

National Outcomes and Indicators

AREERA Plan of Work Reporting System

Background

NIFA is required to report outcomes (“evidence of performance”) to USDA, the Office of Management and Budget (OMB) and Congress in its budget documents. Guidance has been received from USDA and OMB leadership that national outcomes which aggregate data across all states and territories are desired. Meanwhile, NIFA itself recognizes that impacts stated on a national scale help better tell the formula fund story and garner support for continued funding. Regarding the Plan of Work reporting system, in the past, NIFA has gleaned and reported primarily single university outcomes as examples of evidence of past performance because those are what the reporting system provides. A Panel of Experts was convened in May 2010 to identify improvements that could be made to the POW reporting system. As part of the overall charge, the Panel agreed that NIFA and select Land Grant University representatives would lead an initiative to develop National Outcomes and Indicators that would satisfy the need for NIFA to report nationally aggregated data. Ultimately, the ability of NIFA to report on nationally aggregated data on certain outcomes and indicators will help OMB and Congress see the continued value of the formula funding covered by the AREERA State Plan of Work system.

Summary of this Document

This document contains outcomes grouped according to the five NIFA Priority Areas: Childhood Obesity, Climate Change, Food Safety, Global Food Security and Hunger, and Sustainable Energy. They are the result of a conference held in New Orleans, LA, on February 22-24, 2011. Attendees at the conference consisted of: 60 Land-Grant Participants (equal representation of Research and Extension; Evaluation Specialists; Professional Facilitators) and 10 NIFA National Program Leaders. Five groups were each charged with developing outcomes and associated indicators for their assigned NIFA Priority Area. Where applicable, definitions have been provided for the outcomes, and other information, such as potential associated KAs and other measurement guidance, have been listed within each area to help facilitate reporting.

In summary, this document contains the following:

Childhood Obesity: 3 Outcomes (total of 23 associated Indicators)

Climate Change: 3 Outcomes (total of 19 associated Indicators)

Food Safety: 4 Outcomes (total of 19 associated Indicators)

Global Food Security &Hunger: 4 Outcomes (total of 34 associated Indicators)

Sustainable Energy: 7 Outcomes (total of 34 associated Indicators)

*NOTE: As reported in multiple other communications by NIFA, all outcomes and indicators contained in this document are available for states to **voluntarily** adopt and report on in the Plan of Work (the first available iteration of this will occur in the 2012 Annual Report of Accomplishments & Results, to be submitted in April 2013).*

Planned Program: Childhood Obesity

Report outcomes of programs funded by Hatch, Smith-Lever 3(b and c), Evans-Allen and 1890 Extension. Outcomes of these programs funded by multiple sources may be included, unless they are reported elsewhere (please do not include EFNEP data).

Outcome #1: Children practice healthy eating

KAs: 703, 704, 724, 806, 802, 701, 702, 501,502

Outcome Definition: Children and youth practice healthy eating as defined by the current U.S. Dietary Guidelines for Americans. Recommendations include: A) **consuming more healthy foods** such as: vegetables, fruits, whole grains, fat-free or low-fat milk and milk products, seafood, lean meats and poultry, eggs, beans and peas, and nuts and seeds; B) **consuming less foods/food components that are commonly eaten in excess** such as: sodium, solid fats, added sugars, and refined grains; and C) **following healthy eating patterns** such as: eating breakfast, eating as a family, making healthy snack choices, etc.

