



Figure 1. Traveling gun irrigation system. Gun pressure typically ranges from 40 to 80 psi.



Figure 2. Center pivot or linear move with high-pressure (20-30 psi) drop nozzles.



Figure 3. Hosedrag sprayer with 5 nozzles operating at less than 5 psi.

sion because it is related to the area where wastewater application occurs. Are there neighbors nearby, or is that potential likely? Is the site close to high-impact areas (historic sites, parks, hospitals)? Have there been complaints; and if so, what is the frequency of these complaints? If complaints or regulatory pressure has been low, then perhaps simple solutions such as irrigation timing decisions or a vegetative windbreak are all that is needed.

Any type of management strategy that affects the type of crop or tillage must complement the farm's existing erosion-control plan. Further, soil incorporation may have limited value, as drift and odor can occur during application. Incorporation immediately after application can better control odor than allowing a waste product with persistent odors to remain on the surface. Most irrigated wastewater will soak into the soil and usually not result in persistent residual odor. In taller vegetation, odor may persist longer than on bare soil, because as the liquid intercepted by the vegetation evaporates, odorous gases are released. Liquids with higher solids content can present persistent odor problems. For those materials, soil incorporation in coordination with the farm management plan may be a good odor control measure.

There are many factors to assess when selecting wastewater application methods. Along with odor and drift, consider cost, ease of operation, applicability to the site, and maintenance requirements. Table 2 gives some general guidance and comments concerning various land application systems. The system types listed in Table 2 are not exactly parallel to those in Table 1. Table 2 defines the systems by category, without focus on the specific nozzle or sprinkler types that can be used with each system.

Summary

Many factors affect the potential for drift and odor from a wastewater application system, as well as the potential for such drift to become a problem for the community or environment. Drift and odor will increase with application equipment factors such as operating pressure and discharge angle (and height). Weather factors such as wind speed affect both drift and odor; however, some weather factors that can increase drift (such as high temperature and low relative humidity) can reduce odor. An operator should evaluate both management and equipment factors to help with odor and drift control.

Table 1. Most commonly used types of wastewater application equipment with simple definitions and relative potential for drift and odor.

Equipment type	Description	Relative Potential for Drift *	Relative Potential for Odor *
Big gun <i>Stationary</i> Traveling (Figure 1) <i>Center pivot/linear move</i>	<p>A sprinkler with a large bore opening, ranging from 0.5 to 2.0 inch diameter. Typical operating pressure is 40–80 pounds per square inch (psi).</p> <p>Typical height above ground surface is 4 to 6 feet</p> <p>Typical height above ground surface is 4 to 6 feet</p> <p>Typical height above ground surface is 10 to 12 feet</p>	High	High
Impact Sprinkler <i>Stationary</i> Center pivot/linear move	<p>A sprinkler with a small bore opening, generally from 1/8 to 3/8 inch diameter. Typical operating pressure is 25 to 60 psi.</p> <p>Typical height above ground surface is 1.5 to 5 feet</p> <p>Typical height above ground surface is 10 to 12 feet</p>	Moderately high to high (height dependent)	High
Drop nozzle <i>Center pivot/linear move (Figure 2)</i> Boom sprayer	<p>A nozzle typically attached to a drop hose and pressure regulator to allow water discharge at a height just above or just below the crop canopy. Typical operating pressure is 15 to 30 psi.</p> <p>Typical height above ground surface is 3 to 6 feet</p> <p>Typical height above ground surface is 2 to 4 feet</p>	Low to moderate	Low
Low drift drop nozzle <i>Center pivot/linear move</i> Boom sprayer	<p>A specialized drop nozzle designed to create a stream of water and minimize the fine droplets that are prone to drift. Typical operating pressure is 5 to 20 psi.</p> <p>Typical height above ground surface is 3 to 6 feet</p> <p>Typical height above ground surface is 2 to 4 feet</p>	Very low	Very low
Large diameter, low pressure discharge hose Boom sprayer Hosedrag sprayer (Figure 3)	<p>A device or opening designed for a large volume discharge at a very low pressure (less than 5 psi). These nozzles are typically 2 inches and larger, with a swath width usually less than 10 feet.</p> <p>Typical height above ground surface is 1 to 3 feet</p> <p>Typical height above ground surface is 1 to 3 feet</p>	Very low	Very low
Tanker wagon Broadcast Injected	<p>These are liquid tankers that also use a large diameter, low pressure nozzle for water distribution. Typical operating pressure is less than 10 psi.</p> <p>Typical height above ground surface is 3 to 10 feet</p>	Very low to low (height dependent)	Low
Drip emitter at ground surface below ground	<p>This is a specially designed tubing that discharges very low volumes of wastewater at low pressure. While internal operating pressures within the tubing may be high, discharge pressure is very low.</p>	Very low to none None	Very low None

For wastewater application systems not shown here, information may be available from the manufacturer or equipment dealer. *Source: Sheffield.

Reducing Drift and Odor with Wastewater Application

Table 2. Factors for selection and operation of various types of wastewater application equipment.					
System Type	Relative Cost	Operational demands	Applicability to the site	Maintenance requirements	Comments
Stationary big gun	Moderate	Low	Not suited to small fields or fields with slow infiltration rates	Moderate	
Small impact sprinkler	Moderate	Low	Suited well to small or oddly-shaped fields	Moderate	Smaller nozzles clog readily with wastewater solids. Smaller nozzles clog readily with wastewater solids.
Traveling gun unit	Moderate (A tractor is assumed to be available)	Moderate	Suited to medium to large fields. Not suited to moderately sloping or irregularly shaped land	Moderate	Mobile, easy to add additional acres
Center pivot and linear move systems	High	Low	Suited to large fields only. Not suited to moderately sloping or irregularly shaped land	Moderate	Per acre cost decreases as field size increases. Small nozzles are prone to clogging with wastewater constituents.
Boom sprayers	Moderate	High	Not suited to moderately sloping or dissected land	Moderate	Typically used in buffer or problem areas. Not practical to move frequently to cover large areas. Small nozzles are prone to clogging with wastewater constituents.
Hosedrag systems	Moderate	High- requires full-time operator	Applicable to a wide range of conditions. Possibly suitable for areas that cannot be covered by irrigation systems.	High-unit plus tractor	Relative cost does not include tractor, assumes one of adequate size available
Tanker wagon system	High	High- requires full-time operator	Applicable to a wide range of conditions. Possibly suitable for areas that cannot be covered by irrigation systems.	High-unit plus tractor	Cost figure does not include tractor, assumes one of adequate size available
Drip irrigation	Very high	Very high	Suited for small fields and small flows	High	Could be used in buffers/sensitive areas in conjunction with other systems. Wastewater must have very low suspended solids.

References:

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