

SPECIAL FOCUS

BOOTS ON THE GROUND

LAND-GRANT UNIVERSITIES IN THE FIGHT AGAINST THREATS TO FOOD AND AGRICULTURE

A REPORT BY THE BIPARTISAN COMMISSION ON BIODEFENSE

May 2022



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AFRICAN SWINE FEVER DEVASTATES US PORK INDUSTRY

No one was surprised when a veterinarian at the South Dakota State University Cooperative Extension Service identified the first case of African Swine Fever (ASF) on American soil. The veterinarian was not surprised, nor was the Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS), nor the farmer who raised the pig, nor the national organizations representing the domestic pork industry, nor even those that participated in ASF exercises previously.

The extremely contagious hemorrhagic fever virus swept the globe following a 2007 outbreak in the Republic of Georgia, killing over 90% of the pigs it infected. Wild boars became mobile carriers that eventually spread the virus to Europe, Latin America, and Asia. By 2021, attempts to stop the disease had been unsuccessful and it spread to over 28 countries. We should have assumed that ASF would spread and prepared for it, but we did not. We should have known that our pork industry could lose as much as \$15 billion over two years from ASF. ¹ Instead of investing in preparedness, we focused on increasing exports of pork and pork products, particularly to China. APHIS policies intended to protect against the virus (most notably import restrictions on live pigs, pig products, and swine feed from affected countries) failed to prevent the disease from reaching America.

Following the first identified case, an outbreak of ASF quickly occurred in the United States due to lax farm biosecurity protocols and unimpeded transportation of infected livestock. The disease then spread aggressively throughout the Midwest. Local veterinarians noted the symptoms but with some difficulty; state, local, and tribal governments shared information slowly; and case reporting lagged far behind the rapid growth of the outbreak.

Without effective treatment or prevention measures such as vaccines or easy-to-use rapid tests to identify infected animals or detect contaminated feed or garbage that might spread the disease, containment practices were the only tools available, leaving about 75 million hogs and pigs exceedingly vulnerable to ASF.

There were too few mechanisms in place to aggregate data and develop a common operating understanding, but the federal government finally realized the severity and scope of the threat. By the time USDA deployed resources and personnel to support non-federal officials, an additional four major pork-producing states also detected the presence of ASF.

The impacts of the outbreaks were immediate and devastating. The global community halted pork exports from the United States. Without a vaccine or other medical countermeasures (MCMs) to blunt the disease, the states culled 15 million infected pigs. Eventually, USDA brought additional resources to bear (funded by the Commodity Credit Corporation) to help response efforts. Officials prevented further movement of the virus with aggressive surveillance, quarantine, and depopulation measures, but it was too late. The damage was already done. The trade disruption and livestock deaths resulted in over \$25 billion in losses over the following two years. Indemnity payments to producers from the federal government (meant to offset the fiscal impact of killing infected livestock) could not cover the financial shortfall and many farms would not recover. The Secretary of Agriculture voiced concern about the possibility of the virus lingering in local wildlife and continuing to produce outbreaks for years to come.

States with robust land-grant university extension activities (i.e., the sharing of knowledge gained through research with agricultural producers, consumers, and families) appeared to suffer less from ASF than states without such support.

There were too few mechanisms in place to aggregate data and develop a common operating understanding, but the federal government finally realized the severity and scope of the threat.

EXECUTIVE SUMMARY

Land-grant universities are institutions of higher education designated by Congress or state legislatures to receive benefits associated with the Morrill Acts of 1862 (12 Stat. 503) and 1890 (P.L. 51-841, 26 Stat. 417), as well as the Equity in Educational Land-Grant Status Act of 1994 (P.L. 103-382 §531-535).² As the United States works to identify critical biodefense gaps exposed by the Coronavirus Disease 2019 (COVID-19) pandemic, the Nation should also draw upon the resources and relationships land-grant universities possess to fill those gaps.

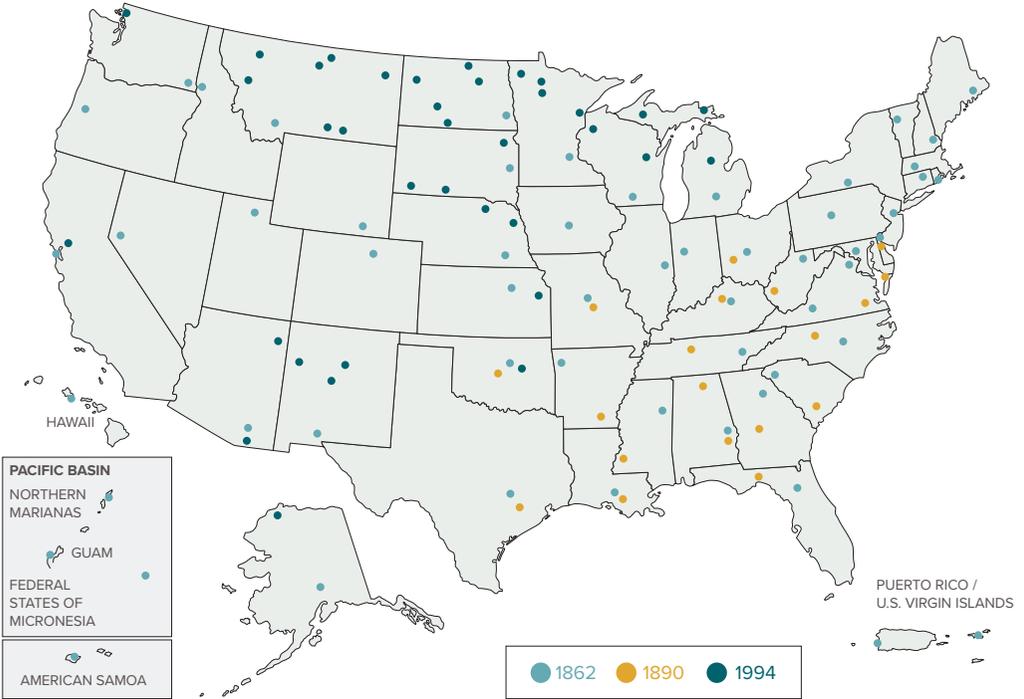
The food- and agro-biodefense challenge is different from, but as daunting as, biodefense of human public health due to the diversity of targets (e.g., livestock, crops, soil); spectrum of potential pathogens and pests; and different geographies, ecosystems, and infrastructures at risk. Land-grant universities are uniquely positioned to help defend the United States against biological threats to food, livestock, crops, wildlife, biofuels, pharmaceuticals, textiles, the environment, the bioeconomy, and the food and agro-economy, valued at more than \$1 trillion annually. In serving the states, localities, tribes, and territories in which they reside, the land-grant universities have their boots on the ground in the fight against threats to food and agriculture.

The Commission makes the following recommendations to coordinate federal and land-grant food and agro-biodefense efforts, provide early warning of threats to food and agriculture, and incorporate land-grant universities into preparedness, response, and mitigation of these events:

Table 1. Recommendations to Address the Role of the Land-Grant Universities in Addressing Threats to Food and Agriculture.

