cals applied through the irrigation system will be in greater concentrations near the drip emitters. Figure 3 shows an example of the progression of the wetting front from a drip emitter located on a sandy soil. After 20 min of run time, the wetting front had progressed 4 inches from the drip emitter. Thus, as previously discussed, sufficient run time may need to be scheduled in order to move the applied water laterally into the root zone of immature plant systems. After roots grow into the areas wetted by the drip emitters, schedules can be adjusted accordingly.

Sandy soils generally have poor water distribution characteristics, with maximum lateral water distributions ranging from 8 to 12 inches from the emitter. This will depend on how long the system is operated and initial moisture conditions. Pulsing the water application with a series of on/off cycles may affect lateral movement of water on some soil types, but generally not on very sandy soils. On heavy, fine textured (loam or clay) soils, drip application rates may exceed the infiltration rate of the soil, resulting in ponding or runoff of applied water. In general, on sandy soils, closely spaced emitters will result in greater uniformity of moisture distribution within the soil profile. Individual soils should be tested to determine their lateral wetting capabilities to aid in selecting an emitter spacing and in irrigation scheduling. Field instruments such as tensiometers or other moisture measurement devices should be used to check actual soil wetting patterns and water distributions from irrigation schedules.

Run time per irrigation cycle is also important. The total run time required per day can be divided into 2 or 3 cycles per day depending on the dripper, soil, plant, and irrigation system constraints. Multiple, short duration cycles (e.g. 15 min/cycle) will minimize deep percolation of applied water (Fig. 4A), but may also confine the lateral distribution of water near the dripper and may not be long enough for liquid fertilizer injections. As dripper spacing increases, complete distribution of applied water between drippers will be reduced (Fig. 4B) unless greater run times are used (Fig. 4C), which could potentially leach nutrients away from the plant root zone.

Volume of Available Water

The volume of water available to a drip-irrigated plant will depend upon water distributions from the drip emitters, the soil water-holding properties, and the size of the root zone. Water distributions will be: 1) hemispheres for short duration run times with wide spacings (Fig. 5); 2) vertical cylinders for long run times with wide spacings (Fig. 6); 3) hori-

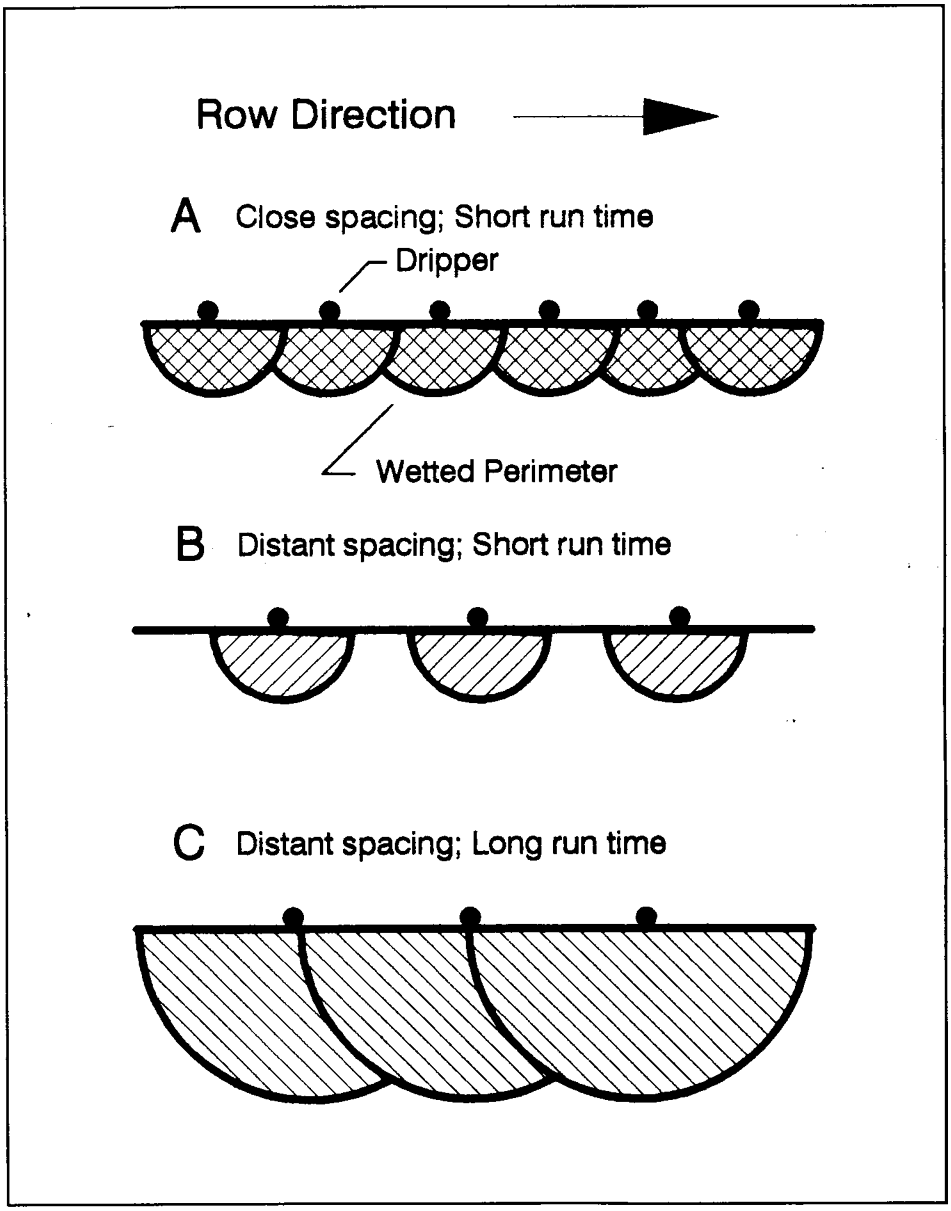

Figure 4. Wetting patterns for different emitter spacings and run times (A) close emitter spacing, short run time; (B) wide emitter spacing, short run time; and (C) wide emitter spacing, long run time.