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## GRIPAVI: A PROJECT TO STUDY AVIAN INFLUENZA AND NEWCASTLE DISEASE IN DEVELOPING COUNTRIES EPIDEMIOLOGICAL STUDIES IN VIETNAM

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GRIPAVI, funded by the French Ministry of Foreign and European Affairs, is a research

programme implemented by CIRAD, coordinator of the project, in collaboration with scientific teams from developing countries.

### THE PROJECT

This project develops epidemiological, virological and ecological research axes around wild and domestic birds in 6 countries in Africa and Asia (Ethiopia, Madagascar, Mali, Mauritania, Vietnam, and Zimbabwe).

Two viral diseases are more specifically targeted: Avian Influenza (AI) and Newcastle disease (ND). These two diseases are distributed worldwide. When considering the highly pathogenic strains, they are characterized by the same clinical signs: being highly contagious and carrying heavy rates of mortality. Great economic losses are the result.

H5N1 (Highly Pathogenic Avian Influenza) H5N1 Asian lineage virus was first detected in poultry in Asia in 1996 and reached Europe and Africa between 2005 and 2006.

Today 387 human cases have been reported worldwide, with a 60% rate of mortality. (WHO World Health Organization).

### THREE OBJECTIVES

The GRIPAVI project encompasses three objectives aiming at better understanding

AI and ND:

- To study virus transmission between wild and domestic birds as well as viral persistence pathways in infected countries;
- Model the spread of the virus;
- Analyze control and surveillance methods used today with a view towards recommending measures to increase the effectiveness of containment efforts.

### BUDGET

3,600,000 € funded by the French Ministry of Foreign and European Affairs.

### PROJECT DURATION

36 months of field and laboratory studies.

### WORLD PARTNERS

AFSSA, CIRDES, CNERV, DRZV, EISMV, FAO, ILRI, INRA,

Institut Pasteur, LCV, NAHDIC, PRISE consortium, NUST, OIE, OVI.

### SIX COUNTRIES FOR SIX DIFFERENT STUDY FRAMEWORKS

1. ETHIOPIA AND ITS RIFT VALLEY: Smallholder farming systems and traditional commercial organisation
2. THE HIGH PLATEAU OF MADAGASCAR and its large rice field: A meeting place for migratory and domestic species

3. MALI AND ITS INNER NIGER DELTA: A zone of wintering of wild birds and of traditional hunting for commercial trade.
4. MAURITANIA AND ITS "BANC D'ARGUIN": wintering zone for millions of seabirds, in particular palaeartic waders.
5. VIET NAM: intensive breeding systems with multi-species farms; where avian influenza is endemic, and where a vaccination strategy is in place.
6. ZIMBABWE AND THE LAKE CHIVERO/ MANYAME ECOSYSTEM: A place of strong sanitary interaction between wild, domestic, traditional and industrial compartments.

### GRIPAVI IN VIETNAM

#### General context

Since 2003, H5N1 outbreaks have been reported in both poultry and humans. Poultry vaccination was adopted in 2005 to deal with the non-clinical expression of the virus on waterfowl and to limit the risks of human transmission. In Vietnam, 200 million poultry are cultivated over a diversity of production systems. The commodity chains are complex and involve

many actors. Human and poultry population densities are very high in the Delta areas, which facilitate the spread of this contagious disease.

#### Multiple Sublineages of Avian Influenza Virus Are Present

Different virus clades are circulating in Vietnam.

In the South, index virus clade 1 (Genotype Z) is still present, so there is probably a continuous low level circulation there with sporadic outbreaks.

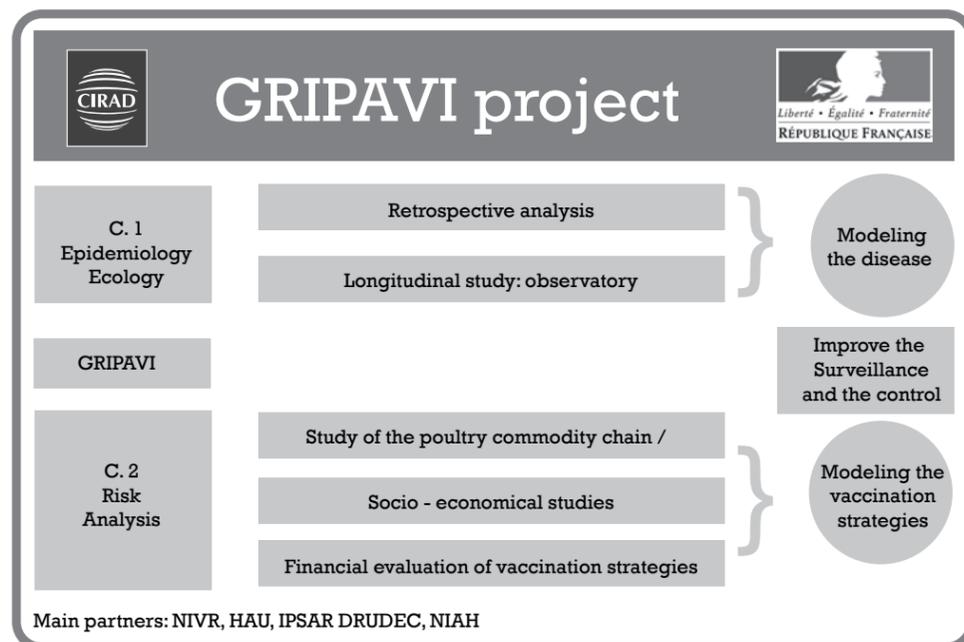
In the North: clade 2 was predominant in 2007 (N.T.Dung, 2008) but there is a need to confirm the absence of clade 1 with representative sampling

Strains isolated from North Vietnam are close to those from China, which demonstrates probable regular introductions.

