Consider this

- As irrigation levels are decreased and water restrictions introduced, salt accumulation will become an increasingly important and troublesome problem.

- It will be necessary in the future to use more and more recycled water for irrigation of turf areas.

If you are looking for any of the following:

Less packing and cracking of soil
Less soil erosion
More efficient water use
More efficient fertilizer use
Better survival and growth of plants
Enhanced value of organics and other soil amendments
Less soil crusting with more and faster seed emergence
Easier weed removal
Better soil aeration to improve root growth
Fewer soil-borne diseases
Better success when irrigating with recycled water
Less compacted soil
A perfect bed for sod or seeds
Earlier crop maturity
Decrease the effects of too much clay—

Consider PAM

After a considerable amount of research including extensive phytotoxicity trials Paton Fertilizers are now able to offer a new generation of fertilizers and products aimed at meeting the nutritional needs of your turf and also aiding with moisture retention and utilization.

These polymers were developed to improve the physical properties of soil in view of:

- Increasing their water-holding capacity
- Increasing water use efficiency
- Enhancing soil permeability and infiltration rates
- Reducing irrigation frequency
- Reducing compaction
- Stopping erosion and water run-off
- Increasing turf performance (especially in structureless soils in areas subject to drought).

Turf Managers may well be familiar with one group of polymers already and these are the water holding crystals. However, there are in fact two distinct types of polymers that have been studied and recent trials on turf are showing considerable promise in relation to their use. These polymers can be either soluble or insoluble in water.

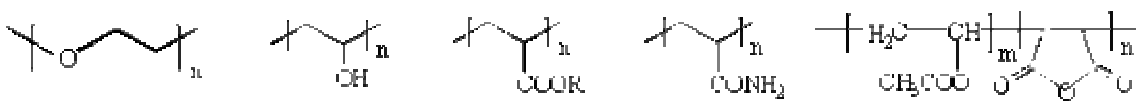
The two different types of polymers used in landscaping and horticulture may cause confusion. Water absorbing, gel forming polymers, are an aid for increasing water holding capacity of sandy soils or of well drained synthetic potting media which do not have the ability to hold as much moisture as loam or clay soils. The advantages of the gel polymers are that they reduce the frequency of irrigation and the soil moisture becomes more constant.

These gels store water in soil and, in contrast, the other polymers bind soil particles for structural soil enhancement. For gels, the polymers are bridged between adjacent molecules and are thus cross-linked to make them insoluble so that they act like sponges.

Water-soluble linear anionic polymers are a single chain of an enormous number with repeating units. These polymers are designed to bind together thousands of soil particles and form a latticework in and around soil crumbs. In times this polymer also becomes water-insoluble in the soil. The function of the soil enhancing polymer is not to absorb water -- the function is to stabilize cultivated soil by maintaining soil in a loose and friable state; The soil particles become “water-stable".

Water-soluble Polymers

They were the first ones to be developed, primarily to aggregate and stabilise soils, combat erosion and improve percolation. Paton Fertilizers recently carried out phytotoxicity trials on turf using both a liquid and coated fertilizer formulations with interesting results. Linear water-soluble polymers have structures along the following lines:



All the polymers, except poly(ethylene glycol), are synthesised by free-radical polymerisation of the corresponding monomers. One of the necessary characteristics of these polymers is a high molar mass. Polyacrylamide (PAM) is one of the most widely employed soil conditioners but issues re application over turf and phytotoxicity have not been clear.

Benefits of water-soluble polymeric soil conditioners

Prior to commencing these trials, considerable work has been carried out overseas in both Europe and Asia and the success of PAM in modifying calcareous nonfertile land near Dijon in France is a well-known example of its application. A common trait of tropical soils in intense high rainfall regions, is that they suffer from a decrease in aggregate stability and an increase in bulk density. PAM has proved to be effective against soil erosion and work in Indonesia with PAM has made it possible to reduce soil losses under rainfall from 17 000 to 4000 kg ha^{-1}. The permeable layer of soil produced by the conditioner stabilises the soil, thus preventing runoff with a further benefit being that the penetrability of water in a PAM treated soil increases by a factor of 2.5 while its mean diffusivity increases four fold.

