SMART Broiler– Request for Applications

Sensors, Monitoring, Analysis and Reporting Technologies for Broiler Welfare

SMART Broiler is a global research collaboration initiative between the Foundation for Food and Agriculture Research (FFAR) and the McDonald's Corporation that seeks to transform broiler (meat) chicken animal health and welfare and production by offering a minimum of $4 million for research that will accelerate the development and adoption of automated monitoring technologies. These technologies will assist producers in monitoring, measuring, improving and documenting animal welfare, and will improve producer efficiency and profitability on a global scale.

SMART Broiler will support cross-disciplinary teams as they develop, validate and deploy technologies to capture key welfare indicators in commercial broiler chicken facilities. The anticipated outcomes include externally validated tools for poultry producers, integrators and other supply chain partners to objectively verify on-farm welfare in commercial production facilities anywhere in the world.

1. Background

The rapidly developing field of precision agriculture encompasses innovative technologies such as sensors, robotics, thermal imaging, digital cameras, predictive analytics and other technologies currently utilized in other business sectors. These technologies offer new opportunities for real-time monitoring and measurement of animal activities/behaviors leading to improved management of animals, providing producers with the critical information needed to improve on-farm outcomes. While hardware capable of capturing a variety of indicators has become readily available, there has been little advancement in the use of these technologies at the farm level able to demonstrate on-farm animal welfare. The development automated tools for welfare monitoring would improve the accuracy of welfare assessments, enable benchmarking for reporting and continuous improvement, reduce labor costs associated with current welfare monitoring methods and could enhance producer viability through promoting more sustainable outcomes by improving efficiency in animal performance, product quality, quantity, food-safety, etc.

Many existing animal welfare standards focus on resource base, prescriptive production parameters such as access to food and water, genetics, space per animal, lighting, temperature and other environmental conditions. These parameters can be extremely important to ensuring animal wellbeing. However, given that the end-goal is animal level or outcome-based improvements, it is critical to develop objective, animal-based assessments.

There is a major need for commercially-feasible tools that enable real-time, quantitative assessment of behavior, health and wellbeing in large-scale poultry facilities.

In October 2017, McDonald's announced 8 specific welfare commitments for the improved health and welfare of broiler chickens in their supply chain. These global commitments are consistent with McDonald's decade's long dedication to the health and welfare of animals in its supply chain. The commitment centers on an animal outcomes approach to measuring and improving key welfare indicators (KWIs). These KWI's provide a comprehensive assessment of animal health and welfare regardless of production system or geographic location. By measuring and aggregating KWI outcomes, McDonald's will identify areas of opportunity and set improvement targets, the outcomes of which will be used to inform the development of McDonald's future global welfare policies and provide transparency through reporting.

The Foundation for Food and Agriculture Research supports innovative science that includes strategic approaches to improving animal productivity, health and welfare. Automated animal monitoring tools provide the opportunity to improve animal health and welfare, food production, environmental stewardship, address on-farm labor shortages and enhance the transparency and economic sustainability of the animal agriculture enterprise.

2. Objective

The goal of this program is to support the identification, development and commercialization of innovative tools for automated and quantitative assessment of key welfare indicators (KWIs), on-farm in broiler chickens. Focused attention will be given to technologies that have the ability to quantify the following KWIs:

- Gait score/walking ability and leg health
- Expression of natural behaviors and activities, including individual or flock movement patterns

The tool must be accurate and by the end of the project timeline, must be piloted in commercial production facility within the McDonald's supply chain in two locations (1) in the U.S. and (2) in Europe.

We encourage applicants to develop the needed partnerships to conduct this study. Access to research sites within the McDonald's supply chain will be provided to selected applicants.

Applicants must be willing to work collaboratively across teams and technologies during the program if requested.

3. Research Areas Supported

This program will support research to rapidly develop **hardware components, data management and analytics** necessary to achieve the stated Objectives. Approaches may include any reasonable combination of audio or video, thermal imaging, robotics, artificial intelligence/machine learning or other sensors and technologies.

