



Trends in sustainable potato cultivation

By Lukie Pieterse

The potato, a staple food for millions across the globe, finds itself at a critical juncture. The industry is navigating a complex matrix of challenges, ranging from climate change and environmental sustainability to evolving market demands and global food security concerns. These challenges are shaping the present and defining the future trajectory of potato cultivation.

At the heart of this transformation is a growing emphasis on sustainability and resilience. The agricultural sector, including the potato industry, is increasingly recognising the need to adopt practices that are ecofriendly, economically viable and socially responsible. This shift is driven by a deeper insight of the interconnectedness of our ecosystems and the impact of agricultural practices on the planet and its inhabitants.

In response to these challenges, stakeholders from diverse sectors are coming together. The focus of this collaborative effort is on the research and development of sustainable potato varieties.

This endeavour is marked by several emerging trends, each addressing different aspects of sustainability and resilience. From leveraging cutting-edge genetic research to adopting age-old farming practices in new ways, the potato industry is transforming. This ensures sustainability and sets a precedent for other agricultural sectors.

As we delve into each of these trends, it becomes clear that the future of potato cultivation is being rewritten.

Disease resistance

Potatoes are threatened by various diseases. Chief among these is late blight and potato cyst nematodes. These lead to substantial yield losses

and necessitate the use of chemical pesticides.

The development of disease-resistant cultivars is trending. This represents a paradigm shift in agricultural practices, moving away from chemical dependency towards a more holistic approach to crop health.

Disease-resistant potatoes are a culmination of cutting-edge genetic research and traditional breeding methods. Scientists are identifying and isolating genes that confer natural resistance to specific diseases. These genes are then introduced into popular potato varieties through advanced breeding techniques, creating new cultivars that inherently resist diseases.

The development of the Sarpo Mira variety in Scotland, known for its exceptional resistance to late blight, has been a game-changer. This variety, developed through traditional breeding methods, has shown remarkable resilience to blight outbreaks.

By reducing its dependency on chemical treatments, these varieties lower production costs and mitigate environmental pollution and health risks associated with pesticide use.

Reduced carbon footprint

Agriculture contributes greatly to global greenhouse gas (GHG) emissions. There is an increasing focus on sustainable agricultural practices due to climate change. Potatoes are emerging as potential allies in the fight.

The development and adoption of varieties that contribute to carbon sequestration is a good example. Carbon sequestration refers to capturing and storing atmospheric carbon dioxide. Certain potato varieties have shown an enhanced ability to sequester carbon in the soil.

Potatoes influence carbon sequestration in several ways:

- **Root system:** Potatoes have a dense root system that contributes to soil organic matter. As the roots decompose, they become part of the soil organic carbon pool, effectively locking away carbon that would otherwise be released into the atmosphere.
- **Crop residues:** After harvest, the leaves and stems of potato plants add to the soil organic matter as they decompose, further contributing to carbon sequestration.
- **Soil health:** Healthy potato cultivation practices, such as reduced tillage and cover cropping, can enhance soil health and its ability to store carbon. Healthier soils with higher organic matter content can store more carbon over longer periods.

Breeding programmes focus on selecting potato varieties that are high-yielding, disease-resistant and efficient in carbon sequestration. This involves understanding the genetic traits that influence root growth and decomposition rates, as well as how these plants interact with soil microbes.

Reducing the carbon footprint of one of the world's major food crops can have a substantial impact on agriculture's contribution to GHG emissions.

Sustainable farming practices play a crucial role in maximising the carbon sequestration potential of potatoes. Crop rotation, organic farming, and precision agriculture support the health and yield of potato crops and enhance their environmental benefits.

By addressing the carbon footprint, the potato industry is contributing to global efforts to combat climate change. This trend aligns with the United Nations' sustainable development

goals, particularly those related to climate action and sustainable land use.

