Challenge to control the animal diseases; the implications for the sustainable productivity of livestock

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Presentation overview

1. History of animal disease control: Eradication of rinderpest
2. Overview of animal diseases: Epidemiological aspects
3. Animal health risks associated with “Livestock Revolution”
4. Conclusions

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History of animal disease control: Eradication of rinderpest

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Rinderpest

Highly contagious viral disease with a high degree of fatality(>70%) in cattle, buffalo, pig and many other wild ungulates

Agents:

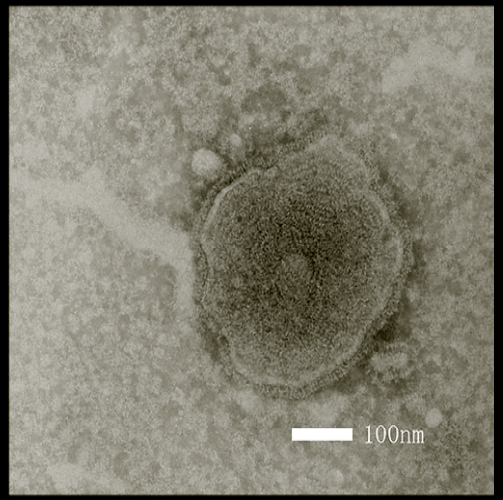
Rinderpest virus, transmitted by direct or close indirect contacts

Ancestor of all morbilliviruses

Clinical Signs:

Fever, Discharges(nose, eyes), Diarrhea/dysentery, Ulcers and Death

Rinderpest virus



Affected cattle (Japanese Black)

Brief History of Rinderpest Eradication

- Described as early as 384-322 B.C by Aristotle
- Until the 19th c.: Spread across the Afro-Eurasian continent
- 1713: Lanticisi's recommendations for the disease control
- 1762: The first veterinary school in Europe
- 1924: Establishment of OIE
- 1928/1962: Development of vaccines (Edwards & Plowright)
- 1962-:Rinderpest control programmes in Africa and South Asia using vaccine (JP15, PARC, W/SAREC)
- 1998-:Global Rinderpest Eradication Programme (GREP) by FAO, OIE and IAEA, aiming at complete eradication by 2010

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Brief History of Rinderpest Eradication in Japan

- The 17th c : Described as a disease namely '*Tachi* '
- Until the 20th c.: Many outbreaks in Japan
- 1886: The first legislation of animal disease prevention
- 1891: The first veterinary research laboratory in Japan
- 1906: Passive immunization for the disease prevention
- 1918: The world's first inactivated vaccine by Kakizaki
- 1922: The last case in Japan
- 1930: OIE accession of Japan
- 1941: Development of live vaccine by Nakamura.
  It contributed to eradicate the disease in East and Southeast Asia.

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Overview of animal diseases: Epidemiological aspects

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Transboundary animal diseases

are defined by FAO as:

those that are of significant economic, trade and/or food security importance for a considerable number of countries; which can easily spread to other countries and reach epidemic proportions; and where control/management, including exclusion, requires cooperation between several countries.

Foot-and-mouth disease, Classical swine fever, Bovine spongiform encephalopathy, Highly pathogenic avian influenza, Peste des petits ruminants, African swine fever, Newcastle disease, etc.

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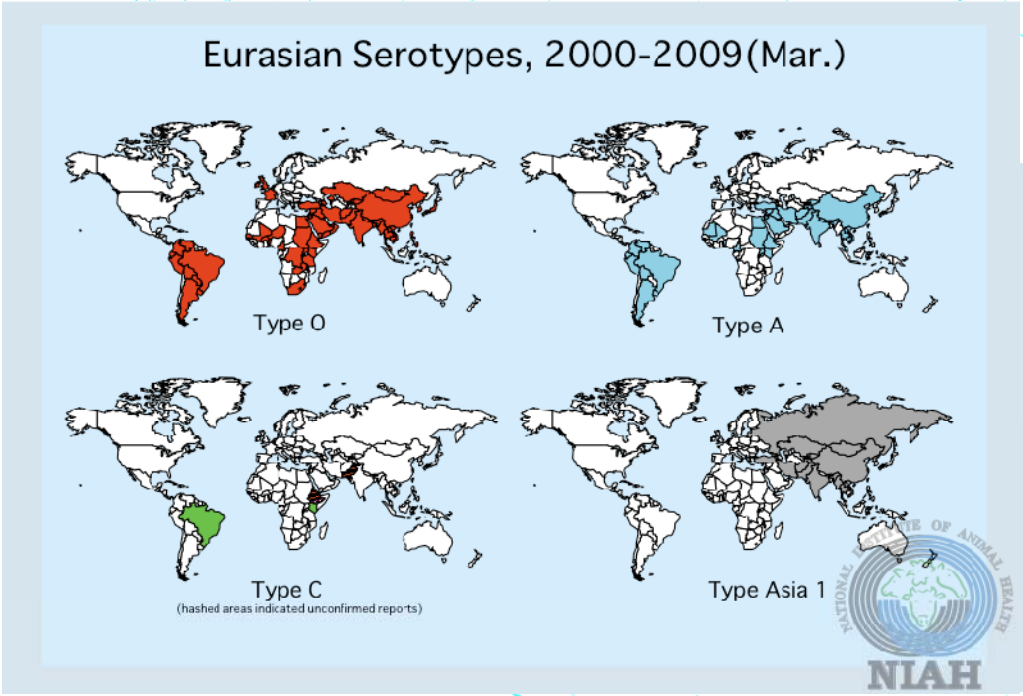
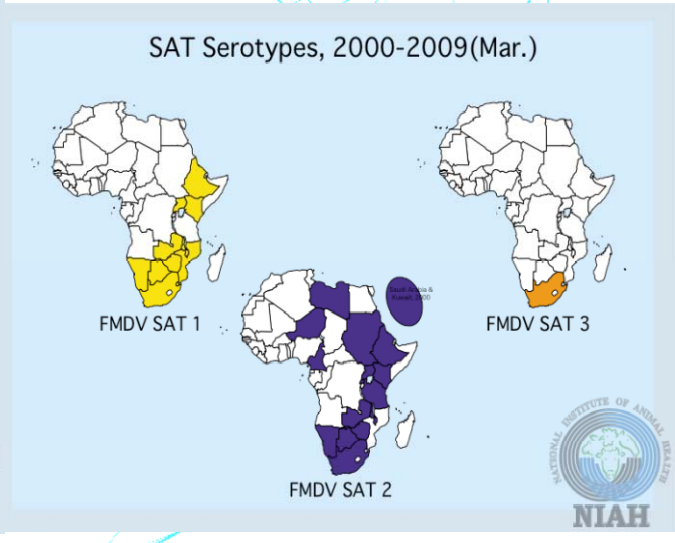
Foot-and-mouth disease (1)