This program will not support the development or identification of environmental sensors for measuring temperature, humidity, volatile chemicals, other non-animal based measures, water or feed equipment, transportation conditions, enrichment devices, manual welfare assessment protocols, etc.*

*Existing sensors could be incorporated as part of the SMART research effort, as long as the proposal includes the KWI's mentioned as the primary focus.

4. Program Timeline and Award Information

Anticipated Funding
FFAR and McDonald's anticipate awarding a minimum of $4 million dollars total under this program. Matching funds are not required.

Phase I: Early testing and refinement.
  Objective: Explore potential technologies and monitoring methods.
  Number of Anticipated Awards: 1-4
  Maximum Request per Proposal: $500,000
  Pre-Proposal Due Date: May 29, 2019
  Selected Full Proposals Invited: July 5, 2019
  Invited Full Proposals Due Date: September 5, 2019
  Anticipated Project Start Date: January, 2020
  Phase I Duration: 18 months
  Indirect Expenses: A maximum of 10% of the total award may be used for indirect costs. FFAR's indirect cost allotment is not an indirect cost rate applied to the total modified direct costs but instead it is an overall allotment from the Total Funds Request, also known as the Total Project Costs, to be used for IDC. This means 90% of the total funds requested must go directly to the proposed research. So, if you request the maximum, the total direct cost available to the project is $500,000 -10% = $450,000.00.

Phase II: A subset of teams will be selected to further refine and validate their welfare assessment tools, possible in collaboration with each other. Phase II funding is in addition to the previous awards and depends upon demonstrated progress in Phase I and submission of a new work plan.

Objective: Refinement and large-scale validation of most promising technologies
Number of Anticipated Awards: 2
Maximum Request: $1,000,000
Phase I Report Due Date: June 2021
Anticipated Renewal Start Date: July 2021
Duration: 18 months
Indirect Expenses: A maximum of 10% of the total award may be used for indirect costs. FFAR's indirect cost allotment is not an indirect cost rate applied to the total modified direct costs but instead it is an overall allotment from the Total Funds Request, also known as the Total Project Costs, to be used for IDC. This means 90% of the total funds requested must go directly to the proposed research. So, if you request the maximum, the total direct cost available to the project is $400,000 ÷ 1.111 = $360,000.00.

Key Dates:
Phase I
April 3, 2019: Funding Opportunity Announcement. Application Package Available at https://grants.foundationfar.org/
May 29, 2019. 3:00 PM (EDT): Pre-proposal Submission Deadline
September 5, 2019. 3:00 PM (EDT): Invited Full Proposals Deadline
November - December 2019: Applicants Notified and Awards Made
January 2020: Anticipated Phase I Project Start Date

Phase II
Phase II will start in mid-2021
This is a renewal, dependent upon progress in Phase I.

5. Eligibility

Any domestic or international public or private institution, consortium, non-profit organization, for-profit company, tribal government entity or any combination of the above is eligible to apply.

6. Phase I Review Criteria

Review Process: Submitted full and pre-proposals will undergo review using a two-stage peer review process: (1) Internal review, and (2) Poultry Welfare Steering Committee review. In the first stage, applications will be evaluated by a combination of FFAR and McDonald's staff, with advising from independent, scientific experts as necessary. Application pre-proposals judged to be most meritorious will be invited to submit a full proposal. Full proposals will be evaluated by a group of independent subject-matter experts that are required to read and acknowledge acceptance of policies consistent with FFAR's Conflict of Interest Policy and Non-Disclosure Agreement. We make reasonable efforts to ensure that proposals are not assigned to reviewers with a real or apparent

conflict with the applicant or project personnel. Reviewers with a conflict of interest are recused from evaluating or participating in the discussions of proposals with which they have a conflict. Each stage of the review is conducted confidentially, and as such, FFAR and McDonald's are responsible for protecting the confidentiality of the contents of the applications.

Applications recommended for funding by the Steering Committee will go to the FFAR Scientific Program Director and the McDonald's Manager of Animal Welfare and Agriculture to consider program priorities and available funding.

