

# USAHA Annual Meeting

## Greensboro, N.C.



## Radiological Preparedness Activities

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Radiological Program Analyst  
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October 25<sup>th</sup>, 2012



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# NCAHEM Radiological Preparedness

- USDA Responsibilities in Radiological Emergencies.
- NCAHEM, Radiological Program Analyst Position Description.
- Radiological Emergency Preparedness in the Animal Sector.
- **Fukushima** Emergency Response Issues, NCAHEM Involvement in Japan's Agricultural Recovery, and Lessons Learned.



# USDA Responsibilities: Nuke-RAD Incident Annex to the NRF:

- **Assists** in the planning and collection of agricultural samples
- **Assesses** damage to crops, soil, livestock, poultry, and processing facilities
- Inspects and **assists** in the disposition of agricultural animals and monitors the production, processing and storage of their products
- Provides **support** and **advice** on screening and decontamination of contaminated animals

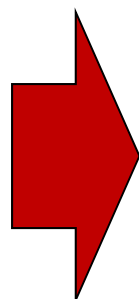


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# USDA Responsibilities: Nuke-RAD Incident Annex to the NRF:

- Provides **support and advice** on screening and decontamination of pets, companion animals and livestock
- **Assists** in the planning for, and disposition of, animal carcasses



## Operational Topic

*A methodology for decisions regarding contaminated livestock.*

### A Plan for the Handling of Externally Contaminated Livestock

Dayton McMillan, Thomas Johnson, Yuanqing Guo, and Alexander Brandl\*

**Abstract:** Nuclear accidents and access to radiological weapons for terrorist organizations and countries with hostile intentions towards the United States are realistic scenarios in the current global landscape. A dispersion of radionuclides can result from a nuclear weapon detonation or from a nuclear accident occurring in facilities handling or using radioactive material, such as nuclear power reactors. Any target of a radiological dispersal device (RDD) or an attack with a nuclear weapon and the surrounding area of a reactor accident could be subject to a significant amount of fallout and radioactive contamination. Therefore, a nuclear event in close proximity to agricultural areas will cause significant concern regarding the contamination of food products. In order to respond quickly and effectively to a large amount of contaminated agricultural products, such as livestock, a prepared and effective plan for handling and processing of these products is necessary. A protocol outlining the evaluation of and procedures for handling and processing radioactively contaminated livestock is proposed, to ensure safe animal food production and economic stability in the livestock industry in the wake of such a nuclear or radiological event. An evaluation of the salvagability of the contaminated livestock is performed based on the degree of exposure, the cost of decontamination, expected demand for food products, and economic impact to the owner/producer. Important factors that impact the salvagability of affected livestock are listed and analyzed to support the decision process for handling contaminated animals. *Health Phys.* 101(Supplement 3):S164-S169, 2011.

\*Department of Environmental and Radiological Health Sciences, Colorado State University, Fort Collins, CO 80523.



S164

**Key words:** operational topics; decontamination; emergency planning; fallout

#### INTRODUCTION

External radioactive contamination of livestock is a concern after any nuclear or radiological event. Difficulties in managing contaminated livestock after Chernobyl resulted in a massive destruction of animal stock, which subsequently created large quantities of radioactive waste that required additional handling and disposal (Fesenko 2007; IAEA 2006). High costs associated with radioactive animal waste disposal and losses of investment in livestock are deterrents for indiscriminate slaughter of contaminated animals, apart from the hygiene problem associated with the management of large numbers of animal carcasses and the practical and economic impact of such measures (IAEA 2006). In order to avoid any unnecessary disruption to food production and premature or unnecessary slaughter of livestock, emergency planning should include appropriate provisions for agricultural animals. An economically-efficient method of handling mass quantities of contaminated livestock is currently not available for the agricultural industry.

