

# Exploring the Benefits and Challenges of Twin-Row Planting in Northern Maine

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## Abstract

The demand for sustainable agriculture practices has increased significantly in recent years due to global population growth and the need to maximize food production while minimizing resource consumption. The study investigates twin-row potato planting in Northern Maine, focusing on optimizing land use efficiency. This method, involving closely spaced double rows of potato plants, enhances yield per unit area by maximizing soil nutrients, water utilization, and chemical consumption. Twin-row planting boosts productivity while minimizing environmental impact, presenting a promising avenue for sustainable agriculture. However, further research is necessary to evaluate its long-term effects and applicability across various agro-climatic conditions.

## Initial Concept

- Increased plant population:** By adopting the twin-row potato production system and increasing row spacing from 3 ft (91.4 cm) to 3.5 ft (106.7 cm), the plant population can increase by 40–60% (Fig. 1). This higher plant density can result in greater overall potato yield per unit area.
- Increased profit:** With a higher plant population and improved land use efficiency, potato growers can potentially increase their profits. This is because land rental, labor, and spraying costs are often based on acres. By utilizing the available land more effectively and increasing yields, the revenue generated per acre can be higher, leading to increased profitability.
- Reduced spraying materials:** Herbicides, insecticides, and fungicides are generally applied based on acres. Improved land efficiency, achieved through increased plant population without expanding acreage, has the potential to reduce overall spraying materials. With increased plant density and better light interception in the twin-row system, there may be a potential reduction in the need for spraying materials to control pests and diseases.
- Reduced fertilizer usage:** In the twin-row potato production system, the improved utilization of soil nutrients and water can lead to more efficient nutrient uptake by the plants. This could result in reduced fertilizer requirements, which is beneficial for cost savings and minimizing environmental impact.