 <p>COORDINATION</p>	Drive federal engagement and coordination with land-grant universities to inform grant awards and improve food and agriculture defense research.
	Revise, implement, and comply with the National Agriculture and Food Defense Strategy.
	Incorporate all land-grant universities in national food and agro-biodefense activities.
 <p>EARLY WARNING</p>	Expand the role of land-grant universities in international surveillance and interdiction for food and agriculture defense.
	Acquire and procure mobile information sharing technologies.
 <p>RESEARCH AND DEVELOPMENT</p>	Establish land-grant university biodefense research coalitions.
	Fully fund the Agriculture and Food Research Initiative.
	Fully fund and extend the Agriculture Advanced Research and Development Authority Pilot Program.
	Increase federal support for tribal land-grant institutions.
 <p>PREPAREDNESS, RESPONSE, AND MITIGATION</p>	Protect national security assets and programs collocated with land-grant universities.
	Establish a cooperative extension preparedness and response framework that extends the capabilities of the Extension Disaster Education Network.
	Establish a food and agriculture emergency response technical assistance program.
	Review the extent and quality of emergency management of food and agriculture events.
	Improve distribution of pharmaceuticals, medical equipment, and other essential medical supplies needed to treat those affected by large-scale food and agriculture events.
Establish regional food and agriculture advanced development and manufacturing.	

Land-Grant Colleges and Universities³



The Nation hosts 112 Land-Grant Colleges and Universities. See Appendix B on page 27 for a full list of those institutions.

INTRODUCTION

In the 19th Century, President Lincoln and Congress granted land to the states for the purpose of establishing higher educational institutions (known today as land-grant universities) to teach agriculture and mechanical arts.⁴ The Morrill Acts of 1862 (12 Stat. 503) and 1890 (P.L. 51-841, 26 Stat. 417) made practical agricultural education one of their chief responsibilities. The Hatch Act of 1887 (P.L. 49-314, 24 Stat. 440) established research centers known as agricultural experiment stations within many of these universities. The Smith-Lever Act of 1914 (P.L. 63-95) directed the establishment of a cooperative extension service to ensure rural areas benefited from the results of agricultural research conducted in large part by the land-grant universities.

The University of the District of Columbia received land-grant status in 1967 with money in lieu of land. In one of the Higher Education Amendments of 1972 (P.L. 92-318), American Samoa, Guam, Micronesia, the Northern Mariana Islands, and the US Virgin Islands also received land-grant funds. The Equity in Educational Land-Grant Status Act of 1994 (P.L. 103-382, Title V, Part C; 7 U.S.C. §301 note) bestowed land-grant recognition upon 29 tribal colleges and universities. As of 2008, 32 tribal colleges and universities possess land-grant status.

Most public and private universities in the United States have two primary missions: (1) provide higher education for the next generation; and (2) conduct research to generate new knowledge that will lead to future advances. Land-grant universities also utilize cooperative extension programs to translate academic knowledge into actionable and practical information for the communities they serve. An extension office and extension agents serve almost every county in the United States.⁵ Cooperative extension and extension agents differentiate land-grant universities from other universities and traditional academic institutions. At least one land-grant university per state is also home to an Agricultural Experiment Station.

INTRODUCTION

The mission of the land-grant universities (as set forth in the Morrill Act of 1862 (12 Stat. 503)) is to teach practical agriculture, science, military science, and engineering in response to changing society. Despite the practical, community-oriented role numerous Administrations and Congresses envisioned for the land-grant universities, there has been little public discussion about how land-grant universities can and should contribute to US food- and agro-biodefense beyond current research efforts.

Land-grant universities (which now include Historically Black Universities and Colleges, Hispanic-Serving Institutions, Tribal Colleges and Universities, Asian American and Pacific Islander Serving Institutions, and other Minority Serving Institutions) carry out important scientific and community outreach functions. They provide links to underserved and rural communities and continue a long tradition of supporting agriculture production, sustainment, food safety, nutrition, and natural resource conservation.

There is no integrated preparedness plan in place for pandemics affecting food or agriculture. Chronic underfunding has created major vulnerabilities affecting all aspects of preparedness and recovery. Surveillance and detection systems are fragmented and unable to provide decision-makers with real-time situational awareness to support agile and rational decisions in a major incident. The roles, responsibilities and accountabilities of the multiple agencies involved are ill-defined, and there is no mechanism or authority in place to coordinate the disparate activities of those agencies in responding to these events. Defense against 21st century biological threats must encompass more than public health and national defense against biological weapons. It should embrace a comprehensive, overarching One Health approach to protecting people, food, animals, plants, environments, and bioeconomies to reduce disease and socioeconomic consequences. This includes protecting agricultural commodities, such as crops and food-producing animals.

In Recommendation 7 of our 2015 foundational report, *A National Blueprint for Biodefense: Leadership and Major Reform Needed to Optimize Efforts*, the Commission recommended (a) institutionalizing One Health in biodefense policy documents; (b) developing a nationally notifiable animal disease system; and (c) prioritizing emerging and reemerging infectious diseases. The Commission further addressed agro-biodefense during a meeting held at Kansas State University in 2016 and in its 2017 report, *Defense of Animal Agriculture*. Though the Executive and Legislative Branches addressed three of the recommendations in that report (in The Agriculture Improvement Act of 2018 (P.L. 115-334) and the Consolidated Appropriations Act of 2021 (P.L. 116-260)), the Food and Agriculture Sector remains very vulnerable to biological events.⁶

The Commission also recognizes that defense of food and non-animal aspects of agriculture (e.g., plants, crops, soil, biofuels, textiles) does not receive adequate attention or funding. An intentionally introduced, naturally occurring, or accidentally released plant or animal pathogen could cause severe food shortages and seriously damage the Nation's economy. The Food and Agriculture Critical Infrastructure Sector needs additional investments to address its vulnerabilities.⁷

In November 2019 at Colorado State University, the Commission held its second special focus meeting on agro-biodefense. Co-chaired by former Senate Majority Leader Tom Daschle and former Homeland Security Advisor Ken Wainstein, this daylong meeting allowed federal and state officials, academics, and private sector experts to describe challenges in achieving food and agriculture security and ways that land-grant universities can help address these threats. Based on the input received during that meeting and additional research, the Commission developed the following policy recommendations in order to coordinate federal and land-grant agro-biodefense efforts, provide early warning by land-grant universities of food and agriculture incidents, and incorporate land-grant universities into preparedness, response, and mitigation of food and agriculture biological events. These recommendations build on those found in two of our reports: *A National Blueprint for Biodefense* and *Defense of Animal Agriculture*.

COORDINATION

Land-grant universities interact with many federal departments and agencies including the Department of Education, the Department of Health and Human Services (HHS), and the Department of Interior's United States Geological Survey.⁸ The USDA National Institute of Food and Agriculture (NIFA) administers federal funding dedicated to supporting land-grant university research and extension activities.⁹ NIFA requires institutions to submit project plans for individual grant awards, but the agency does not coordinate research and extension activities conducted by the land-grant universities.

Recognizing the need for coordination, Colorado State University, Kansas State University, Iowa State University, Texas A&M University, University of California-Davis, University of Nebraska-Lincoln, and University of Nebraska Medical Center established the Coalition for Epi Response Engagement and Science.¹⁰ This coordinating entity focuses on: (1) diagnostics and surveillance; (2) MCMs and manufacturing; and (3) outreach and engagement.¹¹ However, this effort lacks federal government involvement.