Previous studies have shown that the financial viability of radioactively decontaminated animal products is quite complex and depends on multiple factors (Grande et al. 1999). Few data are available on consumer perception and behavior after a radiological event; some information can be extracted from studies in Norway and Scotland after the 1986 Chernobyl accident (Grande et al. 1999). A general observation, however, has been that the public acceptance of various emergency countermeasures is increased when social and economic factors are considered in the design and planning of these countermeasures (IAEA 2006). Recognizing that consumption patterns, availability of alternative food sources, and cultural influences will play a major role in the post-event market, extrapolation from these data can hardly provide for sound market projections. However, the general principles to which the affected livestock will have to be evaluated can be investigated and are summarized here. Possible market values of decontaminated animal products and costs to decontaminate animals to safe levels were extrapolated based on current market prices.

#### MATERIALS AND METHODS

A plan for the handling of contaminated livestock was devised by review and analysis of the relevant literature, national and in-

November 2011

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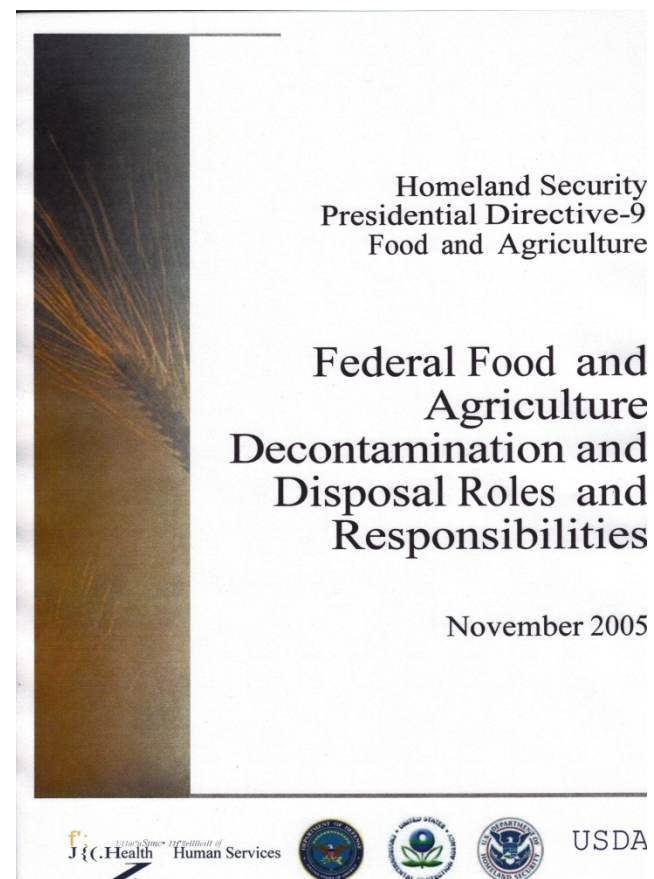
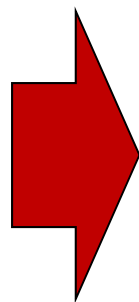


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# USDA Responsibilities: Nuke-RAD Incident Annex to the NRF:

- Provides **support and advice** on screening and decontamination of pets, companion animals and livestock
- **Assists** in the planning for, and disposition of, animal carcasses



