Using KISSS in a Transpiration Field

The efficiency of the KISSS system is sometimes wrongly perceived to be a disadvantage where the objective is to dispose of water in a transpiration field. In fact, the KISSS system is both safer and more effective for this purpose than conventional buried drip pipe. This is because the features of the system that deliver water savings can also be exploited to maximise the loss of water by evaporation and transpiration.

Saving water

KISSS achieves water savings by minimising the two main sources of loss during irrigation: **evaporation** and **deep drainage**.

Evaporation is lower because the system can be operated to keep the soil surface relatively dry. This is because the water from a conventional buried drip pipe is discharged towards the surface from an upward facing emitter whereas the water stream is deflected laterally into the geo-textile cover of the KISSS system before entering the soil (Figure 1). In many soils, the water stream from an uncovered emitter will tunnel its way to the surface causing puddling.

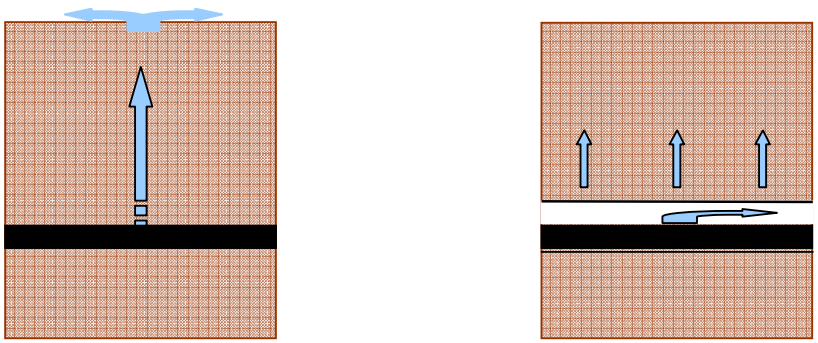

Figure 1 Path followed by water discharged from conventional buried drip pipe and from KISSS

Drainage losses using KISSS are lower because the soil does not get as wet during an irrigation. The proportion of the application moving down under the influence of gravity compared to up by capillary action increases as the soil becomes more saturated. The soil around the KISSS line is drier because the water is discharged at a rate that is closer to the soil absorption rate than other systems (as much as 400 times lower).

Disposing of water

Where the objective is to dispose of water, KISSS can be operated to maximise the evaporation and transpiration loss without increasing the risk to human and animal health or to the environment.

Evaporation
Evaporation is maximised by:

1. Ensuring the surface soil is moist but not saturated. This is achieved by installing KISSS at a depth that means the wetting pattern reaches the surface under normal irrigation. A specialized soil test is used to predict the optimum installation depth for a site.

2. Producing a more uniform surface wetting pattern. The evaporation loss from a disposal area will not be fully exploited if there are significant areas where the soil remains relatively dry. Conventional drip pipe produces a much less even surface wetting pattern than KISSS (Figure 2).

Figure 2 Surface wetting pattern produced by conventional buried drip pipe (left) and KISSS (right) on the same soil and under the same irrigation regime.

Transpiration
The vegetation in a disposal area will lose more water through transpiration when the plants are healthy and growing rapidly. Losses are highest when leaves are large and soft and soil moisture is close to field capacity.

The most common restriction on plant growth in a disposal field is water logging of the soil. This is the condition where air is excluded from the pore space in a soil by

water. The problem is not one of too much water but of too little air or more precisely not enough oxygen.

Roots need oxygen to grow and to absorb nutrients from the soil solution. When oxygen is in short supply, the root system will be shallow and sparse, reducing the plants capacity to absorb water and nutrients. A small root system also means the tops will be smaller as the below and above ground portions of a plant are in balance. When the tops are small there is less leaf area for transpiration.

The moisture content of a soil irrigated with KISSS is slightly less than field capacity (moisture content of a soil that has been watered from above and allowed to drain). This is because the soil above the system is wet by capillary action (flow of moisture over surfaces as a film) which leaves the larger pores full of air. The KISSS system ensures the air-filled porosity of the soil is at a maximum and as a result the risk of water logging is greatly reduced compared with surface irrigation methods.

Given the same amount of water, KISSS wets a larger volume of soil than other surface and subsurface irrigation methods (2.8 times that of surface drip). An obvious consequence of this is that the moisture content of the soil is lower which means there is more air for roots and for soil micro-organisms.

Health and environmental risk
Human and animal contact with contaminated water is minimised because the water is dispersed underground and tunnelling from the KISSS system is uncommon.

No tunnelling means no water can reach the surface without some biological filtering by the soil. Tunnelling occurs when water produces an open channel to the surface by a mining process. Once a tunnel has formed it cannot easily be removed even when the overlying soil is cultivated. Where tunnels exist, a puddle of contaminated water will appear on the surface every time there is an irrigation.

The proportion of water draining below the root zone is higher with conventional buried drip than with KISSS. This increases the risk that ground water will become contaminated.

More uniform distribution of water in the soil increases the P sorption life of a disposal area irrigated with KISSS. Where the distribution is not uniform, the soil in those regions receiving the highest volume of effluent will become saturated with P first. In other words, the disposal area will become leaky well before the full sorption capacity of the site has been exploited. This phenomenon could be called “point source leakage”.

Conventional drip pipe systems discharge water at rates that are much higher than the soil can accept producing soggy areas. The wider and more uniform soil wetting pattern produced by KISSS ensures the surface conditions are more stable under foot.

No spray drift means that the KISSS system can be safely installed closer to dwellings and fence lines. The area gained could be significant for householders on small blocks.

KISSS can be operated even when the disposal area is in use without risk to the public.

KISSS is entirely below ground and less susceptible to vandalism