Drought tolerance

In a world increasingly affected by climate change, water scarcity is becoming a critical challenge, particularly in agriculture. Droughts occur more frequently due to global warming. This shift poses a threat to crops such as potatoes that are traditionally reliant on consistent water supply. In response, the development of drought-tolerant potato varieties has become a key focus in sustainable agriculture.

Potato cultivation is water intensive. In regions facing water scarcity or restrictions, the ability to grow potatoes with less water is an agricultural advancement and necessary for food security.

The quest for drought-resistant potatoes involves both traditional breeding methods and advanced genetic techniques. Scientists are identifying and harnessing genetic traits that enable potatoes to thrive with less water. These traits include:

- *Deeper root systems*: Deeper roots can access water from deeper soil layers, reducing their reliance on surface water.
- *Waxy leaf surfaces*: Leaves with a waxy coating reduce water loss through transpiration, helping the plant retain moisture.
- *Efficient water use*: Some varieties are being bred to use available water more efficiently, ensuring maximum yield with minimal water input.

In parts of Africa and South America, producers are successfully growing new varieties that maintain yield and quality under reduced irrigation. These successes demonstrate the viability of drought-tolerant potatoes in real-world agricultural settings. Producers in drought-prone areas can maintain potato production without the need for extensive irrigation systems. This shift conserves precious water resources and reduces the energy and costs associated with irrigation.

Developing drought-tolerant potatoes is part of a broader strategy to make agriculture more resilient to climate change. These varieties are often bred to withstand other stressors, such as high temperatures and salinity, making them well-suited for the changing environmental conditions expected in many potato-growing regions.

Advances in genomics and plant physiology are accelerating the development of new varieties. Moreover, as these varieties become more widely available, they have the potential to transform potato farming in arid and semi-arid regions around the world.

Market demand and collaboration

There has been a significant shift in consumer preferences towards sustainability in the food sector. A growing awareness of environmental issues, health concerns, and a desire for quality and traceability in food products drives this change. The potato industry is responding by focussing on sustainable potato varieties.

Consumers are increasingly seeking out products that are grown in an environmentally friendly and socially responsible manner. This includes preferences for organically grown potatoes, locally sourced varieties, non-genetically modified organisms and heritage varieties.

Many producers are transitioning to organic farming and exploring a wider range of potato varieties, including those that are better suited to local growing conditions and consumer tastes.

Retailers and the food industry play a crucial role in shaping consumer preferences. By offering a variety of sustainable potato products and promoting their benefits, these entities can drive consumer choices towards more sustainable options.

Transitioning to sustainable farming practices can require significant investment and a learning curve for producers. Meeting the specific preferences of diverse markets can be complex, requiring careful selection and cultivation of appropriate potato varieties. Innovation and adaptation are key.

This trend involves the synergistic efforts of various stakeholders – including academic institutions, government agencies, private companies, and international organisations – working together to address the complex challenges facing potato cultivation.

Collaborative research encompasses a wide range of activities, from genetic research and breeding programmes to field trials and the dissemination of best practices. The primary goal is to develop potato varieties that are more sustainable in terms of environmental impact and resilient to climate change, diseases, and other challenges:

- *Genetic research and breeding*: Focus on potato varieties that are disease-resistant, drought-tolerant, and capable of thriving in diverse environmental conditions. This involves sharing genetic resources, technologies, and expertise across borders and institutions.
- *Sustainable farming practices*: Partnerships work towards developing and promoting sustainable farming practices. This includes research into soil health, water management, and organic farming techniques that can be adopted by potato producers worldwide.
- *Climate change adaptation*: Collaborative research is increasingly focussing on developing potato varieties and farming practices that are resilient to changing weather patterns, temperatures, and precipitation levels.

Numerous successful collaborations highlight the effectiveness of this approach. For instance, the International Potato Center works globally to improve potato genetics and share knowledge on sustainable cultivation practices. Similarly, collaborations between universities and agricultural research institutes have led to the development of new varieties. 

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