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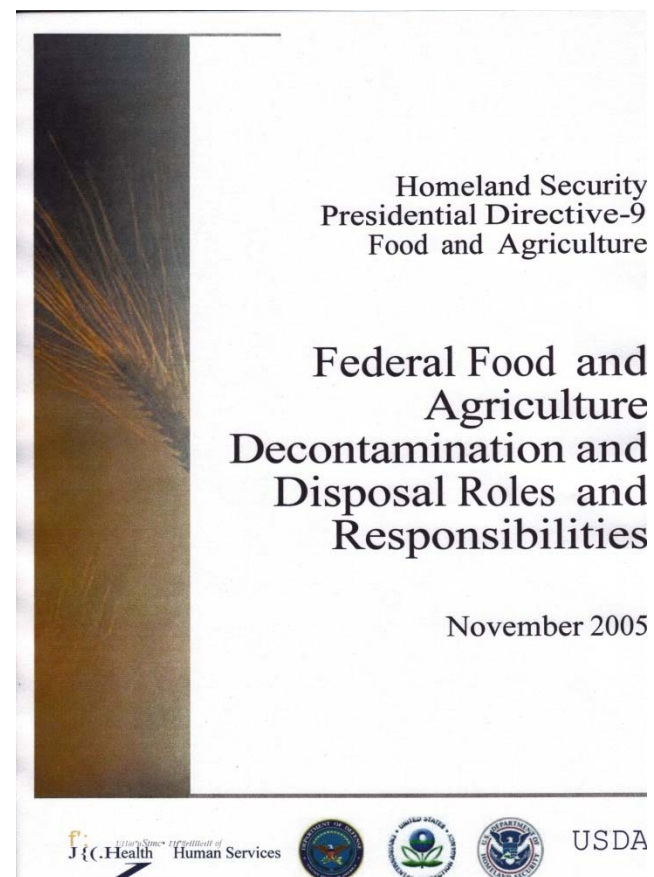
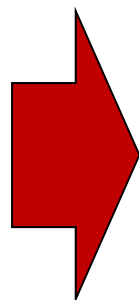


# USDA Responsibilities: Nuke-RAD Incident Annex to the NRF:

“This document describes the general Federal roles and responsibilities for decontamination and disposal in response to animal, crop, and food incidents.”

“Radiological incidents are not addressed.”\*

- **Assists** in the planning for, and disposition of, animal carcasses

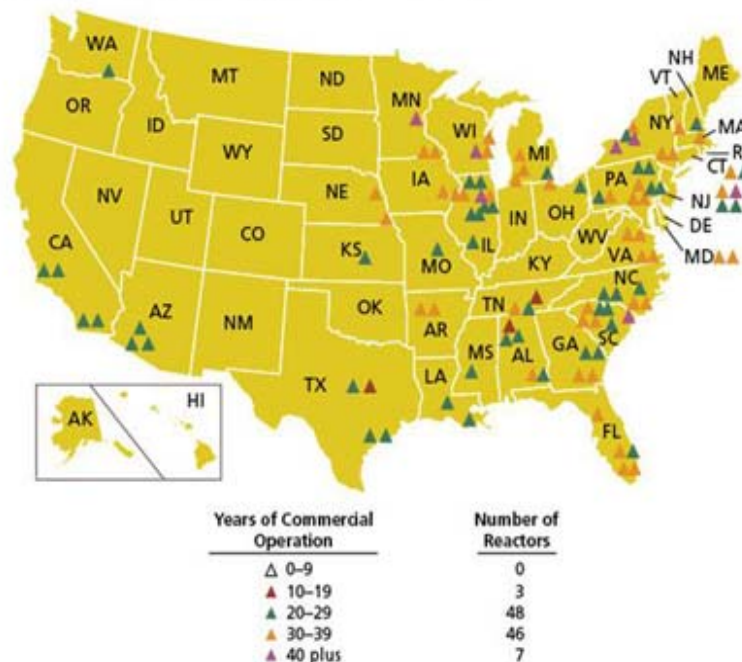


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# USDA's Preparedness Challenges

U.S. Commercial Nuclear Power Reactors—  
Years of Operation by the End of 2010



Note: Ages have been rounded up to the end of the year.

Source: U.S. Nuclear Regulatory Commission

- 104 Nuclear Power Reactors
- Many in concentrated agricultural production zones
- Location avoids the New Madrid liquefaction zone



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# USDA's Preparedness Challenges

- **Radiological surveillance** for contaminated or irradiated animals/crops/feeds
- **Radiological decontamination** for livestock/poultry/pets/zoo animals/wildlife
- **Therapeutic countermeasures** to mitigate the effects of radionuclide contaminants ingested by animals/**Euthanasia strategies** if necessitated
- **Remediation strategies** for soils and crops contaminated by radionuclides



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# Radiological Program Analyst

- Position created by **National Center for Animal Health Emergency Management** to meet USDA Radiological Preparedness and Response Challenges

**POSITION DESCRIPTION:** To develop robust and practicable strategies for maintaining agricultural production and a safe food supply following a purposeful or accidental nuclear or radiological release.



