



SCIPOD

## IMPROVING THE PRODUCTION OF COWPEA, A SUSTAINABLE SUPERFOOD

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# Improving the Production of Cowpea, a Sustainable Superfood

Cowpea is an extremely versatile food crop. Packed with high-quality protein, it has become a staple legume in many households in Africa, where it is indigenous. Cowpea also cycles nutrients back into the soil, supporting sustainable farming and healthy ecological networks. However, the production of this sustainable crop faces many hurdles, including drought, pesticide use, and declining soil quality. In a recent review, Professor Olubukola Oluranti Babalola of North-West University in South Africa outlines the issues facing cowpea production and highlights potential solutions.

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In the face of a rising human population, climate change, soil depletion and decreasing land availability, the global food crisis continues to escalate.

Conventional agricultural approaches, which aim to increase yield at all costs, are clearly not working. For instance, our over-use of synthetic pesticides and fertilisers has created a cascading series of issues, robbed soils of their nutrients, and has given rise to pesticide resistance. Continuing forward with conventional agriculture will simply devastate what little fertile land that remains.

The current crisis demands that we develop new methods for enhancing agricultural yields in a sustainable way, in order to feed the growing human population.

Part of the solution to the global food crisis lies in cultivating crops that are resilient to a changing climate, produce high yields, and are highly nutritious. Cowpea is one example of this type of super crop. Native to West Africa, cowpea is packed with protein and other essential nutrients, making it a staple vegetable in many countries throughout the African continent. It

is also used by farmers as nutritious fodder for livestock. Like other legumes, cowpea forms a symbiotic relationship with bacteria that allows it to fix nitrogen into the soil, improving soil health.

Cowpea is also relatively high-yielding compared to other legumes, as it grows quickly. The plants can also tolerate long dry spells, which is particularly important as climate change increases the frequency and severity of drought. These benefits have made cowpea a prized yet common crop throughout Africa, where it is an important resource in the fight against malnutrition.

However, the effects of soil depletion, climate change and pest infestations have now begun to take their toll on cowpea production. As such, maintaining and improving the productivity of cowpea farms is becoming increasingly challenging.

Recognising its clear potential, many researchers have been exploring new ways to improve the yields and resilience of cowpea in the face of these challenges. In a 2021 paper in the journal *Frontiers in Plant Science*, Professor Olubukola Oluranti Babalola,





Director of Food Security and Safety at North-West University in South Africa, summarised the latest research in cowpea production.

Alongside her student Mr Olawale Omomowo, Professor Babalola details the various issues facing cowpea production, while also highlighting promising solutions that will help boost cowpea production and give us new tools to feed a growing population.

They point out that the issues facing cowpea production are diverse and require a multifaceted approach to tackle several interlinking problems simultaneously. We will need to deploy climate-smart agricultural practices and rely on newly developed biotechnological techniques to effectively address climate change, pests, soil depletion and other constraints on cowpea production.

For example, in order to reduce the use of synthetic pesticides and fertilisers, Omomowo and Babalola recommend microbial-based formulations as 'bio-pesticides' and 'bio-fertilisers'. These resources are

cheaper, renewable, and safe for humans and the environment. Additionally, they don't strip the soil of its nutrients, leading to improved soil health.

These formulations contain microbes that are beneficial for plant health, including root-associated microbes, which produce hormones that help plants respond to stress. In exchange for a place to live and some sugar secreted from the roots, these microbes form an alliance with the plant, helping them uptake more nutrients and adapt to stress.

The researchers also delve into various biotechnology tools that can improve crop yields, productivity, nutrition, food safety and sustainability.

These tools include the suite of techniques that scientists use to change the genetic makeup of an organism. As a result of these practices, scientists and breeders have developed new crop varieties that are more resilient to various stressors, including pests, diseases and long periods of drought. These same tools can also be used





to increase yields. For instance, a desirable variety of cowpea might grow faster or produce more seed, greatly improving yields.

Omomowo and Babalola explain that scientists have already identified the genes that are essential for cowpea growth and development, along with genes related to stress-resilience. If researchers can modify these genes to enhance growth and to improve resilience in the face of common stressors, we will be well on our way to boosting cowpea yield.

These same tools could create cowpea varieties that are resistant to common toxins found in degraded soils. For example, we know that manganese tolerance is related to a series of genes that help to detoxify manganese and other heavy metals. If scientists can increase the expression of these genes, cowpea will be better equipped to handle the toxins it will inevitably uptake through its roots.

Babalola and Omomowo emphasise that there are also simpler, yet effective, tools that can be employed to improve cowpea productivity. For example, receiving training in indigenous agricultural methods has helped farmers to adopt low-input sustainable practices that can boost yield while also protecting the environment. These practices include efficient water, soil, and pest management systems.

The list of challenges facing cowpea production can feel tremendously daunting. However, the reality is that issues associated with climate change, fertilisers, disease, pests and toxins plague all of our most important crops. In their important paper, Babalola and Omomowo present holistic solutions that work together to increase food production, while also protecting Earth's natural environment for future generations.

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This SciPod is a summary of the paper 'Constraints and Prospects of Improving Cowpea Productivity to Ensure Food, Nutritional Security and Environmental Sustainability' from *Frontiers in Plant Science*. [doi.org/10.3389/fpls.2021.751731](https://doi.org/10.3389/fpls.2021.751731)

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