The USDA Agricultural Research Service
Capital Investment Strategy

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Preface

Highly specialized and quality laboratory facilities are among the essential assets of organizations that conduct scientific research. As the principal intramural scientific research agency of the Department of Agriculture (USDA), the Agricultural Research Service (ARS) operates an extensive network of more than one hundred Federally-owned research facilities. Over the past 25 years USDA has invested significant levels of public funds to maintain and enhance this valuable resource in order to sustain its capacity to address important technical problems and explore new scientific opportunities to benefit the nation’s food and agriculture system and the public.

For much of the past decade the Federal budgetary process for capital improvements to ARS buildings and facilities was focused almost exclusively on the new $462 million biocontainment science facility complex for the National Centers for Animal Health in Ames, Iowa. During this period when budget requests for other new construction or recapitalization of research facilities were being deferred by the Administration, more than 25 Congressionally-directed facility projects received partial funding. To assess the merit and priority for fully funding those pending research facility projects and others in need, the USDA Secretary directed ARS to review its laboratory portfolio and develop a plan for future capital investments. Additionally, Senate Report (111-221) on Fiscal Year 2011 appropriations from the Committee on Appropriations “...directs the Secretary to evaluate the agency’s [ARS’] capital asset requirements...” Similarly, House Report (112-101) on Fiscal Year 2012 appropriations, “...directs ARS to establish a long term, multi-year plan to guide capital asset construction decisions for new agricultural research buildings and facilities consistent with program missions, goals, and requirements.”

This report presents a Capital Investment Strategy for recapitalization and new ARS research facilities based on facility condition, needs, and research program priorities. Recommendations also are made for near term investments. This report does not constitute a USDA request for funding, but the recommendations and overall strategy will inform and support the development of Administration budget requests for ARS research facilities in the out years.
Executive Summary

Specialized scientific laboratories and related facilities are essential to the ability and capacity of the USDA Agricultural Research Service (ARS) to carry out its research responsibilities. The portfolio of ARS science facilities consists of more than one hundred major Federally-owned laboratory buildings and many additional research support structures. These facilities are strategically located throughout the U.S., reflective of the wide geographic diversity and site specificity of agricultural production; distinct climatic and agroecosystem zones; and the numerous research partners, cooperators, and customer/users with which ARS works. About 30 percent of ARS research is housed in cooperator (i.e., non-ARS-owned) facilities.

USDA research facilities are valuable public assets. The process and criteria provided in this report for identifying the regular and periodic ARS infrastructure improvements needed, and the specific investment recommendations made, will sustain USDA's capacity to conduct quality scientific agricultural research in support of its mission and responsibilities to enhance agricultural productivity and sustainability and otherwise help to advance the nation's food and agricultural system for public benefit. This research capacity will also importantly address the ever increasing challenges to global food, agricultural, and natural resource systems in the next three to four decades, including world population growth, doubling of food demands, changing climates, dwindling availability of arable land and water for food production, and the growing needs for renewable bioenergy production.

While considerable levels of public funds have been allocated over the past 25 years to maintain and improve the ARS laboratory infrastructure – now valued at nearly $3.7 billion and consisting of many new and outstanding facilities – investments have not kept pace with standards and needs. In recognition of these unmet needs, and given current and expected continued national economic constraints, the Secretary of Agriculture and the U. S. Congress have directed ARS leadership to develop a strategy for future capital investments in USDA research facilities.

Building upon the already well-established real property management system in ARS, the Capital Investment Strategy described in this report provides a data- and
criteria-based process for assessing capital investment needs based upon facility conditions and program priorities. Applying these criteria to 122 major ARS-owned research facilities, 21 low-condition facilities judged to be among those currently in greatest need of improvement -- and housing high priority programs and/or having the capacity to do so in the future -- are identified for recapitalization over the next decade. Also identified for priority investment are three ARS facilities to be constructed to house priority research now located in cooperator-owned facilities.

To sustain the capacity of ARS' substantial though constantly aging infrastructure for quality scientific research, such facilities require regular maintenance and periodic upgrades throughout their 35 to 40 year functional lifespans; eventually they require major renovation/modernization or replacement. Industry standards suggest that an average annual investment of about 4 percent of the capitalization value of a facility portfolio would be required. Thus, to maintain and upgrade the capacity of the USDA facility portfolio to support quality agricultural science, nearly $150 million in capital investments will be needed on a regular and recurring basis to address current backlogs and the constantly aging infrastructure. As those facilities in least adequate condition and relatively greatest need are improved, other facilities in need will move to a position of higher priority consideration for investment.