- Highly contagious livestock disease, caused by FMD virus
- Seven immunologically distinct serotypes: A, O, C, SAT1-3, Asia1
- Clinical signs; fever, salivation, vesicles (feet, oral cavity and nipple), significant loss of weight and/or milk production
- Reduction of productivity of livestock
- Difficult to control and a major international trade issue

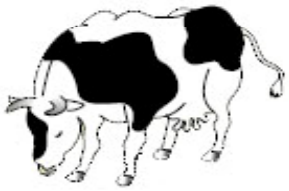




Figures are drawn based on the OIE's information

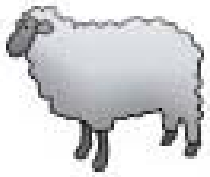
Foot-and-mouth disease (2)

- Extremely variable antigenicity, resulting sequential infection
- Variable host species including wildlife
- Transmitted by direct or indirect contact, animate & Inanimate vectors, and airborne
- Source of infection: Incubating and clinically affected animals, breath, saliva, feces, and urine, milk and semen, meat and by-products, and virus-carriers (cattle and water buffalo)



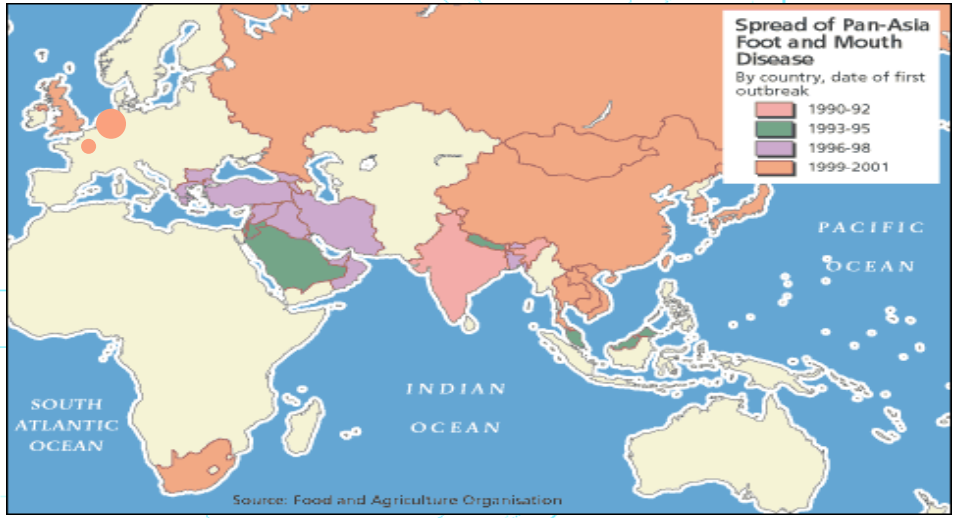
Cattle as a detector

Pig as an amplifier



Sheep/goat as carriers

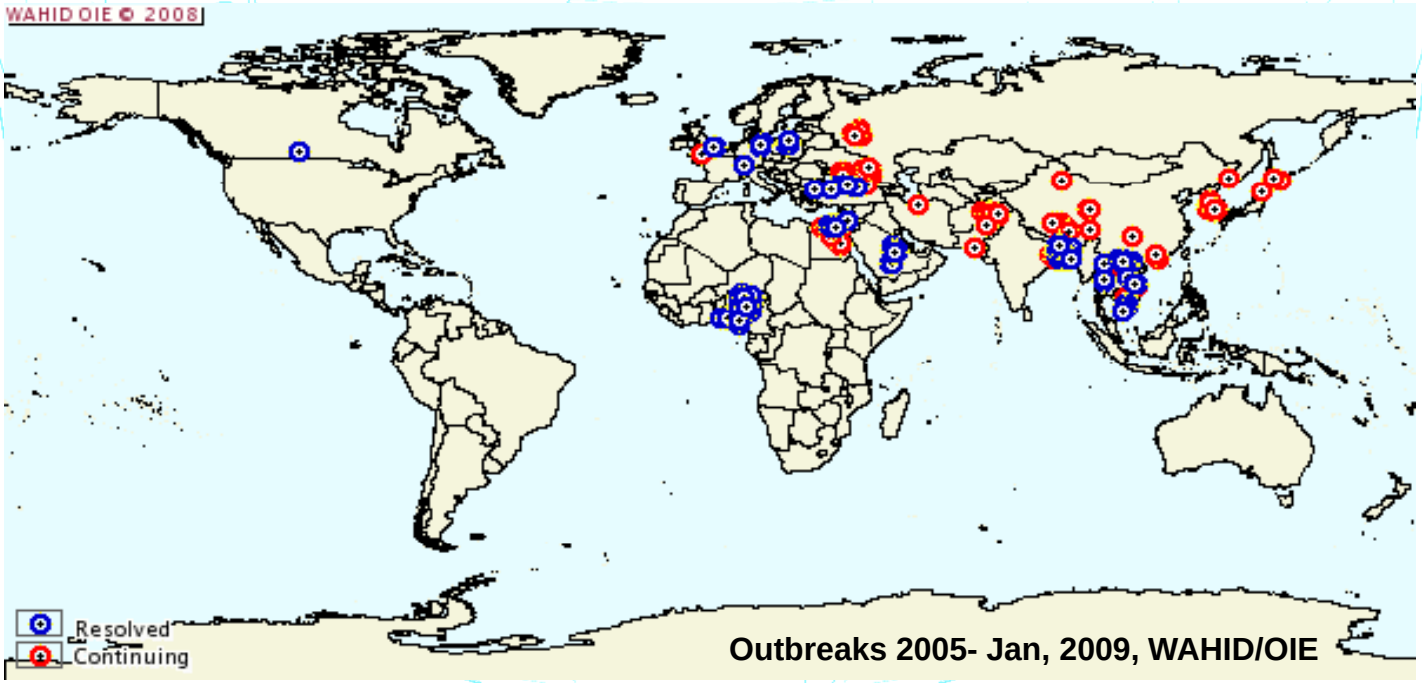
Epidemiological roles of host animals



Spread of emerging PanAsia topotype 1990-2001, (*The economist, 2001*)

Highly Pathogenic Avian Influenza

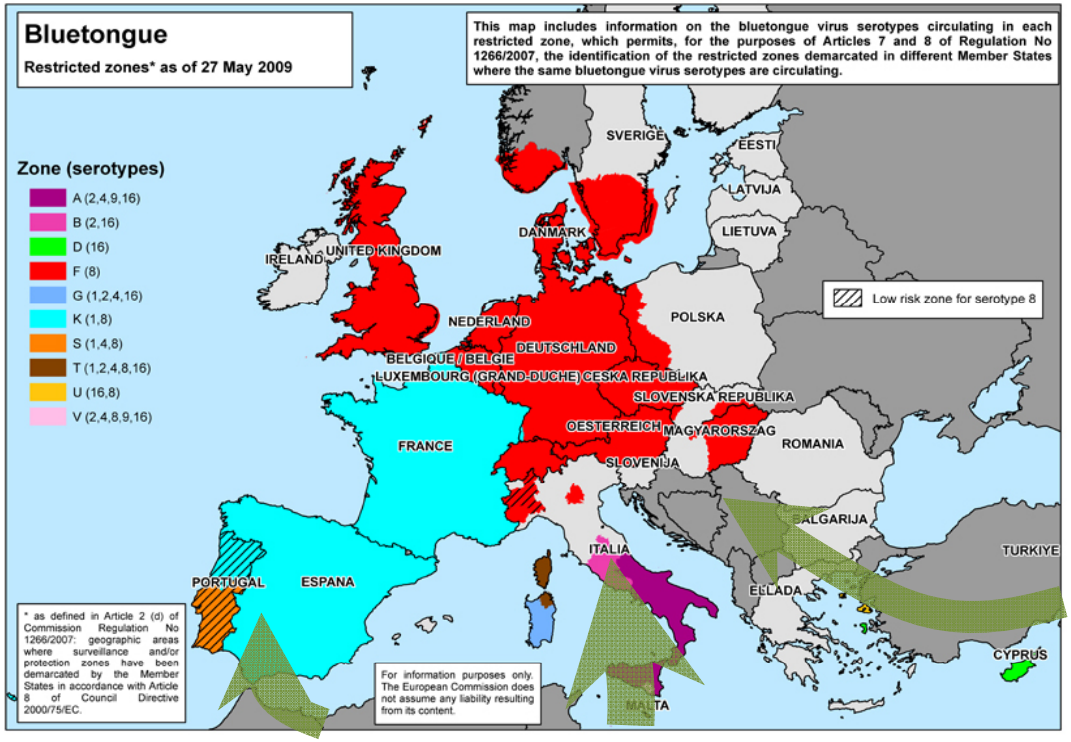
- Agents:Family Orthomyxoviridae, genus *Influenzavirus* A.
- Subtypes H1-H16 and N1-N9 in wild birds (e.g. water fowls) as a natural host
- To date, all highly pathogenic isolates have been influenza A viruses of subtypes H5 and H7
- Outbreaks with subtype H5N1 in poultry (chicken, duck, goose, quail, etc.): Total 51 countries, 1.86 million outbreaks in the world from 2003 to July 2009