Full proposals are evaluated based on scored primary review criteria and unscored secondary review criteria. The bullets listed under the criterion below may serve as examples and guidelines to applicants and serve as guidelines to applicants when writing their proposals, and as a guideline to reviewers on what to consider when judging proposals. The bullets are illustrative and not intended to be comprehensive. Reviewers will evaluate and score each primary criterion and subsequently assign a global score that reflects an overall assessment of the application. The overall assessment will not be an average score of the individual criterions; rather, it will reflect the reviewers' overall impression of the application. Evaluation of the scientific merit of each application is within the sole discretion of the peer reviewers and they may raise additional factors to consider that are not covered in the bullets for each criterion.

The following guidelines are illustrative of the merit-based review process (Weighting of criteria is provided as a general guideline).
  A. **Scientific innovation (approximately 25%).**
     Applications should describe a highly innovative scientific concept that differs from existing approaches to addressing the challenge of quantitative assessment of key welfare indicators. For the purposes of this program, KWIs should include:
     - Broiler chicken behavior and activity at the aggregate/flock level
     - Broiler chicken leg condition via gait scoring at the aggregate/flock level

     The tool should be accurate when applied to poultry throughout the grow-out period.

Approaches that do not fit this RFP will not be considered for Phase I funding. Preference will be given to approaches that may be equally effective across poultry breeds and facilities.

B. **Methods for Proof of Concept (approximately 25%).**
Scientific methods must be clearly elucidated, including an explanation of how the chosen approach may be more successful than existing methods. Applications

should include detailed plans for the development, proof-of-concept and validation of the given technology. Applicants must outline plans to validate their technology in a commercial facility in the U.S. and Europe*. Preference will be given to collaborations and documented partnerships that strengthen the capacity to carry out the goals or implementation of the project. Preliminary data are encouraged but not required.

*Applicants that do not have ready-access to commercial sites will still be considered for funding and must be able to work with a commercial poultry supplier as assigned.

C. **Impact (approximately 25%).**
Applications should include preliminary evidence or theoretical estimates of the accuracy, efficacy, costs and production efficiencies gained. Potential pitfalls should be identified and a clear plan to overcome them should be described.

D. **Feasibility and Timeline (approximately 25%).** Applicants will describe the potential for successful completion of the research project, potential pitfalls and the expertise of the groups/individuals involved in the study. Previous successes in the proposed area of research, including grants, publications, patents or other accomplishments, will be viewed favorably. The research environment (facilities, equipment and institutional/corporate support) should be appropriate to conduct and implement the research. Expected milestones and outputs should be described.

7. Phase II <u>Draft</u> Review Criteria

Important Note: Phase II is continuation/renewal of Phase I.

Phase II will involve further development and validation of a working solution. Criteria for evaluation will be provided to the research team prior to the completion of Phase I.

8. Terms and Conditions

Every Grant Agreement is unique to the project. However, the Foundation for Food and Agriculture Research expects applicants to have reviewed the sample Grant Agreement prior to applying to ensure applicants are aware of the applicable terms under which the grant is offered. FFAR will only entertain potential modifications to the Grant Agreement under the most exceptional circumstances. Successful applicants are strongly encouraged to sign the Grant Agreement as presented.

While all teams are expected to publish data and results from their project, specific inventions, discoveries, or other intellectual property shall remain the property of the grantee. In addition, grantees who intend to develop technologies resulting from the award for commercial sale must not grant exclusive licenses for Project Results (or any technologies resulting or derived from Project Results) to any end users in a manner that would prohibit the applicable technologies from being broadly accessible to end users;

9. To Apply

*Please note: All pre-proposals MUST be completed and submitted through **FFAR's online grants management system**.*

PREPARE TO APPLY:

PRE-PROPOSAL TEMPLATE

Executive Summary* (200 words)
Provide a brief high-level description of the proposal, including the project objectives, anticipated outcomes, potential impact, budget, timeline, and relevance.

