## REFRIGERATION & VENTILATION
# Ventilating Correctly After Cool Down Pays Off

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Adequate ventilation to manage the by-products of respiration and maintain a uniform pile temperature is critical to managing one's potato pile through long-term storage. Yet, over-ventilation can cause significant quality and weight loss, as well as increasing power consumption unnecessarily.

Potato tubers oxidize glucose in their mitochondria to produce the nutrients that keep them viable through dormancy. This respiration produces significant heat, moisture and carbon dioxide as by-products. While the water is retained in the tubers' cells, the $CO_2$ and heat released must be removed from the storage space in order to maintain a consistent, optimal storage environment.

Successful long-term tuber storage depends on maintaining uniform humidity and temperature throughout the pile. The ideal relative humidity for dry, healthy tubers is 92-97 per cent, and 80-90 per cent for wet, leaky tubers. For most varieties and end-uses (excluding certain processing varieties), the temperature differential between the top and bottom of an 18 foot pile should not exceed 1.5 C (2.7 F). Consult with industry experts to determine differential recommendations for your varieties.

To manage temperature fluctuations caused by internal and external convection factors such as cold spots near doors in winter, additional fan time run periodically throughout the day may be necessary.

Buildings with inadequate insulation and/or drafts may require continuous ventilation to prevent condensation and maintain temperature. Opting to invest in building improvements to address these issues is a wise investment that will result in a significant improvement in tuber quality, reduced weight loss, and energy savings.

Invest in accurate temperature sensors for your pile and then calibrate them regularly. The ventilation system should include controls that automatically turn on ventilation when the sensors identify a heat differential exceeding user-set limits.

Managing $CO_2$ levels is also critical, particularly for processing varieties. $CO_2$ should not exceed 2500 ppm for most French fry varieties and 2000 ppm for chipping potatoes (as well as certain French fry varieties). Removing $CO_2$ often requires sacrificing the supply temperature to maximize fresh air intake. $CO_2$ should be purged in brief intervals so tubers are not subjected to unfavourable temperatures for long.

Typically, 120 cfm per ton of potatoes per day of ventilated air is enough to manage the by-products of respiration. Determine the amount and schedule of ventilation by the variety and condition of the crop, its end use, and the airflow capacity of the ventilation system. More ventilation is necessary when the crop's respiration rate is higher, especially in warmer temperatures or if tubers are immature, damaged or diseased. ○

## FERTILIZER
# Understanding P in Your Soil

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Phosphorus plays an incredibly important role in a potato crop's ultimate yield and quality. Ensuring a crop's access to adequate phosphorus is not always easy, however. Because phosphorus has complex, inconsistent soil solubility, it can sometimes be unavailable to plants even in fields where it exists at relatively high levels. Simply dumping on more phosphorus to compensate brings economic, agronomic and environmental repercussions. For these reasons, carefully managing one's phosphorus needs to be a high priority for every potato producer.

A 300 to 500 cwt potato crop requires between 60 and 90 lbs/ac of phosphorus, most of which is absorbed during bulking and about two thirds of which is removed from the field at harvest. While the same crop requires significantly more nitrogen and potassium (about 130 to 215 lbs/ac and 145 to 240 lbs/ac respectively), phosphorus can be tied up in soil, resulting in much lower fertilizer use efficiency.

To overcome phosphorus' low efficiency, farmers often over-fertilize at the beginning of the season, or top up phosphorus via multiple in-season foliar or fertigation applications. Unfortunately, excessive phosphorus fertilizing is economically inefficient, can negatively affect the availability of zinc and other essential crop nutrients, and can lead to damaging nutrient leaching or run-off into ground or surface waters.

Since potatoes have relatively low phosphorus foraging ability, they benefit from aggressive, proactive phosphorus management. Optimizing phosphorus availability requires a combination of practices, fertilizer sources, application timings and placements determined by both the growing environment and the crop's agronomics.

Phosphorus is typically band or broadcast applied at or near planting. Broadcasting is only effective if the broadcast phosphorus is incorporated evenly throughout potato's 12 inch root zone to allow the highest possible root interception. Side-dressing phosphorus post-planting is the poorest application method as surface applications will not reach roots and incorporated applications can damage roots.

Water soluble phosphorus fertilizers applied at or near planting tend to release their phosphorus rapidly, often before peak potato demand. Often, the delay between the nutrient's release and the crop's peak uptake is long enough for the nutrient to become fixed in the soil and unavailable.

Some growers choose to apply foliar sprays and fertigation applications multiple times throughout the growing season. While these can be effective, the crop must be extremely carefully managed to ensure phosphorus levels do not drop below critical levels between applications.

Other growers opt for a combination of an early-season water soluble phosphorus combined with a slow release mid-late season phosphorus in order to ensure adequate nutrition from vegetative growth.

Not sure if your phosphorus application is optimizing your crop potential? Soil testing is always wise and should be the foundation for all of your fertilizer investment decisions across all your crops. ○