The challenging world of the potato producer

By Lukie Pieterse

The potato industry has been a landscape of innovation and adaptation as stakeholders across the globe respond to a wide array of trends and pressures. From the encroaching effects of climate change to technological advancements sweeping through the fields and supply chains, the industry has been shaped by the interplay of environmental, technological and market dynamics.

These factors have ushered in both challenges and progress for potato growers, processors, and retailers, driving change and shaping the future of the industry. This article addresses the factors that are the most difficult to control – those relating to nature.

Climate change

The potato industry was significantly affected by climate change last year, leading to unpredictable weather patterns and increasingly hostile growing conditions. These changes have posed challenges for potato growers worldwide, impacting yield and quality. Producers contended with droughts, heatwaves, flooding in some regions and unseasonal rains in others.

A study involving 553 producers across 22 European countries, funded by the European Union's (EU) Horizon 2020 programme, reveals climate change's impact on potato farming. Drought and heat, resulting from global warming, could cause potato yields to decrease by 18 to 32% by 2069. Current farming strategies are not sufficient, and effective adaptive methods could result in losses. The research highlights the need for improved potato varieties, better knowledge exchange, and wider use of climate-resilient strategies.

A second European EU-funded study highlighted the vulnerability of potato crops to climate shifts, with extreme weather events drastically reducing yields. The study emphasised the importance of proactive adaptation measures to mitigate these losses.

Carbon dioxide (CO_2) fertilisation has the potential to enhance potato growth. However, the benefits of CO_2 fertilisation are limited and do not fully offset the negative impacts of rising temperatures and water stress.

The EU study highlighted the need for affordable and accessible solutions, as many producers lack irrigation systems. Producers have shown awareness of climate change's effects and have started favouring potato varieties that exhibit resilience to harsh weather conditions, such as heat tolerance and disease resistance. However, there is a disconnect between breeders and producers, with limited information transfer regarding breeding programmes and the availability of stress-resistant varieties.

Global weather impact

Ukraine's potato industry was (and still is) under strain due to a combination of erratic weather and geopolitical conflict, according to the vice president of the Ukrainian Potato Growers Association. A wet spring and dry summer led to delayed planting and lower yields in the country.

Due to poor weather and devastating floods, there has been a significant reduction in potato supplies in Britain in the latter part of 2023, leading to a substantial increase in prices. The spot price of potatoes in November was reportedly at least double the usual rate for that time of year.

The 2023 potato harvest in Ireland faced severe challenges due to heavy rains and waterlogged fields. The Irish Farmers' Association issued several reports on a challenging year with delayed planting and rotted crops in many parts of the country.

In Bolivia's high-altitude Potosí region in Latin America, erratic weather and climate change threatened the staple potato crop, essential for local families. A 'heat dome' raised temperatures to 45°C, causing Bolivia's highest-ever recorded winter temperature.

A Canadian-led team developed a comprehensive genetic roadmap of the potato to enhance its resilience to climate change. The study, led by McGill University's Martina Strömvik, created a super-pangenome of the potato, identifying genetic variations that could be used to breed hybrid, climate-resilient varieties. The research could help develop potato varieties resistant to extreme weather and diseases, using clustered regularly interspaced short palindromic repeats (CRISPR) gene-editing technology.

Pest management

Pest management is a critical aspect of potato cultivation, as pests can cause significant reductions in yield and quality.

RNA interference (RNAi) technology has emerged as a promising approach to pest management. GreenLight Biosciences' bioinsecticide, Calantha, is an example of such advancements. Calantha utilises RNAi technology, which silences specific genes crucial for the Colorado potato beetle's survival. This bioinsecticide is designed to be species-specific, minimising the impact on beneficial insects and the broader ecosystem. RNAi-based products offer targeted pest control without leaving toxic residues on crops or in the soil, addressing environmental and

sustainability concerns associated with broad-spectrum chemical pesticides.

