

Science AMA Series: I'm Derek Stewart, I'm a Professor of plant and food chemistry at the James Hutton Institute, Dundee and Heriot Watt University Edinburgh. I do research on making the way we grow our food more sustainable. AMA!

Derek<sub>stewart</sub><sup>1</sup>*andr/ScienceAMAs*<sup>1</sup>

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### Abstract

Reddit-ors! As someone who started off as a drug designer in the pharmaceutical and chemical industries I have always had a keen interest in natural products. Consequently I have worked for many years in the use of plant and natural products for things like improving human health, colours, food ingredients, shelf life extension etc. Over the last decade or so I have become passionate about fully utilizing crops and plants and am leading efforts into promoting and realizing a circular economy approach to agriculture and industry. A circular economy is an alternative to a traditional linear economy (make, use, dispose) in which we keep resources in use for as long as possible and get the most use out of them, then recover and regenerate products and materials at the end of each service life. Can we take this forward in plant and crops science, and industries? I think sustainability is key to our continued survival and lifestyles. I am on the Sense About Science's Plant Science Panel, where you can put questions and opinions for response from researchers. The Panel is made up of over 50 independent plant science researchers. You can ask questions to them on Twitter (@senseaboutsci #plantsci) Facebook or using this online form. Answers are sent back within a couple of days and posted online. The Panel has answered close to 400 questions over the last three years and it's a great want to cut through the noise around what can sometimes be a really polarised debate. I will be back at 12 am EDT (5 pm GMT, 9 am PST) to answer all your questions.

[REDDIT](#)

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DEREK\_STEWART [R/SCIENCE](#)

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Professor Stewart, it has been said that stopping the consumption of meat will make growing food more efficient. Do you think we need to stop consumption of meat or at least reduce it?

[Xenovore](#)

Hi

Well the evidence is stacking up against meat production in comparative terms for GHG production and if we are to get a handle on that we need to make the process more efficient or at the very least reduce the intake. On a personal basis switching to plant protein works for people and this means less animal fat getting taken in: this should all lead to reduced CVD and other degenerative dietary related pathologies

Are you vegan or vegetarian? If so, could you explain how that relates to your studies?

[Versepelles](#)

food more sustainable. AMA!,  
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Increasingly eating less meat through education on the need to simply eat less. Im now buying from better suppliers so that what I do eat is of higher quality. Now doing some work on plant protein crops (faba beans) and how this can be incorporated into processed food systems toe give a more sustainable route for protein in the human food chain

The front page of Reddit recently had a link that talked about lab-grown meat and milk and the regulatory challenges it faces.

What part, if any, do you think these artificially grown meat and dairy cultures will have in this circular agricultural economy you're trying to promote?

[TheArcanist](#)

As it stands it will have to go through several regulatory hoops regarding safety etc. At the moment it is difficult to see how this can be produced sustainably as the input efforts look large for the level of output. However we need to keep an open mind on this and as industrial biotech becomes more accepted and financially viable for food systems it may start to be come more mainstream. I cannot see at the moment how it will become economically viable but am open to being impressed

It is claimed that ecologically based polyculture systems produce a higher total crop yield than analogous monoculture systems.

Even though the yield from any single crop in the polyculture ecology will be just a fraction of what could be yielded by a monoculture of that crop, it is claimed that the sum total of all crops produced by the polyculture ecology outweighs the sum total of crops produced by an analogous monoculture.

These claims have some logic to them, but to my knowledge there is no known evidence or research on this topic, and they are taken on faith by proponents of polyculture ecology.

Are you aware of any evidence to support or reject such claims?

[feugene](#)

The polyculture systems do seem to be attractive but we need to be sure that the crop quality generated matches end use. Ive not read too many papers on that aspect and would need to read around first

What has been the most interesting or incredible advancement in this field that more people should know about?

What should we do as consumers to promote a circular economy?

[commiecomrade](#)

The explosion in genome biology is to my mind the biggest advance that will benefit all agrisystems. This is akin to having both the jigsaw pieces and the picture on the top of the box and will see crop breeding for new environments, better resource use efficiency, resistance of abiotic and biotic stresses etc accelerate at a level never seen before

Hi professor Stewart. What kinds of food do you think we will eat more of in the coming decades, and how will they be produced?

[Matzei](#)

I think our protein sources need to be thought through again. The problem with livestock production is that it is comparatively expensive in terms of GHGs. Shifting, e.g. faba beans etc, at least into processed food systems would help immeasurably here. If we think broader we need to consider marine sources, but take care on mining that too far. We can however take our experience in intensive farming and apply it to insect protein production. This would be a culture change that would need to be bested.

Is Monsanto viewed in a negative light in your industry or are they viewed as innovators?

[andrewtdc](#)

Monsanto are one of many companies and have some interesting approaches. Companies have to make money so their culture may be different to yours but if their approach went against the sector they would not survive. I guess you are referring to their GM work. We need to learn from what happened there as I think it's one tool amongst many that need to be evaluated and not rejected out of hand.

Hi Professor Stewart, thanks for joining us today. My question is: how will the development of sustainable foods impact the cost of living and foods in general? Will food become cheaper or is there a cost for sustainability?

[E3lue](#)

I think we have to realise that we do not pay enough for food and have let the value slip away. I think the shift to more sustainable food production systems will have to have investment and adopting no or low tillage systems, using alternative inputs (green manures etc) adoption of clover and other legumes, biostimulants and controls etc all will all come with costs but maybe savings also.