Background*
1. Does your team have experience developing or working with automated monitoring technologies?
   If yes, please describe the technologies and application/purpose of the monitoring (150 words)
2. Does your team have experience assessing broiler chicken **behavior, activity, walking ability, gait score and/or leg health?**
   If yes, please describe (100 words)
3. Does your team have experience developing, integrating and analyzing large data sets?
   If yes, please describe. Include examples of big-data analysis, development and training of algorithms, and efforts to visually display data on an easily understandable interface (100 words)

4. Does your team currently have technologies deployed in agricultural production systems?
   If yes, please describe. Include locations. (100 words)
5. Does your team currently have technologies deployed in other relevant systems?

If yes, please describe. Include locations. (100 words)

6. Who are your competitors?
(list)
7. Do you have technologies to assess other broiler welfare indicators?
If yes, can your technologies capture any of the following **welfare indicators** (select all that apply):
Footpad lesions
Hock burns
Breast blisters
Ascites
Feather condition/cleanliness
Broken wings/legs
Bruising
Myopathy grading
Other: [please describe]

Research Plan*

This program is divided into two phases. Phase I will be focused on technology development and testing. A subset of technologies will be selected for continuation into Phase II, which will focus on refinement and validation. Phase II funding is contingent upon demonstration of substantial progress in Phase I.

Describe the Phase I project plan. Include the approaches, Key Welfare Indicators to be captured, technologies to be developed/tested (e.g. sensors, cameras, etc.) and the plan for data management and analysis. The goal of this program is to support the identification, development and commercialization of innovative tools for automated and quantitative assessment of key welfare indicators (KWIs), on-farm in broiler chickens. Focused attention will be given to the ability to quantify the following KWIs:

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We encourage applicants to develop the needed partnerships to conduct this study. Access to research sites within the McDonald's supply chain will be provided to selected applicants.

Given that certain solutions may be complementary and that the best results may be gained through a combination of technologies, we may request that applicants work collaboratively across teams during the program. Please indicate your willingness to collaborate with other research teams that may have complementary technologies or expertise (50 words).

If selected for continuation into Phase II, how do you plan to refine and validate your technologies? (250 words)

Partners*
List committed partners, including researchers, hardware and/or software experts or companies and/or poultry producers or experts. Describe how they strengthen the ability to conduct this project and any prior contact or working relationship you have developed with them that is relevant to this project. (100 words)

In addition to improving broiler welfare, describe how the project outcomes may provide other benefits to poultry producers and/or food companies, such as efficiency increases in product quality, quantity, food safety, etc.* (100 words)

Outputs and Stakeholder Involvement*
What are the anticipated project outputs? How will results be disseminated? How will the proposed project achieve a globally relevant outcome?

Total FFAR Request (up to $500000.00)   _____

Total Project Budget   _____

Other contributions?   _____

APPLICATION SUBMISSION GUIDELINES:

Applications must be submitted through FFAR's online application receipt system. If you are a new user, register for an account by clicking the green "Register" button at the top right corner of the home page. You will receive a confirmation email to activate your account before you can sign-in to your account. Once you log in, click on the corresponding program to start your application.

Only applications submitted through this portal will be considered eligible for evaluation. FFAR will not accept applications submitted by any other medium. There is a two-hour grace period for all deadlines. Proposals that are not submitted by the deadline or within

the grace period will not be accepted. To be fair to all our applicants, FFAR cannot grant an extension to applicants who missed the deadlines posted in the Key Dates section.

Contact Information

FFAR Staff Contact
Please direct all eligibility, funding and scientific content inquiries to Dr. Timothy Kurt, Scientific Program Director: tkurt@foundationfar.org

McDonald's Staff Contact
For poultry suppliers and technology companies interested in opportunities to collaborate, please direct all inquiries to Mr. Banks Baker, Manager, Animal Welfare and Agriculture: Banks.Baker@us.mcd.com

Please direct all inquiries related to proposal submission to: grants@foundationfar.org

Technical Support Contact

Hours of operations: Monday – Friday 6am – 10pm EST; weekends: 10am – 6pm EST

Phone support: Monday – Friday 8am – 8pm EST

Email: support@smapply.io