How to use water optimally in the garden

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We all know from experience that Southern Africa is a region where water is scarce for most part of the year. Most of the rainfall takes place during 4-5 months of the year with frequent dry spells in between, while the remainder of the year is hot and dry. By following a few simple tips, any person with an ornamental- or vegetable garden can get more "crop" for every water drop used. These tips are also applicable for irrigation farming. When water is used optimally, it means that the potential water losses are minimized, while the plants still receive the water that they need for optimal growth.

In this article the different types of water losses will be discussed as well as measures that can be implemented to use the water efficiently and minimize the specific wastage. Note that all the different type of losses that are discussed will not necessarily take place simultaneously. Different methods of small-scale watering and irrigation will also be discussed.

Causes of water loss
- Water losses can occur by means of:
- Evaporation in the air
- Evaporation from the wet soil surface
- Run-off
- Water that is applied where it is not needed
- Over irrigation
- Non-uniform water application
- Leakages
- Exotic “water-thirsty” plants

Evaporation in the air
Losses to the atmosphere could be significant. With heat and wind, exposed water that is sprayed or in water bodies such as ponds, reservoirs or swimming pools evaporates into the atmosphere. Losses could be in the order of up to 50%. Irrigation should be scheduled early in the morning or late afternoon to minimize evaporation losses. Micro- and sprinkler irrigation systems should be operated at the correct pressure to minimize wind drift of spray mist, which occurs when the operating pressure is too high. Preferably, water bodies should be covered to minimize evaporation losses.

Evaporation from wet soil surface
This is responsible for the nice fresh smell of an irrigated garden. When the soil is bare or when the plant leaf canopy does not cover the soil sufficiently, unnecessary evaporation loss occurs from the soil surface. This loss could be 3mm on a hot day. For example, if 3mm was irrigated the loss is 100%, and if 10mm was irrigated, the loss is 30%. This loss could be minimized by placing a layer of mulch consisting of organic material on the bare patches and by irrigating late afternoon or at night. Providing partial shade by means of indigenous trees for ornamental gardens, or a shade net structure for vegetable gardens could limit evaporation also.

Run-off
Run-off takes place when the irrigation application rate exceeds the infiltration rate of
the soil. It is clearly seen when an emitter or
irrigation system is left irrigating in the same
place for too long. Valuable top soil and plant
nutrients could be lost in addition to the water
losses which could range from 10% to 30%
of the water applied. Care should be taken in
selecting an emitter with an application rate
that is lower than the infiltration rate of the
soil. Automation of the irrigation system would
provide a means to prevent irrigating for too
long time in one place.

Water that is applied where it is not needed
This is self-explanatory and happens in most
gardens. The losses could also be from 10%
to 30% of the water applied. Proper planning
of an irrigation system or care when placing a
sprayer could minimize this type of loss.

Non-uniform water application
Irrigation efficiency is a term used to describe
how much of the water that is applied through
an irrigation system gets stored in the soil
within the root zone of the plant and becomes
available to the plant. Efficiency is determined
by how well water is distributed across the
irrigated area. The design and day-to-day
management of the system as well as the
maintenance that is done on the system will
influence the distribution of water across an
area. Soft, even rainfall over a field with a
uniform soil type will allow water to penetrate
the soil to the same depth at each point in
the field. Each plant has an equal chance of
getting the water it needs. Irrigation tries
to mimic evenly distributed rainfall, but no
irrigation system can do it perfectly, therefore
Irrigation systems need to be designed by
specialists in order to be able to achieve the
highest possible water distribution efficiency
for the specific irrigation system. Plant growth
and crop production is largely determined by
the effort that the plant must put into sucking up the water needed. Uneven irrigation results in over irrigation in some places and under irrigation at other places.

**Over irrigation**

Over irrigation is when more water is applied to an area than what is needed to fill the root zone of the crop. The water then percolates down, replenishes the groundwater, and is lost to the crop. The average root depth of vegetables and garden plants is around 300mm. This type of loss can be up to 20% of the water applied and is more applicable to sandy and rocky soil. These losses deeper into the soil profile is inevitable. Perfect distribution of water is never achieved with irrigation, but we must try to irrigate as efficiently as possible. Systems are designed to keep these losses to a minimum. Distribution patterns will, however, change as emitters wear or get clogged. The way in which water moves through and is stored in the soil is also affected by tillage and land use practices. There are several scheduling devices available which can measure the soil moisture status at different depths in the soil, thereby equipping the irrigator with sound knowledge to manage irrigation more efficiently.

If enough water is provided in the drier areas of the field, over irrigation occurs in wetter areas, where more water is applied than what is needed to fill the root zone of the crop.

Plants that receive different amounts of water will grow at different rates. Only plants that receive sufficient water for their needs will produce abundantly. Non-uniform irrigation typically happens when an installed irrigation system is not planned or managed properly or when the sprayers are moved haphazardly, or the valve is left open in manual controlled irrigation.

**Leakages**

Leakages is a major cause of water loss. No water leakage should be tolerated but repaired as soon as possible.

**Exotic “Water thirsty” plants**

Water – smart plants are:
- Plants that uses water the most efficiently in the local climatic zone.
- Plants that have food value and are not only
for ornamental purposes.
In a water-constrained environment the priority will be to cultivate crops that are indigenous or adapted to the local climate, as they would need less water than an exotic crop. Plants with food value must have priority over ornamental, water consuming plants like lawns.

Small scale Irrigation methods

Hosepipe without sprayer
Small ponds should be made around plants to contain the water. Provide a valve at the front-end of the hosepipe to close-off the water flow when moving between plants. This is also time consuming and thus only practical for small gardens, because the hosepipe must be attended to the whole time to prevent overflowing of ponds or run-off. It is also used where the water pressure is low or when greywater is conveyed directly to the garden with a hosepipe.

Hosepipe connected to sprinkler / sprayer
A single sprinkler is connected to the hosepipe and moved manually in set time intervals over the area that is to be watered. Care should be taken in the placement of the sprinkler to avoid unnecessary overlapping of the wetted areas or else dry patches in between as well as wetting areas that need not to be watered. It is also especially important to move the sprinkler timeously to avoid over irrigation of an area as well as run-off of water. A timing device could be connected to the valve or to the borehole pump to assist in managing the time which every area is irrigated. When a greywater collection and pump system is installed it can also be applied to the garden with a hose and sprayer.

Watering can or bucket
This is only practical for single-, containerized- or a small number of plants, as it is very time consuming. It is preferable to make small ponds around the plants if possible and to spread the water as evenly as possible. Take care to avoid overflowing of ponds or containers. Greywater from showers can be applied to plants in this way also.

Permanently Installed Irrigation system
When a permanent irrigation system is installed, it is important to adhere to the manufacturer’s recommendations regarding the installation, spacing and operating pressure of the sprinklers. Care should be taken in the placement and orientation of the sprayers in order that water is not applied on areas that does not need to be irrigated. The number of emitters that can be operating simultaneously is determined by the available flowrate from the pump or municipal supply at the optimum operating pressure of the emitters. This system is suitable for sprinklers, turf sprayers, micro irrigation, and drip irrigation, depending on the relevant application. This system can be controlled manually, but preferably it should be automatically managed with an irrigation controller to achieve maximum water saving.

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