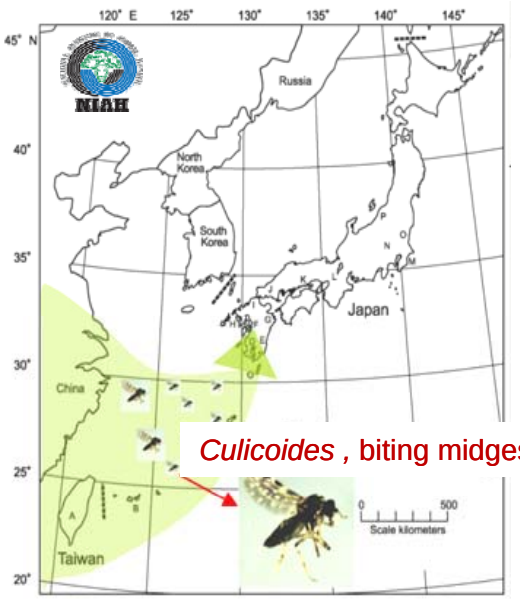
Outbreaks 2005- Jan, 2009, WAHID/OIE

Climate change & animal diseases

- Vector-borne diseases critically dependent on environmental and climatic conditions (e.g. Bluetongue in Europe, Akabane Dis. in Asia)
- Need for strong and efficient veterinary services and global surveillance network for early detection of the hazards
- Combination with public health services as zoonoses (e.g. WNV, JEV)



(Bluetongue virus serotypes in EU, modified EU web. 2009)



Akabane disease.; abortion, stillbirth, premature birth or congenital abnormalities in cattle

Animal Health Risks associated with "Livestock Revolution"

