





Water management on golf courses and the potentials of Fytofoam as water saving soil amendment

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What is on-going?

News from Spain

EURORESIDENTES*:

Ads by Google Catalonia Measuring Rainfall

FRIDAY, APRIL 29, 2005

Drought in Spain

The Spanish Meteorological Institute has declared that for the last seven months Spain has been suffering severe drought. This is the first time ever that a public institution in Spain has given a drought warning.

According to figures released by the Institute, during the autumn and winter months it rained 37 percent less than the

a fifth of what i Rainfall registe the lowest sinc measuring its I

June 11, 2005

its¹ The rain in Spain falls mainly on

Galicia

the plain – but not for 60 years

BY GRAHAM KEELEY

Drought is turning farmers off the land but the water shortage is at least partly man-made

CROPS are withering, fountains are turned off and swimming pools will stand empty through the summer across much of southern Spain as the worst drought for 60 years reaches emergency levels.





Without shadow of a doubt, for those cor as their primary residence or a holiday ho crucial for both quality living and protecting

It goes without saying that no one will be they rent property where toilets cannot be may say . . so what?

Well contrary to what you may believe, years. Resort areas have been well catere for foreigners to buy property inland, many

Although it has been kept relatively quiet, officially Spain is suffering from a drought which has worsened to the extent that seven regio far. The figure is expected to increase over the next few weeks.





What can we do?

So, what do we need for high quality turf?

- Optimal water/air ratios in the root zone
- Sufficient nutrient availability for the plant
- Uniform conditions over entire golf course







What can we do?







Greens are sand based

Why?

- Sufficient drainage
- Reduced compaction
- Aeration
- Allows intensive play
- Provides uniformity





Different ways of constructing greens

- USGA specification
- Californian greens
- Dutch greens

Specifications give (broad) ranges how greens can be built. However, saturated hydraulic conductivity should be al least 360 cm/day







Sand (soil) consist of a mixture of mineral particles, organic compounds and soil pores

The particle size distribution of the soil determines to a large extent how much water can be retained and how slow/fast water and solutes can be transported







Generally fine-textured soils have a larger water holding capacity but smaller transport capacity than coarse textured soils







The specific soil physical properties needed to compute flow and transport processes are the soil water retention characteristic and the (un) saturated hydraulic conductivity curve











Evaluation of different root zone mixtures by using

- A soil-water-grass model (SWAP)
- Daily meteorological data for 1994-2004 (site in Holland)
- Specific soil properties and plant characteristics
- An irrigation criteria (90% ET ratio)





Potential benefits of soil amendments







Potential benefits of soil amendments

Several product/technologies are on the market for increasing soil water availability and improving wetting uniformity (e.g. peat, foam, polymers, zeolites, surfactants).

Potentials of foam studied in detail, and proven to make a difference







Potential benefits of foam – experimental set-up

On the 'Mosa Trajectum' golf course in Spain, an experimental set-up was constructed to compare two identical USGA greens: one with Fytofoam application and one without. Aim was to:

- measure the difference in water holding capacity and leaching potentials of the two experimental greens
- to determine the irrigation water requirements of both greens







Potential benefits of foam – green construction

Building the bottom part of the greens









Potential benefits of foam – green construction

Foam is mixed into the sand off-site before constructing the test green.







Potential benefits of foam – green construction

The greens were constructed with a 25 cm top layer using USGA-type sand, one with and one without Fytofoam mixed through it.





















- The sensor data is stored every hour.







Rain gauge

Tipping bucket drainage meter for measuring drain outflow from the plot







Potential benefits of foam – overview of experimental site







Potential benefits of foam – measurement results

- The data that are retrieved from the TDR moisture sensor are plotted as time series
- Information for every time step is rendered two-dimensionally in order to give spatial information for the two greens
- The two-dimensional images are displayed sequentially in order to give temporal information about water movement in the profiles; a '*water-movement animation*' is created
- The 'animations' of both greens can then be compared
- Additional water-balance calculations can be done using an advanced computer simulation model





Potential benefits of foam – measurement results







Potential benefits of foam – measurement results

Observations indicate that

- The green containing Fytofoam is wetter than the green without foam.
- The green containing Fytofoam can hold water for a longer period of time than the green without foam.
- The green with foam apparently needs less irrigation water compared to the untreated green.







SWAP has been used for computing the irrigation water needs of both greens

Model input: weather data, and soil and grass characteristics

Model output: water balance, irrigation water requirements to keep the turf in optimal condition





- irrigation trigger 90% ET
- irrigation rate 5 mm/event
- irrigation scheduled either in the morning and/or evening















Total irrigation water reduction around 40-50%





Conclusions

Water usage on golf courses in the Mediterranean can be reduced significantly by

- optimizing green root zone construction
- selecting the most appropriate irrigation system
- improving irrigation scheduling using advanced monitoring techniques and
- by using foam as a soil amendment to increase the water holding capacity of the greens, tees, and/or fairways



