

Analysis of the swine movement network in a province of Northern Vietnam: implications for swine influenza surveillance

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Introduction

South-East Asia, and especially Vietnam, is known for its high human, poultry and pig population density. Located in Northern Vietnam, the Red River Delta region (RRD) alone includes about a quarter of the human, pig and poultry population of the country in just 6.4% of its area [1]. This high density along with familial production practices could put the area at a higher risk for inter-species influenza virus transmission and emergence of reassortant viruses. Live animal movements are one of the most important factors for disease transmission between holdings and geographical areas, and its description is required to study disease spread and design surveillance. The objective of the present study was to describe the swine movement network in the RRD, and to draw implications for local surveillance of swine influenza viruses.

Methods

The study was carried out in Vietnam, in two communes of Hung Yen province. Structured interviews of farmers were conducted to collect data on animal production and live pig movements from January 2011 to June 2012. All the large familial farmers (100-1,000 fattening pigs per cycle and/or 10-250 sows) were interviewed in the two selected communes (n=50), as well as all the small familial farmers (<100 fattening pigs per cycle and/or <10 sows) in one selected village in each of the communes (n=88). Based on the farmer questionnaires, a sample of the mentioned middlemen (n=20), slaughterhouses (n=12) and industrial farms (n=2) were chosen for interview. Data were entered into a computerized database and analyzed using R 2.15.3, Gephi 0.8.2 and ArcGis 10.2.

Results

The communes and farms had strong similarities, however one commune had a greater number of large farms (Fig. 1).

Figure 1. Description of the communes of study and interviewed farms

Attributes	Me So Commune	Dinh Du Commune
Surface (sqkm) [2]	6.6	4.5
Inhabitants [2]	9626	7062
Number of farmers interviewed by farm category	41 Large 48 Small	9 Large 40 Small
Total number of pigs at the visit	7900 Large 1700 Small	1900 Large 800 Small
Average number of pigs per farm at the visit	193 Large 35 Small	211 Large 20 Small

Discussion

- Diversity and complexity of the pig value chain organization in Vietnam.
- Some farm categories are not represented in certain compartments:
 - Slaughterhouses: pigs mainly from large and industrial farms,
 - One Market: pigs only from small farms, and markets are not frequent.
- High number of provinces involved in the trades generated by a limited sample: spread of swine influenza viruses is unlikely to be limited geographically.

Farming systems: different compartments to consider for surveillance but there is a low centralization of the production; difficulty to sample the small farms.

Geography: surveillance in a selected area in the RRD may be sufficient to capture the virus diversity of the Northern region at least.

References

- [1] General Statistics Office of Vietnam website, http://www.gso.gov.vn/default_en.aspx?tabid=494, data for 2011 (accessed June 2013).
[2] Geographical information system, Vietnamese government website, <http://gis.chinhphu.vn/vbdmap.aspx> (accessed August 2013).

Acknowledgements

The project was funded in part by CIRAD and by the Area of Excellence Scheme of the University Grants Committee of Hong Kong .

Interviewed farmers reported 1,600 live pig trades for a total of 49,000 pigs, with strong differences in practices between the two communes and the farm categories (Fig. 2). Interviewed traders and industrial farms mentioned 22,000 trades for a total of 550,000 pigs. Up to 22 provinces were involved in those trades (Fig 3).

Figure 2. Trading practices of interviewed farmers in the two districts of study

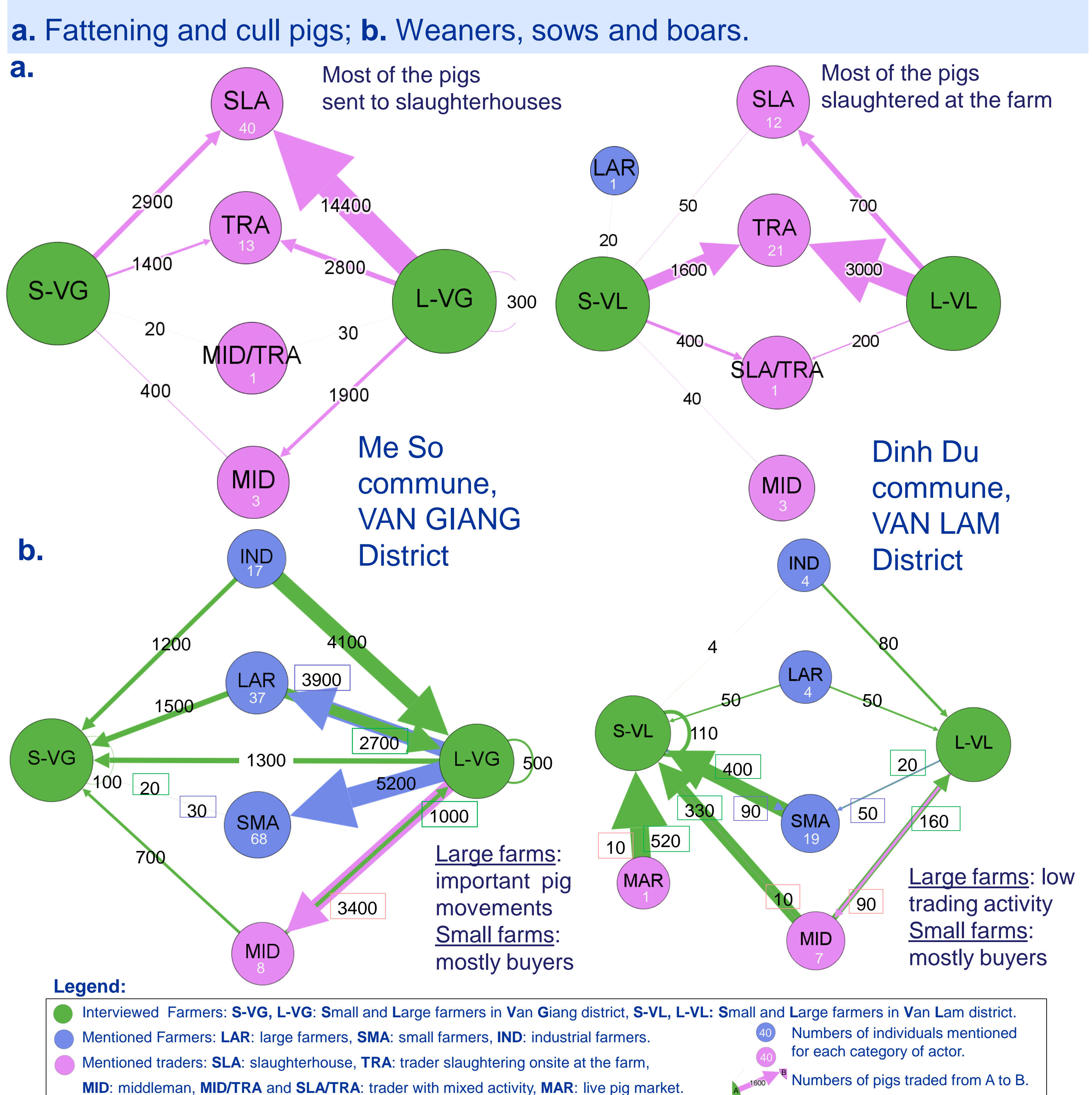


Figure 3. Trades between provinces generated by the interviewed farmers and traders. (right: country level; left: zoom of Northern Vietnam)

