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Key Findings

- Almost 50 percent of all poultry-producing households in Ghana are located in three regions (Northern, Upper Eastern, and Ashanti)—key regions to target for HPAI prevention and surveillance among small-scale poultry production systems.
- Because they have diversified income sources and derive small proportions of their total household income from poultry, poultry-producing households are likely to be resilient against HPAI shocks.
- The impact of HPAI on incomes is small; however, larger small-scale poultry producers stand to lose significant proportions of their wealth (assets) as a result of HPAI shocks. Households in the areas with medium HPAI risk (Central, Western, Eastern, Ashanti, and Brong Ahafo regions) are most vulnerable to HPAI and should be encouraged to adopt HPAI control and mitigation measures.

Controlling Avian Flu and Protecting People's Livelihoods in Africa and Indonesia

HPAI Research Brief | No. 9 – Year: 2009

Investigating the Role of Poultry and the Impact of HPAI on Livelihoods in Ghana

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Ghana experienced three confirmed highly pathogenic avian influenza (HPAI) outbreaks in 2007. The virus was detected on commercial farms of different sizes in three regions: in the Tema area (Greater Accra region) at the end of April, in the Sunyani area (Brong Ahafo region) in May, and in the Ketu district (Volta region) in June. These outbreaks were successfully controlled by the Veterinary Services Directorate (VSD), and no outbreaks have been recorded in the country since. However, the VSD is in a state of high alert because the virus is still circulating in West Africa (Aning et al. 2008).

Even though the VSD dealt with the outbreaks in an effective and timely manner, media reports incited panic among the general public. Panic caused significant demand shocks to the Ghanaian poultry sector, affecting the incomes of commercial poultry producers, a significant proportion of whom went bankrupt (Aning et al. 2008). As a result, the total economic cost of these outbreaks is thought to be significantly higher than the VSD containment, control, and prevention costs (estimated at US\$4,297,790 [VSD 2008]).

With the exception of Diao (2009), few authors have conducted in-depth analyses of the economic costs of HPAI outbreaks and scares to the overall Ghanaian economy. Even fewer studies have investigated the impact of HPAI on noncommercial or semicommercial small-scale poultry producers.

Small-scale poultry production is defined as keeping 500 or fewer birds in a backyard or village free-range or scavenging production system, with few or no biosecurity measures. It is an important livelihood activity, especially in rural areas. Birol and Asare-Marfo (2008) report that in Ghana, few studies have been done on the role of poultry in the livelihoods of small-scale, household-level producers and none at a national level. They used nationally representative 2005–06 Ghana Living Standards Survey (GLSS) data and statistical analysis to examine the role of poultry in the incomes of rural poultry-producing households. The study quantified the magnitudes of the impacts of HPAI shocks on incomes, across agroecological zones and income groups.

The present study uses the same data set and econometric models (i) to predict and profile which households are most likely to be poultry producers and which are most likely to keep larger small-scale flocks (6–500 birds), to understand who would be most affected in case of an HPAI outbreak, and (ii) to assess the impact of a potential HPAI outbreak on livelihood outcomes, including income and wealth (measured as value of assets). Such information is expected to assist in the design of efficient, effective, and equitable interventions for HPAI mitigation and control in Ghana.