The Food and Drug Administration (FDA) Food Safety Modernization Act (P.L. 111-353, signed into law in 2011) required the development and implementation of a National Agricultural and Food Defense Strategy.¹² USDA and HHS jointly issued the strategy in 2015. The strategy addressed federal roles and responsibilities for food- and agro-biodefense preparedness and response and included an implementation plan. The strategy addresses academia in general, but it does not specifically address the unique role of land-grant universities or the capabilities (e.g., land-grant research and extension activities) they can bring to defending the Nation from biological threats to food and agriculture.¹³

The government has also been slow to engage in the necessary coordinating activities to strengthen food and agriculture defense.¹⁴ For example, in 2019, USDA and HHS surveyed 32 states to assess efforts to implement the National Agricultural and Food Defense Strategy. However, USDA and HHS did not advocate for any other concrete steps for implementation.¹⁵ Seven years (since the release of the strategy in 2015) is more than enough time to execute the strategy and determine the extent of federal, state, local, tribal, and territorial (SLTT), and non-governmental capabilities and activities in this regard.

RECOMMENDATION: Drive federal engagement and coordination with land-grant universities to inform grant awards and improve food and agriculture defense research.

Congress should amend the Agriculture Improvement Act (P.L. 115-334) and the Federal Food, Drug, and Cosmetic Act (P.L. 75-717, 52 Stat. 1040) to direct the Secretary of Agriculture and Secretary of Health and Human Services to drive engagement and coordination with land-grant universities through dedicated new offices at the FDA and NIFA. These offices should inform NIFA decision-making with regard to grant awards, ensuring that resources advance food and agro-biodefense research and cooperative extension services. Congress should also establish a discrete food and agriculture defense program in the Foundation for Food and Agricultural Research to increase coordination with land-grant universities.

RECOMMENDATION: Revise, implement, and comply with the National Agriculture and Food Defense Strategy.

Congress should amend Section 108 of the FDA Food Safety Modernization Act (P.L. 111-353) to require the Secretary of Agriculture and the Secretary of Health and Human Services, in coordination with the Secretary of Education and the Secretary of Homeland Security, to recognize and incorporate the research conducted by land-grant universities (supported by federal dollars), as well as other relevant land-grant food and agro-biodefense activities, in the next iteration of the National Agriculture and Food Defense Strategy. Congress should require the Secretary of Agriculture and Secretary of Health and Human Services to coordinate with other federal departments and agencies charged with food and agriculture responsibilities to implement the strategy no later than one year after enactment.

RECOMMENDATION: Incorporate all land-grant universities in national food and agro-biodefense activities.

In providing input to future iterations of federal plans and strategies that address national food and agro-biodefense (including Homeland Security Presidential Directive 9, the National Biodefense Strategy, National Agriculture and Food Defense Strategy, American Preparedness Plan, Securing our Agriculture and Food Act (P.L. 115-43) and Consolidated Appropriations Act of 2021 (P.L. 116-260)), the Secretary of Agriculture and the Secretary of Health and Human Services should establish a federal advisory committee that addresses the role of land-grant universities, including coordination of federal and land-grant extension activities.¹⁶ This advisory committee should include representatives from land-grant universities designated under the Morrill Acts of 1862 (12 Stat. 503) and 1890 (P.L. 51-841), and the Equity in Educational Land-Grant Status Act of 1994 (P.L. 103-382). The Secretary should, in coordination with the committee, also incorporate the land-grant institutional capabilities and expertise of land-grant Historically Black Universities and Colleges, Hispanic-Serving Institutions, Tribal Colleges and Universities, Asian American and Pacific Islander Serving Institutions, and other Minority Serving Institutions into future iterations of federal food and agro-biodefense plans and strategies.

EARLY WARNING

International disease surveillance organizations do not proactively identify atypical food- and agriculture events throughout the world. Land-grant universities could help meet the need for national and international biosurveillance and early warning.

Effective early warning systems should take advantage of multiple information sources, including direct field observations, analyses, and near real-time information sharing. Cooperative extension agents are equipped with mobile tablet technology and software applications (specifically designed with back-end data processing to assist with their daily duties). They could share information and augment early warning and situational awareness during food, agricultural, and other biological incidents. These technology solutions could facilitate biosurveillance of food and agriculture, as well as near real-time information sharing among cooperative extension agents, veterinarians, public health officials, industry professionals, state animal health authorities, and others.

The Department of Homeland Security (DHS) supported a multi-year research and development program that led to a prototype mobile app-based technology called AgConnect.¹⁷ DHS launched it in 15 states in 2014 with a comprehensive suite of customizable agriculture and animal health applications that could serve many stakeholders. However, the program had difficulty reconciling information sharing restrictions and competing interests and ended without an acquisition pathway. The Pork Board also developed a similar mobile platform with specific applications for the swine industry (called AgView) that became operational in 2021.¹⁸

USDA and HHS should work with land-grant universities to leverage emerging technologies and information sharing activities to inform existing surveillance systems. Mobile technology and rapid reporting could inform the efforts of the Food Emergency Response Network, Laboratory Response Network for Biological Threats, National Animal Health Laboratory Network, National Plant Diagnostic Network, and Veterinary Laboratory Investigation and Response Network.

RECOMMENDATION: Expand the role of land-grant universities in international surveillance and interdiction for food and agriculture defense.

The Secretary of Agriculture, in coordination with the Secretary of State, Secretary of Defense, and Secretary of Health and Human Services, should strengthen international extension programs in areas of the world where outbreaks involving food or agriculture are more likely to occur.

RECOMMENDATION: Acquire and procure mobile information sharing technologies.

The Secretary of Agriculture, in coordination with the Secretary of Health and Human Services and the Secretary of Homeland Security, should conduct an assessment of mobile technologies that could augment early warning and near real-time information sharing among cooperative extension agents and emergency management officials at all levels of government. In developing and executing this assessment, the Secretary should consult with representatives from land-grant institutions as designated by the Morrill Acts of 1862 (12 Stat. 503) and 1890 (P.L. 51-841), and Equity in Educational Land-Grant Status Act of 1994 (P.L. 103-382). Based on the results of this assessment, Congress should amend the Agriculture Improvement Act (P.L. 115-334) to direct the Secretary of Agriculture to establish an acquisition and procurement program for mobile information sharing technologies to augment land-grant universities' ability to support biodefense early warning and near real-time all-hazard situational awareness. This program should include enhanced mobile technologies in the modernization of the National Animal Health Laboratory Network required by the Agriculture Improvement Act.

RESEARCH AND DEVELOPMENT

Land-grant universities possess research laboratories, diagnostic laboratories, scientific programs, and other capabilities that can contribute to national biodefense, but they need mechanisms to facilitate collaboration and coordination. Near-term opportunities for food, agriculture, and biological defense initiatives include reallocating some portion of existing land-grant statutory formula-based research and extension funds. Moving forward too quickly, however, could lead to unintended negative consequences, including the reallocation of existing Hatch Act (P.L. 49-314), Animal Health, and Extension formula-based funding for ongoing and competing food and agriculture defense programs. Historically, food and agro-biodefense research has been underfunded or not funded commensurate with national risks and vulnerabilities.¹⁹

After years of stagnant funding at the USDA Agricultural Research Service (ARS), Congress took steps to support innovative research activities that could address food and agro-biodefense needs.²⁰ The US House of Representatives and US Senate both supported increased funding for ARS in Fiscal Year (FY) 2022 appropriations, the most recent in a series of increases for the agency. However, for the most part, ARS funding does not support research activities at land-grant and other educational research institutions, funding research at federal laboratories instead.²¹

The Agriculture Improvement Act (P.L. 115-334) also established a dedicated Agriculture Advanced Research and Development Authority (AGARDA) pilot program at USDA to develop solutions for long-term and high-risk threats to food and agriculture.²² The law stated that land-grant institutions could collaborate with USDA in this regard. However, Congress only appropriated \$1 million to plan the pilot program for FY2022, far short of the \$50 million authorized annually for

the pilot. Additionally, USDA has yet to release the statutorily mandated strategic plan for the program. Full funding would enable Congress to determine whether AGARDA can contribute to federal biodefense research as envisioned. The pilot program was scheduled to terminate at the end of FY2023 but gauging the effectiveness of the program with adequate funding will require additional time.

