The role of value chain analysis in animal disease impact studies: methodology and case studies of Rift Valley Fever in Kenya and Avian Influenza in Nigeria

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INTRODUCTION

An overlooked component in the socio-economic analysis of animal diseases is its impact in the larger livestock value chain. Cumulatively, downstream impacts can often dwarf the impacts of disease at the farm level, but public policy tends to concentrate primarily on losses accruing to producers. Within this environment, recognizing the vertical relations within chains, and the synergistic, complementary, and competitive relations between chains is key to tracking and measuring such impacts from an epidemiological and economic perspective.

Value chain analysis captures the interactions of complex markets in developing countries and examines the inter-relationships between diverse actors involved in the marketing channel. A value chain is defined as "the full range of activities which are required to bring a product or service from conception, through the intermediary phases of production, delivery to final consumers, and final disposal after use" (Kaplinsky, 2000, p.121). Value chain analysis is particularly appropriate in livestock systems, given their long marketing chains, many phases of weight gain and feeding regimes, various traders and transactions, numerous stages of processing, variety of employment-creating services and inputs, and interactions between commercial and smallholder systems. However, their utilization in animal disease impact analyses has been surprisingly limited given the wealth of information they can provide on impacts and risk pathways that exist throughout the marketing system.

Rift Valley Fever (RVF) in Kenya in 2007 killed over 300 people and engendered estimated economy-wide losses of more than US$30 million (ILRI 2009). Two major outbreaks of Highly Pathogenic Avian Influenza (HPAI) in February 2006 and February 2007 in Nigeria affected 3,057 farms and farmers; 1.3 million of the country's 140 million birds were destroyed at a cost of US$5.4 million in compensation paid by the Nigerian government (FDL 2008). In this context, this paper highlights the application of value chain analysis to tease out the more nuanced effects of each disease on different stakeholders in a chain setting and to provide greater insights on critical control points that may accentuate the entry and spread of disease.

METHODS AND MATERIALS

In both studies, a value chain analysis was conducted based on the use of semi-structured interviews and focus group discussions, following the methods espoused by Kaplinsky (2000). The value chain analysis paid careful attention to the linkages and relationships both between and within actors at each stage of production. For the Kenya study, a major focus of the analysis was to assess impact among chain stakeholders, while for the Nigeria study, the analysis further identified critical control points of disease entry and spread. Focus group discussions and key informant interviews generated information from key actors: traditional and commercial producers; traders and transporters; processors; and final points of retail. The Nigeria study further explored relationships with breeder and hatchery operators, while the Kenya study interviewed a number of local butchery operations. Our primary data was supplemented with secondary data on livestock production, price movements, poverty rates, and income levels to contextualize the nature of the chain and assess the market impacts of each disease.

RESULTS

RVF in Kenya

Results demonstrated that the negative impacts of the RVF outbreak not only affected livestock producers in the pastoral areas where the study was conducted (Garissa and Ijara districts in Northeastern (NE) Kenya) but also other downstream actors in the value chain, including livestock traders, abattoirs, casual laborers, and butchers, as well as other, non-agricultural sectors. A particular impact on producers was food insecurity. Owing to a ban on the marketing and slaughtering of animals, meat, which forms an important part of diets in these regions, was not available. In NE Kenya, sales of livestock and livestock products account for nearly 90 percent of the total income in pastoral households, 70 percent of which is spent on food. Financial losses resulting from the death of animals were also profound. In Garissa District, herders lost 17,882 heads of cattle, 110,426 goats, 145,551 sheep, and 26,136 camels due to RVF. In Ijara, 18,212 heads of cattle, 24,861 goats, and 77,996 sheep died. On average, each household lost animals worth KSh 19,881 (US$305[1]) in Garissa and KSh 13,535 (US$208) in Ijara. The loss is equivalent to 17 and 12 percent of the total household income in a year in the two districts, respectively.

Losses also occurred in the form of reduced build-up of animal stocks and lower milk productivity due to abortions. People in non-farm economies in production areas were also affected. In NE Kenya, livestock marketing provides off-farm employment and income to a large section of the urban population, including livestock traders and brokers (*dalal*), truck brokers (*dalaal*), water sellers, herders, trekkers, transporters, loaders, and food store owners.

The RVF outbreak also imposed huge losses on livestock traders. Traders in NE Kenya could not operate in areas where livestock movement bans were established. In areas where the bans were not in force, demand for slaughter animals plummeted. Traders also incurred costs associated with maintenance of unsold stocks. In the outbreak areas, some of the unsold stock held by traders fell sick and had to be treated (at a cost) while some died. Some traders drew down their working capital and were unable to resume their livestock trading activities at the time of this study (about 4 months after the outbreak). In Mwingi, one-half (50 of 100) of cattle traders and three-quarters (150 of 200) of goat traders could not restart operations after movement bans were lifted.