Indicators:

1. Of the ____ total number of children and youth reached,
 - a. The number that gained knowledge about eating more of healthy foods _____
 - b. The number that reported an intention to eat more of healthy foods _____
 - c. The number that reported eating more of healthy foods _____

2. Of the ____ total number of children and youth reached,
 - a. The number that gained knowledge about eating less of foods/food components which are commonly eaten in excess _____
 - b. The number that reported an intention to eat less of foods/food components which are commonly eaten in excess _____
 - c. The number that reported eating less of foods/food components which are commonly eaten in excess _____

3. Of the ____ total number of children and youth reached,
 - a. The number that gained knowledge on healthy eating patterns _____
 - b. The number that reported an intention to adopt healthy eating patterns _____
 - c. The number that reported adopting healthy eating patterns _____

4. Of the ____ total number of families/caregivers reached,
 - a. The number that gained knowledge about eating more of healthy foods _____
 - b. The number that reported an intention to eat more of healthy foods _____
 - c. The number that reported eating more of healthy foods _____

5. Of the ____ total number of families/caregivers reached,
 - a. The number that gained knowledge about eating less of foods/food components which are commonly eaten in excess _____
 - b. The number that reported an intention to eat less of foods/food components which are commonly eaten in excess _____

- c. The number that reported eating less of foods/food components which are commonly eaten in excess _____
6. Of the _____ total number of families/caregivers reached with programs about healthy eating patterns,
 - a. The number that gained knowledge on healthy eating patterns _____
 - b. The number that reported an intention to adopt healthy eating patterns _____
 - c. The number that reported adopting healthy eating patterns _____
 7. Number of new and improved technologies and processes to enhance the nutritional value and marketability of foods and food products (excluding patents) _____
 8. Number of active research projects on the development or adoption of healthy eating guidelines and childhood obesity _____
 9. Number of policy changes implemented to support healthy eating guidelines
 - a. _____community
 - b. _____state
 10. Number of environmental changes implemented to support healthy eating guidelines
 - a. _____ community
 - b. _____state

Outcome #2: Children engage in healthy levels of physical activity

KAs: 703, 724, 806, 804

Outcome Definition: Children and youth engage in healthy levels of physical activity as defined by national physical activity guidelines.

Indicators

1. Of the _____ total number of children and youth reached,
 - a. The number that understand the benefits of physical activity
 - b. The number that reported an intention to increase physical activity and/or reduce sedentary time in their daily lives _____
 - c. The number that reported increasing their physical activity and/or reducing sedentary time _____
 - d. The number that reported engaging daily in 60 minutes or more of physical activity _____
2. Of the _____ total number of children and youth reached,
 - a. The number that understand the benefits of spending time together in physical activity _____
 - b. The number that reported an intention to spend time together in physical activity _____
 - c. The number that reported spending time together in physical activity _____
3. Of the _____ total number of children and youth reached,

- a. The number that understand the importance of balancing food intake and physical activity_____
- 4. Of the _____ total number of families/caregivers reached
 - a. The number that understand the benefits of spending time together in physical activity_____
 - b. The number that reported an intention to spend time together in physical activity_____
 - c. The number that reported spending time together in physical activity_____
- 5. Of the _____ total number of families/caregivers reached,
 - a. The number that understand the importance of balancing food intake and physical activity_____
- 6. Number of active research projects on the development or adoption of physical activity recommendations and childhood obesity _____
- 7. Number of policy changes implemented to support physical activity guidelines
 - a. _____community
 - b. _____state
- 8. Number of environmental changes implemented to support physical activity guidelines
 - a. _____community
 - b. _____state

Outcome #3: Families, children, and youth have access to healthy foods

Outcome Definition: Healthy food is available and affordable in *personally and socially acceptable ways* (i.e. according to generally accepted social norms and mores).

KAs: 607, 703, 704

Indicators:

- 1. Of the _____ total number of families with children reached,
 - a. The number that gained knowledge of how to access/produce/preserve healthy foods_____
 - b. The number that reported an intention to access/produce/preserve healthy foods_____
 - c. The number that reported supplementing their diets with healthy foods that they produce/preserve/obtain utilizing community/backyard gardens, fishing hunting, etc. _____
 - d. The number that reported utilizing delivery systems/access points that offer healthy foods_____
- 2. Of the _____ total number of stakeholders reached,
 - a. The number that reported an intention to make healthy foods more accessible in their communities in personally and socially acceptable ways_____.