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# Radiological Program Analyst

- Develops Radiological surveillance strategies and capabilities for contaminated or irradiated animals/crops/feeds

Computer Simulations to Determine the Proper Portal Configuration for Livestock following Radiological Accident  
J. Justina, C.M. Mariano, S.S. Chirayath

**INTRODUCTION**  
This work is the first phase of a project to develop a radiation portal monitor (RPM) for livestock. This device would be employed following a large scale accident following a release of radioactive material. The objective of this work is to employ a computer simulation to evaluate the optimal detector configuration required to detect point or surface contamination on livestock due to gamma emitting radio-isotopes. This includes the determination of the best size, placement and detection material composition. Using the results of this work a theoretical minimum detectable activity (MDA) will be determined.

**Motivation for Work**

- The Department of Agriculture (USDA), through the National Response Framework Nuclear/Radiological Annex, has the responsibility of controlling, assessing and decontaminating the affected animals.
- For humans, plans and equipment exist to evaluate the amount of contamination, but for household animals and for livestock plans and equipment are limited.
- Total retail value of beef consumed in the United States: \$80.6 billion (2009) (USDA)
- For a state like Texas:
  - 13 million head of cattle
  - #1 state commodity generating \$6.9 billion in sales
  - Feedlot industry in Texas produces "50% of the nation's beef"

**Scope of Work**

- Produce Monte Carlo N-Particle Simulations to evaluate the best configuration for a radiation detection portal
- Simulations will include:
  - Cow
  - Preret Chute
  - Nai and PVT detectors
  - Concrete Pad for background radiation
  - Point and distributed source contamination on the animal
- Data will be used to predict minimum detectable activities

**Detectors placed parallel to the ground**  
Comparison of gamma counts registered in parallel and perpendicular orientations.

**Detectors placed perpendicular to the ground**  
In the case of detectors being placed perpendicular to the ground, counts registered were higher as compared to detectors placed parallel to the ground.

**Conclusions**  
Optimal configuration of the detectors for effective assessment of contamination would be  
 > Six 2"x4"x16" Nai detectors on either side of the chute  
 > Placed such that the 2"x16" face is perpendicular to the ground.  
 > This configuration provides very high value of signal to noise ratio

# Radiological Program Analyst



- Collaborates with Animal Care on tactics for **decontamination** of livestock, poultry, pets, service animals, zoo animals, and wildlife
- Researches **Therapeutic countermeasures** to mitigate contaminants ingested by animals

# Radiological Program Analyst

- Develops **remediation strategies** for animals, crops and soils contaminated by radionuclides
- Collaborates with relevant agencies on strategies for **euthanasia and carcass disposal** for injured, abandoned or excessively contaminated animals
- Advises of development of **disposal strategies** for radiologically contaminated feeds/crops/FSIS regulated products