Criteria for determining priority capital investments can also be used to inform and support cost-effective decisions for divesting some low condition facilities and consolidating the research housed in them to adequate facilities located elsewhere, thus minimizing overall capital investment requirements.

While not constituting a request for Congressional appropriations, the report recommendations can be used to shape the development of future annual USDA budget proposals as economic conditions and opportunities permit.
Introduction: Sustaining the ARS Infrastructure

The Agricultural Research Service (ARS) is USDA's principal intramural scientific research agency and the Nation's primary public institution that conducts agricultural research. From field to table, ARS scientists find solutions to technical problems that affect agricultural producers and American consumers every day. ARS is supported by an annual appropriated research budget of about $1.1 billion, and operates an established supporting network of laboratories and research facilities and world-class scientific expertise in food and agriculture, consisting of 8,800 employees of which 2,200 are Ph.D. scientists, and 800 research projects at nearly 100 research locations throughout the Nation and in several foreign countries. ARS addresses public good and emerging and critical national agricultural research needs on a scale that only the Federal government can muster.

ARS research priorities are driven by the Administration, Congress, customers, and stakeholders, focusing on the areas of research most crucial to American agriculture where Federal research is inherently suited to make innovative contributions. ARS program managers ensure that research programs remain relevant to national priorities and the ARS peer review system ensures that this research meets high standards of scientific merit.

Agriculture is inherently location specific. ARS' network of specialized research facilities located throughout the Nation reflects the diversity and site specificity of agriculture, climates and natural resources, stakeholders, and research partners. ARS programs focus on core, long-term agricultural concerns, while maintaining the capacity and readiness to respond to emerging and pressing problems when the need arises.

ARS manages substantial real property assets having a capitalization value of nearly $3.7 billion. These assets include over 400,000 acres of Federal land on which ARS-owned research facility complexes are located consisting of 4,600 individual buildings and structures totaling 14 million square feet of space. This collective ARS-owned and managed infrastructure houses about 70 percent of all ARS staff and programs, as well as those of numerous cooperators. About 30 percent of ARS staff and programs are housed in cooperator-owned or leased
facilities for which ARS has varying degrees of management and maintenance responsibilities.

Scientific research facilities, like all physical infrastructures, deteriorate over time. In fact, due to their highly specialized nature many are more demanding in terms of maintenance and repair and have an average functional lifespan of only 35 to 40 years. During this span, facilities require increasingly regular repair and maintenance to sustain their capacity for effective research. If not regularly maintained, the costs of needed repairs and major upgrades could ultimately exceed the value of the facility. Federal research facilities need additional regular attention and periodic upgrades in order to comply with municipal and Federal building code requirements, adhere to standard engineering safety principles and physical security and biosecurity requirements, and provide contemporary information technology and biosafety infrastructure.

Dale Bumpers National Rice Research Center
Stuttgart, Arkansas

ARS has many highly adequate and state-of-the-art research facilities constructed anew or modernized in the past several decades. It also has a significant number of older facilities and a constantly aging infrastructure overall. Many of these facilities are at the limit or well in excess of their functional lifespan according to engineering standards.
ARS scientists need to have adequate and up-to-date facilities on a sustained basis in order to produce research results that will help the U.S. continue to lead the world in agricultural innovation. In recognition of this principle, ARS real property management is an ongoing process of very high priority. This process entails timely and accurate assessments and inventories of facility conditions, and their periodic repair, maintenance, and recapitalization as needed and as the availability of resources permits. This report builds upon ongoing real property management, and describes a Capital Investment Strategy (CIS) that establishes an updated and enduring framework for prioritizing future investments in ARS facilities. The plan is consistent with Federal asset management standards and requirements, and has been benchmarked against similar strategic plans and best practices of other Federal agencies (see Appendix A).

This CIS provides a systematic, data- and criteria-based process for assessing capital investment needs based on facility physical conditions, lifespan criteria, cost estimates, and research program priorities. The CIS provides a blueprint for future capital investments that will allow ARS to continue to meet its mission, and provides specific capital investment recommendations for the near term, that is, during the next 10 years.

Grand Forks Human Nutrition Center
Grand Forks, North Dakota
ARS Facility Evaluation and Prioritization Process

Background information presented in the subsections that follow provide the context and basis for identifying and recommending near-term priority capital investments for current and future highest priority research programs housed in least adequate facilities.