3. Number of existing delivery systems/access points of those reached that expand and/or improve their offering of healthy foods
 - a. _____ farmers markets
 - b. _____ produce at corner stores
 - c. _____ school food programs and other food options (vending machines, school events, etc.)
 - d. _____ grocery stores
 - e. _____ other systems/access points, not noted
 - f. _____ total (if not reported above)

4. Number of new delivery systems/access points offering healthy foods
 - a. _____ farmers markets
 - b. _____ produce at corner stores
 - c. _____ school food programs and other food options (vending machines, school events, etc.)
 - d. _____ grocery stores
 - e. _____ other systems/access points, not noted
 - f. _____ total (if not reported above)

5. Number of active research projects on families' ability to access healthy and affordable foods in personal and socially acceptable ways _____

Definitions for direct /indirect contacts:

- Direct – People receiving educational experiences (i.e. a series of lessons or one-time contacts)
- Indirect – The distribution of information and resources including mass communication, public events, and material distribution

Planned Program: Climate Change

Outcome #1: Development of new knowledge and technologies

Outcome Definition: Development of new knowledge and new technologies in agricultural and forestry science and the transfer of these to clientele to address the effects of climate variability and change.

Indicators:

1. Number of current year citations of climate related publications _____
2. Number of current year climate relevant educational and programs _____
3. Number of current year climate relevant research programs _____
4. Number of new crop varieties and genotypes with climate adaptive traits _____
5. Number of new animal breeds and genotypes with climate adaptive traits _____
6. Number of new assessment and management tools developed, including models and measurements of greenhouse gas emissions _____
7. Number of climate relevant social media products, web-based products and communication tools (smart phone apps, facebook, twitter) _____
8. Number of new climate relevant databases, monitoring systems, and inventories managed or under development _____
9. Of the _____ number of program participants, the number that increase knowledge of management practices under climate variability and change _____

Outcome #2: Enhance adaptive capacity to climate change

Outcome Definition: Enhance adaptive capacity of production and natural systems to reduce exposure and vulnerability to climate variability and change

Indicators:

1. Of the _____ number of participants, the number that employ climate adaptation strategies in various production and natural ecosystems, including strategies for biodiversity _____
2. Number of acres under recommended adaptation strategies for production agriculture and natural resources management, including invasive species, pest management, pollutant loads, wetlands _____
3. Of the _____ number of participants, the number that adopted recommended adaptation strategies for production agriculture and natural resources management, including invasive species, pest management, pollutant loads, wetlands _____
4. Number of new genotypes and varieties for climate adaptation in production agriculture and forestry _____
5. Number of acres planted with new recommended genotypes or varieties with climate adaptive traits _____
6. Of the number of participants, the number who planted recommended genotypes or varieties with climate adaptive traits _____
7. Number of agencies/organizations/communities participating in the programs that incorporate climate-based management practices in community development _____
 - (for example: to address future rise in sea level, not building on the flood plain, etc.)

Outcome #3: Improve climate mitigation strategies and their adoption

Outcome Definition: Improve mitigation strategies for the reduction of greenhouse gas emissions and increase carbon sequestration in production and natural systems and communities

Indicators:

1. Of the _____ number of total program participants, the number who adopted recommended climate mitigation practices (in areas such as: water use efficiency, livestock production feeding practices, carbon sequestration, reducing carbon and energy footprint, etc.) _____
2. Number of acres under recommended climate mitigation practices (in areas such as: water use efficiency, livestock production feeding practices, carbon sequestration, reducing carbon and energy footprint, etc.) _____
3. Numbers of agencies/organizations/communities that adopted recommended climate mitigation practices and policies (for example: built bike paths, installed solar panels, applied water conservation policies, etc.) _____

Planned Program: Food Safety

Outcome #1: Increase number of viable technologies to improve food safety

Outcome Definition: On national and global scales, increase and improve the number of viable (validated, statistically relevant, economical, environmental and socially acceptable) technologies (to include communication and information technologies, and sampling strategies) for the detection and characterization of food supply foodborne threats. Foodborne threats include microbial pathogens, toxins, chemical contaminants, and biologics (vaccines, allergens, nanoparticles, etc). Develop or increase the number of improved viable prevention, intervention, and control strategies for foodborne threats along the food production continuum and for all food production scales (small, medium and large producers, processors and retail).