Slaughterhouses and the hundreds of butcheries in outbreak areas (where slaughter bans were instituted) closed down. In downstream end-markets such as Thika and Nairobi (where there were no slaughter bans), the kill volume in slaughterhouses fell by 66-94 percent. About 60 percent of casual workers in slaughterhouses were idled. Income for those casual workers who remained employed (e.g. flayers, splinters, and offal washers) fell significantly (from KSh300 (US$4.60) daily to about KSh30 (US$0.46 per day) because their pay is linked to the volume of daily throughput at the slaughterhouse. Other small businesses that rely on people who visit slaughterhouses as customers (e.g., tea and food sellers, cart pushers, scrap sellers etc.) remained idle or experienced very low level of activities. Meat sales in butcheries plummeted, with butcheries incurring significant losses due to spoilage of unsold meat. For instance, in Thika, we interviewed two butchers who reported losses of KSh125,000 (US$1,923) and KSh76,000 (US$1,169) in the two-month period when the outbreak was at its peak. Paradoxically during the outbreak, the Kenya Meat Commission (KMC) reported increased demand for their meat as many consumers believed it was safer. The outbreak also triggered increased demand for inspected meat in Garissa with the rate of kill at the Garissa slaughterhouse doubling from about 50 sheep and goats daily before the outbreak to about 100 after the outbreak. Poultry producers also benefitted as demand for their products skyrocketed.

[1] Based on an exchange rate of US$1=Ksh 65 at the time of the study.

HPAI in Nigeria

The results indicate that trading practices strongly contribute to the entry and spread of disease, both in commercial and indigenous markets. For example, the movement between farms increases traders' HPAI exposure, but economic motives encourage traders to pursue the trade even when they encounter the disease and lose birds and money. Small-scale breeder farms carrying fertile eggs to hatcheries expose themselves, other breeders, and the hatchery to the possibility of HPAI contamination. The practice of mixing poultry species in cages reduces costs for traders, with disease risk a secondary concern. Transporters of poultry and poultry products care little about the health of the birds they carry—which may be healthy or sick—as long as they are paid for their services. More bio-secure methods of transport are too costly for most traders to adopt. Washing and disinfecting vehicles increases operation costs (thus lowering net incomes), so traders are reluctant to do so. Similarly, live bird traders and processors resent the extra effort and cost of disposing of waste (e.g., dead birds, viscera, and feathers) properly. Indeed, before the Nigerian government raised the compensation from a flat rate of N250/bird (US$2) to market rates, producers tried to sell birds at the slightest suspicion of HPAI outbreak on their farms because the compensation offered was less than production costs at the time.

Input suppliers, particularly the feed industry, also represent a source of disease entry and spread. Toll-feed millers provide cheap, convenient feed to small-scale poultry farmers in Nigeria. While they provide a useful service, they contribute to the spread of HPAI by packaging feed in previously used bags that may be contaminated with HPAI. For toll-feed millers and farmers, the economic incentives are stronger than the disease risk. The increasing transport and use of poultry manure for vegetable fertilizer also potentially spreads HPAI from farm to farm. In addition, some grain suppliers transport poultry manure in bags later reused for grain, increasing the possibility of spreading infection across the country.

In the various poultry value chains, governance relationships typically involve arms-length or relationship-based interactions among actors. They tend to be codified through the actions of traders and collectors, which mediate the exchange between producers and retailers. Informant interviews revealed limited competition among live bird traders and collectors, with a small, powerful group of collectors and distributors cornering large portions of the business, which could influence various incentives, including HPAI control, among upstream and downstream actors. Formalized standards in the poultry sector appear to be relatively ad hoc, with limited coordination among chain actors to provide consistency in the quality, food safety, or disease status of poultry and poultry products. End consumers have little input on the quality- and safety-based attributes of live birds and poultry meat, and their willingness to pay for higher quality is probably quite low. Consequently, no single consumer group has been able to force producers or traders to modify processes to suit consumer demand.

CONCLUSIONS

The RVF case study examined the value chain impacts of the 2006/07 outbreak in Kenya. While short-lived, these non-farm impacts nonetheless had important poverty impacts that public policy tends to overlook. Public policies that could assist downstream actors, through the provision of short-term, low-interest loans to help refinance operations for example, would not only dampen the negative impact associated with disease, but also provide incentives for impacted groups to not engage in livestock-related activities that might compromise disease control efforts (e.g., illegal trading during periods of quarantine and animal movement controls).

In the case of HPAI in Nigeria, preliminary results revealed that disease transmission pathways and the risk of disease transmission are strongly linked to economic incentives faced by chain actors relative to commercial practice. In particular, limited coordination

in the chain combined with high transactions costs reduces incentives for more biosecure production and trading practices.

We found that the private sector has an important role to play when disease outbreaks strike. While governments typically led and managed the response to disease, practices needed to mitigate the entry and spread of disease must be driven by the private sector. In both countries, associations were quite common in the value chain and could play a potential role in assisting members cope with such crises and coordinating activities to improve compliance with more biosecure practices. In Nigeria, for example, associations helped educate chain actors on HPAI, and their roles could be expanded to improve coordination within the chain. The development and administration of "rainy day" funds that members could draw from in periods of crisis, including disease outbreaks, may be one possible function for associations to deal with animal health emergencies. Association resources could be further mobilized to induce better incentives for practices that improve quality and biosecurity as well.

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