Background and summary:

- The Department of Plant Sciences at the University of Cambridge is internationally renowned for its ground-breaking research in plant ecology, virology, biochemistry and genetics. Currently the department employs 14 postdoctoral researchers (30% of total) who are EU (non-UK) nationals and has an annual research income from EU sources of over £1 million (17-28% annual budget over past 5 years).

- The postdoctoral community within the department (and throughout this and other Universities) do not have permanent positions and are regularly employed on a per project basis. Having the freedom of movement and mobility across the EU for research opportunities and collaborations is a vital necessity in our career.

- We set about a consultation period for postdoctoral researchers in our plant science department and the views on the causes and consequences of Brexit on plant science research and career progression are summarised in the text below.

- **Global challenges require large scale collaborations:** The UK has to demonstrate to the world that its researchers are open to collaborations, and this and subsequent British government must support and commit to these efforts.

- **Funding of collaborative research projects and networks:** The UK has to reassure researchers about the funding situation. We believe that the UK Government must agree and announce to match the loss of EU funding in UK research now and over the next years. A lack of investment in science and research will set back the UK in the global market.

- **Effects and impact of current uncertainty and Free movement of researchers:** Freedom of movement for UK and EU nationals must be maintained and on the same terms as they are now. UK scientists must be able to visit and join EU institutes and universities without increased obstacles.
EVIDENCE:

1. Global challenges require large scale collaborations

As early career researchers in the Department of Plant Sciences, we are all working on science that has a global impact. The questions or problems that drive us have no frontiers, be it understanding the effect of climate change on biodiversity, spread of plant diseases, developing bioenergy or improving crop yield for an increasing global population.

We work in international and multicultural laboratories and offices, with experimental sites located around Europe and the world. We thrive in a world of diversity, and this is under severe threat due to Brexit. EU funded programs have been instrumental in building bridges between researchers across Europe and the main risk is that Brexit will bring barriers between UK-based scientists and EU-based scientists in the first instance. It is important that the UK-based researchers and institutes not only are seen as being open to collaborations but also that they are given the financial and political means to establish and maintain collaborative work.

Being part of a large network of EU scientists makes us more attractive to worldwide collaborations. Collaborations across borders increase the quality and impact of our science for example, being part of the EU has simplified our implementation of international agreements such as the Nagoya protocol on biodiversity.

2. Funding of collaborative research projects and networks

As early career researchers who require international collaboration and funding, we are already seeing the adverse negative effects of Brexit. There is evidence from our consultation period that various fellowship schemes are now unavailable, networking meetings for future projects have been boycotted by potential non-UK collaborators, and that the amount of research that can be carried out in EU funded laboratories has been affected due to the devaluation of the pound.

There are also valid concerns over the ineligibility of new EU funded grants, this threatens potential collaborations, networking, invention and discovery. The consequence of this is that the UK will no longer be an attractive place for ground breaking plant scientists. Being outside of the EU will negate any influence on the direction of the research calls.

Although the Government has recently announced that they will underwrite any new UK EU H2020 proposal signed before the end of the year, this goes no way to secure funding streams and research in
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plant sciences as there are usually 1 year lead in times to construct proposals and set up new collaborations. We need secure funding streams announced now for the next 2-5 years.

As potential Principal Investigators we are also concerned that we will have a smaller pool of potential applicants for our research as restrictions of movement make the UK less attractive to work in. Even if we can access EU research money in any future deal, there is the valid concern that full member states will rightly have first right to any funding (ie, why should UK have same funding access rights as full member states), this mean that future research funding will increase in non-UK EU states, thus increasing the research competition and innovation outside the UK.

One example is the research in algal biotechnology that we currently perform, over the past few years we have had substantial investment by the EU (the EnAlgae program which provided nearly €0.9 million of funding to the department www.enalgae.eu) in providing employment, networking, research and development of infrastructure (such as our £0.5 million Algal Innovation Centre). Postdoctoral researchers have also been employed on European Regional Development Funding (InCrops and CambPlants http://cambplants.group.cam.ac.uk) which again ensures and facilitates research into the local farming and biotechnology arena. Having uncertainty in funding and freedom of movement, means that the full potential of these new facilities cannot be realised.

3. Effects and impact of current uncertainty

Early career researchers are often on project-specific fixed-term contracts and face a lot of uncertainty in their professional career progression.

Researchers are applying for highly competitive fellowships to set up independent research groups and/or are involved in research grant applications that will allow them to continue with their research. Often the different funding schemes have a substantial lead time of one to two years. The risk is that the lack of clarity of the UK status may be impairing the chances of researchers to access EU money and as a result talented young researchers are deciding to leave the UK and continue their research in other EU and non-EU countries, where the funding situation is more stable and foreseeable.

If access to EU funding will be limited in the future and no additional funding will be provided to compensate the effects, the pressure among researchers will further increase. Already now access to UK funding (such as BBSRC and NERC funds of which the plant sciences are already highly reliant on) is highly contested. In our opinion, advancements in science and technology are based on a collaborative environment among researchers and not on fierce competition.
The overwhelming consensus during our consultation was that there are no obvious benefits or positive opportunities for UK plant scientists. This negatively impacts on the international reputation that UK plant sciences has on delivering the innovation aspect of our science. As innovative research with high impact is a core strategy for UK and EU plant and biotechnology projects, having restricted access to the EU market in terms of setting up new businesses, interacting with EU SMEs, access to innovation funds and access to the best researchers will only add to the difficulties in delivering innovative research to the UK and international markets.

4. Free movement of researchers
Researchers are encouraged to be mobile and move institutions during their career. Many researchers in the department have spent time abroad and this is an attractive asset when applying for research funding and research posts (academic and non-academic). Having access to different programs that allow visits of research laboratories and universities across Europe (e.g. ERASMUS, Marie Curie, EMBO fellowship program) has a positive impact on research.

These programs are often used to learn, train and/or apply a specific technique available in a certain laboratory to answer a research question. In addition these programs also expose participants to different cultures, give them the opportunities to learn in a different environment and can be a way to establish future collaborations. After leaving the EU, UK early career researcher could loss access to these programs. A lack of similar programs post Brexit due to funding will harm the UK research community.

Currently, movement across Europe is free for UK and other EU citizens. No VISA is required to visit a laboratory or to take part in a field study across Europe. The Plant Science department for example organises a field trip to Portugal each year as part of their undergraduate teaching and are heavily involved in training UK based NERC (and international) early career plant physiologists in a Portugal research station. If post Brexit the movement will be restricted and a VISA will become necessary, costs will increase and field trips and research exchanges will become less feasible, especially if also additional time for VISA applications has to be considered. Missing out on training and collaborative opportunities will negatively influence future UK based researchers.

Brexit imposes the risk that in the future EU citizens have restricted access to the UK and may need to apply for VISAs. In addition, the risk exist of increasing costs for insurance and NHS access for EU citizens. Increasing living costs could influence the decision of early career researchers to work and raise families in the UK, especially as they are on short-term contracts already.
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