Each land-grant university established under the Morrill Acts of 1862 (12 Stat. 503) and 1890 (P.L. 51-841) is eligible for federal financial support through two mechanisms: (1) annual capacity grant funding for research and extension activities; and (2) competitive grants.²³ These grants are conditional on state matching funds. However, dedicated endowments provide tribal land-grant universities with most of their capacity funding; paltry support compared to the amounts available to land-grant universities recognized by the Morrill Acts of 1862 and 1890. Many tribal land-grant institutions are located in geographically remote areas of the country. With additional resources, they would be well-positioned to conduct surveillance in underserved areas and provide additional extension support to their local areas.

Many land-grant universities also operate complex, high biosafety level (BSL) laboratories capable of conducting research on livestock and other large animals.²⁴ While ARS did establish a university-led Research Alliance for Veterinary Science and Biodefense BSL-3 Network to promote collaboration and coordination among high containment laboratories and scientists addressing threats to food and agriculture, USDA offers limited competitive research grant opportunities to these institutions. High cost of operations, maintenance, and sustainment exacerbate the lack of federal animal, plant, and food and agriculture biodefense research opportunities. Laboratories that receive federal biodefense funding incur substantial costs. Land-grant BSL-3Ag laboratories²⁵ lack similar support for food and agro-biodefense.²⁶

The NIFA Agriculture and Food Research Initiative (established in the Food, Conservation, and Energy Act of 2008, P.L. 110-246, Section 7406) provides the bulk of extramural agricultural research funding and is the Nation's primary competitive, peer reviewed research grant program for university-based food and agriculture sciences. The Agriculture Improvement Act (P.L. 115-334) reauthorized this grant program at \$700 million annually.²⁷ In FY2022, the program received \$435 million.²⁸ The President's Budget Request for FY2023 seeks an increase in funding to \$564 million, falling short of authorized levels.²⁹ The President's Budget Request also describes priorities for the program, including climate-smart agriculture, nutrition security, and clean energy with focused investments in: (1) sustainable agriculture systems; (2) foundational and applied science; and (3) education and workforce development to transform agriculture innovations to address climate change, improve nutrition, and promote economic growth. Unfortunately, Agriculture and Food Research Initiative funding priorities do not include agricultural biodefense and emerging infectious disease research to protect livestock and crops.

Recognizing the need for additional food and agro-biodefense research through public-private partnerships, Congress established the Foundation for Food and Agricultural Research in the Agricultural Act of 2014 (P.L. 113-79).³⁰ The Foundation provides funding to land-grant universities, combining private (including corporate) funds with Foundation funds, but has yet to explicitly fund food- and agro-biodefense activities.

Many land-grant institutions already host valuable elements of national biodefense (e.g., private sector research laboratories, SLTT public health laboratories, federal offices) through colocation agreements. These agreements provide land-grant universities with the opportunity to work in close proximity to these entities, as well as the responsibility to safeguard those capabilities from future threats.³¹

Additionally, the large industry presence on land-grant universities provides an ideal opportunity to fund public-private partnerships in food and agriculture defense. The private sector also requires additional support given the crucial role it plays in the defense of food and agriculture. The private sector provides innovative technologies to respond to a large animal health threat or widespread crop infestation, develops diagnostics and countermeasures, and decontaminates large areas. The capacity of companies in the food and agriculture sector with comparable expertise in advanced research and development is a fraction of what the human biopharmaceutical, medical device, and diagnostic sectors made available to combat COVID-19. But partnerships and colocation agreements with land-grant universities can provide additional capacity and capabilities to develop and manufacture solutions.

RECOMMENDATION: Establish land-grant university biodefense research coalitions.

Congress should amend the Agriculture Improvement Act (P.L. 115-334) to direct the Secretary of Agriculture, in consultation with land-grant institutions designated by the Morrill Acts of 1862 (12 Stat. 503) and 1890 (P.L. 51-841) and the Equity in Educational Land-Grant Status Act of 1994 (P.L. 103-382), to establish land-grant regional biodefense coalitions to coordinate and integrate animal, plant, and human health research for food security and agro-biodefense and biological defense. Congress should make participation in these coalitions mandatory as a condition for continued federal support for any land-grant institution receiving funding under the Hatch Act (P.L. 49-314), the Evans-Allen Act (P.L. 95-113), and the Equity in Educational Land-Grant Status Act of 1994.

RECOMMENDATION: Fully fund the Agriculture and Food Research Initiative.

Congress should fully fund the NIFA Agriculture and Food Research Initiative to the authorized level of \$700 million and designate 20 percent of the total appropriation for competitive land-grant university-based food and agro-biodefense research that focuses on technical innovation platforms and public-private animal and crop health partnerships.

RECOMMENDATION: Fully fund and extend the Agriculture Advanced Research and Development Authority Pilot Program.

Congress should fund the AGARDA pilot program at no less than the \$50 million annually authorized by the Agriculture Improvement Act (P.L. 115-334). Congress should change the sunset of the pilot from the end of FY2023 to the end of FY2025, to give the program at least three years with funding to demonstrate value. If the pilot is successful, Congress should amend the Agriculture Improvement Act to permanently authorize AGARDA and establish annual appropriations for the program. As the Agriculture Improvement Act required the AGARDA strategic plan to be released publicly no later than December 15, 2019, the Secretary of Agriculture should immediately develop and release that plan. The Secretary of Agriculture should also execute an implementation plan for the strategy no later than 180 days after finalizing and releasing the strategic plan. The strategic plan should detail how land-grant universities can collaborate with federal agencies in support of AGARDA.

RECOMMENDATION: Increase federal support for tribal land-grant institutions.

Congress should amend the Hatch Act (P.L. 49-314) and the Smith-Lever Act (P.L. 63-95) to make tribal land-grant universities eligible for capacity formula funding under those statutes, along with the Tribal College Research Grants Program and the Tribal Colleges Extension Program. Congress should waive the funding match requirement associated with these programs for tribal land-grant institutions. Congress should also appropriate funding for the establishment of dedicated biodefense research and extension activities at these universities. In addition, Congress should amend the Higher Education Opportunity Act (P.L. 110-315) to authorize additional funding for establishing or strengthening extension activities at tribal land-grant universities. Congress should explicitly add extension programs as an authorized activity for Department of Education grants to tribal colleges and universities.³² The Secretary of Agriculture, in coordination with the Secretary of Health and Human Services, should also provide technical assistance (including on site) to all tribal land-grant universities working to establish or expand existing food- and agro-biodefense extension activities, and engage in regular communication with, and outreach to, these universities.

RECOMMENDATION: Protect national security assets and programs collocated with land-grant universities.

Congress should amend the Agriculture Improvement Act (P.L. 115-334), Public Health Service Act (P.L. 78-410), and the Homeland Security Act of 2002 (P.L. 107-296) to require the Secretary of Agriculture, Secretary of Health and Human Services, and Secretary of Homeland Security to establish security criteria for collocation agreements for all federal national security assets or programs located on land-grant university land. Collocation agreements that address national security assets or programs located on land-grant university campuses and other areas should make the land-grant host institutions responsible for securing the area surrounding these assets and programs, and accountable for working with federal owners to secure the physical structures and spaces housing these assets and programs. Congress should appropriate sufficient funds to help land-grant universities secure the university areas surrounding these federal assets. Congress should require these land-grant universities to submit plans to the relevant federal department or agency for securing the areas surrounding these assets and programs on their campuses and other areas from threats that could significantly impact or otherwise hinder national security.