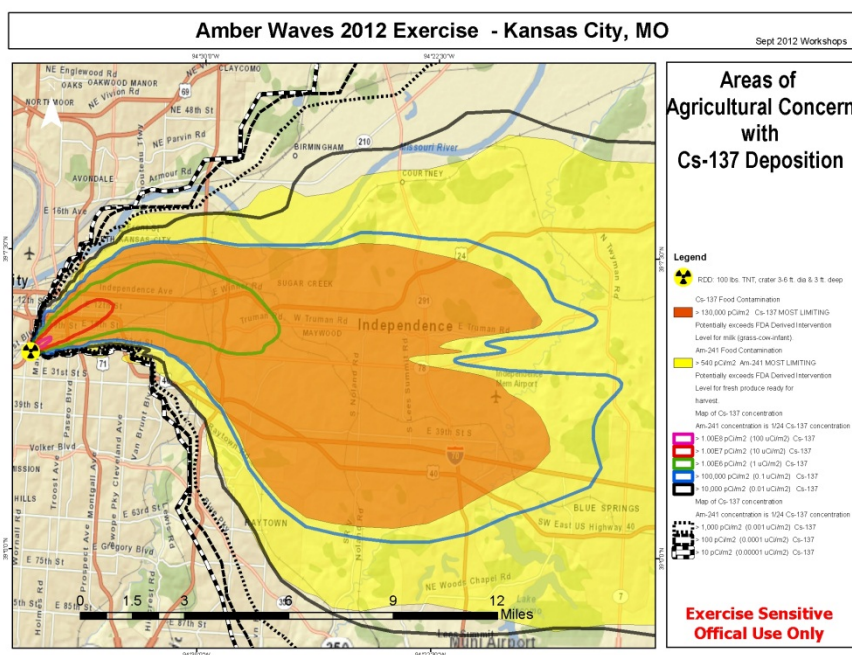
# Radiological Program Analyst

- Provides **Subject Matter Expertise**, support, and Protective Action Recommendations to federal, state, local, and tribal emergency responders during radiological response exercises and real events (DOE/NRC/FEMA IPX, IFAW mission)
- Maintains communication, liaison with, and membership in, national and international radiological emergency preparedness and response organizations (IAEA, HPS, EDEN)



# Radiological Program Analyst

- Participates in, and **provides guidance** for, the development of radiological exercises to enhance radiological emergency preparedness in the agricultural sector





# Radiological Program Analyst

- Maintains membership in the **Radiological Advisory Team for Environment Food and Health**, the active arm of the FRPCC Subcommittee on Environment Food and Health

## The Advisory Team for Environment, Food, and Health (formerly known as the A-Team)

The goal of the Advisory Team is to provide coordinated advice and recommendations to the State, Coordinating Agency, and DHS concerning environmental, food, and health matters.

Membership is comprised principally of :



and other Federal agencies as needed

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# Advisory Team Duties Overview

The Advisory Team works with the Department of Energy Federal Radiological Monitoring and Assessment Center to provide **recommendations** concerning:

- Environmental assessments
- Protective Action Guides and their application
- Protective Action Recommendations
- Use of radioprotective substances (K-I)
- Recommendations for minimizing losses of agricultural resources
- Based on coordinated technical and scientific advice, and best practices



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# Advisory Team Duties Overview

The Advisory Team works with the Department of Energy Federal Radiological Monitoring and Assessment Center to provide **recommendations** concerning:

- Minimizing radiation exposure from deposition and through the ingestion pathway
- Regarding the disposition of contaminated livestock, **pets**, poultry, and foods



# The Great Tohoku Earthquake and Fukushima Dai-ichi Nuclear Power Plant Disaster



# Fukushima Dai-ichi Nuclear Power Plant Disaster

 文部科学省 MINISTRY OF EDUCATION,  
CULTURE, SPORTS,  
SCIENCE AND TECHNOLOGY-JAPAN

**The 2011 off the Pacific coast of Tohoku  
Earthquake and the seismic damage to the  
NPPs**

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**Kazuo SAKAI** (National Institute of Radiological Sciences)  
And  
Ministry of Education, Culture, Sports, Science and  
Technology (MEXT), Japan

**CRPPH-69 (17<sup>th</sup> – 19<sup>th</sup> May, 2011)**



# Fukushima Dai-ichi Nuclear Power Plant Disaster

1-1. 2011 off Tohoku Pacific Earthquake



- Occurred 14:46 March 11, 2011
- Magnitude: 9.0 Mw
- Epicenter location: 38° 6"N and 142° 51"E, and 24km in depth
- It is said that the height of tsunami attacked Fukushima Dai-ichi was more than 14m



