

Dry litter and ventilation

Circulation fans



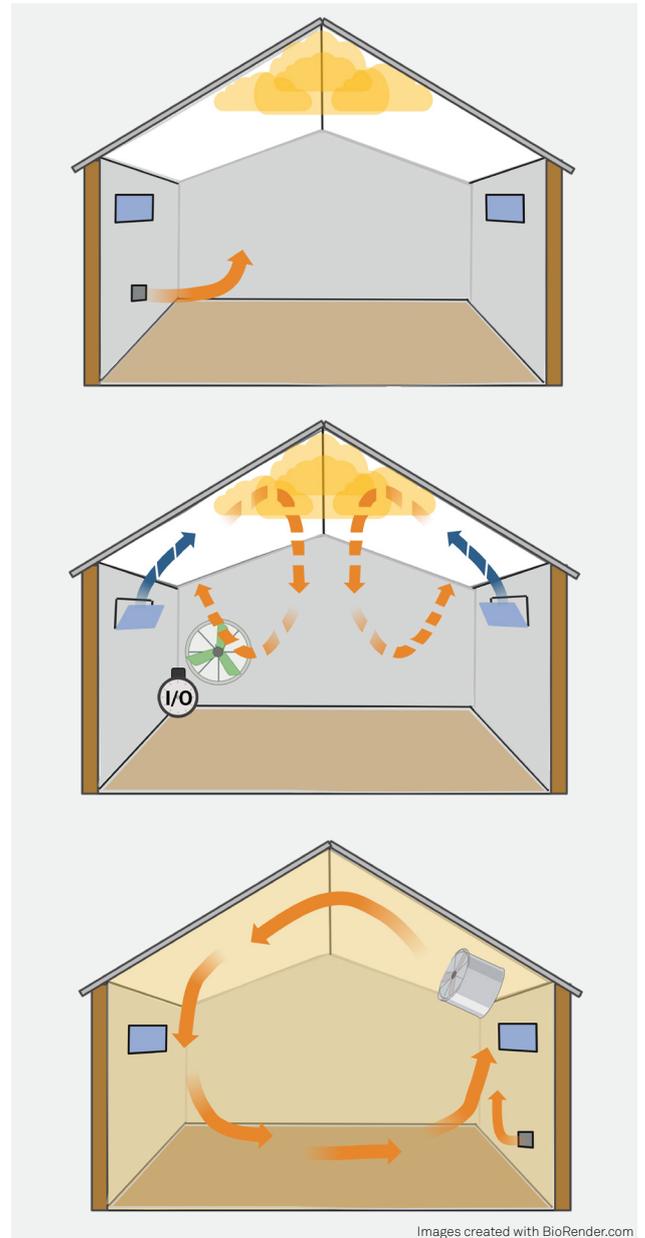
Introduction to circulation fans

Circulation fans systems redistribute hot air that collects at the ceiling of the shed. Hot air accumulates when minimum fans turn off (top), when there are low levels of ventilation, or when air currents in the shed are inadequate or poorly defined (centre). Poor air movement in the shed may be due to incorrectly adjusted side-wall vents, not enough static pressure, obstacles in the shed or on the ceiling, or due to duty cycles not running long enough to get all of the air in the shed moving. This leaves hot air against the ceiling and doesn't generate air movement across the litter surface to remove water from the litter.

Running circulation fans constantly (bottom) is one way to mix the warm air throughout the shed to produce more uniform conditions.

There are different styles of circulation fans. Most are mounted on the ceiling where the hot air accumulates. Some fans blow air directly towards the floor while others pull the warm air down and blow it horizontally in all directions, but usually well above the litter surface to minimise drafts. Other circulation fans blow air horizontally and are installed as a system of fans. Warm air is blown from one circulation fan to the next, and then the next, to build air momentum within the shed and get all the air moving.

All these circulation fan styles redistribute warm air and bring it down towards the litter. By doing so, some heat is transferred to the litter and the relative humidity of air that is in contact with the litter is reduced. This improves two of the elements required for drying litter and will have positive benefits. However, to maximise the drying effect it would be beneficial to add air speed at the litter surface (for more information, refer to fact sheet *The elements of drying litter*).



