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 Department for Environment, Food and Rural Affairs
 Second Floor
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 Submitted by email to gm-regulation@defra.gsi.gov.uk

16 April 2019

Dear Madam/Sir

Re: Application from the Sainsbury Laboratory to release a genetically modified organism, reference 19/R29/01 as published at <https://www.gov.uk/government/publications/genetically-modified-organisms-the-sainsbury-laboratory-19r2901>.

We are writing on behalf of GM Freeze, EcoNexus, GeneWatch UK, GMWatch, OF&G (Organic Farmers and Growers), the Soil Association, the Organic Research Centre, Garden Organic, Biodynamic Association, WWOOF UK (World Wide Opportunities on Organic Farms), the Kindling Trust, Sheepdrove Organic Farm, Shepton Farm, the Real Seed Catalogue, Banc Hadau Llambled / Lampeter Seed Library, Unicorn Grocery, ACE Energy, the Springhead Trust, Beyond GM, Mums Say No to GMOs, GM Free Dorset, GM Free Somerset, GM Free Cymru, Genetic Engineering Network, Agri-Activism UK, South East Essex Organic Gardeners, Cardiff Friends of the Earth, East Dorset Friends of the Earth, West Dorset Friends of the Earth, Sustainable Dorset/Dorset Agenda 21 and Resurgence Dorset to request that the above application to release genetically modified (GM) potato is refused.

GM Freeze is the UK umbrella campaign for a responsible, fair and sustainable food system, calling for a moratorium on the use of GM in food and farming.

EcoNexus analyses developments in science and technology and their impacts on environment and society. **GeneWatch UK** monitors developments in genetic technologies from a public interest, human rights, environmental protection and animal welfare perspective. **GMWatch** is a news and information service that aims to keep the public up to date on issues around GM crops and foods and associated pesticides.

OF&G (Organic Farmers and Growers) was the first body to be approved by the government to inspect and certify organic food and farming and is now the largest certifier of organic land in the UK. The **Soil Association** is the UK's leading membership charity campaigning for healthy, humane and sustainable food, farming and land use. **The Organic Research Centre** is the UK's leading independent research, development and advisory institution for organic agriculture. **Garden Organic** (formerly known as the Henry Doubleday Research Association) is the UK's leading organic growing charity with over 20,000 members throughout the UK and abroad. **Biodynamic Association** champions a uniquely holistic and respectful approach to organic farming, food and health.

WWOOF UK (World Wide Opportunities on Organic Farms) is a membership charity which connects people wanting to learn about ecological growing and low impact lifestyles with sites across the country living ethically and needing practical help on the land. **The Kindling Trust** is working to create a more sustainable local food system through a number of practical initiatives in Greater Manchester. **Sheepdrove Organic Farm** and award-winning eco-conference centre are committed to sustainability, conservation and education. **Shepton Farm** in Somerset grows grass/clover, arable crops and apples.

The **Real Seed Catalogue** provides open pollinated seeds for home gardens and organic growing. **Banc Hadau Llambled / Lampeter Seed Library** offers free locally adapted and produced open pollinated seeds to its members. **Unicorn Grocery** in Manchester has pioneered a cooperative approach to sustainable urban food supply. **ACE Energy** helps farmers to use less energy intensive methods of farming. The **Springhead Trust** promotes environmental education, sustainability, organic agriculture and local performing arts.

Beyond GM is a creative initiative to educate and engage the public and raise the level of debate around the issues of GMOs and sustainable food production in the UK. **Mums Say No to GMOs** is a coalition of mothers and their families using consumer pressure to stop GM crops being grown and sold in the UK. **GM Free Dorset** and **GM Free Somerset** are grass roots campaigns supported by individuals, groups, local businesses and charities that exist to promote rural sustainability. **GM Free Cymru** is the community pressure group campaigning to keep Wales free of genetically-modified crops. **Genetic Engineering Network** facilitates the exchange of information between groups and campaigners. **Agri-Activism UK** is a network of people who campaign for cleaner, healthier and more sustainable agricultural and food systems.

South East Essex Organic Gardeners promotes the principles of organic gardening. **Cardiff Friends of the Earth**, **East Dorset Friends of the Earth** and **West Dorset Friends of the Earth**, work on a local level to create a just world where people and nature thrive. **Sustainable Dorset/Dorset Agenda 21** is the online and outreach interface of Dorset Agenda 21, a central hub for sustainable and resilient activity across the county, with the aim of raising awareness and increasing interest and involvement in sustainability. **Resurgence Dorset** is a monthly community group of environmentalists and nature-lovers set up to discuss Resurgence & Ecologist articles and host talks to raise public awareness of environmental issues.