Do you think mistrust of GMOs is a transient issue? And if so, what is the most important factor in changing perceptions?

[honved711](#)

I have seen this go up and down over the years. GM and its associated technologies DO have a place to play and getting truly societal benefits need to be better identified and exploited. The climate changes we are seeing now with large areas going from dustbowls to flooded areas mean getting crops to manage to grow in these very different environments is difficult. I think standard breeding will struggle to match the pace of environmental change. Using market technology, genomic selection etc is already looking much better as a route forward. However GM, including CRISPR/Cas9, holds the potential to make paradigm changes and advancements.

Do you think lab-grown meat will surpass real meat in sales and quality in the next 20 years?

[camdoodlebop](#)

This is not an easy question and the lab meat is the equivalent to the model T Ford car and look how far we can come with cars now: hydrogen fueled, electric, stop-start technology for fuel efficiency etc. This means that the advances in cell biology, industrial biotech, genome biology will, if targeted at lab

meat, see it change significantly in terms of production efficiency, quality, taste, cookability. Deliverable in 20 years? Im not so sure.

1 What do you think of the insect-as-food trend currently growing? ( Recently I read an article where cockroach milk is predicted to be the food of future)

2 Will algae play much a role in the future of the food industry?

[ASilverStorm](#)

1. Its a readily available sources of protein so it seems like a sensible way forward. We eat the sea insects (shrimp , prawn lobster etc) so the stretch to land insects is culture than common sense based. I may come into the food chain as an ingredient rather than a whole food to deal with this recalcitrance to eat the insects.
2. Algae look interesting as is has some interesting compounds that could be the next wave of food thickeners. Also we are doing some work on the polyphenol compounds that would be sustainable antioxidants in processed foods.

As a student and, as such, someone with a low budget, what can I do to contribute to a more sustainable, healthy, environment-friendly and fair world, regarding food and its industry?

[siderorb](#)

I agree with some of the answers and reducing meat consumption is key. Training you palate to new protein sources will take time but using pulses, beans etc will pay great dividends for your health budget and the general agri-environmental system as they are much more in tune with a sustainable approach

As someone who has worked with drugs and the pharmaceutical industry, and also with your knowledge in plants and human health, what's your take on marijuana and (other) psychedelic drugs? Where do you think we will be, say, in the next five years, regarding that subject? What can we do to end stereotyping and to fix the damage the War on Drugs has done to real drug knowledge? Also, do you think it was just government actions or did the pharmaceutical industry play some role into demonizing certain drugs for their profit? Thank you!

[siderorb](#)

Interesting question. As someone who was a pharma research scientists what became increasingly obvious is that natural products are continuing to be big targets and will continue to be, also from marines sources. Allied to this is the development of industrial biotechnology so it increasingly feasible to take the whole pathways and drop them into facile IB organisms (yeast) or grow these crops and marine sources under controlled systems. For the pharma crops using vertical farming looks particularly attractive especially as we can slightly tress the organisms as this often increases the production of the target drug. All in all we will need new pharma going forward and these will be therapeutics and potentially cannabis could be one of these

Totally unrelated but hey I visited Herriot Watt! Then turned down the place offer..sorry! But it's a lovely place

[ch4rl1e97](#)

Maybe some other time!

I'm a food production luddite, how can I easily wrap my head around the pros and cons of sustainable food production?

[wasabi-mayo](#)

Its all about realising that there are many viewpoints to food production and we will never please everyone. Many people rely on the traditional food production industry products but we need to ensure the education is out there so all can see what they are eating and how they can improve their diet at an affordable price. And importantly that the production will continue. The conventional approach to agriculture that has focused on yield and disease resistance, and empoly agrichemicals and synthetic fertilisers. Now I am no full pro and con person and this approach to agric has been very successful and has produced well but we need to think longer terms and look at sustainability, reducing inputs, restoring the soils etc. In addition these sustainable routes may need more man hours, tractor use etc so everything in the production system needs to be measured and then looked at as a full farm business.

Is there a place for a chemical analyst intern from the netherlands?

Also, what about the phosphate shortage in third world countries. wouldn't it be possible to create crops that don't need much phosphate?

[FlamingAurora](#)

Regarding the P shortage. Many scientists are working on crops that are more efficient on P utilization and better routes to P mobilisation to stop if getting locked up. Better designing crops with roots that can do this is within the crop and plant scientists grasp

Hi Professor Stewart. What do you think about biomass energy ? Which culture should avoid being a biomass energy ?

Answer me anything and good continuation !

[Ricky7831](#)

The systems for much more fully utilising biomass for energy with the efficiencies improving all the time. Whats also needed with this is to ensure that any co-products (wastes) are also fully utilised to get the economy of the system maximised. Not sure what your second question is asking?

If you could make a documentary or short film about any subject that wasn't in your current field of work, what would it be about?

[crsf29](#)

About me being in a successful rock band. Well, you did ask!

What is your opinion on the system of rice intensification? Does it make sense as an alternative to chemical farming, or has its examples of success been flukes?

[simonthefoxsays](#)

Do you mean the rice intensification system that is labor intensive. I suspect its fine but will it produce enough for the areas its in? I think I would like to see a decent all round assessment of its sustainability that include nutrient cycles, labour costs yields vs other systems etc. Not the answer you might have wanted but its more research is needed