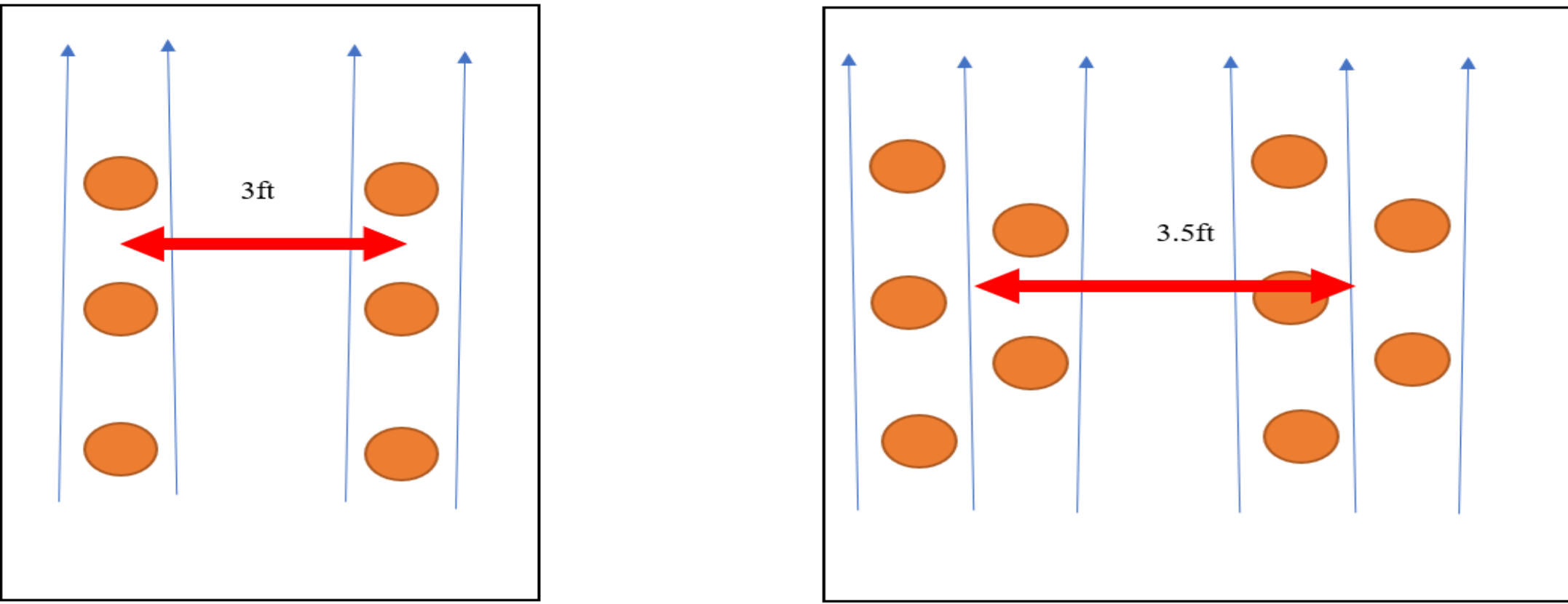


Figure 1. Diagram of the standard row spacing (left) versus twin-row spacing (right). NOTE: Orange indicates seed potato; blue line indicates fertilizer band.

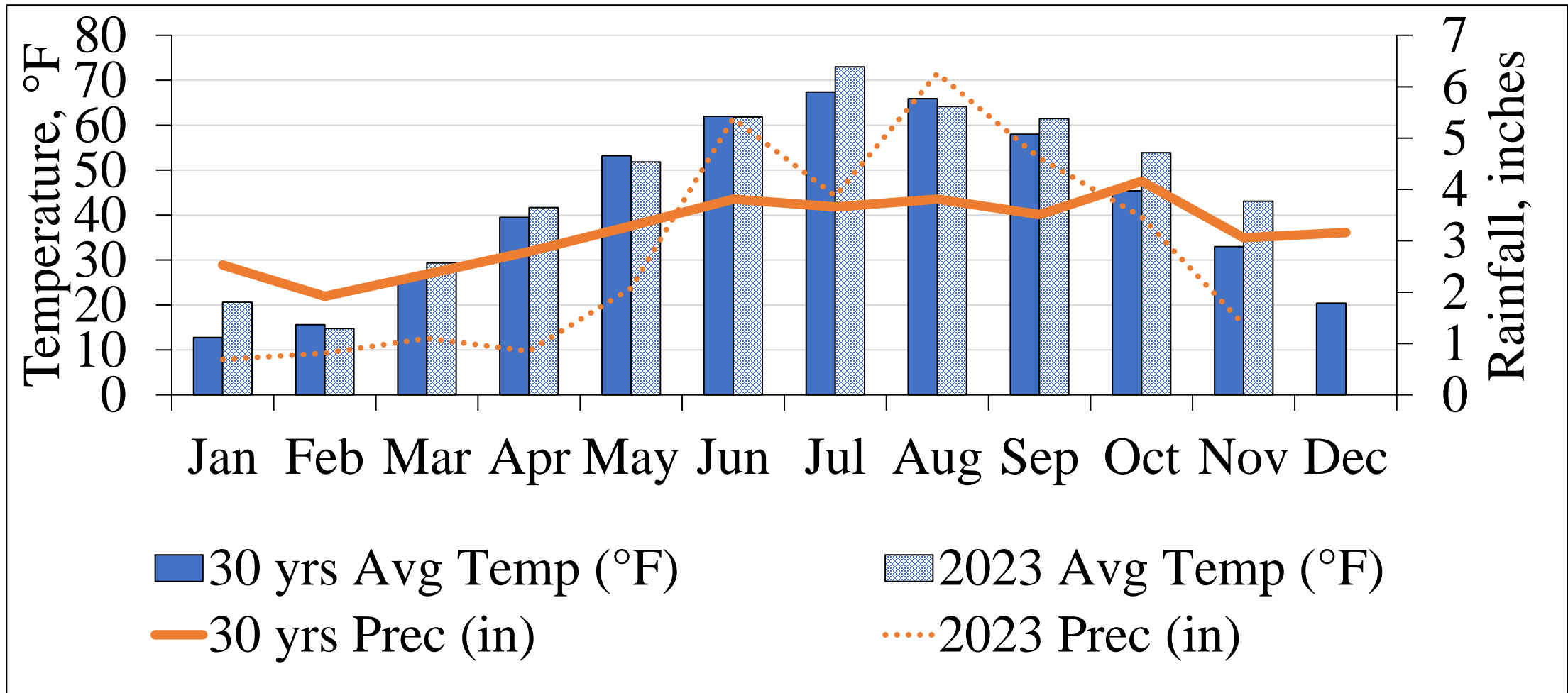


Figure 2. 30-year average temperature (°F) and Precipitation (in) and Year 2023 average temperature (°F) and Precipitation (in) in Presque Isle, ME.