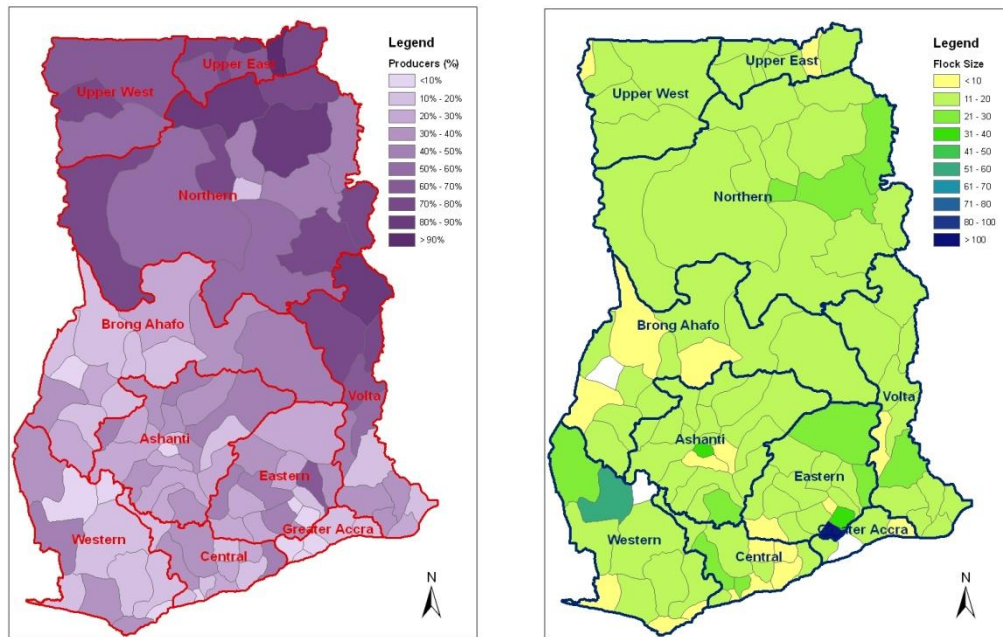
Poultry-Producing Households

According to GLSS data, almost 35 percent of all Ghanaian households engage in small-scale poultry production. It is mainly a rural phenomenon; about 51 percent of all rural households keep poultry, whereas only 11 percent of all urban households do. About 17 percent of all small-scale poultry-producing households are located in the Northern region, followed by Upper East (16 percent) and Ashanti (13 percent); only 1.1 percent are located in Greater Accra (where 50 percent of the country's total poultry supply is produced in medium- and large-scale commercial poultry farms). The Upper East region supports the highest proportion of households that engage in poultry production (80 percent), followed by Upper West (68 percent), Northern (64 percent), and Volta (46 percent). The smallest proportion of poultry-producing households is in Greater Accra. The left map in Figure 1 presents the percentages of poultry-producing households by district, according to the GLSS data.

The average flock size managed by a small-scale poultry-producing household in Ghana is 14 birds. Poultry-producing households in the Eastern region manage the largest flocks (19 birds), followed by Western, Volta, and Northern (all about 15 birds); those in the Upper East region manage the smallest flocks (12 birds). The right map on Figure 1 presents the average poultry flock size, by district, according to the GLSS data.

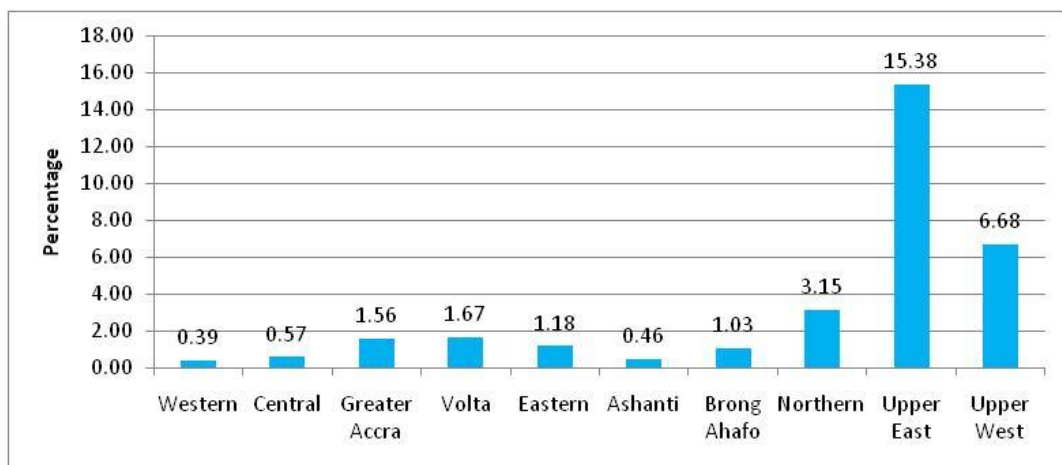
In this study, total annual household income includes salaries from industry employment (agriculture, mining, manufacturing, services, and so on); income from livestock and crop sales; and remittances, rent income, and other reported income. On average, poultry (live bird) and egg sales contribute 4.3 percent to the poultry-producing household's total annual household income, but this figure varies by region. The highest percentages of total annual household income derived from poultry are in the Upper East (15.4 percent) and the Upper West (6.7 percent) regions; poultry-producing households in the Ashanti, Central, and Western regions rely the least on poultry income (<1 percent of overall household income derived from poultry) (Figure 2).

Figure 1. Small-scale poultry production (left) and average flock size (right), by district



Source: GLSS

Figure 2. Proportion of household income derived from poultry production, by region



Source: GLSS

Two probabilistic models were used to determine the agroecological and the household-, farm-, and market-level factors that affect a household’s decisions regarding (i) whether to engage in poultry production as a livelihood strategy and (ii) the size of flock to manage.