The effect of polymeric soil conditioners on plant growth and crop yield has also been extensively studied. The rates of germination and emergence of a number of plants such as tomato, lettuce or maize increased markedly in the presence of the conditioner (Wallace and Wallace 1986a). Other studies (Batyuk et al. 1973) have shown that the yield of (sugar beets) is increased while the requirements for irrigation decreased by the use of conditioners such as this.

Wallace and Wallace (1986b) showed that very low concentrations of a mixture of PAM and a polysaccharide (below 0.001% or 22 kg ha^{-1}) have a favourable effect on the physical properties of soils, particularly regarding percolation and infiltration rates as well as the sizes of soil particles. These very low rates of soil conditioners now make their use economically feasible.

Gel-forming polymers

This second class of polymers referred to as gel-forming polymers or insoluble water-absorbing polymers were first introduced for agricultural use in the early 1980's. These polymers do not possess linear chain structures as described previously but the chains are rather cross-linked to form a three-dimensional network. Cross-linking occurs when polymerisation is carried out in the presence of a small amount of a divinyl compound. Three main types of hydrogels (water absorbing) have so far been developed as agricultural polymers: (1) starch-graft copolymers obtained by graft polymerisation of polyacrylonitrile onto starch followed by saponification of the acrylonitrile units (2) cross-linked polyacrylates (3) cross-linked polyacrylamides and cross-linked acrylamide-acrylate copolymers containing a major percentage of acrylamide units. Most of the hydrogels marketed for agriculture come from the latter group as they are claimed to remain active for a much longer time.

Most soils hold adequate moisture for good plant growth. However, with poor soil physical properties, irrigation water runs off and is wasted. Water conservation requires porous soils, which are best accomplished with linear soil polymers. Soil moisture can then be maintained longer by decreasing evaporative loss. Well structured soils have less evaporative loss because the top 25mm of polymer-treated soil acts like a mulch. This is another benefit of linear soil polymers.

The available soil moisture reserve for plants is proportional to the depth of the roots. Turf rooted to a 150mm depth can have 6 times the moisture reserves as turf rooted to a 25mm depth. In lieu of a daily irrigation requirement, deeply rooted plants can be watered weekly or even less frequently. Since roots do not grow deeper than where oxygen can penetrate, plants will not root deeply in heavy soils. Good soil structure, coupled with aeration, low bulk density and porosity, needs to be maintained. The best technique for creating good soil is through the use of soil enhancing linear polymers. To achieve this goal Paton Fertilizers have been trialling a specifically designed linear polymer either as a liquid or else in combination with custom blended fertilizer.

8 Benefits of using Water-Soluble Polyacrylamide (PAM)

1. Water-soluble polymer reacts with the clay in soil resulting in water-stable soil particles, which do not crust after irrigation. Water then runs into the soil, thus ensuring a larger percentage of rain/irrigation water will move into the soil when prepared with water-soluble polymer.

2. Roots grow deeper into soil well prepared with water-soluble PAM and therefore plants more efficiently use water. With deep rooting, there can be longer periods between irrigation, which means less loss of water by evaporation that results from frequent irrigations.

3. Soil prepared with water-soluble polymer reduces evaporative losses.

4. Soil prepared with water-soluble PAM or even applications of water-soluble PAM with the first irrigation prevents crusting of the soil surface so that the need for supplementary irrigation is reduced.

5. Soil treated with water-soluble PAM on slopes permits applied water to penetrate into the soil before water run off occurs.

6. Where salts and sodium are soil problems, treatment and leaching are more easily accomplished with less irrigation water when soils are prepared with water-soluble PAM.

7. Use of water-soluble PAM makes it possible to more easily use recycled water for irrigation without causing compaction of the soil. The water-soluble PAM also makes it possible to more efficiently use any low-quality water for irrigation.

8. Fertilizer efficiency is significantly improved.