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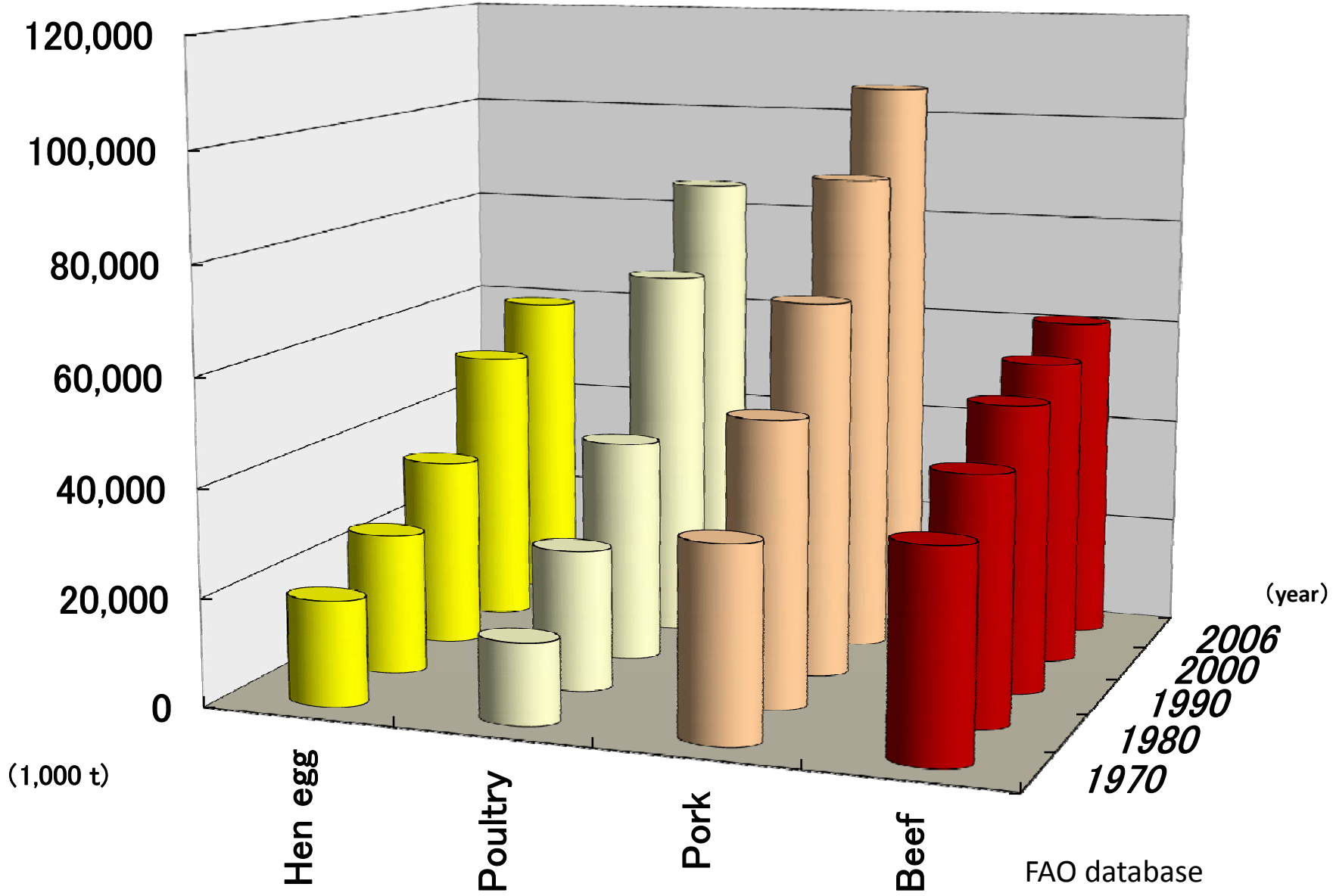
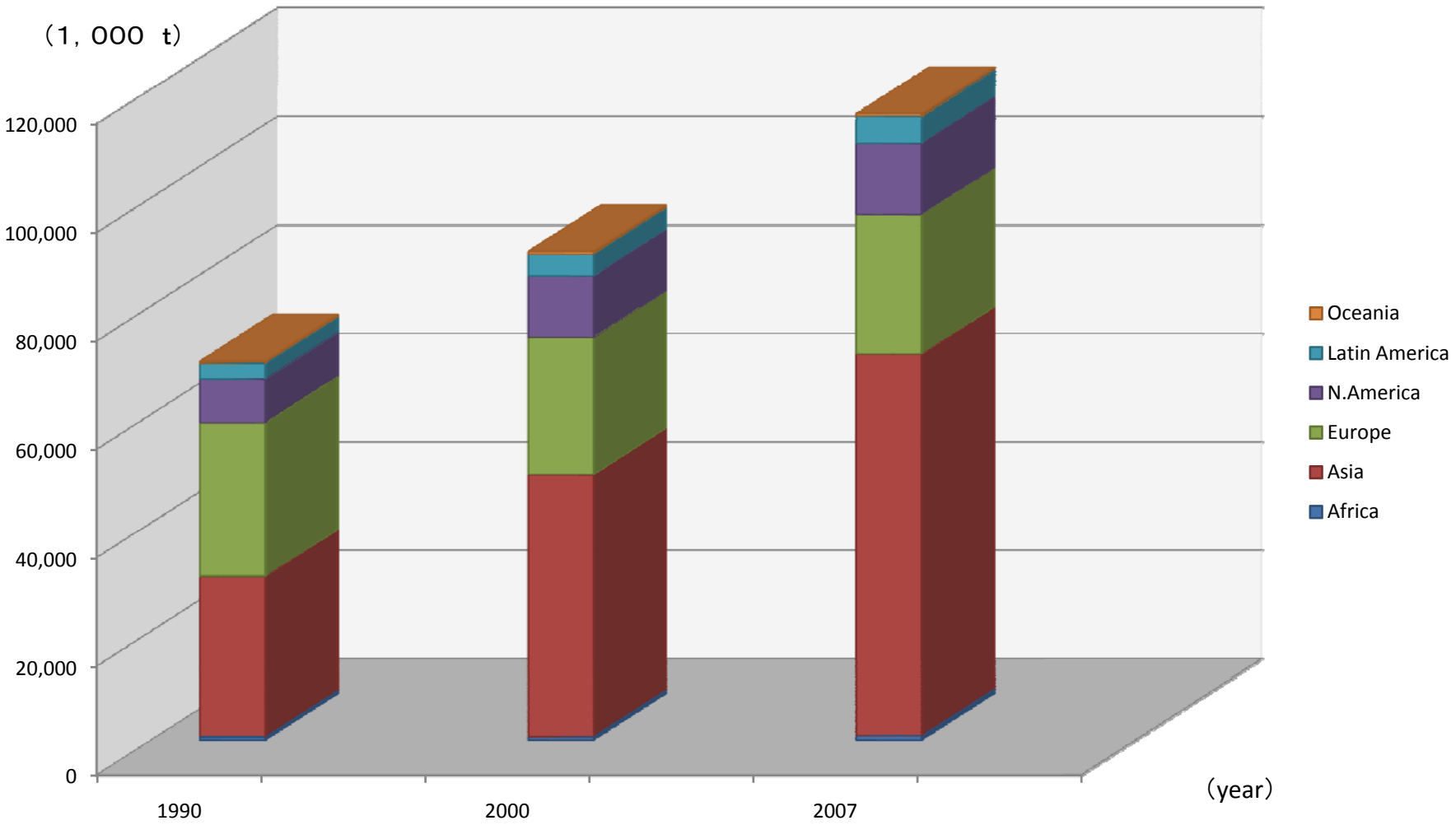
Global Meat & Egg production 1970-2006



