

CALL FOR PROPOSALS

The use of artificial intelligence in food and agriculture

1. Programme summary

The Foreign, Commonwealth and Development Office (FCDO) Research Commissioning Centre (RCC) has been established to effectively commission and manage research to enhance FCDO's development and foreign policy impact. Led by the International Initiative for Impact Evaluation (3ie), the University of Birmingham, and an unmatched consortium of UK and global research partners, the RCC aims to commission different types of high-quality research in FCDO's key priority areas. All FCDO-funded research and development (R&D) investments commissioned by the RCC will be implemented using rigorous and robust research methodologies and quality standards. These R&D standards include meeting the Frascati definition requirements and FCDO's Ethical Guidance for Research Evaluation and Monitoring Activities.¹ The RCC is working with FCDO's Climate, Energy, Environment and Water team for this research.

2. Description of research to be commissioned

Research title: The use of artificial intelligence in food and agriculture.

This call for proposals aims to identify a research team to produce a landscape study of the application of artificial intelligence (AI) in agriculture.

3. Background

AI is in the process of transforming the world and is likely to have profound implications for many aspects of society, not least in how we produce, distribute and consume our food. The advent of AI is potentially timely given the increasing demands placed on agriculture and food systems, with estimates that the global population will reach almost 10 billion people by 2050 and the rising impact of climate change. However, whilst AI and automation technologies have the potential to deliver the step change required to address these challenges, there are also potential risks, and the full implications of AI's impact are not yet clear.

Opportunities and applications currently in practice or being developed

- Precision farming - predicting optimal planting, irrigation and harvesting times for maximising yield while minimising resource use and adapting to a changing climate. AI models can simulate how climate change will impact agriculture and recommend strategies to make farming more resilient with a lower environmental footprint.

¹See OECD. 2002. *Frascati Manual*. <https://doi.org/10.1787/9789264199040-en>; European Commission, Eurostat. 2014. "Manual on Measuring Research and Development in ESA 2010." Publications Office. <https://data.europa.eu/doi/10.2785/52718>; and the [FCDO Ethical Guidance for Research, Evaluation and Monitoring Activities - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/444444/FCDO_Ethical_Guidance_for_Research_Evaluation_and_Monitoring_Activities.pdf)

- Crop monitoring: tracking crop health to offer tailored guidance for farmers to ensure a good harvest, simultaneously safeguarding their livelihoods and reducing waste.
- Agro-climatic forecasts and agronomic advice: allowing farmers to plan harvests and prepare their products for market by generating both short- and long-term weather predictions, as well as estimations of their maize and wheat yield for the coming season. Predicting farm outputs by analysing soil type, the seed varieties used, the days they sowed the seeds, as well as the past and predicted climatic conditions. This information allows farmers to plan optimal harvesting dates and estimate their income for the season.
- Disease monitoring and management: detecting and diagnosing diseases and pests, tailored advice on prevention and management options.
- Accelerated crop breeding: development of more locally-adapted crops through faster and more accurate phenotyping (observing how crops perform to select the most promising varieties by analysing and comparing thousands of images of crop varieties as they grow in the field).
- Automation of irrigation and farm-level tasks: installation of underground soil humidity sensors that could allow farmers to estimate irrigation needs, thus helping them use resources efficiently. Advanced robotic technologies can automate manual tasks such as sowing and harvesting, thus reducing the time-consuming labour needs of farming, potentially saving money for farmers and reducing human error.
- Applying AI to finance and risk management solutions that have the capacity to expand smallholder farmers' access to financial products, including credit, loans, and insurance. This includes creating supply chain management solutions that facilitate value chain linkages, matching suppliers with producers and integrating smallholder farmers into broader value chains.
- Further facilitating asset sharing and aggregation, allowing smallholders to access supplies such as inputs and assets like tractors that would otherwise remain out of reach (for example, [Hello Tractor](#)).
- Developing automated traceability solutions that can also drive down certification costs and increase market access, bringing smallholders into more resilient value chains and allowing them to receive higher prices for their produce.

Challenges

There are a number of challenges in using AI across different sectors – including data privacy and data equity, job displacement, dependency on technology, equity of access, lack of infrastructure and lack of a suitable governance framework. Issues specific to agriculture include the risks of promoting monoculture systems rather than more biodiverse farm systems, regulation and ethics through technology choices and unintended environmental consequences. As with all innovation, a major challenge is moving the current applications from relatively small-scale pilots to deployment at scale.