Indicators:

1. Number of viable technologies developed or modified for the detection and characterization of food supply contamination from foodborne threats. (KAs 404, 501, 711) _____
2. Number of viable prevention, control and intervention strategies for all food production scales for foodborne threats along the food production continuum. (KAs 404, 501, 502, 711, 712) _____
3. Number of individuals who learn about prevention, detection, control and intervention technologies. (KAs 400s, 500s, 700s) _____
4. Number of improved prevention, detection, control and intervention technologies adopted. (KAs 501, 502, 404, 711, 712) _____
5. Number of reported changes in prevention, detection, control, and intervention strategies. (KAs 501, 711, 712) _____

Additional information to assist in measuring the above indicators:

1. Review patents, peer-reviewed manuscripts, and peer-reviewed articles to determine the number of new methods used by commercial and state labs and those reported by AODC, USDA (FSIS), and others. For example, KSU keeps a log on rapid detection methods for foodborne pathogens.
2. Survey results collected by Extension and direct information from producers, processors, and retail. Information can also be gathered from local science, Extension, and other groups. Information from the National HAACP alliance, Seafood HAACP alliance, GAPs (Cornell program on Produce Safety), and others.
3. The number of students, producers, food industry employees, and state and commercial lab workers trained to use the technologies. The number of producers trained by Extension initiatives. The number reporting new knowledge in detection, prevention, control and intervention technologies. Information from the National HAACP alliance, Seafood HAACP alliance, GAPs (Cornell program on Produce Safety), and others.
4. Same as #3, above.
5. Same as #3, above.

Outcome #2: Reduce incidence of foodborne illness

Outcome Definition: Design strategies and tools to detect and eliminate pathogens and chemical and physical contaminants. Identify processes that enhance safety during production, transportation, preservation/processing, and preparation/handling of food.

Indicators:

1. Number of foodborne illness cases reported to medical professionals. (KA 712) _____
2. Number of absences reported in schools or workplace. (KAs 712, 723) _____
3. Number of food safety regulatory actions including recalls. (KAs 711, 712) _____
4. Amount of potential economic losses from reduced productivity, increased medical expenses, and food industry losses. (KAs 603, 723) _____

Additional information to assist in measuring the above indicators:

1. Foodnet website, state epidemiologist, secondary data, and CDC.
2. Department of Education, public health agencies, insurance companies.
3. Secondary data, public health agencies, FDA website, FSIS website, and industry food recalls.
4. Food safety news blogs (ex, Bill Marler).

Outcome #3: Increase adoption of recommended safe food handling practices at the individual, family, community, production, and supply system levels

Outcome Definition: Food borne illness incidence can be reduced when recommended food safety practices are adopted by users all along the food chain. These recommended practices need to be adopted by individuals, families, and communities, as well as producers, processors, and those at the retail levels (restaurants and other vendors). Safe food handling includes using proper time and temperature controls (keeping hot foods hot and cold foods cold including proper thawing).

Indicators:

1. Number of growers, producers, and food workers completing GAPs, GMPs, HACCP, food safety certification (like ServSafe), and on farm BMP programs to increase food safety. (KAs 711, 712, 723) _____
2. Number of food handlers receiving food safety training and education in safe food handling practices. (KAs 711, 712, 723) _____
3. Number of food handlers adopting recommended hand washing practices. (KAs 703, 711, 723) _____
4. Number of food handlers reporting taking steps to reduce cross contamination. (KAs 703, 711, 723) _____
5. Number of food preparers reporting using proper time and temperature controls. (KAs 703, 723) _____

Additional information to assist in measuring the above indicators:

1. FDA evaluation tools, pressure gauge testing clinics, FDA audits, HACCP plans inspected and certified, certificates of completion, certified food handlers, pre and post test, and standard survey (ServSafe).
2. Pre and post test observations, pressure gauge testing, and other clinics, training, and certification numbers.
3. Reported change, clinics, observations, and use of hand sanitizers.
4. Self reporting of hand washing and use of sanitizers on counter tops and cutting boards.
5. Pre and post test observations on the use of thermometers, numbers of students who complete cooking school, inspection records, and eXtension virtual food safety "House of Germs" scores.