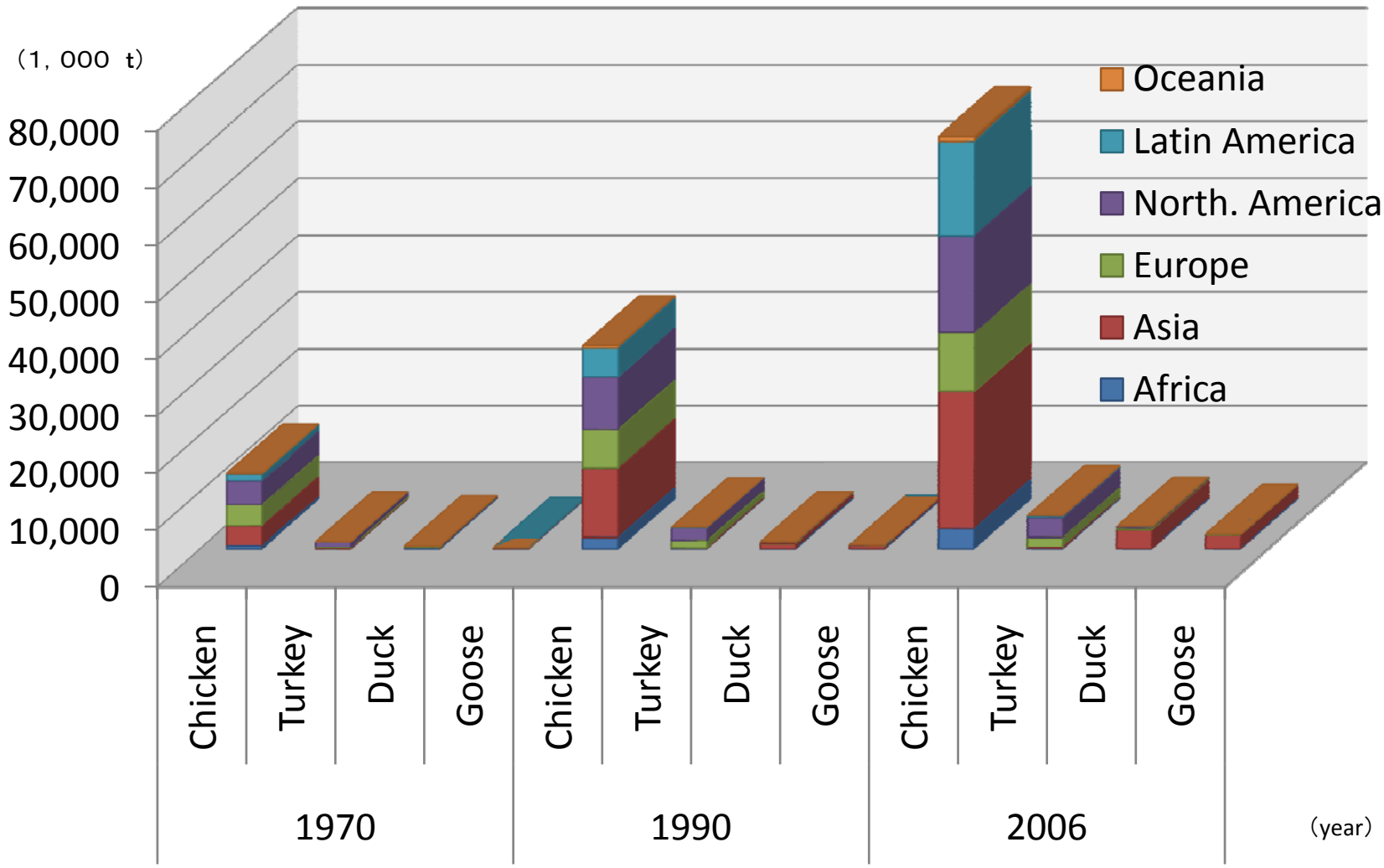
FAO database

Pork Production 1990-2007



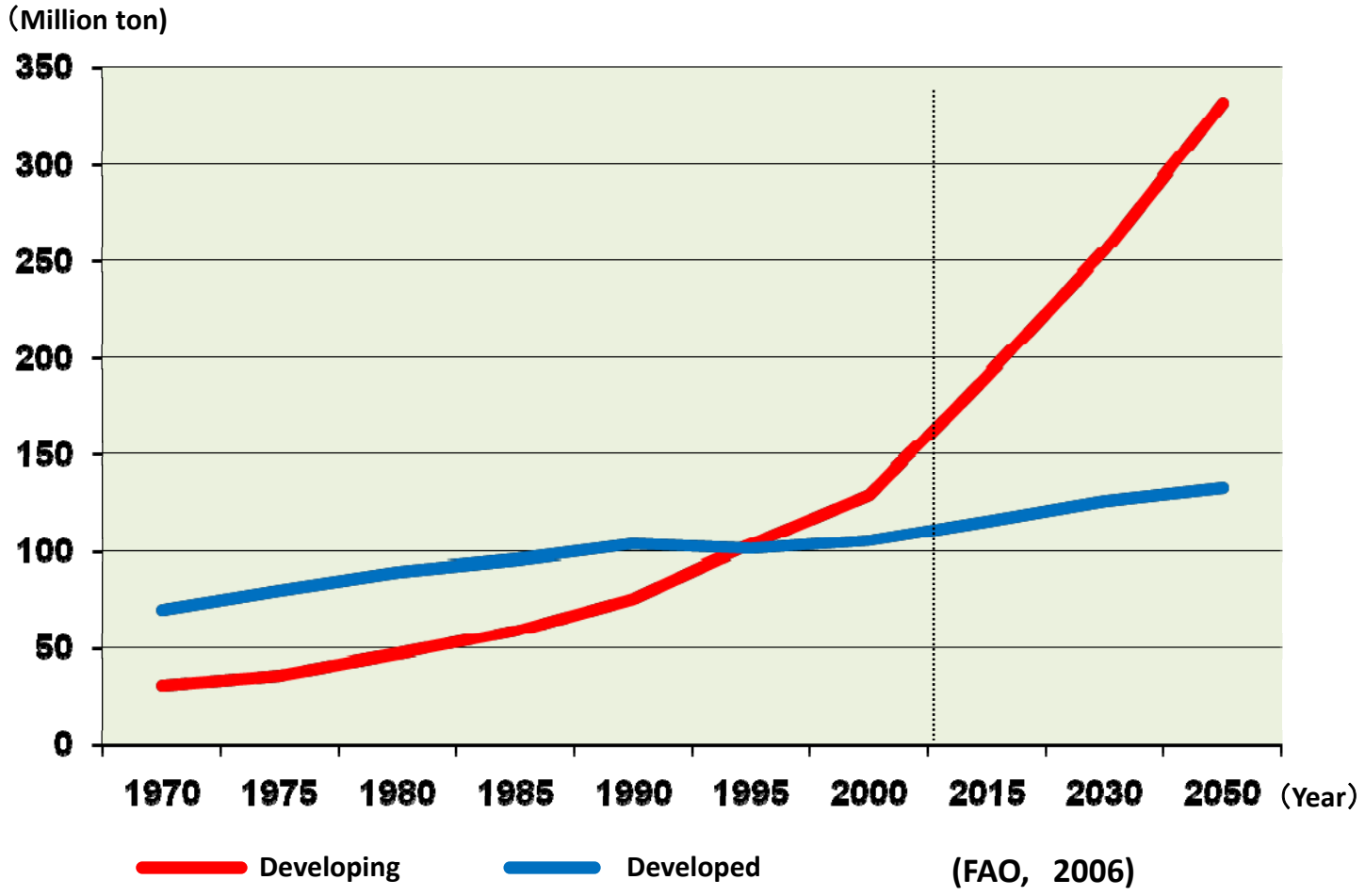
(FAO database)