We do not believe that this trial should go ahead. The GM plants have not been fully characterised, the impacts of the modifications have not been adequately assessed, the containment measures are inadequate, and the proposed trial will be of no net benefit to society. In summary, our objection covers the following points:

1. The GM plants have not been fully characterized.
2. The GM plants are modified in complex and novel ways that have not been adequately assessed.
 - 2.1. The GMO lines to be trialled feature stacked traits.
 - 2.2. The application does not consider the potential environmental or human health effects of RNAi-based crops.
3. The GM plants also include more familiar, potentially damaging traits.
 - 3.1. The GM potatoes may include an antibiotic resistance marker gene.
 - 3.2. The GM potatoes contain herbicide tolerance genes.
4. The containment and monitoring measures are not adequate.
 - 4.1. Containment of GM potatoes cannot be guaranteed.
 - 4.2. No non-GM guard potatoes are proposed for this trial.
 - 4.3. The post-harvest monitoring period is insufficient.
5. The proposed trial will be of no net benefit to society.

1. THE GM PLANTS HAVE NOT BEEN FULLY CHARACTERISED

Applications for consent to release a GMO higher plant must include information “*on the sequences actually inserted or deleted*” (Part A1, para 14) but this application includes only Initial molecular characterization of the GM potatoes. The copy number of the insert has not been determined for any of the lines covered by the application and it is not possible to determine whether backbone DNA (from the inserted plasmid) has inadvertently been transferred into the plant. Full characterization of the sequences inserted is necessary for any assessment of the risks the GM potato may pose. In this instance, the presence or absence of backbone DNA is particularly important as it contains the antibiotic resistance marker gene, *nptII* (see 3.1 below).

2. THE GM PLANTS ARE MODIFIED IN COMPLEX AND NOVEL WAYS THAT HAVE NOT BEEN ADEQUATELY ASSESSED

2.1 The GMO lines to be trialled feature stacked traits

The GM potatoes have been created by inserting cassettes with multiple genes, resulting in the stacking of multiple traits.

- The plants transformed with SLJ24904 will contain two types of genes conferring resistance to potato cyst nematode (PCN) (*Oc-ID86* and “repellent”), which act upon the PCN in different ways.
- The plants transformed with SLJ25057 will contain 3 stacked genes for resistance to late blight (*Rpi-amr3i*; *Rpi-amr1e* and *Rpi-vnt1.1*), together with two gene-silencing modules, one of which is intended to silence the *Ppo* gene, which gives rise to tuber browning upon bruising, while the other is intended to silence the *Vinv* gene, which is associated with potato blackening when tubers are cooked after cold storage.

As we stated in our objection to the applicant’s closely related GM potato field trial that received consent in 2017 (17/R29/01)¹, *“Genetic modification is promoted to the public as the straightforward insertion of individual genes conferring simple traits. The complexity of this proposed trial reveals a more worrying step towards a ‘transgenic treadmill’ where an increasing number of genes and traits are inserted into a single GM crop. The mixing of pest resistance with ‘designer’ traits focused on ‘tuber quality’ takes us a significant step towards the production of very complex GMOs where numerous novel compounds are produced at once. This considerably increases the potential for unexpected interactions between both genes and compounds produced, with implications for food, feed and environmental safety.”*

This treadmill can be seen clearly in North America, where a similar GM potato, produced by the company J.R. Simplot, was deregulated (i.e. permitted for cultivation and marketing) in 2015. A second version of this GM potato encompassing additional traits for low reducing sugars and blight resistance was released just two years later and a third is now planned with yet more traits². It is clear that the acceptance of stacked traits on a “face value” basis leads quickly to layer upon layer of complexity being added without due consideration of the potential this creates for novel interactions or effects.

Commenting on the applicant’s ongoing field trial (17/R29/01), the Advisory Committee on Releases to the Environment (ACRE) stated³ that it had *“considered the potential for the different gene products or traits to interact and could not identify a plausible scientific hypothesis that would lead to harm.”* However, the nature of these trials means that any interactions would be novel so a credible risk assessment for stacked traits requires experimental data. For example, evidence is needed that the two gene-silencing modules do not interfere with each other, or that the products of the two genes conferring resistance to PCN do not interact. Such evidence should be published in the peer-reviewed scientific literature before any application for a field trial is considered.