Colorado State University in Fort Collins, CO, hosts not only academic research capacity and private sector MCM partnerships but critical infrastructure of national importance as well. The National Laboratory for Genetic Resources Preservation, operated by USDA, resides on the main campus and contains the Nation's seed vault. If catastrophe strikes our plants, this facility is responsible for providing the means to recover and grow essential crops. Though the building possesses some external and internal security measures to withstand natural hazards and human-generated threats, the federal government should work with Colorado State University to ensure the University prevents unauthorized personnel and vehicles from approaching the building and crippling or destroying this facility. While USDA insists that the facility could withstand a car crashing into it, that is only one risk among many that federal buildings and universities face today.³³ Together, the federal government and the university must ensure this facility is secure and protected from crime, terrorism, and warfare.

PREPAREDNESS, RESPONSE, AND MITIGATION

Historically, cooperative extension programs and experiment stations have focused on serving farmers and ranchers by identifying, and providing them with, agricultural and mechanical best practices. This mission has evolved over the years to address other topics that individual states and the land-grant universities have identified as priorities for the communities they serve, commensurate with available funding. Faculty, staff, and extension agents who work in the cooperative extension enterprise are trusted voices in the counties they serve. Having a trusted voice with an ability to effectively translate technical knowledge into plain language is an invaluable resource, especially in times of crisis.

Most cooperative extension programs are not responsible for preparedness and crisis response. Historically, public health preparedness has focused on human public health, paying far less attention to agricultural public health preparedness. Cooperative extension agents that have assumed this role have proven invaluable for preparedness planning, training, education, and all-hazard response, as well as obtaining reimbursements under the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (P.L. 100-707). Some states have augmented cooperative extension staffing to engage in preparedness initiatives and have routinely deployed cooperative extension agents and other land-grant university capabilities for crisis response. This expanded preparedness and response mission provides new research opportunities for faculty, and life-long learning opportunities for students preparing them for community leadership roles in the future.

Many land-grant universities contributed to SLTT, national, and international COVID-19 response. They assisted with laboratory diagnostic testing, genomic sequencing, infectious disease modeling, the development of personal protective equipment and community-based protective measures, vaccine distribution to underserved and rural communities, situational awareness between county and state authorities, public education, and local public service announcements.

The federal government must engage with SLTT officials to strengthen capabilities to respond to events affecting food and agriculture. USDA should work with federal, SLTT, and land-grant universities to establish an emergency management system for food and agriculture events that draws on previous experiences, leverages the land-grant system's Extension Disaster Education Network (EDEN) (which provides training and resources to assist in disaster response and recovery) and aligns with the National Response Framework. This system needs to clarify the role of the Federal Bureau of Investigation, as any evidence of a biological attack would thrust the Bureau into a larger leadership and coordinating role in biological incident response. Fusion centers lack subject matter expertise and security clearances needed to address animal, food, and human health threats.

Animal Emergency Medical Services (EMS) operates separately from human EMS. Currently, local veterinarians provide urgent care to animals in communities. Nine states have passed laws allowing human EMS to provide emergency care to animals, but most traditional human EMS professionals do not possess the training necessary to properly treat animals.³⁴ Dedicated animal ambulance services exist but are few in number, generally serve larger metropolitan areas, and have varying capabilities.³⁵ Providing dedicated personnel, authorities, coordination, and training would elevate animal health standards of care following a biological or other event affecting animal agriculture. The research and community connections developed by land-grant institutions could contribute to improving SLTT support for animal EMS.

The zoonotic nature of many emerging infectious diseases can exacerbate a biological event. Rift Valley fever, Japanese encephalitis, and other biological threats can live in livestock and wildlife and threaten to infect humans. An effective response requires essential medical supplies and MCMs. The Commission recommended in *Defense of Animal Agriculture* that USDA assess the ability of the National Veterinary Stockpile (NVS) to deploy sufficient MCMs within 24 hours in response to a biological event impacting animal agriculture. The NVS traditionally focuses only on MCMs for a few pathogens (e.g., Foot and Mouth Disease). Congress authorized the NVS in the Agriculture Improvement Act (P.L. 115-334) and provided initial funding for the program. Congress funded the program at \$5.75 million for FY2022, extraordinarily little as compared to the human Strategic National Stockpile that received more than \$845 million that same year.³⁶ The NVS requires additional funding and public-private partnerships to sustain MCM research, development, acquisition, and procurement successfully.

Advanced development and manufacturing (ADM) centers could help increase domestic veterinary MCM manufacturing. The history of those programs suggests that poor management and contracting loopholes prevented past success, but with proper oversight and funding, ADM activities would be helpful.

RECOMMENDATION: Establish a cooperative extension preparedness and response framework that extends the capabilities of the Extension Disaster Education Network.

Congress should amend the Agriculture Improvement Act (P.L. 115-334) to authorize EDEN and require the Secretary of Agriculture, in coordination with the Administrator of the Federal Emergency Management Agency, to develop a cooperative extension food and agriculture preparedness and response framework for land-grant universities. The process to develop this framework should include the identification of preparedness resource requirements, appropriations that support participating land-grant cooperative extension programs, and the determination of any new authorities needed to enable effective food and agriculture crisis response. The Secretary of Agriculture should coordinate with SLTT emergency management officials to integrate the biological, food, and agricultural response capabilities and capacities of land-grant institutions into SLTT and national emergency response plans, including the National Response Framework.

RECOMMENDATION: Establish a food and agriculture emergency response technical assistance program.

Congress should amend the Hatch Act (P.L. 49-314) to require the Secretary of Agriculture to work with the land-grant universities to develop SLTT food and agriculture emergency response personnel and provide other SLTT first responders with training and technical assistance regarding emergency response to the use or threatened use of agricultural weapons of mass destruction or biological agents that affect food, animal health, plant health or agricultural materials and activities (e.g., textiles, biofuels). The program should incorporate food and crop scientists, public health experts, and veterinarians from land-grant universities to provide technical assistance covering the full range of response needs for biological incidents involving food and agriculture. Assistance available under this program should include training in the use, operation, and maintenance of equipment for (1) detecting biological agents in food and agriculture environments; (2) monitoring for the presence of such biological agents in food and agriculture facilities and environments; (3) protecting food, agriculture, emergency personnel, and the public during and after attacks on food and agriculture; and (4) decontamination of food and agriculture facilities and environments.

RECOMMENDATION: Review the extent and quality of emergency management of food and agriculture events.

Congress should amend the Hatch Act (P.L. 49-314) to direct the Secretary of Agriculture to work with the land-grant universities to conduct a national food and agriculture emergency management assessment, as well as periodic, comprehensive, and independent reviews

and evaluations regarding the extent and quality of food and agriculture emergency management provided throughout the Nation. Such assessment should consider differences in emergency management needs and activities between naturally occurring biological events and biological attacks on agriculture. Congress should direct the Secretary of Agriculture, Secretary of Health and Human Services, and Attorney General to work with the land-grant universities to prepare and submit annually to Congress a report on food and agriculture emergency management that includes: (1) an evaluation of the adequacy of a food and agriculture emergency management system in the United States (factoring in different levels of SLTT preparedness) during the period covered by the report; (2) an evaluation of the extent to which insurance programs, the Commodity Credit Corporation, and federal grant programs adequately reimburse food and agriculture emergency management services; (3) an evaluation of the distribution of food and agriculture emergency preparedness grant funds by all grant-making federal agencies; and (4) identified needs for legislation to provide adequate SLTT food and agriculture emergency management capabilities. USDA, HHS, and the Department of Justice should task land-grant universities to assist in assessing the capabilities of states, localities, tribes, and territories for this report.