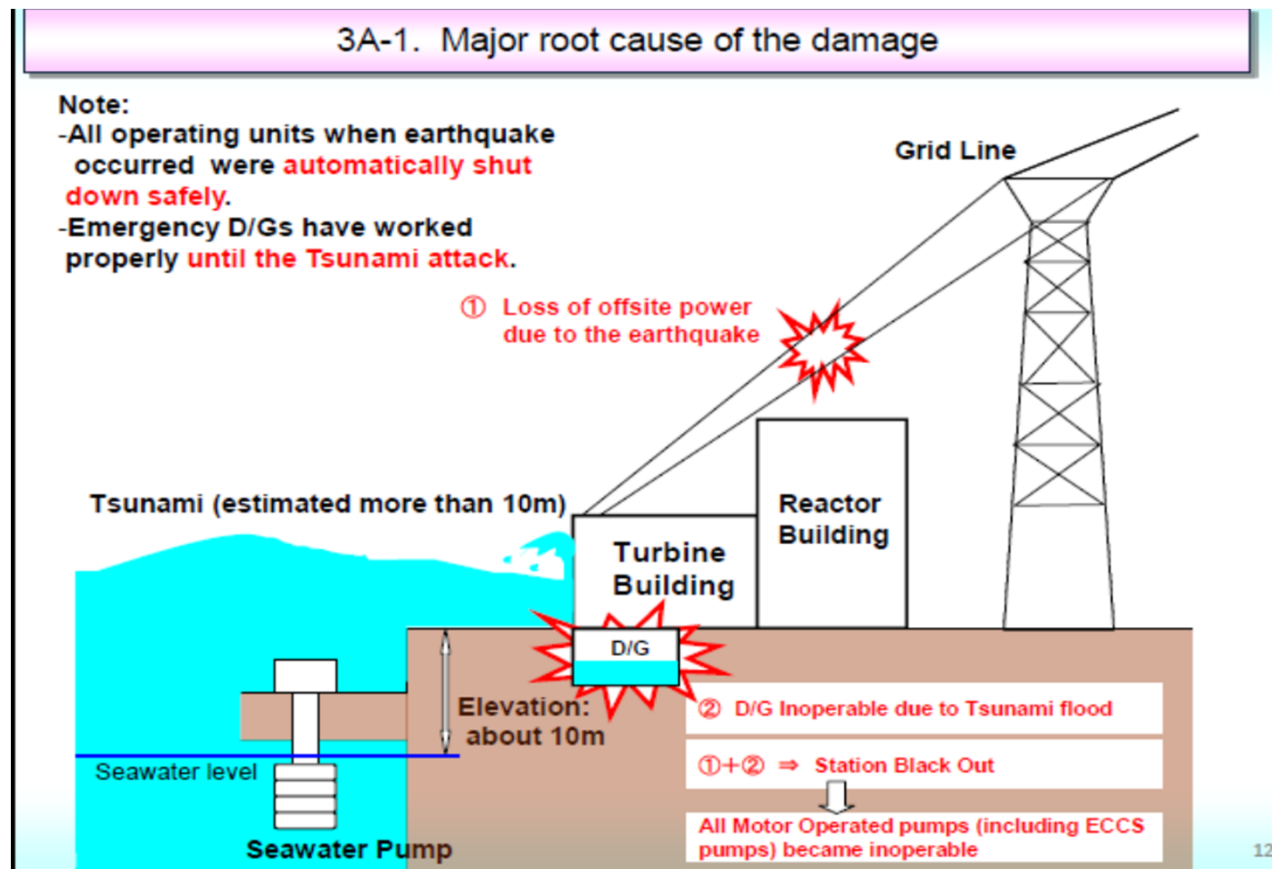




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# Fukushima Dai-ichi Nuclear Power Plant Disaster



# Fukushima Dai-ichi Nuclear Power Plant Disaster

- 47 foot tsunami overwhelms the protective barrier
- Emergency Diesel Generators flooded
- Reactors and spent fuel pools now have inadequate coolant (water supply)
- Cores begin to heat.
- Zirconium fuel cladding overheats giving off hydrogen.





