant market share (about three-fifths of total supply) in fresh pork markets. However, in the Vietnamese case, the researchers found that the modern pig subsector would capture a dominant market share for fresh pork under two scenarios (Figure 2):

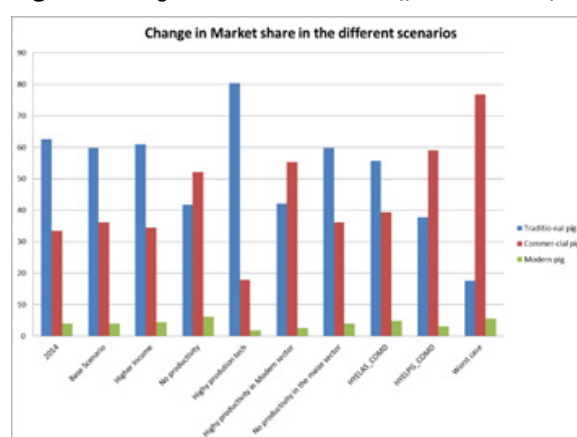
1. In the high-technology and high-income elasticity for commercial and modern pork products scenario, the modern pig subsector would capture more than half of total market supply, and
2. In the worst-case scenario with no technology growth in the traditional pig subsector, the latter's share would be reduced to one third of total market supply.

Technology would be the most significant driver in improving the production of modern pig subsector. Increasing demand without technological development would lead to imports instead of developing domestic production. Technology-enhancing productivity changes in feeds, animal health and breeds would help the modern pig subsector increase production. This would help meet national demand and lead to surplus production available for export. It would also enable the traditional pig subsectors to reduce pork prices, maintain their market shares and generate pro-poor impacts, such as improved livelihoods and better health and nutrition.

In the maize subsector, improving technology in crop breeding and agronomic practices would help reduce imports. Thus, policies to regulate large producers, for example, to protect small-scale pig farmers may not

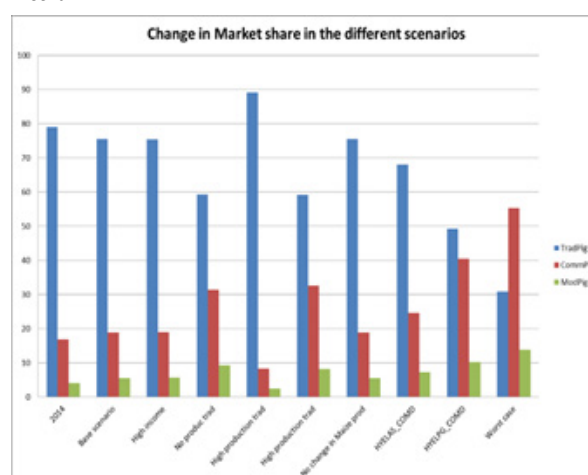
be necessary. Despite the slower growth rate of the traditional pig subsector relative to the modern pig subsector in both countries, the traditional pig subsector is not likely to disappear for some decades.

Figure 1: Change in market share in the different scenarios for Uganda



Authors' calculations from Uganda Pig Sector Model simulation results.

Figure 2: Change in market share in the different scenarios for Vietnam



Source: VPM and UGM simulation results

References

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