Outcome #4: Increase understanding of the ecology of threats to food safety from microbial and chemical sources

Outcome Definition: To increase our understanding of the ecological impacts on the fate and occurrence of pathogens and fecal indicators in/on water, air, and land. Increase our understanding of the social, cultural, and economic impacts on the ecology of pathogens and fecal indicators in environments associated with food. Understand the interface of food with people, plants, soil, domestic animals and wildlife.

Indicators:

1. Number of projects focused on increased understanding of the ecology of fecal indicators and pathogens. (KAs 712, 723, 501, 503) _____
2. Number of projects focused on increased safety of all inputs into the food chain. (KAs 102, 104, 711, 712) _____
3. Number of projects focused on increased understanding of the roles of humans, plants and animals as vectors. (KAs 311, 721, 722, 723) _____
4. Number of projects focused on increased understanding of preharvest and postharvest process impacts on microbial and chemical threats. (KAs 314, 501, 503) _____
5. Number of projects characterizing social, economic, and/or cultural practices attributed to foodborne illness. (KAs 503, 504, 712, 723, 803) _____

Additional information to assist in measuring the above indicators:

1. Integrated research and CRIS reports, grants, and publications.
2. State department of agriculture, FDA, EPA, and import alerts.
3. Grants, publications, and policy changes.
4. Trace-back information, USDA, FDA, FSIS, CDC, industry self-reporting, and state departments of health.
5. Culturally appropriate surveys, case studies, secondary data (regulatory information), published literature, and interviews.

Planned Program: Global Food Security & Hunger

Outcome #1: Enhanced capacity of a sustainable global food system including new/improved plans, animals, technologies and management systems

Indicators:

1. Numbers of plant releases _____
2. Number of improved animal genetics _____
3. Number of increased efficiencies _____ (i.e. (% pregnant) or increases in yield/unit - (bushels/acre; lbs product (meat, protein, milk) per animal; lbs feed per gain).
4. Adoption of best practices and technologies resulting in increased yields, reduced inputs, increased efficiency, increased economic return, and conservation of resources.
 - a. Number of producers indicating adoption of recommended practices _____
 - b. Number of producers reporting reduction in fertilizer used/acre _____
 - c. Number of producers reporting increased dollar returns per acre or reduced costs per acre _____
 - d. Number acres in conservation tillage or other BMP _____

Outcome #2: More sustainable, diverse, and resilient food systems across scales.

Outcome Definition: Because there is no accepted definition of “sustainable” as an end-point, “sustainable” is typically viewed as a journey toward more sustainable endeavors. We do know what it means to be “more sustainable,” and clearly recognize certain practices, behaviors, policies, and institutions as more sustainable than others. The term “scales” can apply to many dimensions of food systems. For example, it can refer to the size of farms/processors/retailers (as defined by annual revenue), the size of crop markets (e.g., wheat vs. kumquats), or land productivity levels (e.g., central Illinois farmland vs. high-plains rangeland).

Indicators:

Background Note: The following four indicators deal with innovation development, adoption, and economic benefits.