ARS Real Property Asset Management

ARS has well-established processes and databases for managing its real properties in accordance with Federal policy requirements. These functions are carried out by the Facilities Division (FD) of the headquarters-based ARS Administrative and Financial Management (AFM) staff. AFM provides business support to all of ARS programs and some client agencies. FD consists of a professional staff of about 60 FTE that provides management expertise for engineering projects, construction contracts, real property acquisition, space utilization, energy use efficiency, and facility safety and security.

FD carries out these activities within the context of Federal executive orders, OMB guidance, and USDA policy. In particular, Executive Order 13327, Federal Real Property Asset Management Requirements, issued in 2004, provides the foundation for OMB Capital Planning and Investment Control (CPIC) guidance (OMB Circular A-11, Part 7). In accordance with this OMB guidance and the Executive Order, USDA in 2007 issued its Real Property Capital Programming and Investment Process (CPIP), which included an ARS-specific component, the ARS Building Block Plan (BBP). A key operational component of the BBP is the use of internal ARS real property Asset Management Review Boards (AMRB) composed of field and headquarters executives and program leaders who review and recommend investment actions for new construction, repair and maintenance, land purchases and disposal (see sidebar for Board membership). FD utilizes a comprehensive USDA facilities inventory database and tracking and reporting system called the Corporate Property Automated Information System (CPAIS) to support these reviews, actions, and the ongoing stewardship of ARS real property. See Appendix B for the types of data included in CPAIS for each facility. These data are updated periodically with new information via a physical facility inventory verification undertaken every five years by agency staff or contractors.
The ARS Asset Management Review Board

Headquarters membership:

- Deputy Administrator, Administrative & Financial Management (Chair)
- Associate Administrator for National Programs
- Associate Administrator for Research Operations
- Director, Budget & Program Management Staff
- Director, Facilities Division
- ARS Real Property Officer

For management purposes, the network of ARS laboratories in the field is grouped into eight geographic regions or “Areas,” plus the National Agricultural Library. Each of these field Areas has an asset management review board composed of comparable agency officials. The Area AMRBs make real property recommendations to the headquarters board, which in turn advises and recommends real property actions to the ARS Administrator.

San Joaquin Valley Agricultural Research Center
Parlier, California
Using CPAIS, the FD staff, in concert with ARS research program and budget managers, guide investments for capital improvement and maintenance of ARS real property assets through five principal activities, funding sources, and authorities, as follows:

1. Buildings and Facilities (B&F) account. This is an annual ARS appropriation line item separate from the ARS Salaries and Expenses (S&E) appropriation. S&E is the annual program account that funds and supports research operations on an ongoing basis. The separate B&F account is the principal source of funds for capital investments in ARS. The amounts appropriated vary from year to year depending on facility needs, Administration budget requests via the President’s budget, and actual appropriations from the U.S. Congress as approved in Appropriation bills. Over the past 26 years (fiscal years 1985 to 2010), B&F appropriations have averaged about $55 million per year in actual dollars, ranging from zero to $178 million in specific years. Adjusted for inflation, the annual average appropriation in current year dollars is estimated to be $76 million. The annual B&F appropriations are displayed in Appendix C. Capital projects completed with these funds are listed in Appendix D. Selected images of some of these new and modernized facilities are presented throughout this Report. A more complete pictorial portfolio of some of these new and modernized facilities funded with B&F appropriations is provided in Appendix E. Collectively, these facilities are highly valuable USDA assets that are crucial to sustain the U.S. capacity to support and conduct agricultural and food science research that meets the public need for safe and nutritious food.

2. American Recovery and Reinvestment Act (ARRA) of 2009. ARS ARRA projects are itemized and described in Appendix F. They constitute a one-time $176 million appropriation to address critical deferred maintenance of 41 selected high priority mission-critical ARS facilities that had previously been identified through the ARS Capital Project Repair Plan and Asset Management Review Board planning process. ARRA funding importantly complemented B&F funded modernization projects. The renovation and construction work for some of these projects remains underway (2012).

3. Repair and Maintenance (R&M) budget line item in the ARS S&E account. The current R&M line item budget is $18 million annually, a level that has been flat for about 16 years and that has not kept pace with inflation and
the needs of an aging real property inventory and new compliance requirements.

The R&M Program is specifically intended to improve existing ARS facilities within specific guidelines: protection of life, protection of property, implementation of mandated regulations, compliance with building codes, more effective space utilization, and implementation of energy conservation. The definition of repair, as customarily applied to ARS facilities and buildings, is the restoration and renovation of components of an existing facility to a condition substantially equivalent to its original state and efficiency with the repair work complying with the requirements contained in the current applicable codes and standards. Pending the availability of funds, there is no restriction on the amount of funds that can be spent on R&M projects.