2.2 The application does not consider the potential environmental or human health effects of RNAi-based crops

The application contains two gene silencing modules in the SJL25057 plasmid. These operate via RNA interference (RNAi) to silence the genes. As the application states (Part 1A, para 12) *“Sense and antisense sequences from the Ppo and the Vlnv genes are located in between the convergent promoters and they are separated by a ‘spacer’ sequence. The structure of this module is such that it directs the transcription of RNA molecules with complementary sequences. The consequent formation of double-stranded RNA triggers the post-transcriptional silencing of the above-mentioned genes via the endogenous silencing machinery of plants.”*

The fact that this type of genetic modification does not produce a protein should provide no comfort to those charged with protecting our food or the ecosystem as there are considerable concerns regarding the safety of RNAi-based GM crops, compounded by significant gaps in scientific knowledge of the extent and nature of potential adverse effects. As detailed in our comments on the previous application (17/R29/01)⁴, these include: off-target effects whereby double-stranded RNA (dsRNA) and/or short interfering RNA (siRNA) may silence non-target genes within the GM plant with unpredictable results; gene silencing in non-target organisms following ingestion and processing of dsRNA to siRNA⁵; and gene silencing in humans following consumption via uptake and processing of dsRNA to siRNA in the gastro-intestinal tract.

The application does not consider the significant food, feed or environmental concerns associated with the potential effects of the gene-silencing module. For example, in the environmental risk assessment, the applicant simply states (Part A2, para v): *“The gene-silencing module present in plants transformed with SLJ25057 is designed to modify tuber quality traits that are important in post-harvest management and processing of the potato tubers. They are not expected to affect the interaction of the transgenic plants with other organisms”*. Similarly, the applicant states (Part A1, para 19 and Part A2 para vi) for human health risks that *“Potato plants transformed with plasmid SLJ25057 also contain a gene-silencing module. As described previously, this module only includes potato sequences and their structure is such that they do not code for proteins. Instead, they direct the transcription of RNA molecules with complementary sequences and their mode of action is based on using the endogenous post-transcriptional silencing machinery of plants to reduce the expression of the Ppo and Vlnv genes in tubers. No toxic or allergenic potential is therefore expected and nucleic acids (such as the endogenous RNA and DNA molecules of plants) are readily degraded by human digestive fluids (Liu et al, 2015).”*

Both these statements fail to take account of recent scientific literature which highlights the persistence of dsRNA in the environment⁶ and offers important indications of the potential effects of human consumption of artificial dsRNA through studies examining the impact of naturally occurring microRNAs in our food⁷. The principal concern for both non-target organisms and humans is that ingestion of novel dsRNA (i.e. not ordinarily found in the diet), originating from the GM crops, could silence (or otherwise affect) gene expression of native (endogenous) genes⁸. As Nawaz et al.⁹ conclude: *“With respect to plant food miRNAs, we identified evidence that these molecules can indeed survive digestion and enter the body of the consumer. However, to date we find that there is far less, but still compelling evidence, to suggest that these ingested siRNA molecules can target homologous sequences in the consumer and affect gene expression. Nevertheless, even based on the currently available evidence off-target effects from the ingestion of novel siRNAs present in foods derived from either GM crops or foliar insecticidal or anti-viral spray application, cannot be ignored and thus should form an integral part of the risk assessment of these products.”*

There is a growing body of literature detailing concerns about RNAi-based GM crops¹⁰ and, as yet, no guidance from the European Food Safety Authority (EFSA) on the use of gene silencing in GM crops. Acknowledging that this issue caused concern for many of those contributing to the public consultation on the 2017 trial (17/R29/01), ACRE noted in its advice on that trial¹¹ that *“‘Flavr Savr’ tomatoes first sold in 1994 were developed using this technology and that other GM crops have been authorised for food and feed use in the EU since then”*. While individually true, these two points are misleading when placed together in this way as no RNAi-based GM crops have ever been authorised for cultivation in the European Union (EU).

In the same advice issued in 2017¹², ACRE concluded that *“the risk assessment approach for identifying and characterising risk in the EU is appropriate for assessing GMOs developed using gene silencing.”* This does not match current advice from EFSA which has further considered its approach to the risk assessment of RNAi-based GM crops since 2017. EFSA now considers that bioinformatics searches for off-target effects of siRNAs can only usefully contribute to risk assessments for plants as they give unreliable predictions for animals or humans¹³. Thus, EFSA has published a protocol only for off-target bioinformatic searches in plants themselves, not for the animals or humans who might ingest the RNAi-modified plants¹⁴.