Biological control agents involve the use of natural predators or parasites of potato pests to keep their populations in check. Ladybirds, predatory beetles, and parasitic wasps are examples of biological control agents that have been employed as part of integrated pest management (IPM) programmes. By incorporating these agents into the farming system, producers can reduce reliance on chemical pesticides, promoting a more balanced and sustainable agricultural ecosystem.

Pheromones, genetic engineering

Pheromone technology has proven effective in monitoring and disrupting pest populations. Pheromone traps lure pests using chemicals they produce to communicate with each other. These traps serve as an early warning system, enabling producers to implement timely and targeted interventions. By interrupting mating, pheromones help suppress future generations of pests without the use of harmful insecticides.

The development of pest-resistant potato varieties is another critical aspect of pest management. Traditional breeding methods and genetic engineering techniques have been used to produce potato cultivars that are less susceptible to pest attacks. These resistant varieties often possess traits such as thicker skins or foliage that pests find unpalatable, or they may produce compounds that are toxic to specific pests. Cultivating these varieties can significantly decrease the need for pesticide applications, leading to more sustainable farming practices.

Precision agriculture has transformed pest management by enabling more efficient and targeted use of inputs. Technologies such as GPS-guided machinery, drones, and sensors allow for the precise application of pesticides only where and when they are needed. This reduces the overall volume of pesticides used and mitigates the impact on non-pest species and the environment. Data analytics and predictive modelling have also enhanced pest control strategies by providing insights into pest behaviour and lifecycle patterns.

Challenges remain in pest management, including the development of resistance to new technologies and the need for continuous research and monitoring. It is crucial to ensure that the deployment of new pest management tools does not have unintended consequences for the ecosystem or human health. Training and education for producers in the use of these tools are equally important to maximise their effectiveness.

Management strategies

IPM involves the use of a combination of practices, including biological control agents, advanced monitoring techniques, and pest-resistant potato varieties, to manage pests while minimising the use of chemical pesticides. By maintaining ecological balance, producers can reduce the impact on non-target organisms and promote a more sustainable agricultural ecosystem.

Water management is a crucial aspect of sustainability in potato cultivation. Precision irrigation systems are being developed to optimise water use by delivering the exact amount of water needed at the right time. Soil moisture sensors and weather forecasting tools enable producers to make informed decisions and minimise water waste. Efficient water management not only conserves a valuable resource but also reduces the potential for water-related environmental issues.

Regenerative agriculture takes sustainability practices further by aiming to restore and enhance natural resources used in farming. Fewer tillage or no-till techniques decrease soil disturbance, preserve soil structure, and sequester carbon. Organic amendments such as compost and manure are used to build up soil organic matter, improving soil health and water-holding capacity. Agroforestry practices, where trees are integrated into the farming system, provide habitat for beneficial wildlife, improve crop resilience, and contribute to carbon sequestration.

The concept of the circular economy gained traction within the potato industry in 2023. Efforts are being made to minimise waste and make the most of resources. Potato processors are finding innovative uses for by-products, such as converting potato peel and waste into bioplastics, animal feed, or energy through anaerobic digestion. Sustainability certifications, such as those from Rainforest Alliance or Organic Certification, have become important to producers to signal their commitment to environmental stewardship to consumers.

Partnerships between potato producers, environmental organisations, and research institutions have emerged to share best practices and improve sustainable and regenerative agriculture techniques. These collaborations often result in the implementation of cutting-edge technologies designed to decrease environmental impact and enhance crop productivity.

Final thoughts

Global potato production is diverse, with variations across regions. The industry has witnessed advancements in pest management practices and a focus on sustainability and regenerative agriculture to minimise the environmental footprint of potato production.

The potato industry is demonstrating resilience and adaptability in the face of challenges. By embracing innovation, collaboration, and a commitment to sustainability, the industry is well-positioned to meet the demands of a growing global population while ensuring the long-term viability of this vital agricultural sector. Continued efforts in research, technology adoption, and sustainable practices will be key to the industry's success in the future.

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