National Biological Control Laboratory
Stoneville, Mississippi

A portion of the appropriated R&M funds ($2 to 3 million) is used annually to address recurring mandates such as real property, energy, and sustainability assessments and reporting requirements, as well as seismic studies, accessibility surveys and corrective actions, and physical security upgrades. Another portion of the R&M funds are typically used for phased upgrades and modernization of existing structures, generally in the $1 to $3.5 million range per phase. Such notable projects completed in past years or now underway are modernization of ARS facilities or major components thereof at El Reno, Oklahoma; Fort Collins, Colorado; Newark, Delaware; Frederick (Ft. Detrick), Maryland; Ames, Iowa; and Boston, Massachusetts.
4. Based upon internal ARS policy, Research Leaders and managers assign 4 percent or more of their annual base S&E funding to routine and other local real property repair and maintenance requirements at their respective facilities and locations, unless a portion of the set aside is waived due to adequate condition of the facilities. A total of about $26 million is expended annually ARS-wide from this source. Examples of typical local repair and maintenance expenditures include:

- HVAC/electrical/plumbing component repair and maintenance
- Roof replacement
- Building envelope repair and/or maintenance
- Site utility system replacement/repair/maintenance
- Fire protection installation/replacement
- Fume hood replacement/correction of air flow deficiency
- Road paving (site pedestrian and vehicular circulation)
- Correction of site drainage
- Other life safety systems installation/replacement
- Miscellaneous repairs (windows, painting, plumbing, etc.)

5. Limited Small Building Authority. Within the S&E appropriation account are line item authorizations for construction and improvement of "small buildings" to support and enhance specific laboratory facilities the costs of which are not to exceed limited amounts. Three authorities are applicable: the Ten Small Building (TSB) authority limited to $750,000 per project; the Unlimited Small Building (USB) authority limited to $375,000 per project; and the Headhouse/Greenhouse authority limited to $1.2 million per project.

The TSB and USB authorities have been used to construct equipment storage and other support facilities, small laboratory buildings, insectaries, fumigation facilities, chemical handling and storage facilities, grain storage, and similar small structures. From 2001 to 2010, the average annual expenditure on these types of facilities was approximately $2.12 million.

Although variable in amounts from year to year, these collective publicly-funded capital investments and related real property expenditures (items 1 to 5 above) made by ARS over the past 26 years averaged about $125 million per year in
current year dollars. Going forward, this level of annual investment is generally consistent with the order of magnitude amount needed, i.e., the $100 to $150 million range, in current year dollars, on a regular basis to sustain USDA’s in-house laboratory infrastructure and capacity to address long-term research priorities and obligations.

The size of this projected annual capital investment needed is reinforced and validated by an alternative estimation approach based upon standard engineering criteria and principles that suggest a 4 percent annual recapitalization rate of the $3.7 billion current ARS capitalization value is required, or about $148 million per year. Another approximation specific to ARS is based upon the current capitalization value and a 35- to 40-year functional life span of individual facilities. Assuming a staggered and evenly spaced facility age distribution among all ARS facilities, a minimum annual investment of about $100 million in B&F funding would be needed each year in current year dollars to recapitalize the $3.7 billion portfolio on a recurring basis.

Yet another estimation or approximation of the appropriate level of annual infrastructure support and recapitalization is based on the annual S&E appropriation to ARS. At the current (FY 2012) level of $1.095 billion for conducting research, an additional allocation of 10 to 15 percent ($100 to 150 million) is consistent with the magnitude of recurring investment needed to maintain a quality physical infrastructure to sustain that level of research.

Thad Cochran Southern Horticulture Laboratory
Poplarville, Mississippi
**Facility Condition and Program Priority**

A conceptual framework for determining capital investment needs based upon the relation of facility condition to program priority is illustrated in Figure 1.

**Figure 1: Facility Condition and Program Priority Matrix**

<table>
<thead>
<tr>
<th>Facility Condition</th>
<th>Program Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>High priority for capital investment in the near term</td>
<td>High</td>
</tr>
<tr>
<td>Good condition facility with higher priority research</td>
<td>High</td>
</tr>
<tr>
<td>Poor condition facility with higher priority research</td>
<td>Lower</td>
</tr>
<tr>
<td>Poor condition facility with lower priority research</td>
<td>Lower</td>
</tr>
</tbody>
</table>

For illustrative purposes, the graphic of Figure 1 is shown as a 4x4 grid or matrix comprised of 16 cells of varying combinations of facility conditions and research priorities. On the horizontal axis across the top is Facility Condition ranging left to right from low (least adequate) to high (most adequate). This left to right range is inversely correlated with facility age and facility recapitalization need, both high to low. On the vertical axis on the left side of Figure 1 is Program Priority of the research carried out in facilities. At the top left are high priority programs and at the bottom left are lesser priority programs.