## Obstacles and Challenges

Northern Maine potato growers face several obstacles that can impact their agricultural practices and overall productivity. Some of the KEY CHALLENGES include:

- Shorter growing season:** Northern Maine generally has a shorter growing season compared to other potato-growing states. The limited time for planting, growing, and harvesting potatoes can put pressure on growers to optimize their practices and make the most of the available time (Fig. 2).
- Labor shortages:** Northern Maine has a small population, Finding and retaining skilled labor for tasks such as planting, cultivating, and harvesting potatoes can be challenging for growers.
- Cold weather and frost risk:** Frost and cold weather can damage potato crops, especially during the early planting stages. Growers need to carefully time their planting to minimize the risk of frost damage and ensure proper crop development.



Fig. 3. Twin-row spacing with Caribou Russet Variety during the growing season (left), twin-row planting using the planter before hilling (center), and discussion with Haines Manufacturing before using the self-made potato twin-row planter (right). Photo credit: Bee Chim, 2023.

## Preliminary Results

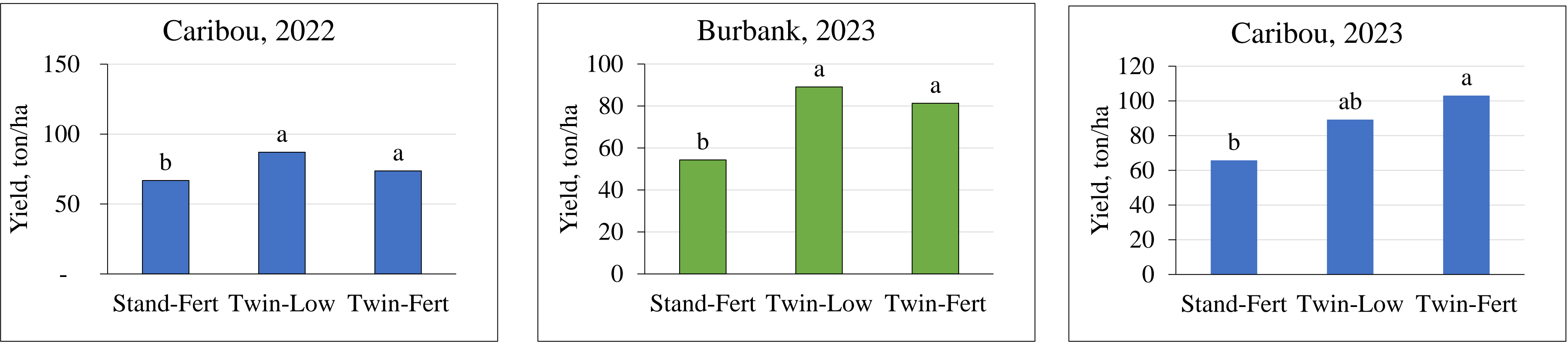


Fig. 4. Total yield (ton/ha) within twin-row (106.7 cm) and standard row (91.4 cm) with low fertilization (15% reduction) and standard fertilization, on Caribou Russet Variety in 2022–2023, and Russet Burbank in 2023, Presque Isle, ME.

## Improvements/Future Research

- Planting with different varieties to identify the potential markets for either seed growers or table stock growers.
- Taking other measurements, such as stem count, Normalized Difference Red-Edge Index (NDRE), and petiole samples, to justify nutrient uptakes and potato yield quality.
- It's important to note that the specific outcomes mentioned above may vary depending on various factors, such as soil type, climate conditions, potato variety, and the expertise of the growers. Conducting further research and field trials can provide more concrete evidence of the potential benefits of adopting the twin-row potato production system and increasing land use efficiency.

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