Cost of supplemental irrigation for potato production in Prince Edward Island

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Highly variable precipitation in the growing season presents a challenge for consistent potato production in Prince Edward Island (PEI). Potato growers have shown an increasing interest in supplemental irrigation for mitigating drought risk. However, information regarding local costs for different irrigation systems is lacking, posing a barrier for doing cost-benefit analyses and making irrigation investment decisions. An estimate of the costs associated with typical irrigation systems in PEI was made with the assistance of four growers.

Of the four farmers, two provided cost data for center pivot irrigation systems (Pivot I and Pivot II), one supplied cost data for irrigation using a hose reel and sprinkler, and another shared cost information for a hose reel and boom cart. Pivot I was used to irrigate one field per year with a dedicated water supply system; it covered three fields ranging from 95 to 100 ac over three years under a crop rotation system. The smaller Pivot II was moved back and forth to irrigate two adjacent 50-ac fields per year with a shared water supply system; it served six fields over three years under a crop rotation system. The reel sprinkler was used to irrigate two 50-ac fields annually, each with a separate water supply system; this reel sprinkler covered six fields over three years under a three-year potato rotation. Similarly, the reel boom cart was moved back and forth to cover two 50-ac fields per year with separate water supply systems and was used to irrigate six fields over three years under a three-year potato crop rotation.

The overall cost of each irrigation system comprised annual ownership and operation costs. Annual ownership costs included capital depreciation and interest payments. Capital costs covered equipment purchase, piping installation, water reservoir (or pond) construction and accessories (e.g., float and in-pond pump), power access (power line, electrical panel, and wiring), well drilling, and in-well pump installation. Operation costs included services (setting/wrapping up, system operation/mobilization, and app subscription) and fuel/electricity. The total capital cost over the capital asset lifespan was annualized to provide a uniform annual capital cost per acre, including interest. In this process, the capital asset was assumed to have a 25-year lifespan with an annual depreciation rate of 8.1% (i.e., the salvage value was 12% of the total capital cost). The growers agreed that a bank loan for 85% of the capital investment was usually obtained, and the total interest over 25 years was calculated using an annual rate of 5% over a five-year term amortized over 25 years. The annual interest payment was calculated on a per-acre basis as the total interest paid divided by 25 years. The results are summarized in Table 1.

Among the cost items, ownership accounted for 61%, 84%, 48%, and 70% of the total costs for center pivots I and II, the hose reel and sprinkler, and the hose reel and boom cart (Table 1), respectively. This means that growers had to pay the majority of the total annual irrigation cost to have the irrigation system in place in three out of four cases, regardless of whether or not they irrigated or how often. Pivot I was 52% more expensive than pivot II because it is a larger system, with one pass covering about twice as much area as pivot II. Although the two pivots required a similar investment in developing a water supply system and were used to irrigate a similar total area in one year, the total annual cost of using pivot II to irrigate was about 52% lower. This was due to pivot II being moved back and forth to irrigate two 50-ac fields with a shared water supply system, lowering the unit capital cost. Additionally, the service cost for pivot II, which had access to a cheaper power source, was lower. The overall costs for the reel sprinkler and boom cart systems were considerably higher than the two pivots. The reel sprinkler had higher ownership costs and was powered by diesel, incurring higher operation costs. The boom cart system's extensive piping contributed to higher ownership costs. These cost data suggest that different irrigation systems require varying levels of investment and that operation and water supply system costs are field-dependent. Using site-specific parameters, including the type of irrigation system, financial variables, capital depreciation rates, power/fuel, and service costs, would produce a more accurate estimate.

Table 1 Cost of supplemental irrigation for potato production in PEI

Irrigation equipment and water supply system	Pivot I covers one 95-ac field/year with a dedicated water supply system	Pivot II covers two 50-ac fields/year with a shared water supply system	Hose reel & sprinkler covers two 50-ac fields/year with separate water supply systems	Hose reel & boom cart covers two 50-ac fields/year with separate water supply systems
Equipment ($/ac)	140,000/95	92,000/100	68,000/100	100,000/100
Piping ($/ac)		28,000/100	56,000/100	130,680/100
Water pond + accessories ($/ac)		45,000/100	83,000/100	45,000/100
Well (s) + pump (s) ($/ac)		30,000/100	90,000/100	75,000/100
Power access ($/ac)		15,000/100	45,000/100	
Total asset ($/ac)	250,000/95	210,000/100	342,000/100	350,680/100
Depreciation ($/ac/year)	93	74	120	123
Interest ($/ac/year)	83	53	102	89
Ownership cost ($/ac/year)	176	127	222	212
Power/fuel use ($/ac/year)	5		104	50
Services ($/ac/year)	103		135	40
App. subscription ($/ac/year)	3			
Operation cost ($/ac/year)	111	24	239	90
Total cost ($/ac/year)	287	151	461	302
Marketable yield increase from irrigation required to break even (CWT/ac/year)	25	13	40	26

Notes: All costs are in (or approximately equal to) 2018 Canadian Dollars. Operation cost was based on five water applications per year.

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