Poultry Meat Production 1970-2006



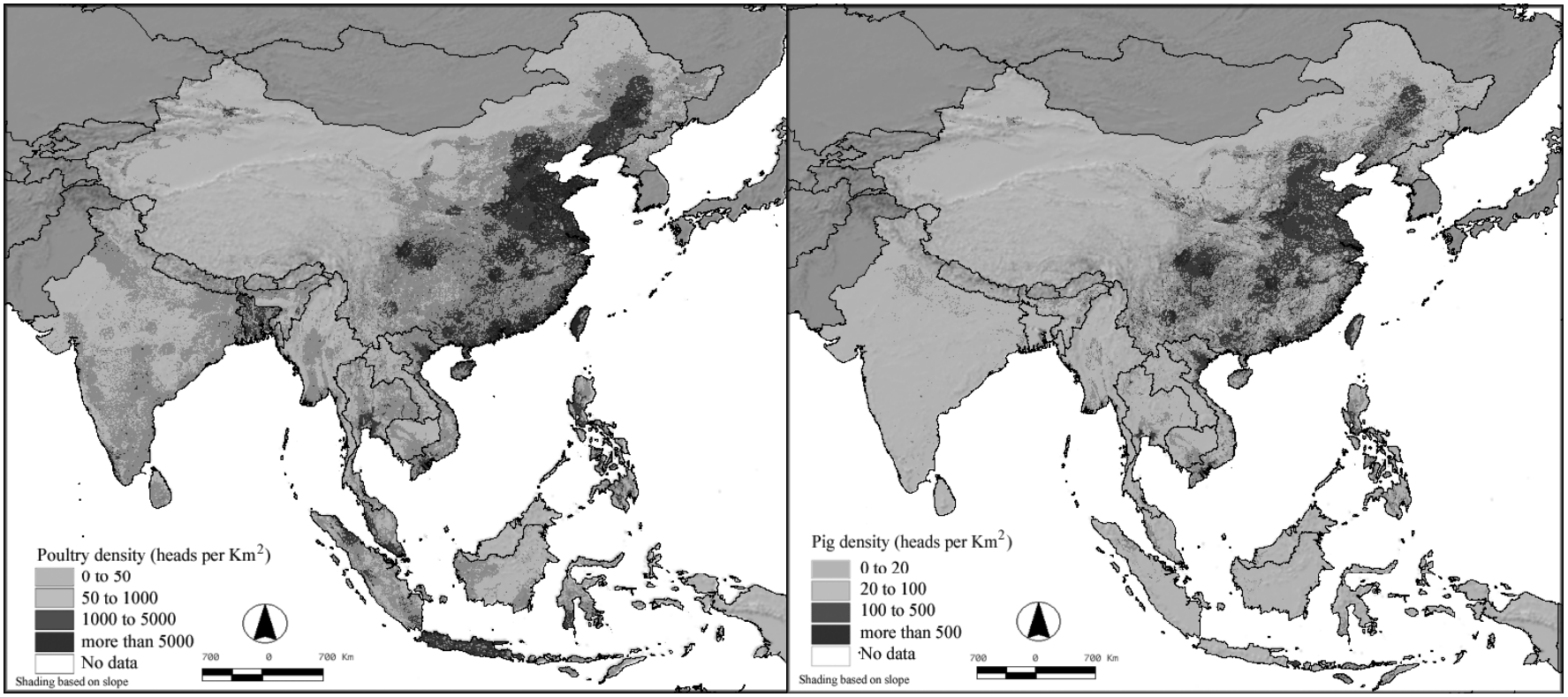
(FAO database)