1. Number of new or improved innovations developed for food enterprises. _____
[Innovations could be any of: models (biological, economic, business, management, etc.), technologies, networks, products, processes, etc. that provide expanded opportunities for food system enterprises. Enterprises include all entities along the food supply chain: producers, processors, distributors, retailers, allied services, etc.]
2. Number of new or improved value-added products that can be sold by producers (and other members of the food supply chain). _____
[While the broad category of “innovations,” above, includes “value-added products, we explicitly list it here as a particularly valuable innovation leading to greater food system diversity.]
3. Number of innovations adopted in food enterprises including production, allied services, processing, and distribution. _____

4. Number of producers (and other members of the food supply chain) that have increased revenue. _____

Background Note: The following six indicators deal with acute disruptions of food systems.

5. Number of new diagnostic systems analyzing plant and animal pests and diseases.

_____ [Diagnostic systems refer to, among other things: labs, networks, procedures, access points. We have used the term “available” because maintaining capacity is just as important as developing and deploying new capacity. So, this indicator and the next one refer to both existing and recently deployed diagnostics.]

6. Number of new diagnostic technologies available for plant and animal pests and diseases.

_____ [The intent here is not to count individual pieces of equipment or devices, but to enumerate technologies that add to the diagnostic capacity.]

7. Number of first detectors trained in early detection and rapid response of plant pests, animal pests and diseases. _____

8. Number of communities trained in agricultural disaster preparedness. _____

9. Number of communities that have written agriculture and food considerations into disaster preparedness plans or procedures. _____

10. Number of networks prepared to mitigate biological and abiotic disruptions. _____

Background Note: The following two indicators address viable and healthy land resources that contribute to diverse and sustainable food systems.

11. Number of acres that incorporate ecosystem services and/or biodiversity considerations.

12. Percent of privately owned agricultural acreage retained during landowner succession due to educational interventions. _____

[“Agricultural acreage” refers to working lands, nonworking lands, and other landscape components. This includes: rangeland, forestland, cropland, conservation lands, and other, spatially included land resources that contribute non-food benefits (e.g., wetlands, water bodies, riparian areas, etc.).]

Outcome #3: Improved national and global capacity to meet growing food demands.

Outcome Definition:

- Promoting food literacy and understanding of food systems which includes the development of an inclusive, diverse and culturally sensitive workforce.
- Obtaining, processing, and understanding basic information about food to shape decision-making.

- Engaging the public in the development of sound, favorable policies for food access and distribution.
- Development of research-based, educational materials dedicated to food systems

Indicators:

1. Of the _____ number of youth participating in food system educational programs (e.g., 4-H programs and K-16 programs),
 - a. _____ improved knowledge of food systems.
[e.g., career development educational opportunities in food systems for young adults]
2. Of the _____ number of adults participating in food system knowledge and skill enhancement programs,
 - a. _____ improved knowledge of food systems .
3. Number of extension publications and presentations (fact sheets, white paper, web-based learning modules, etc.) _____
4. Number of extension learning opportunities _____
5. Number of food councils and institutes created to promote practical food systems policies _____
6. Number of research and extension advisory councils and boards _____
7. Number food policy decisions informed by university research and extension _____
8. Number of constraints removed in food production, processing, and distribution by policy makers _____
9. Number of incentives implemented for food production, processing, and distribution by policy makers _____

Outcome #4: Reduction in hunger: Larger quantities of healthy food eaten by the hungry

Outcome Definition:

- Improved access, availability, affordability to vulnerable populations (Indicators 1 & 2 below)
- Increased research to identify culturally relevant and sensitive solutions to hunger. (Indicators 3-5 below)
- Increased partnering across parochial boundaries to reduce hunger (Indicator 6 below)
- Community action to reduce food disparity (Indicator 7 & 8 below)
- Communities solve their own hunger problems (Indicator 9 below)

Indicators:

1. Number of pounds of fresh produce donated for consumption by vulnerable populations _____
2. Number of pounds of shelf stable items donated for consumption by vulnerable populations _____
3. Number of individuals/families eligible for government food assistance using non-public food distribution resources _____
4. Number of hunger reducing solutions created _____

5. Number of hunger reducing solutions adopted by communities/organizations _____
6. Number initiatives accessing new multi-sector, multidisciplinary, and intergenerational resources from partnerships _____
7. Number of individuals increasing understanding the causes and implications of hunger _____
8. Number of community action plans implemented as a result of science and community based assessment _____
9. Percentage of individuals eligible for public food assistance utilizing local non- state/federal government resources _____

Planned Program: Sustainable Energy

Outcome #1: Energy Security: U.S. replaces a portion of fossil fuel consumption with biofuels.