While some examples of AI and automation solutions promote inclusion (alternative credit scoring promotes access to finance among female smallholders, for example), there are also examples of negative economic, social and ethical consequences where solutions can exacerbate existing inequalities and even create new ones. Where benefits are disproportionately accrued by groups that are already relatively economically privileged, there will be consequences for food security, employment, family and community power

dynamics, and economic development. Navigating these risks is likely to require an iterative approach.

Our investments in international agriculture research and development (R&D) are harnessing the power of AI (and digital tools more broadly) to transform how we produce and distribute food - helping to detect and diagnose devastating diseases that threaten food crops and develop improved crop varieties which are better adapted to climate change. Some prominent examples include:

- Through the Catalysing Agriculture by Scaling Energy Ecosystems (CASEE) partnership between FCDO and the Shell Foundation, we are supporting companies like Apollo Agriculture, who are utilising predictive AI to analyse satellite data and to establish credit profiles for small-scale producers that would otherwise be excluded from accessing crucial finance. Our funding has allowed Apollo Agriculture to grow and deliver impact at scale.
- Juno is a global platform and first-of-its-kind evidence alliance that will equip those working in agriculture, food systems and climate adaptation with the know-how and tools to develop rapid evidence synthesis at short notice and to translate and communicate that evidence so it can be used to inform decision-making. The project will achieve this in part by using an efficient, integrated technology platform that leverages artificial intelligence to mine an expanded data set whilst significantly reducing the cost, time, and effort of producing evidence and guidance.
- Through FCDO's partnership with the Bill & Melinda Gates Foundation, we fund the WAVE project on modelling and managing cassava disease: The Nuru app¹ (developed with support from CGIAR) is in use across WAVE countries for participatory surveillance.

4. Research need

The research will map the landscape of AI usage in agriculture, including emerging technologies, leading vendors, and research groups.

The project should conduct rigorous research to gather and analyse evidence that can inform policy decision-making for taking the necessary steps to adopt a strategic approach to investing in the most promising developments in AI for agriculture:

As we develop our approach to AI, FCDO will expand its portfolio under four main areas:

- AI and agriculture innovation: continue to invest in innovative companies and products that utilise AI in agriculture and food systems, including through existing partnerships (Shell Foundation, Acumen) and the development of a bespoke investment model to help the most impactful ideas reach scale.
- Ethics and governance research: the ethical impacts of both digital² and AI are under-researched and poorly understood, and governance frameworks are lacking. We have the potential to work with partners, including the Bill & Melinda Gates Foundation, to commission research on the ethical implications of AI in agriculture and food systems and to drive the establishment and take up of governance frameworks and best practice approaches.
- Capacity development: AI is a new technology and is evolving more quickly than people's ability to understand it. Strengthening capacity – both within FCDO as well

as with researchers and with smallholder farmers – is important. To this end, we have convened presentations from the authors of the leading reports on AI and agriculture for relevant FCDO cadres.

- Expanding existing workstreams: as referenced above, we have several existing workstreams which we will look to expand over the coming months and years.

The research project should also identify and document lessons learned and make recommendations that project partners and stakeholders might use to improve the design and implementation of other related projects and programs.

5. Research questions and approach

The objective of the project is to identify the most promising avenues for FCDO investment in AI for agriculture. Key research questions include:

- What are the major categories of AI application in agriculture, and what are their current stages of development and deployment in the field?
- What evidence exists, if any, for the effectiveness of AI agriculture tools in improving key outcomes related to agricultural productivity, food security, and livelihoods? How strong is the existing evidence from a methodological standpoint?
- What practical barriers stand in the way of deploying AI for agriculture at scale, particularly in low-resource settings (e.g., smallholder farmers in low- and middle-income countries)?
- How can AI-related projects in agriculture be designed and implemented to maximise equity and avoid exacerbating existing inequalities?

Approach and methodology

The landscape report should adopt systematic and comprehensive procedures for:

- Identifying existing and emerging applications of AI in agriculture and the research groups/vendors pursuing them;
- Identifying the most promising applications from the initial set;
- Assessing the strength of evidence for each application's effectiveness;
- Assessing the potential for each technology to be deployed at scale in an equitable way;
- Identifying the likely barriers and challenges to widespread deployment and adoption of each technology.

We welcome revisions to the proposed research questions, approach, and methods as long as this effectively responds to the overall objective of this call.

6. Deliverables and timeline

The first step of the research project will be a kick-off meeting between the partners and the designated implementing team. Following this meeting, the team will conduct an initial review to take stock of the available evidence. The implementing team is then expected to prepare an inception report and deliver a slide presentation of the report.