Meat Production in the Past and Future



(FAO, 2006)

Density Distribution Maps of Swine and Poultry in Asia estimated for 1998–2000

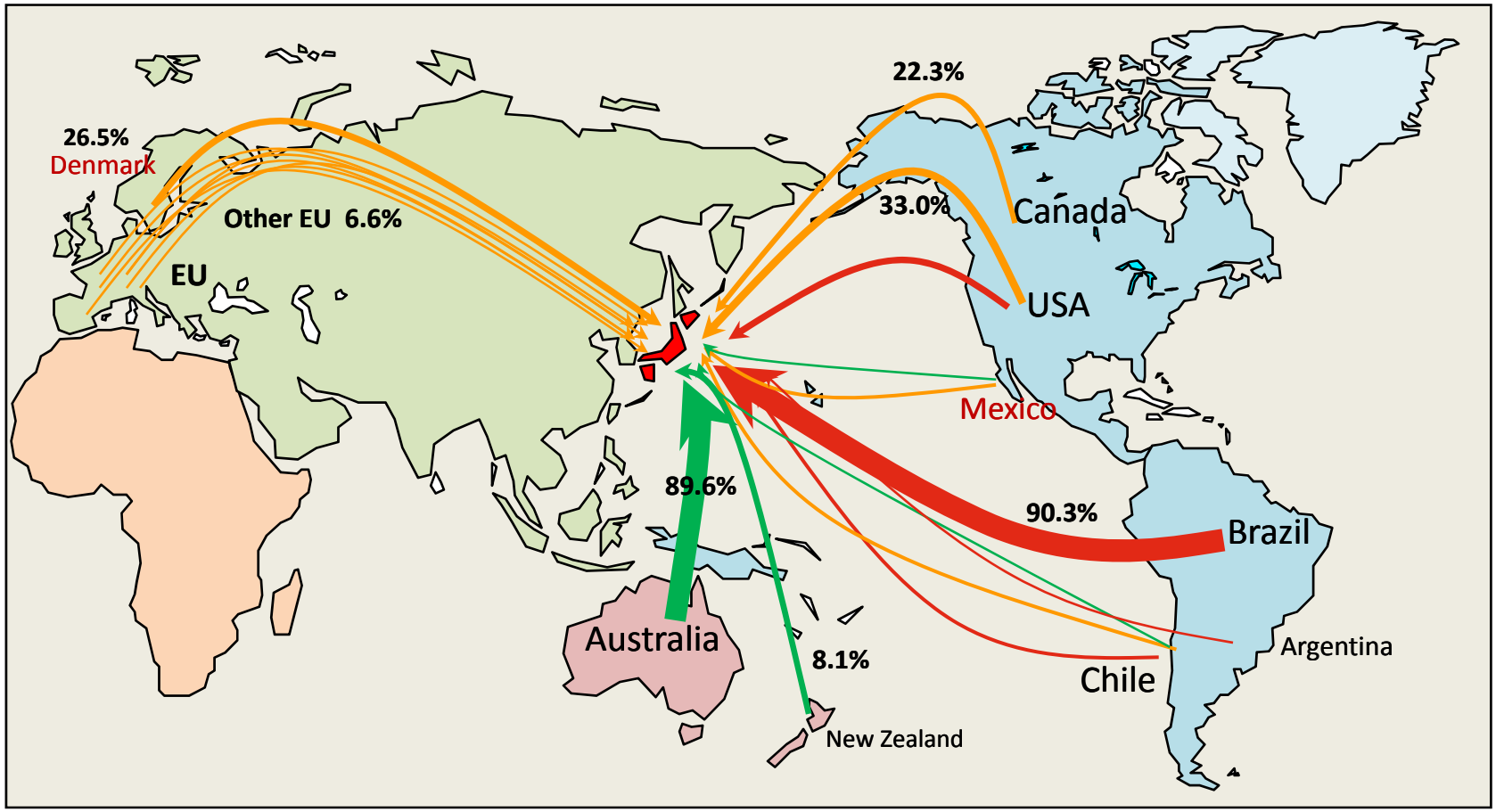


Poultry Density (Head/Km^2)

Pig Density (Head/Km^2)

(Gerber, P. et al., Bioresour.Technol., 2005)

Meat Trade Flows to Japan



: Chicken; total 838,234 t
: Pork ; total 1,742,586 t
: Beef ; total 916,986 t

(Figure was drawn from the FAOSTAT data, 2005)

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Factors related to Increasing Animal Diseases

- *Alterations in the Production Systems*
- *Economic Factors*
- *Social Factors*
- *Disease Control System or Policy*
- *Biological and Ecological Factors*

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Conclusions

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Conclusions (1)

- *Promotion of interdisciplinary researches in addition to the further development of veterinary technologies are needed, since the emergence of TADs are related to biodiversity in agro-ecosystem which are easily influenced by the environmental factors, e.g. climate change, urbanization, deforestation and wildlife distribution.*

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Conclusions (2)

- *Enhancement of international cooperation is indispensable to prevent the disease spread through early warning of TADs outbreaks.*
- *The role of international organizations supported by the further sophistication of disease control strategies becomes increasingly important to strengthen international efforts.*