RECOMMENDATION: Improve distribution of pharmaceuticals, medical equipment, and other essential medical supplies needed to treat those affected by large-scale food and agriculture events.

Congress should amend the Hatch Act (P.L. 49-314) to require the Secretary of Agriculture to work with SLTT Secretaries of Agriculture and land-grant universities to improve existing NVS training offerings, taking into consideration currently limited SLTT abilities to distribute NVS contents upon receipt. In executing this directive, the land-grant universities should build on experiences, working with private sector entities (e.g., veterinary pharmacies) to distribute pharmaceuticals for animal agricultural purposes. Congress should also amend the Agriculture Improvement Act (P.L. 115-334) to direct USDA to immediately develop and make available training pallets for naturally occurring infectious diseases and biological agents that would require distribution from the NVS.

RECOMMENDATION: Establish regional food and agricultural advanced development and manufacturing.

Congress should amend the Animal Health Protection Act (7 USC 8308a) to require the Secretary of Agriculture to establish regional food and agriculture advanced development and manufacturing capacity at land-grant universities in partnership with industry. USDA should oversee the activities to develop this capacity and coordinate with testing and evaluation of MCMs by the National Bio- and Agro-Defense Facility.

CONCLUSION

President Lincoln and Congress established the first land-grant universities in 1862, shortly after they established the USDA. The President and Congress never intended for the land-grant universities to be insular entities. Land-grant universities exemplify the concept of hub-and-spoke organizations, engaging with and supporting the communities they serve. The Nation cannot do without them.

Land-grant universities engage in innovative research and development, cooperative extension activities, and emergency and disaster response. Nationally and internationally recognized scientists work at land-grant universities conducting research on emerging infectious diseases, public health, medicine, animal health, plant health, biomedical engineering, vaccinology, immunology, disease modeling, data sciences, and many other disciplines important for biodefense. Land-grant universities also develop next generation community, state, and national government and industry leaders.

The land-grant universities also help affected state, local, and tribal agriculture and public health programs to track the disease and monitor wildlife. Affected communities can expect assistance from the land-grant universities well before the federal government arrives on the scene because these institutions are already present. They also know that the land-grant universities will remain in their communities long after the federal government departs. Further investment in these capabilities would strengthen national biodefense. Unfortunately, not all land-grant universities possess the resources necessary to provide this critically necessary support.

President Lincoln valued higher education and recognized the role dedicated institutions could play in supporting food, animals, and plants, while also ensuring that citizens with modest means could obtain a university education. Building on Lincoln's legacy, we can strengthen national defense of food and agriculture by funding and reinforcing the work of the land-grant universities before an event destroys food, crops, herds, textiles, biofuels, and other agricultural products, and devastates our national and global economies. Land-grant universities have their boots on the ground. We need to provide them with what they need to win the war against threats to food and agriculture. It is too great a thing to be left undone.

“

“...NO OTHER HUMAN OCCUPATION OPENS SO WIDE A FIELD FOR THE PROFITABLE AND AGREEABLE COMBINATION OF LABOR WITH CULTIVATED THOUGHT, AS AGRICULTURE.”

— Abraham Lincoln, September 30, 1859 Speech Before the Wisconsin State Agricultural Society

ACRONYMS

ADM	Advanced development and manufacturing
ASF	African Swine Fever
AGARDA	Agriculture Advanced Research and Development Authority
APHIS	Animal and Plant Health Inspection Service
ARS	Agricultural Research Service
BSL	biosafety level
COVID-19	Coronavirus Disease 2019
DHS	Department of Homeland Security
EDEN	Extension Disaster Education Network
EMS	Emergency Medical Services
FDA	Food and Drug Administration
FY	Fiscal Year
HHS	Department of Health and Human Services
MCM	Medical countermeasure(s)
NIFA	National Institute of Food and Agriculture
NVS	National Veterinary Stockpile
SLTT	state, local, tribal, and territorial
USDA	Department of Agriculture

APPENDIX A: MEETING AGENDA AND SPEAKERS

Meeting held at Colorado State University, Fort Collins, CO.

TOO GREAT A THING TO LEAVE UNDONE: DEFENSE OF AGRICULTURE

November 5, 2019

Land Acknowledgment and Welcome

Native American representative provides formal statement that recognizes and respects the Native American people of Colorado as traditional stewards of the land upon which Colorado State University stands. Chancellor provides welcome statement.

- Ty Smith, MBA, Director, Native American Cultural Center, Colorado State University
- Anthony A. Frank, DVM, PhD, Chancellor, Colorado State University System

Opening Remarks

- Former US Senate Majority Leader Thomas A. Daschle, Commissioner, Bipartisan Commission on Biodefense
- Former Homeland Security Advisor Kenneth L. Wainstein, Commissioner, Bipartisan Commission on Biodefense

Panel One – Response and Recovery

State and private sector representatives describe requirements for response to and recovery from agricultural crime, terrorism, and naturally occurring outbreaks with large-scale consequences.

- Keith A. Roehr, DVM, State Veterinarian, Colorado Department of Agriculture
- Colonel Brey Hopkins (US Army), Director, Joint Plans, Operations and Military Support, Colorado National Guard
- Lee Leachman, Managing Partner, Leachman Cattle Company of Colorado

Panel Two – Surveillance and Detection

Federal and private sector representatives describe requirements for surveillance and detection of animal and plant diseases before and during agricultural events.

- Captain Casey Barton Behravesh, (US Public Health Service), DVM, DrPH, Director, One Health Office, National Center for Emerging and Zoonotic Infectious Diseases, Centers for Disease Control and Prevention, Department of Health and Human Services

- Amy Delgado, PhD, DVM, MS, Director of Monitoring and Modeling, Center for Epidemiology and Animal Health, Animal and Plant Health Inspection Service, Department of Agriculture
- John M. Hardham, PhD, Research Director, Global Biologics Research and Chair, Zoetis Center for Transboundary and Emerging Diseases, Zoetis

Video: Leadership, Heritage, and Progress

Former Cabinet Member, Governor, and Mayor discusses the need for innovative leadership to develop fresh solutions for biodefense issues of pressing concern to agricultural and other communities of interest and practice.

- The Honorable Thomas J. Vilsack, JD, Former Governor of Iowa, and Former Mayor of Mount Pleasant, Iowa

Panel Three – Land-grant University Roles and Responsibilities

Research leaders and academics discuss the vision for land-grant universities, their support of the US research enterprise, and their current and potential contributions to national security.

- Prasant Mohapatra, PhD, Vice Chancellor for Research, University of California, Davis
- Alan Rudolph, PhD, Vice President for Research, Colorado State University
- Jane Christopher-Hennings, DVM, MS, Head, Veterinary & Biomedical Sciences Department and Director, South Dakota Animal Disease Research and Diagnostic Laboratory, South Dakota State University

Congressional Perspective

Sitting Member of Congress addresses his priorities for agro-defense, how states and localities can contribute to the protection of agricultural and biological contributions to the Nation's economy and security, and his views on the need for public-private partnership in this arena.