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A grower's experience with circulation fans

Andy, a farming manager in Victoria, has trialled several options to improve the in-shed environment and prevent wet litter. He has found circulation fans to be the most effective. The circulation fans Andy uses are suspended below the ceiling to pull the warm air down and blow it horizontally in all directions.

Andy uses several different bedding materials depending on the season and availability. He says circulation fans have been key to successfully using materials that are prone to caking, such as straw.

"Weather in our area isn't perfect in winter and can be very unpredictable," he said.

"Thanks to circulation fans, we achieve really good litter conditions throughout the batch despite the outside weather.

"Using finely chopped straw and circulation fans, we can achieve litter conditions that are as good on day 18 as day one in winter, often without any litter tilling.

"With any bedding material, it comes down to how well you manage all aspects of production—such as ventilation, drinker height and pressure—to ensure the success of your litter.

"Keeping the litter dry from day one, aided by circulation fans, means we don't need to till the litter until day 14 to 18, and then it only needs tilling one or two more times during the batch."

Circulation fans have helped keep the litter drier and reduce the need for tilling, in addition to effectively managing all other aspects of production (ventilation, drinker height etc.). As well as helping keep litter drier and more friable, Andy has found that circulation fans have reduced his gas heating bill by an estimated 20 to 25%.

Andy, Victorian grower

The following case study describes a trial of a higher-powered circulation fan system designed to produce air speed at the litter surface to accelerate the drying of wet litter.

Research case study – Higher-powered circulation fans (University of Georgia)

With an increasing focus on keeping litter dry and friable, research studies have investigated the additional benefit of using more powerful circulation fans that produce more air movement at the litter surface to accelerate drying, rather than just re-distributing heat in the shed.

A study by the University of Georgia demonstrated how circulation fans can increase the air movement across the litter and reduce litter moisture content.

- Circulation fans mounted on the ceiling blow air from one fan to the next. This creates a whole system that moves air throughout the entire shed.
- Air returns to the fans after travelling along the litter surface with an air speed of 0.8 to 1 m/s.
- Fans are directed very slightly towards the ceiling so the air attaches to the ceiling surface and doesn't interfere with the return air travelling back along the floor.
- The total fan capacity in cubic metres per hour (m³/hr) needs to be about 12 to 15 times the shed volume. (If a 150 x 15 m shed has a volume of 8000 m³/hr, the total capacity of the circulation fans should be 96,000 to 120,000 m³/hr. This would require 16 to 20 circulation fans with 6,000 m³/hr capacity, or 10 to 12 circulation fans with 10,000 m³/hr capacity)
- Wider sheds (greater than 14 to 15 m) benefit from having pairs of fans (as shown in the picture below).



Photo courtesy of University of Georgia, 2023

- Fans should be spaced closer than 18 to 21 m so the air blows from one fan (or pair of fans) to the next.
- It takes several minutes for the circulation fans to get all of the air in the shed moving and create steady air flow, so the fans were run continuously (at least until constant ventilation fans activity is required day and night).

The circulation fans enhance the removal of water from the litter. This water must be ventilated out of the house with minimum ventilation fans. The humidity in the shed should be measured and minimum ventilation increased if the relative humidity increases above 60 to 70%.

To achieve drier litter, relative humidity control was still essential. It had to be kept below 60% for the circulation fans to significantly reduce litter moisture content and the presence of wet litter.

The combination of maintaining a moderate house relative humidity (less than 60%) and increased air speed was beneficial for:

- more evenly distributing birds across the entire house
- litter conditions (less wet litter and caking, overall drier and more uniform litter)
- footpad quality (reduced severity and occurrence of footpad lesions)
- reducing ammonia.

These studies also showed air speed did not affect chicken performance. The researchers suggested that circulating warm air was not harmful in the same way as cold drafts.

More resources

- Using circulation fans to keep litter dry – webinar with Connie Mou <https://www.youtube.com/watch?v=oX2AKsZL4Pg>

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