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# Fukushima Dai-ichi Nuclear Power Plant Disaster

**Situation Report: Animals abandoned in the 20 Kilometer Exclusion Zone:**

120 Farms:

- 870 Dairy Cattle
- 2,500 Beef Cattle (¥1,000,000 @) :  
Iitate-gyu and Fukushima-gyu
- 30,000 Swine
- 630,000 Chickens



# Fukushima Dai-ichi Nuclear Power Plant Disaster





# International Fund for Animal Welfare Mission

- Ministry of Environment
- Wildlife Rehabilitation
- Academia
- Agriculture
- Animal Welfare
- Toxicology
- Radiology
- Civil Defense



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## Government of Japan launches animal evacuation operation in Fukushima



13 May 2011

**(Yarmouth Port, MA)** - A day after receiving a **detailed report** that included protocols to safely monitor, evacuate and treat animals contaminated by radiation, the Government of Japan launched an operation to remove abandoned animals from inside the 20km evacuation zone in Fukushima Prefecture. The report was the result of an International Fund for Animal Welfare (IFAW- **<http://www.ifaw.org/>**) led summit that convened subject matter experts in Tokyo earlier this month to find ways to rescue the animals that were left behind. The Japanese Ministry of Environment and Ministry of Agriculture, Forestry and Fisheries (MAFF) participated in the summit as observers.



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# I.F.A.W. Mission



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# I.F.A.W. Mission



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# Fukushima Dai-ichi Nuclear Power Plant Disaster

National Diet of Japan, Report of the Fukushima Nuclear Accident Independent Investigation Commission (NAIIC) 7/5/2012:

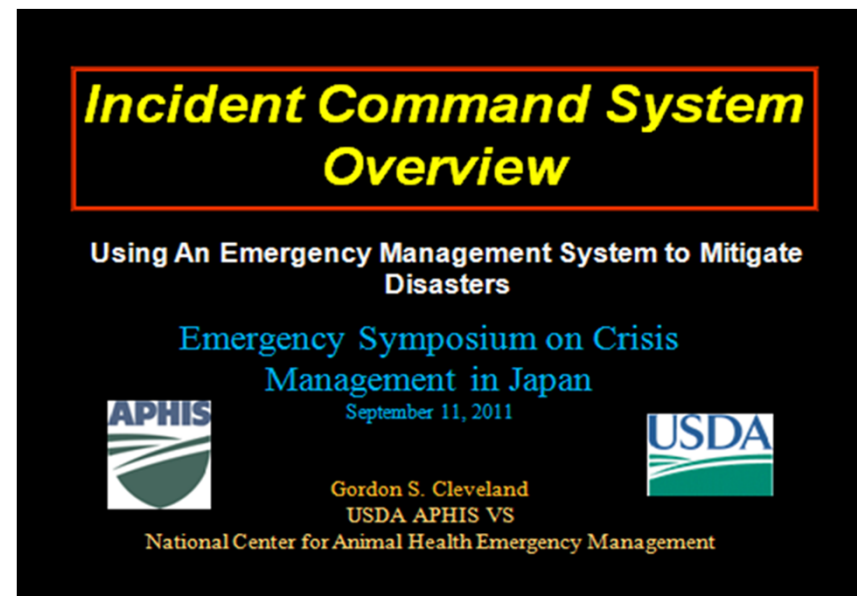


- Government had no response measures for a severe accident in place
- Power company did not have emergency response plan and had no manual or training regimens

# Japan Moves Forward

## Emergency Symposium on Crisis Management in Japan: Adopting Incident Command System

- Organized by Rhisso University in cooperation with members of the Government of Japan, House of Representatives



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# Japan Moves Forward

## The International Science Symposium on Combating Radionuclide Contamination in Agro-soil Environment:

- Post-Chernobyl radioecology researchers from Ukraine, Belarus, Russia, Kazakhstan and Germany
- Japanese researchers and technologists developing procedures for decontaminating soils and agricultural products



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# QUESTIONS?

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