- Representative Joe Neguse (D- CO), Vice Chair, Subcommittee on Antitrust, Commercial, and Administrative Law, Committee on the Judiciary, US House of Representatives

Closing Remarks

- Former US Senate Majority Leader Thomas A. Daschle, Commissioner, Bipartisan Commission on Biodefense

APPENDIX B: LIST OF LAND-GRANT UNIVERSITIES

ALABAMA

Alabama A&M University, Normal
Auburn University, Auburn
Tuskegee University, Tuskegee

ALASKA

Ilisagvik College, Barrow
University of Alaska, Fairbanks

AMERICAN SAMOA

American Samoa Community College,
Pago Pago

ARIZONA

Diné College, Tsaile
University of Arizona, Tucson
Tohono O'Odham Community College, Sells

ARKANSAS

University of Arkansas, Fayetteville
University of Arkansas at Pine Bluff,
Pine Bluff

CALIFORNIA

D-Q University, (Davis vicinity)
University of California System-Oakland
as Headquarters, Oakland

COLORADO

Colorado State University, Fort Collins

CONNECTICUT

University of Connecticut, Storrs

DELAWARE

Delaware State University, Dover
University of Delaware, Newark

DISTRICT OF COLUMBIA

University of the District of Columbia,
Washington

FLORIDA

Florida A&M University, Tallahassee
University of Florida, Gainesville

GEORGIA

Fort Valley State University, Fort Valley
University of Georgia, Athens

GUAM

University of Guam, Mangilao

HAWAII

University of Hawaii, Honolulu

IDAHO

University of Idaho, Moscow

ILLINOIS

University of Illinois, Urbana

INDIANA

Purdue University, West Lafayette

IOWA

Iowa State University, Ames

KANSAS

Haskell Indian Nations University, Lawrence
Kansas State University, Manhattan

KENTUCKY

Kentucky State University, Frankfort
University of Kentucky, Lexington

LOUISIANA

Louisiana State University, Baton Rouge
Southern University and A&M College,
Baton Rouge

MAINE

University of Maine, Orono

MARYLAND

University of Maryland, College Park
University of Maryland Eastern Shore,
Princess Anne

MASSACHUSETTS

University of Massachusetts, Amherst

MICHIGAN

Bay Mills Community College, Brimely
Keweenaw Bay Ojibwa Community College,
Baraga
Michigan State University, East Lansing
Saginaw Chippewa Tribal College,
Mount Pleasant

MICRONESIA

College of Micronesia, Kolonia, Pohnpei

MINNESOTA

Fond du Lac Tribal & Community College,
Cloquet
Leech Lake Tribal College, Cass Lake
Red Lake Nation College, Red Lake
University of Minnesota, St. Paul
White Earth Tribal and Community College,
Mahnomen

MISSISSIPPI

Alcorn State University, Lorman
Mississippi State University, Starkville

MISSOURI

Lincoln University, Jefferson City
University of Missouri, Columbia

MONTANA

Blackfeet Community College, Browning
Chief Dull Knife College, Lame Deer
Aaniiih Nakoda College, Harlem
Fort Peck Community College, Poplar
Little Big Horn College, Crow Agency
Montana State University, Bozeman
Salish Kootenai College, Pablo
Stone Child College, Box Elder

NEBRASKA

Little Priest Tribal College, Winnebago
Nebraska Indian Community College,
Winnebago
University of Nebraska, Lincoln

NEVADA

University of Nevada, Reno

NEW HAMPSHIRE

University of New Hampshire, Durham

NEW JERSEY

Rutgers University, New Brunswick

NEW MEXICO

Navajo Technical College, Crownpoint
Institute of American Indian and Alaska
Native Culture and Arts Development,
Sante Fe
New Mexico State University, Las Cruces
Southwestern Indian Polytechnic Institute,
Albuquerque

NEW YORK

Cornell University, Ithaca

NORTH CAROLINA

North Carolina A&T State University,
Greensboro
North Carolina State University, Raleigh

NORTH DAKOTA

Fort Berthold Community College,
New Town
Cankdeska Cikana Community College,
Fort Totten
North Dakota State University, Fargo
Sitting Bull College, Fort Yates
Turtle Mountain Community College,
Belcourt
United Tribes Technical College, Bismarck

NORTHERN MARIANAS

Northern Marianas College, Saipan, CM

OHIO

Central State University, Wilberforce
Ohio State University, Columbus

OKLAHOMA

College of the Muscogee Nation, Okmulgee
Langston University, Langston
Oklahoma State University, Stillwater

OREGON

Oregon State University, Corvallis

PENNSYLVANIA

Pennsylvania State University,
University Park

PUERTO RICO

University of Puerto Rico, Mayaguez

RHODE ISLAND

University of Rhode Island, Kingston

SOUTH CAROLINA

Clemson University, Clemson
South Carolina State University,
Orangeburg

SOUTH DAKOTA

Oglala Lakota College, Kyle
Sinte Gleska University, Rosebud
Sisseton Wahpeton College, Sisseton
South Dakota State University, Brookings

TENNESSEE

Tennessee State University, Nashville
University of Tennessee, Knoxville

TEXAS

Prairie View A&M University, Prairie View
Texas A&M University, College Station

UTAH

Utah State University, Logan

VERMONT

University of Vermont, Burlington

VIRGIN ISLANDS

University of the Virgin Islands, St. Croix

VIRGINIA

Virginia Tech, Blacksburg
Virginia State University, Petersburg

WASHINGTON

Northwest Indian College, Bellingham
Washington State University, Pullman

WEST VIRGINIA

West Virginia State University, Institute
West Virginia University, Morgantown

WISCONSIN

College of Menominee Nation, Keshena
Lac Courte Oreilles Ojibwa, Community
College, Hayward
University of Wisconsin, Madison