Results of the first model indicate that households predicted to engage in poultry production have older, less-educated household heads; are larger; and have more adult females and higher children-to-adults ratios. Predicted poultry keepers have lower per capita expenditures (a proxy for incomes), but an insignificant, small proportion of these households have expenditures below the hardcore poverty line. Consequently, even though poorer households tend to engage in household-level poultry production in Ghana, the poorest of the poor (hardcore poor) do not. In terms of income sources, predicted poultry keepers have fewer household members employed outside of the

household, but they have more diversified livelihood strategies (measured as the number of income sources) than households less likely to be engaged in poultry production. In fact, significantly higher proportions of predicted poultry producers are engaged in the production of crops and other livestock.

Results of the second model indicate that the households significantly more likely to manage larger flocks have older, more-educated household heads, are larger, and have more adult females and a higher children-to-adults ratio. They are wealthier, in terms of asset ownership (land, livestock, and durable assets). They also have diversified income sources, are more likely to produce crops and other (small) livestock, and are less likely to have household expenditures below the poverty line.

HPAI Scenarios and Livelihood Impacts

To estimate the impact of HPAI on poultry-producing households' livelihood indicators (income and asset wealth), especially those pertaining to livestock, six artificial counterfactual scenarios were created and investigated. The analysis involved matching households in treatment and control groups for the scenarios described in Table 1.

Table 1. HPAI scenarios for household-level poultry production

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Simulated impact	100% loss of poultry flocks	100% loss of small-scale poultry flocks	80% loss in large-scale poultry flock	50% reduction in poultry price	100 % loss of poultry flock in high-risk areas	80% loss in large-scale poultry flocks in medium- risk areas
Treatment group	All households without poultry	All households without poultry	Small-scale poultry keepers (1–5 birds)	Poultry keepers who sold at low prices	All households without poultry	Small-scale poultry keepers (1–5 birds)
Control group	All households with poultry	Small-scale poultry keepers (1–5 birds)	Large-scale poultry keepers (6–500 birds)	Poultry keepers who sold at high prices	All households with poultry	Large-scale poultry keepers (6–500 birds)

Note: For scenarios 5 and 6, Ghana disease-spread maps from Stevens et al. (2009) were used to categorize regions as areas where the risk of HPAI spread was high (Upper East, Upper West, Northern, Greater Accra, and Volta regions) or medium (Central, Western, Eastern, Ashanti, and Brong Ahafo regions).

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Control group	All households with poultry	Small-scale poultry keepers (1–5 birds)	Large-scale poultry keepers (6–500 birds)	Poultry keepers who sold at high prices	All households with poultry	Large-scale poultry keepers (6–500 birds)
Treatment group	All households without poultry	All households without poultry	Small-scale poultry keepers (1–5 birds)	Poultry keepers who sold at low prices	All households without poultry	Small-scale poultry keepers (1–5 birds)

Simulated impact	100% loss of poultry flocks	100% loss of small-scale poultry flocks	80% loss in large-scale poultry flock	50% reduction in poultry price	100 % loss of poultry flock in high-risk areas	80% loss in large-scale poultry flocks in medium- risk areas
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Note: For scenarios 5 and 6, Ghana disease-spread maps from Stevens et al. (2009) were used to categorize regions as areas where the risk of HPAI spread was high (Upper East, Upper West, Northern, Greater Accra, and Volta regions) or medium (Central, Western, Eastern, Ashanti, and Brong Ahafo regions).

In each scenario, statistical methods were used to compare the livelihood outcomes of a treatment group of households, representing the result of HPAI demand or supply shocks, and a control group, representing the status quo (no HPAI shocks). The groups were matched according to various household-level characteristics (household demographics, assets, and regional characteristics such as location, poverty status, and number of income sources) expected to affect a household's propensity to be in the treatment situation as well as their outcomes (livestock income and livestock wealth). According to this method, the two groups should differ only in poultry ownership characteristics.

Impacts of HPAI on Poultry-Producing Households' Livelihoods

Table 2 presents the differences in livelihood outcomes of control and treatment households. Results reveal that HPAI shocks significantly reduce incomes from livestock under scenarios 1, 5, and 6.

