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Citrus irrigation in Pakistan

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Introduction

In Pakistan, almost 75% of arable is serviced by irrigation canals which are one of the largest systems in the world. Currently there are three large dams and 85 small dams and barrages servicing the canals. About 0.7 million bores have been installed to service additional water needs.

Flood irrigation has been used to irrigate fields around the world since 2000BC. This is still the main method of irrigation in Pakistan.

Figure 1: Flood irrigated field

Flood irrigation

Flood irrigation applies 5-10 cm of water over the designated land surface. The cheap operation, prolong irrigation intervals and no requirements of infrastructure or machinery are the main advantages of flood irrigation. The disadvantages of flood irrigation include:

- Wastage of water ;
- pooling water around the plant temporarily reduces oxygen levels and increases the risk of root rot diseases ;
- deep drainage raises water table levels that can induce water logging and soil salinity problems and ;
- reduces the availability of water for other crops.

Figure 2: Flood irrigated orchard

Pressurized irrigation

Pressurized systems such as drip or sprinkler are the modern and efficient irrigation systems; however their introduction in Pakistan is hampered due to;

- limited and irregular electricity supplies ;
- high cost of electricity and fuel for diesel driven pumps ;
- relative high cost of infrastructure ;
- poor service, parts and maintenance ;
- theft and vandalism ;
- rodents damage and;
- regular maintenance

Figure 3: Furrow irrigated orchard

However, drip and sprinkler irrigation systems are very successful in areas where the water is a limiting factor. Many areas around the world that suffer irrigation induced rising water tables and salinity have been solved with the adoption of well-designed and scheduled drip and sprinkler irrigation systems.

Furrow irrigation

Furrow irrigation is excavating small channels/furrows beside the tree so water is delivered to the majority root zone. Furrow irrigation is generally not considered as an efficient irrigation method however it is more efficient than flood irrigation. Limiting the supply of water to nonproductive area of the field improves water use efficiency.

Water savings up to 30% ad productivity improvements are major advantages of furrow irrigation over flood. Irrigation needs to be applied twice as often as flood however this reduces plant water stress that results in tree health and productivity improvements. It is also requires minimal capital for infrastructure upgradation and very affordable for growers throughout Pakistan.

It does require slightly more work and maintenance than flood irrigation because furrows will need to be made and reformed once every 1 to 2 years. It also increases the frequency of irrigation. The mid-row is not watered thus inter-row crops would not be productive. Some growers have overcome this by installing a furrow in the middle of the row and irrigating it according to inter-crop needs. Although furrow irrigation is slightly more work in maintaining and inter-cropping, it is gaining popularity in Pakistan. Citrus growers are adopting furrow irrigation due to its low cost, simple maintenance and improvements in tree health and productivity from reduced water stress and salinity issues. It is also a good steppingstone towards the adoption of pressurised irrigation.

In Khyber Pakhtunkhwa region the adoption of furrow irrigation has increased by 50% from 2012 to

2015. .

Forming furrows

The most common way to construct furrow is with tractor drawn a ridger implement. Prior to the formation of furrows with the ridger the soil is cultivated so the ridger can easily move the soil and form a smooth even furrow.

Figure 4: A tractor drawn ridger implement to make furrows