WYOMING

University of Wyoming

ENDNOTES

- ¹ Animal and Plant Health Inspection Service. (2021). African Swine Fever: A Producer's Guide to the Federal Emergency Response Process. Washington, DC: Department of Agriculture. Retrieved from: https://www.aphis.usda.gov/publications/animal_health/fsc-asf-producers-guide-emer-response.pdf
- ² The Morrill Act of 1862 (12 Stat. 503), The Morrill Act of 1890 (P.L. 51-841), and the Equity in Educational Land-Grant Status Act (103-382).
- ³ National Institute of Food and Agriculture. (2019). *NIFA Land-Grant Colleges and Universities*. Washington DC: Department of Agriculture. Retrieved from: <https://nifa.usda.gov/sites/default/files/resource/LGU-Map-03-18-19.pdf>.
- ⁴ Land-grant universities are also known as state agricultural experiment stations in statute.
- ⁵ State cooperative agents are defined by 7 U.S.C. § 3103(18) as agents designated by: (a) the Act of July 2, 1862 (7 U.S.C. 301 et seq.), commonly known as the First Morrill Act; (b) the Act of August 30, 1890 (7 U.S.C. 321 et seq.), commonly known as the Second Morrill Act, including Tuskegee University; (c) the Act of March 2, 1887 (7 U.S.C. 361a et seq.), commonly known as the Hatch Act of 1887; (d) the Act of May 8, 1914 (7 U.S.C. 341 et seq.), commonly known as the Smith-Lever Act; (e) the Act of October 10, 1962 (16 U.S.C. 582a et seq.), commonly known as the McIntire-Stennis Act of 1962; (r) section 3192 of this title; and subchapters VI, XI, and XII of this chapter.
- ⁶ The Agriculture Improvement Act of 2018 (P.L. 115-334) addressed two of the recommendations in the Commission's report *Defense of Animal Agriculture*: (1) The establishment of a discreet National Animal Disease Preparedness and Response Program; and (2) the creation of a National Animal Vaccine and Veterinary Counter-Measures Bank. Additionally, the law included increased authorized funding levels for the National Animal Health Laboratory Network that addresses Recommendation 14b of the Commission's *National Blueprint for Biodefense*. The Consolidated Appropriations Act of 2021 (P.L. 116-260) addressed an additional recommendation in *Defense of Animal Agriculture* to require a business plan for the National Bio- and Agro-Defense Facility that will be managed by USDA and located in Manhattan, Kansas.
- ⁷ Cybersecurity and Infrastructure Agency (2015). *Food and Agriculture Sector-Specific Plan*. Washington, DC: Department of Homeland Security. Retrieved from: <https://www.cisa.gov/sites/default/files/publications/nipp-ssp-food-ag-2015-508.pdf>.
- ⁸ Land-grant universities partner with the United States Geological Survey to conduct research addressing state and regional water problems through the Water Resources Research Act (P.L. 88-379). See United States Geological Survey. "Water Resources Research Act Program." Retrieved from: <https://water.usgs.gov/wrri/index.php>.
- ⁹ The Cooperative State Research, Education, and Extension Service was renamed the National Institute for Food and Agriculture in the Food, Conservation and Energy Act of 2008 (P.L. 110-234).
- ¹⁰ Epi in this title stands for epidemiological.
- ¹¹ Colorado State University. "Coalition for Epi Response, Engagement and Science". Retrieved from: <https://www.research.colostate.edu/ceres-agricultural-biosecurity/>.
- ¹² Section 108 of the FDA Food and Safety Modernization Act (P.L. 111-353, 21 USC § 2202).
- ¹³ Food and Drug Administration (2015). *Report to Congress on the National Agriculture and Food Defense Strategy*. Washington, DC: Department of Health and Human Services. Retrieved from: <https://www.fda.gov/food/food-safety-modernization-act-fsma/report-congress-national-agriculture-and-food-defense-strategy-nafds-2015>.

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- ¹⁴ Office of the Inspector General (2017, March 27). *Agroterrorism Prevention, Detection, and Response*. Audit Report 61701-0001-21. Washington, DC: Department of Agriculture. Retrieved from: <https://www.usda.gov/oig/audit-reports/agroterrorism-prevention-detection-and-response>. See also Office of the Inspector General (2020, July 16). *DHS is Not Coordinating the Department's Efforts to Defend the Nation's Food, Agriculture, and Veterinary Systems against Terrorism*. OIG-20-53. Department of Homeland Security. Retrieved from: <https://www.oig.dhs.gov/sites/default/files/assets/2020-07/OIG-20-53-Jul20.pdf>.
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- ¹⁶ Federal statutes addressing agricultural and food security include the Securing our Agriculture and Food Act (PL 115-43) and the Consolidated Appropriations Act of 2021 (PL 116-260), which contains the National Bio and Agro-defense Facility Act of 2020.
- ¹⁷ Science and Technology Directorate. *AgConnect*. Washington, DC: Department of Homeland Security. Retrieved from: https://www.dhs.gov/sites/default/files/publications/zadd_protecting-ag-infrastructure_coe-factsheet_1701-508.pdf. See also IAD. (2021, October 7). *AgConnect: Empowering better animal health decisions with technology*. Retrieved from Institute for Infectious Animal Diseases. Retrieved from: <https://iiad.tamu.edu/agconnect/>.
- ¹⁸ National Pork Board. (2020, November 10). National Pork Board Launches AgView. National Hog Farmer. Retrieved from: <https://www.nationalhogfarmer.com/animal-health/national-pork-board-launches-agview>.
- ¹⁹ Seddiq, O. (2019). Research Gaps Hurt Hunt for African Swine Fever Vaccine. *Politico*. Retrieved from: <https://www.politico.com/news/2019/10/28/research-african-swine-fever-vaccine-060263>. See also Gernstein, D. (2017, November 2). *Federal Research and Development for Agricultural Biodefense*. Testimony presented before the Subcommittee on Research and Technology of the House Committee on Science, Space, and Technology. Washington DC: RAND Corporation. Retrieved from: https://www.rand.org/content/dam/rand/pubs/testimonies/CT400/CT482/RAND_CT482.pdf.
- ²⁰ For example, Congress appropriated \$1.53 billion for ARS in the Consolidated Appropriations Act of 2021 (P.L. 116-260), a substantial increase from the \$1.18 billion appropriated to the agency six years earlier in the Consolidated and Further Continuing Appropriations Act of 2015 (P.L. 113-235). See also the President's FY2023 Department of Agriculture Budget Request.
- ²¹ ARS funds some university and industry work through agreements to supplement government research efforts.
- ²² Section 7132 of the Agriculture Improvement Act of 2018 (P.L. 115-334).
- ²³ Land-grant universities created under the Morrill Act of 1862 (12 Stat. 503) receive research capacity grants through the Hatch Act of 1887 (P.L. 49-314) and extension capacity grants through the Smith-Lever Act of 1914 (38 Stat. 372). Land-grant universities established in 1890 receive research capacity grants through the Evans-Allen Act (P.L. 95-113, 7 U.S.C. 3222) and extension capacity grants through the National Agricultural Research, Extension, and Teaching Policy Act of 1977 (7 U.S.C. 321-329).
- ²⁴ There are four BSLs in ascending order of security, with BSL-4 facilities representing the most secure research centers that can study the most severe and transmissible infectious agents and toxins. See Office of the Assistant Secretary for Preparedness and Response. *Biosafety Levels*. Department of Health and Human Services. Retrieved from: <https://www.phe.gov/s3/BioriskManagement/biosafety/Pages/Biosafety-Levels.aspx>.

ENDNOTES

- ²⁵ The BSL-3Ag designation refers to the high containment required in an agricultural setting to prevent organisms from escaping into the environment and causing animal disease, zoonotic disease, and/or significant economic impacts.
- ²⁶ LeDuc, J. (2020). *Biocontainment Laboratories: A Critical Component of the U.S. Bioeconomy in Need of Attention*. Health Security, 61-66.
- ²⁷ Section 7504 of the Agriculture Improvement Act of 2018 (P.L. 115-334), which extended the authorization of appropriations for AFRI in 7 USC 3157(b)(11) to FY 2023.
- ²⁸ Department of Agriculture. (2021). FY2022 Budget Summary. Retrieved from: <https://www.usda.gov/sites/default/files/documents/2022-budget-summary.pdf>.
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- ³⁰ Section 7601 of the Agricultural Act of 2014 (P.L. 113-79).
- ³¹ For example, Colorado State University at Fort Collins hosts the USDA National Laboratory for Genetic Resource Preservation, essentially serving as a seed vault for the United States.
- ³² See 20 U.S.C. § 1059c for examples of authorized activities.
- ³³ Hood, G. (2016). “‘You Can Hit It With A Cadillac,’ And Other Fun Facts About CSU’s Seed Vault.” Colorado Public Radio. Retrieved from: <https://www.cpr.org/2016/10/25/you-can-hit-it-with-a-cadillac-and-other-fun-facts-about-csus-seed-vault/>.
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- ³⁶ Consolidated Appropriations Act, 2022 (P.L. 117-103).



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