Table 2. Estimated impact of HPAI on livelihood outcomes of household-level poultry producers in Ghana Cedis (GH¢) (standard deviations)

Scenario	Livestock income	Livestock wealth
1: All Ghana, lose all poultry	-6 (2.5)**	-
2: All Ghana, lose all small flocks	-a	-
3: All Ghana, large flocks become small flocks	-	-117.6 (32.6)***
4: Poultry sellers, high price falls to low price	-	-
5: High HPAI risk, lose all poultry	-7.4 (3.7)**	-
6: Medium HPAI risk, large flocks become small flocks	-8.9 (4.4)**	-143 (64.5)**

^a - indicates insignificant estimated impact.

Livelihood outcomes between the two groups were significantly different at the ***1 percent and **5 percent significance levels.

According to scenario 1, if an HPAI outbreak wiped out 100 percent of all poultry, then an average small-scale poultry-producing household would lose 6 Ghana cedis (GH¢6.00; approximately US\$4.10) of its total annual income from livestock (GH¢35)—a 17 percent loss in total annual livestock income and an 0.8 percent loss in total annual household income. According to scenario 5, if all poultry-producing households in the areas of high HPAI risk lost 100 percent of their flocks, then they could lose GH¢7.4 (US\$5) of their annual livestock incomes (GH¢34)—reducing annual livestock incomes by 22 percent and annual household incomes by 1.6 percent. According to scenario 6, if poultry-producing households with larger small-scale flocks lost 80 percent of their poultry, then they could lose GH¢8.9 (US\$6.1) of their annual incomes from livestock (GH¢30)—reducing annual livestock incomes by 30 percent and overall annual household incomes by 0.5 percent.

HPAI shocks are expected to result in significant negative impacts on wealth under scenarios 3 and 6. Under scenario 3, if an average poultry-producing household that manages a larger small-scale flock lost 80 percent of its flock as a result of HPAI, then total livestock wealth would decrease by

GH¢117.6 (US\$80.2) from the current average (GH¢291)—reducing livestock wealth by 41 percent and overall household wealth by 12 percent. Under scenario 6, if a household with a larger small-scale flock in a medium-risk area lost 80 percent of its flock, then it could lose GH¢143 (US\$97.5) of livestock wealth from the current average (GH¢464)—reducing household livestock wealth by 31 percent and overall household wealth by 16 percent.

Concluding Remarks

Overall, about 35 percent of all Ghanaian households are predicted to raise poultry. This figure is significantly higher for rural households (51 percent) than urban ones (11 percent), indicating that poultry production is a popular livelihood activity for rural households. Almost 50 percent of all poultry-producing households are located in three regions: Northern, Upper Eastern, and Ashanti. Therefore, these regions (especially their rural areas) may be the key regions to target for HPAI prevention and surveillance measures in small-scale poultry-production systems.

Results of the analyses indicate that, on average, poultry producers derive small proportions (4.3 percent) of their total household income from poultry; they have diverse income sources and are likely to be engaged in crop and/or other livestock production. Therefore, poultry producers are expected to be resilient against shocks and stresses such as those that may be caused by HPAI scares and outbreaks. It also was found that households with more children and women are more likely to keep poultry and also more likely to keep larger flocks. Several previous studies have found that women and children depend on poultry for their livelihood (income, nutrition, and so on). Therefore HPAI shocks may have significant negative impacts on intra-household gender equality, as well as nutritional repercussions that could have impacts on future livelihoods (Iannotti et al 2008). Detailed household-level livelihood research on these topics is warranted.

Finally, the results indicated that households that tend to manage larger small-scale flocks are wealthier and more educated than those predicted to manage smaller flocks. The poultry producers with larger small-scale flocks have higher human capital and wealth, which might imply that they also have the capacity to process information regarding HPAI mitigation and control strategies. Therefore, the risk of HPAI spread may be greater among those who raise smaller flocks.

The assessment of the livelihood impacts of HPAI on poultry producers reveals that the effects on households' total annual incomes are likely to be small, with a loss of less than 1 percent in overall household income if all Ghanaian households lost their poultry to HPAI. However, the impact of HPAI on total household wealth would be more significant, especially for households with larger small-scale flocks, which stand to lose 12 percent (countrywide) to 16 percent (in medium-risk areas) of their total household wealth. Given the magnitude of loss in total asset value, the larger small-scale poultry-producing households—especially those in the areas of medium HPAI risk—have much to lose. And given the important role of assets in the sustainability of future livelihoods, these households should be encouraged to adopt HPAI-mitigation measures and should be targeted when designing compensation and training programs.

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