Placement in the upper left cell would be those facilities housing highest priority programs but in the least adequate physical conditions, thus in greatest need of near term recapitalization investments, i.e., replacement or major
renovation/modernization. Such facilities are generally those that have exceeded their functional life span and have high levels of deferred maintenance. Conversely, high priority program facilities in the upper right cell are generally new, in good condition, and not in need of near term investment other than continued routine maintenance.

As facilities age and deteriorate over time, their condition, capacity, and adequacy for housing research generally diminish. Thus, with time the placement of aging facilities on the graphic will trend toward the left along the horizontal axis, regardless of the vertical placement of the priority of the research programs housed in them.

![U.S. Arid Land Agricultural Research Center
Maricopa, Arizona](image)

The facilities placed in the entire horizontal bottom tier of cells in Figure 1 house lesser priority research programs over the entire spectrum of facility conditions. Such facilities are those having the greatest potential to be utilized, redirected, and/or retrofitted for higher priority research programs. In times of overall budget reductions, needs for cost savings, and improved operational and program efficiencies, such facilities and the lower priority programs they house are potential candidates for consolidation or closure, thus avoiding the cost of future operations and recapitalization, and allowing ARS to redirect resources toward higher priority needs and opportunities.

As will be shown later in this CIS report, the matrix illustrated in Figure 1 will be used to display the relative conditions and priorities of major ARS owned research facilities.
Conditions of Major ARS Owned Facilities

Among the multiple buildings and structures at each of the nearly 100 locations where ARS has a research presence, 122 major ARS owned research facilities have been identified for consideration in this CIS report. In most cases an identified facility represents a complex of structures that house and support a named Research Center, Laboratory, or other programmatic organizational unit. At some locations (e.g., Beltsville, Maryland; Ames, Iowa; Madison, Wisconsin; Davis, California; College Station, Texas; Stoneville, Mississippi), there are multiple major ARS research programs and owned facilities that are identified separately.

Table 1 lists the 122 major ARS owned facilities, each identified by name, city/state location, and an ordinal number, 1 to 122 (i.e., Site ID). Also indicated in Table 1 for each facility is an important metric labeled Condition Index (CI). The latter is derived from the CPAIS database and is calculated from the ratio of facility deferred maintenance and replacement value (see sidebar). While the CI value is not a precise or absolute metric for determining recapitalization requirements, it is the starting point and relative indicator of investment needs. In Table 1, adjustments have been made to calculated CI values for some facilities, either downward to reflect known facilities deficiencies and needs, or upward to reflect improvements already made or underway, that are not yet reflected in the CPAIS database. Among other important factors and determinants of facility condition and need for recapitalization are facility age, capacity, safety and health issues, security, time since repair or renovation, new capabilities needed, urgency, and of course the current and future priority of the research carried out in the facility.

For the named facilities in Table 1 that consist of multiple buildings and structures, the CI number provided generally represents the main laboratory/office structure that houses and supports the named unit. In some instances the CI number represents a weighted average of the conditions of multiple structures that are more or less equally essential for housing the named unit.
Condition Index

In the CPAIS database one set of fields includes industry-standard measures of deferred maintenance and facility replacement values, which are combined into a Condition Index (CI) for the facility that is calculated as follows in accordance with Federal Real Property Council (FRPC) guidelines and definitions:

\[ CI = (1 - \frac{DM}{PRV}) \times 100 \]

where Deferred Maintenance (DM) is the funding amount necessary to ensure that a constructed asset (e.g., facility) is restored to a condition substantially equivalent to the originally intended design, capacity, efficiency, or capability. Deferred Maintenance can also be considered to be equivalent to “Repair Need.” Plant Replacement Value (PRV) is the cost of replacing an existing asset at today’s standards (in current year dollars).

Calculated CI values in CPAIS can range from 0 to 100, with 100 indicating like-new condition. A calculated CI value can be adjusted downward to reflect recent damage or other known renovation need (i.e., higher DM), or adjusted upward to indicate ongoing or recent investments (i.e., reduced DM) for renovations not yet reflected in the CPAIS database.

National Center for Cool and Coldwater Aquaculture
Leetown, West Virginia