Pathogenicity is regularly changing (Cf clade 2 and clade 7 recently) which makes recognition in the field more difficult.

#### Different activities in Vietnam

Various studies are currently being undertaken in Vietnam. There are summarized in



the figure below.

The partners are diverse and all PRISE partners are involved to one extent or another.

The virology team of NIVR is the main partner for the epidemiology and ecology component.

### EPIDEMIOLOGY AND ECOLOGY COMPONENT

#### Research question

«What are the determinants and the patterns of introduction, diffusion and persistence of the highly pathogenic avian influenza virus H5N1 in the Red River Delta in North Vietnam and the consequences in terms of surveillance and control? »

#### Methodology

##### 1. Classical epidemiology:

- Retrospective studies
- Prospective study

##### 2. Virtual laboratory:

- Multi-Agent Based modeling in collaboration with the IRD

#### Retrospective analysis in the RRD

The objective is to identify factors related to the introduction or persistence of the virus

Some initial results show that:

- The average number of outbreaks per commune, and the levels of risk at commune level decrease with each outbreak of the virus, indicating improvement controls implemented by the veterinary services after an outbreak is detected.
- In some areas, outbreaks are concentrated, but at commune level. There are very few cases of reoccurrence -- which may be explained by the impact of the control measures applied after an outbreak has been declared.

#### Case control study

The case control study is aimed at testing different variables related to the human and natural environment and to the poultry production system.

In Bac Giang province, data were collected in 20 case villages and 40 non-matched control villages, as well as in 19 case farms and 19 non-case matched control farms.

The data analysis is on going.

The case definition applied to the outbreak lists from different sources was:

Farm having reported mortality whatever the percentage, or farm with laboratory confirmation reported.

The case definition applied on the field for confirmation was:

- Acute disease
- mortality over 10 % within 1 day
- + nervous signs on ducks
- rapid test + (usually not reported on the list)

#### Prospective Study

The objectives of this study are to:

- 1 Identify potential seasonal patterns for the incidence of H5N1 in the different compartments and to try to link these patterns to seasonal cycles and other human interventions.
- 2 Test hypothesis of the persistence of the virus in the population of poultry throughout a year against a regular reintroduction using bio molecular analysis of the strains collected.
- 3 Identify the local factors for the diffusion intra and inter-compartments.
- 4 Formulate hypothesis related to the virological ecology (comparing the strains detected in the different compartments)

The methodology:

For domestic poultry

1. → Repeated population-based cross-sectional surveys on domestic poultry (around 1000 birds/survey)
  - Frequency: 4 to 6 surveys over 1 year
  - Virology and serology (exploration of ELISA against NS1 protein)
2. → Sampling of highly connected markets
3. → Nested case-control study at farm level within the study population
4. → Estimation of the risk of getting AI for a subset of the study population followed over the different cross-sectional surveys
5. → Outbreak investigation

For Wild birds

- 4 species targeted: Chinese pond heron / Little Egret / Munia / Sparrow
- collection from hunters
- feces collection from roosting site (Heron / Egret)

## High Pathogenic Avian Influenza in Poultry Production Systems in Vietnam: TENTATIVE APPROACH FOR AN HACCP-LIKE RISK SCORING METHODOLOGY

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### ABSTRACT

The circulation of the HPAI virus can be studied at farm level, but relevant data gathered at other points in the poultry production chain, such as markets or collection points, help create a clearer picture of the virus' circulation, since these points are often more accessible than the farms. There is also potential for the virus to become concentrated at these points. Observation of critical points along the chain should draw a good picture of the virus' circulation. Either this could be used as a comparison with farm survey data, or it could provide more efficient and rapid detection of HPAI in a given context and production sector.

The objectives of the present study are to analyze and describe flows and practices from the top to the bottom of the poultry marketing chain in two Provinces of North Vietnam to evaluate a HACCP-like risk scoring methodology and to identify critical points for the detection of pathogen circulation along these marketing chains.

The qualitative description of poultry production sectors was based on questionnaires compiled between May and August 2008 on 240 poultry semi-commercial production farms and 60 collective interviews of backyard producers and 60 traders in Ha Tay and Bac Giang Provinces. Possible observation points were identified. The HACCP-like approach with a risk scoring methodology, tested on two points from the

layer production sector, was able to discriminate between these two points. Our result confirms that this method could be used to identify a few critical observation points with a higher risk of virus circulation in the chain, where the early detection of HPAI virus would be most effective.

Keywords: High-Pathogenic Avian Influenza; Risk scoring; HACCP; Poultry production; Poultry traders; Chicken; Duck; Vietnam

### INTRODUCTION

Poultry marketing chains converge to a single geographical point. Birds come in from many village farms in a given geographic zone to singular pool of markets and collection points. As these locations are more easily accessible than farms, they may be suitable points for observing the circulation of pathogens, such as high-pathogenic avian influenza virus, throughout the supply pool. The propensity of small farmers in developing countries to sell-off sick animals as a precautionary measure – even when faced with only a vague suspicion of risk, likely leads to a concentration of pathogenic prevalence that can be easily detected in poultry available at central markets-as compared to the likelihood of detecting such prevalence in poultry still being raised on farms. Therefore, inspecting certain key points along the marketing chain can create a more complete picture of pathogen circulation higher up the chain, at the level of

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