There is currently no protocol to assess either the possibility or the potential effects of uptake by humans and animals of dsRNA (and their derivatives) from RNAi-based GM plants. This makes it impossible for the applicant to adequately assess the environmental risks of the proposed trial in terms of impact on non-target organisms. It also, of course, makes it impossible to even begin assessing the safety of these potatoes for future human consumption.

The GM potato field trial should be refused on the grounds that the environmental risk assessment is incomplete and, importantly, cannot be completed at the current time because of the acknowledged gaps in scientific understanding regarding potential effects on non-target organisms.

3 THE GM PLANTS ALSO INCLUDE MORE FAMILIAR, POTENTIALLY DAMAGING TRAITS

3.1 The GM potatoes may include an antibiotic resistance marker gene

Inadvertent integration of the plasmid backbone sequence (see 1 above) may result in the inclusion of an antibiotic resistance marker gene, *nptII* in the GM potato. This gene confers resistance to the kanamycin family of antibiotics and kanamycin is listed as an essential medicine for priority diseases by the United Nations World Health Organisation (WHO)¹⁵.

We are aware of ACRE’s view (as stated in advice given in response to previous applications to UK GM potato trials including 16/R29/01 and 17/R29/01), *“that the therapeutic effect of antibiotics that are substrates for NPTII will not be compromised by the presence of the nptII gene in GM plants. ACRE’s advice on this issue is that (i) the likelihood of transfer of a functional gene from plant material to bacteria is extremely low and that (ii) bacteria with resistance to these antibiotics are widespread in the environment.”*¹⁶

Since the time of the last GM potato trial application (2017), concern among learned organisations such as the European Medicines Agency¹⁷ has been growing about the future of therapeutic antibiotics. Globally, there is a high level of concern regarding the rise of antibiotic resistance that could render key antibiotics ineffective in treating infections in humans and animals. The UK government recently published a 20-year vision and 5-year national action plan¹⁸ to prevent further antimicrobial resistance, which includes antibiotic resistance. The vision calls tackling antimicrobial resistance a “global priority”, while the 5-year plan includes the reduction of antimicrobials in agriculture¹⁹. Therefore, any consent to cultivate GM plants that may contain antibiotic resistance genes, even as field trial, is not in keeping with the UK national action plan to prevent further antimicrobial resistance.

3.2 The GM potatoes contain herbicide tolerance genes

The GM potatoes will be tolerant to certain herbicides. The application states (Part A1, para 13): “*All the transgenic plants proposed for release in this application also contain the CSR gene which confers resistance to some herbicides (sulfonylureas and imidazolinones).*” Although the herbicide tolerance is intended for the selection of transformed lines, there is no guarantee that it will be used only for this purpose in the event of any future commercialisation as several pesticides in this family are approved for use in the EU²⁰. The use of this herbicide tolerance trait could have a significant effect on biodiversity by reducing plants available to wildlife, as shown in the UK Field Scale evaluations for oilseed rape²¹. Even for field trial purposes, no GM crops with herbicide tolerance traits should be introduced to the environment.

4 THE CONTAINMENT AND MONITORING MEASURES ARE NOT ADEQUATE

4.1 Containment of GM potatoes cannot be guaranteed

Although ACRE has asserted in previous advice that “*cultivated potatoes are a low-risk crop for pollen-mediated gene flow because they are highly self-compatible and cannot cross with other wild or ornamental species in the UK to produce viable offspring*”, it also “*recognises that rare long-distance cross-pollination events are possible, especially where pollen beetles are common in the area of the trial site*”²². Whatever measures are put in place, the GM potato field trial cannot be guaranteed to be contained. Human error has resulted in GM contamination of potatoes in the EU (Sweden) as a result of ‘co-mingling’²³.

4.2 No non-GM guard potatoes are proposed for this trial.

The applicant’s 2017 GM potato field trial application (17/R29/01) specified a surrounding guard crop of non-GM potatoes (Part A1, para 27): “*With the exception of a surrounding guard crop of Désirée no potatoes will be grown within the accepted distance of 20 metres from the release site.*”²⁴ The applicant’s stated primary purpose was to protect the GM potato crop from wind and rain, but the guard crop will also serve as a pollen trap, hindering any spread of pollen from the GM potatoes. Such a guard crop is absent in the current (2019) application but should be included to hinder pollen movement.