Indicators:

1. Number of gallons of fossil fuels displaced _____
2. Number of gallons of biofuels consumed _____
3. Number of gallons of biofuel produced _____
4. BTUs utilized from biomass/biofuels _____
5. Amount of on-farm biofuels consumed _____

Outcome #2: Economic Development: An enhanced or improved economy as a result of bioenergy development.

Indicators:

1. Number of new rural careers created _____
2. Number of new urban careers created _____
3. Number of jobs maintained/created _____
4. Number of small businesses _____
5. Increased revenue/increased savings/one-time capital purchases (in dollars) _____
6. Increased private income (in dollars) _____

Additional information:

- Difference between "jobs" and "careers": jobs are net gain of paid employment; new businesses created or adopted can indicate new careers.
- Can use DOD Office of Procurement formula for "jobs created or maintained."

Outcome #3: Implementation of sustainable biofuels systems

Outcome Definition: New systems complement existing systems; qualitative information regarding new cropping systems; implement new practices and technologies (e.g. cropping systems, biomass technologies; biofuel feedstock). Technical definitions needed for reporting BTUs/acre. Use of decision making models (LCA) by researchers and policy/decision makers; qualitative report where information is used for policy-building/support.

Indicators:

1. Acres of dedicated bioenergy crops produced: _____
2. Number of farmers who adopted a dedicated bioenergy crop; _____
3. Number of dedicated energy crops; _____
4. Tons of feedstocks delivered; _____
5. Creation of new business systems to provide new industry growth; _____
6. Measure of biofuels (gallon/acre); _____
7. Measure of BTUs/acre produced in energy production _____

Outcome #4: Increased knowledge and understanding of the biofuels supply chain

Indicators:

1. Number of new technologies developed _____
2. Number of new varieties or other new feedstock sources (residues/urban wood waste) developed _____
3. Of the _____ number of stakeholders participating in programs on production/harvesting/storage systems
 - a. _____ Increased knowledge;
 - b. _____ Actually adopted BMPs for production/harvesting/storage systems.
4. Number of new production/logistic practices developed _____

Additional information to assist in measuring the above indicators:

- Look at new species/varieties identified.
- Analyse issues regarding sustainable production practices/transportation/harvesting/storage practices developed and disseminated.
- New technologies are measured by the number of patents, licensing agreements, etc.

Outcome #5: Integration and evaluation of sustainable biofuels and bioproducts systems

Indicators:

1. Number of decision tools available; _____
2. Number of LCA datasets available; _____
3. Number of life cycle datasets validated; _____
4. Number of alternative uses of feedstock identified; _____
5. Of the _____ of Producers participating in programs on decisions models, the number that increased knowledge of decision models _____
6. Of the _____ of Policy Makers participating in programs on decisions models, the number that increased knowledge of decision models _____

Additional information to assist in measuring the above indicators:

- Conversion technologies; co-product opportunities; holistic assessment of individual supply chain components.

Outcome #6: Develop a diverse and educated workforce for a biofuels industry

Indicators:

1. Number of undergraduates working in biofuels labs _____
2. Number of graduate students working in biofuels labs _____
3. Number of biofuels workers trained _____
4. Number of youth who gain science process skills in biofuels _____
5. Number of persons in biofuels internships _____
6. Percentage of under-represented persons entering the biofuels industry workforce _____

Additional information to assist in measuring the above indicators:

- Analyze continuing education initiatives, STEM, diversity, report on demographics of trainees (gender, race, socio-economic status, age, ethnicity, current employment status, rural status).