The presentation of the inception report will be followed by the interim stage, when the draft of the landscape report will be prepared. The preliminary findings will then be shared with the main partners in a presentation meeting. Lastly, the team will finish writing the final

landscape report and present it in a final meeting with the partners. The team should also identify other suitable venues for presenting the work and engaging with stakeholders to ensure research uptake.

The final output of the project will be a report, edited in English. The length of the report should not exceed 50 pages in total (excluding the annexes).

The report should:

- Provide an executive summary.
- Highlight issues and related findings/lessons learned.
- Include conclusions.
- Draw recommendations for policymaking.

Milestone	Timeline or target date
Satisfactory delivery of inception report and initial slide presentation	Within two months of contract signing
Satisfactory delivery of final report and slide presentation	Within ten months of contract signing

7. Preferred expertise and skills of the team

The team members should have the following qualifications and expertise:

- Proven experience conducting systematic reviews or other methods for the rigorous synthesis and/or mapping of evidence will be considered an asset.
- Research experience in agriculture/agricultural economics, particularly as relevant to low- and middle-income countries.
- Sufficient expertise in AI applications to assess the plausibility of claims about AI's ability to solve current problems in agricultural practice.
- Excellent writing skills.
- Fluency in English.

8. Estimated budget

The estimated budget limit of the project is £200,000.

- Payments will be made upon delivery of outputs and 3ie's confirmation of receipts and utilisation of the resources.
- The process for budget and technical scope virement (i.e. any changes between project lines or to technical scope) will need to be discussed with 3ie and approved by the FCDO.

9. Eligibility

An organisation that believes it can conduct high-quality research will likely qualify, either independently or in collaboration with a partner. Only legally registered organisations and/or their consortia of registered organisations, not individuals, may apply.

10. Page limits and criteria for selection

The CVs should not exceed two pages. The proposals will be appraised based on the criteria summarised in the table below. The FCDO claims the rights to use the results and the deliverables of the research project.

Table2: Criteria for selection

#	Criterion	Description	Maximum Score
1	Understanding of call for proposals	The extent to which the application reflects the call for proposals. The application shall address important aspects of the objectives of the project, directly tackle the issue to be solved, and embrace a critical approach to solve the question.	15
2	Methodological approach and academic rigour	The overall quality of the methodological approach. This includes but is not limited to: the logical and theoretical coherence of the proposal, the design, the proposed methods and technical instruments, innovative components of the research, and stakeholder engagement.	15
3	Proposed team	The overall quality of the proposed team against the required expertise. This includes expertise and experience in the relevant fields of the project; proven experience in development projects, and in advising governments and affiliated agencies; expertise in using the required research methods; and team experience in the geographical area (if applicable).	15
4	Equity and inclusion	To what extent the proposal takes into consideration cross-cutting issues, including aspects such as stakeholders' involvement and participation, gender issues, safeguarding of minorities and vulnerable groups, and protection of participants and/or respondents from risks or any harmful activity.	15
5	Financial feasibility and value for money	To what extent the proposed methodology and the expected outcomes justify the budget request. This includes the potential societal impact, clarity and organisation of activities and planning feasibility, the alignment of ambition of resources.	15
6	Research uptake plan	The overall quality of the research uptake plan. This includes the clarity of the influence goals and their consistency in relation to the uptake objectives; whether the proposal specifies strategies that will	15

		encourage the active use of the research findings; and the feasibility of the research plan along all stages of the research: design, implementation, and dissemination strategies.	
7	Overall evaluation of the project	To what extent the project, as a whole, provides a good approach to solving the critical elements of the research questions	10

Proposals will be assessed in order to ensure optimal value for money whilst balancing both costs and quality. Proposals that have clear pathways to meaningful impact will be looked upon favourably, as will proposals with substantial involvement or leadership by researchers based in the Global South.

11. Deadline

Completed proposals should be submitted to rcc@3ieimpact.org by **12am GMT on 10 April 2024**.

12. Competition process and timeline

Stage	Target dates
Call for proposal launched	6 March 2024
Deadline for queries	13 March 2024
FAQs posted	20 March 2024
Proposal submission deadline	10 April 2024
Proposals moderation	11-12 April 2024
Selection committee meetings	15-16 April 2024
Outcome decided and bidders notified	17 April 2024
Due diligence completed	1 May 2024
Signing of the accountable grant	3 May 2024

13. Q&A and contact

This project is managed by the FCDO Research Commissioning Centre. If you have any questions related to this opportunity, please submit these to the rcc@3ieimpact.org mailbox including "RCC AI for Agriculture Request for Clarification" in the subject line. In the interest of fairness and transparency, all questions and answers, will be published on the FCDO Research Commissioning Centre page at [website link](#) alongside other information on how to apply.