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Why drip fertigation yields more ?

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Drip Irrigation is the artificial application of water at right time and in required quantity to the root zone of the crop for the purpose of getting optimum yield. By applying the required quantity of water for the transpiration and metabolic activity to the root zone, the deep percolation water loss and evaporation water loss from the surface are prevented which is making a savings of water from 30 to 50% depends up on the crop and soil. Besides these savings of water 95 to 100% conveyance loss of water is saved as the water is taken up to the root zone through a net work of pipes.

Applying Law of conservation of energy: The law of conservation of energy states that energy can neither be created nor destroyed but can be converted from one form to another. Every irrigated crop possesses same energy initially at establishment. Under drip irrigation, water application is frequent (one to three days) whereas crop under surface irrigation once in six to ten days or so. Thus the soil moisture deficit at any point of time is less in drip irrigation when compared to surface irrigation. When the deficit is more the plant need to spend more energy to suck water and nutrients from soil. Since soil moisture deficit is low under drip irrigation, the plants were made to spend less energy to absorb water and nutrients. Hence considerable amount of energy is saved by drip irrigated crops from the physiological activity of meeting water demands of crops. This saved energy can not be wasted/ discharged in any form and plant prefers to store that energy and use it in growth activities. Thus one can see better and quicker growth of plants under drip irrigation and through the increased number of leaves and increased leaf area. The increased leaf area results in further accumulation of energy and results in higher productivity under drip irrigation.

How much water can be saved? Often researchers make tall claim of saving more than 50% of water by adopting drip irrigation over surface irrigation. One has to remember that our aim is to get more crops per drop. The plant should not suffer for its ET demands when sufficient water is available. The water saving could be achieved only from reduction of evaporation loss from wetting non-root zone area. By this way one can save around 20 to 40 % only depending on the crop. Further when the need is to sustain the tree crops against drought, the stress should be shared among the good yielding trees. The yield does not matter while mitigating drought, surviving more yielding trees should be the objective under such situation. At times, say irrigation planned at once in three days for field crops, the plant may show water stress symptom by showing shrinkage of leaf surface and tired looking plants. This may be due to low humidity and high day time temperature for a short period of time. The irrigation is normally planned by using the average weather data. Under such circumstance one can irrigate on the second day itself or so. That means plant should not be allowed to suffer for want of water based on irrigation schedule alone. The actual irrigation water used can be accounted for while calculating water use. One should not always aim at saving definite quantity of water alone.

What happens to old tree crops? When drip irrigation is introduced to an existing orchard/ groove, the tree is supplied with water in the root zone in patches against 360^{0} supply it was getting earlier. That causes stress to the plant root system even though it gets required water through drip. The rooting system re-orients itself to the new situation. It takes about one to two years and during that period one is to get lesser yield also than existing surface irrigation. But once the plant re-orients itself to the new system of irrigation, it starts performing well and 25% yield increase can easily be seen. Many drip adopters dismantle the system after one year or so due to initial yield reduction.

Influence of fertigation : Fertigation is the art of applying soluble fertilizers through irrigation water. What happens to the plant, when fertilizers and chemicals are supplied in liquid form? Drip fertigation increases fertilizer absorption by plants which results in increased fertilizer use and plant growth when compared to drip irrigation alone. Further it is easy and practicable to supply fertilizer in low doses at number of times. Under surface irrigation the fertilizer is given 50% as basal and remaining 50% as top dressing in two or three splits. In sugarcane 20 to 40 splits were successfully given and compared. Thus for example, if one can increase the yield of sugarcane from an average of 80 tons/ac under surface irrigation to 100 tons/ac under drip irrigation and then to 120 tons/ac under drip fertigation. The uniformity in growth can be seen throughout the field, since the water and fertilizer are evenly distributed to all plants. Also the sugar concentration was found to increase from an average of 8% under surface irrigation upto 13.2% under drip fertigation. Realising this potential only the some sugar factories were paying slightly more to drip fertigated canes compared to surface irrigated canes. In experiments with fruit crop like tomato, the individual fruit size, colour, weight were much better under drip fertigation. Farmers themselves nowadays have seen practicing plastic mulching and drip fertigation for drip fertigated tomato in Coimbatore region. The yield increase of 30 to 40% due to black polythene mulching is realised over drip fertigation. The drip fertigation also tend to reduce the effective growth period by few days. I had seen a groundnut crop maturing in about 95 days under micro-sprinkler fertigation in two successive crop seasons against 110 days (normal) under surface irrigation. The same was confirmed by the rats, which damaged the crops early in fertigated field compared to surface irrigated field.

Is it practicable to drip fertigate all crops and fields in India? – Drip fertigation is basically an energy intensive operation. Most of the states face energy crisis and power shortage. Further in canal irrigated area, once the water is delivered from canals, nearly entire command area is soaked. Thus drip irrigating inbetween lands is practically not feasible. Added to that when drip irrigation is done with poor quality water/ in salt affected soils, the unwanted salts will be gradually driven to the periphery of wetted bulb. But the soaking due to sustained rain/ canal water irrigation of surrounding area will cause a reversal of salt movement towards plant roots causing cracking of fruits/ end products in many cases. That is why it is recommended to irrigate for about 15 minutes atleast on drip irrigated lands even on rainy days, unless flooding is noticed to keep the driven salt particles away from roots. The wide spaced crop can be drip fertigated easily, whereas it is difficult to drip fertigated close growing crop like paddy. For research scale, some successes were reported. But with present level of knowledge and experience gained, it is difficult to recommend/practice drip for field crops like paddy. Then how much we can achieve? Considerable area is being irrigated by well irrigation using pumps. All the well irrigated farmers should be requested to switchover to drip fertigated crops outside canal command areas. By doing this, it is practically feasible to bring huge area under drip fertigation supported by existing subsidies irrespective of farm size.

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