4.3 The post-harvest monitoring period is insufficient

ACRE advised for the 2017 GM potato trial consent (17/R29/01) that *“Monitoring of previous releases of potatoes has revealed that groundkeepers may persist for several years after the initial release... ACRE advises that the ground on which potatoes have been released should remain fallow for two years following the release and not ploughed. This would allow true potato seed and tubers to remain near the soil surface and produce volunteers.... After two years, crops that facilitate the removal of potato groundkeepers and volunteers should be grown throughout the remaining post-trial monitoring period. ACRE considers that TSL should monitor the trial plots for potato groundkeepers and volunteers for at least four years after they are harvested. At the end of four years, the results should be examined to determine whether monitoring can stop.”*

However, the applicant proposes a significantly shorter monitoring period and seems unaware that this is at odds with ACRE advice, stating (Part A1, para 36) that *“monitoring of the plot for groundkeepers will be continued at monthly intervals by walking the trial site for a period of 2 years following the 3-year experiment in accordance with DEFRA guidance.”*

The application for an open field trial should be refused on the basis that the containment and monitoring measures are inadequate.

5 THE PROPOSED TRIAL WILL BE OF NO NET BENEFIT TO SOCIETY

If the proposed trial proceeds and the GM plants eventually go into commercial cultivation, the traits concerning the post-harvest discolouration of potatoes will support further industrialisation of the food chain and a potential reduction in food quality.

Silencing of the *Ppo* gene prevents browning upon bruising (Part A1, para 13), but this does not mean that bruised cells are not damaged. Instead, this change serves to mask the damage and prevent those preparing and eating the potatoes from removing damaged tissue.

The silencing of the *Vinv* gene is intended to prevent blackening upon high temperature cooking following cold storage (Part A1, para 13). It is not necessary for potatoes to be kept in cold storage if they are used within a few weeks of harvesting and changes that facilitate long cold storage will only encourage a practice that increases the environmental footprint of food production (through the highly resource intensive practices of refrigeration and active cooling). Furthermore, as we stated in comments on the applicant's previous GM potato trial application,²⁵ while consumers are advised²⁶ to reduce intake of acrylamide (contained in the browning colour of foods cooked at high temperatures) the most beneficial way for them to do so is to eat less fried starchy food. The chips and crisps likely to be produced from non-browning potatoes will still be high in fat and frequently laden with salt. The marketing of end products from this kind of potato as a “healthy” alternative will undermine more holistic public health messages encouraging people to eat a balanced diet low in fried and processed foods. The net result of these potatoes - should they ever come to market - is, therefore, unlikely to be beneficial to public health.

The proposed trial represents an unacceptable risk to wildlife, the balance of the ecosystem and, in the event of future cultivation, members of the public. The application is incomplete, the genetic modifications may cause harm, the containment measures are inadequate, and the proposed trial will be of no net benefit to society. We request, therefore, that the Minister denies consent and prevents this open-air field trial going ahead.

Yours faithfully

Liz O'Neill Director GM Freeze	Dr Ricarda Steinbrecher Co-Director Econexus	Dr Helen Wallace Director GeneWatch UK	Claire Robinson Editor GMWatch	Roger Kerr Chief Executive OF&G
Helen Browning CEO The Soil Association	Dr Bruce Pearce Director of Research & Innovation Organic Research Centre	James Campbell Chief Executive Garden Organic	Gabriel Kaye Executive Director Biodynamic Association	Scarlett Penn Chief Executive WWOOF UK
Helen Woodcock Director The Kindling Trust	Juliet and Peter Kindersley Farmers Sheepdrove Organic Farm	Oliver Dowding Farmer Shepton Farms Limited	Kate McEvoy and Ben Gabel Founders The Real Seed Catalogue	Cathy Streeter Founder Banc Hadau Llambod / Lampeter Seed Library
Debbie Clarke Co-Operative Member Unicorn Grocery Ltd	Lee Smith Managing Director ACE Energy Ltd	Edward Parker Trust Manager The Springhead Trust	Pat Thomas Director Beyond GM	Sally Beare Campaigner Mums Say No to GMOs
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Pam Rosling Trustee Sustainable Dorset/Dorset Agenda 21	Ken Huggins Organiser Resurgence Dorset			

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