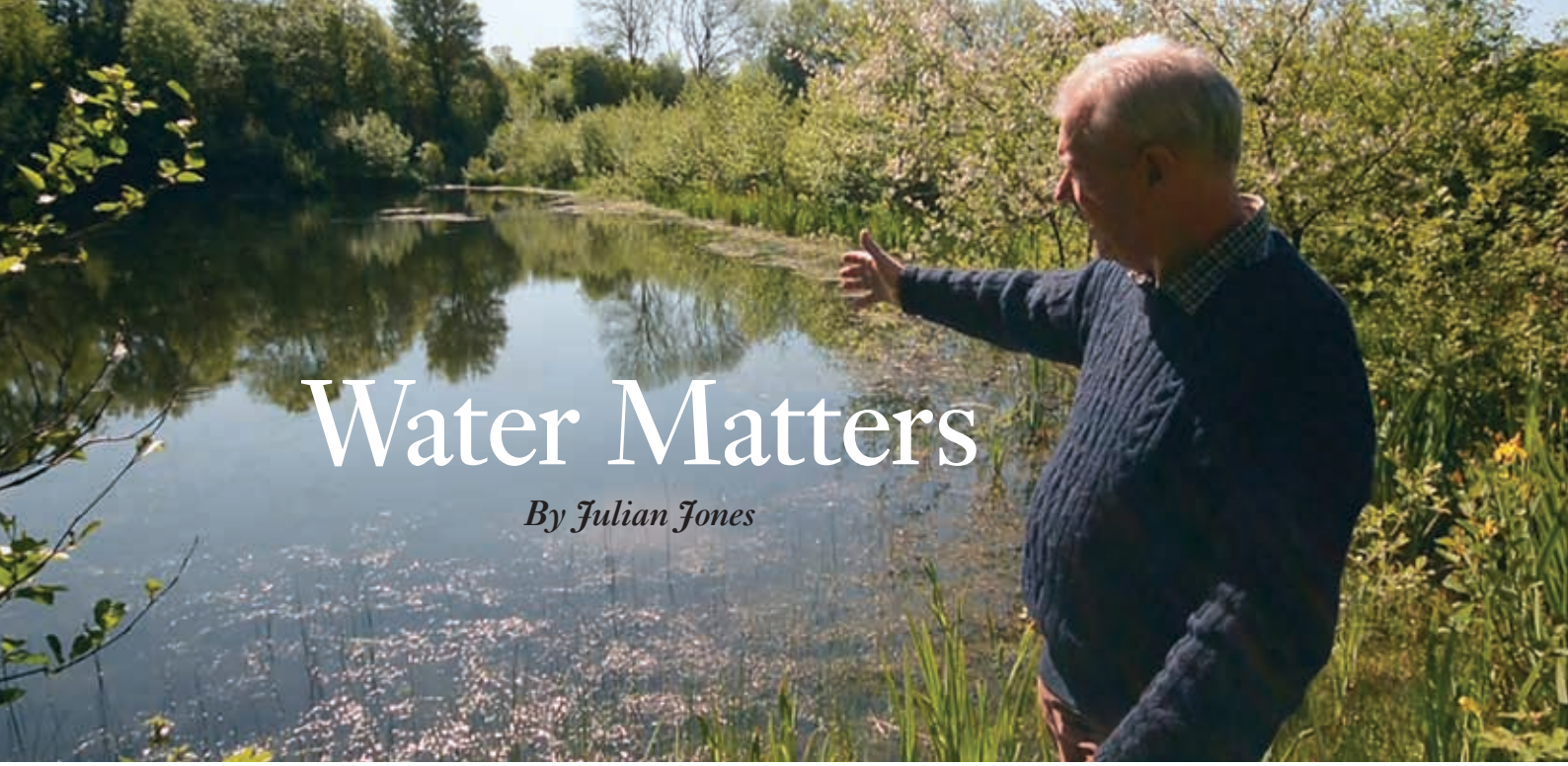

Water Matters

By Julian Jones

Fig 1. An on farm irrigation reservoir at Tablehurst Farm, Sussex with BDA director Peter Brown. This enables greater farm productivity while reducing water costs and helping with flood protection.

One of the cornerstones of sustainable agriculture is taking responsibility, particularly for protection of soil and water. Maintaining soil quality has always been implicit to Biodynamic practice, and now Climate Change has brought a special focus onto water for both community and individual land manager interests. Increased flood and drought is driving fundamental changes to government policy, with new opportunities arising very specifically 'to take responsibility for water'.

It was German historian Karl Wittfogel[1] who described many past civilisations as 'Hydraulic Empires' – explaining a social system of control and exploitation of vital resources, usually water, by a small despotic elite within society. The application of large scale engineering, usually for irrigation and water supply, led to the creation of a social elite who controlled this infrastructure for their own greater benefit, with social inequality as the inevitable result.

Because such large scale centralised water engineering cannot meet the sensitive needs of the environment, this ultimately causes ecological breakdown, leading to failure of the water engineering system itself, and thence economic and social collapse. The former Fertile Crescent in the Middle East is the graveyard of many such failed civilisations, with their ecological and social degradation still apparent to this day.

This is all remarkably similar to the Western economic, social and ecological model prevailing presently; though the vital resources being centrally mis-managed now extend beyond water into energy and food, with evidently the same negative social and environmental consequences. Everything that Fritz Schumacher was also trying to address with his important book 'Small is Beautiful'[2] in 1973.

As contemporary anthropic Climate Change manifests more obviously with increased flooding and recurring droughts, a growing understanding of the processes involved of both causes and effects is taking place. The recent realisation that after decades of draining farmland, degrading soils and filling in field ponds, combined with a municipal flood risk management approach that entailed building ever higher flood defences or trying to flush rainwater away, means a complete reversal of these practices is now required.

Not surprisingly the cumulative effects of these practices have all very effectively accelerated the water cycle, heightening flood and drought effects. Typically in most UK river catchments, over 90% of rainwater is lost to the sea, often causing flooding on its way.

Controlling water resources has long been seen by the UK governments as their own domain, and consequently changes in policy are only occurring slowly, beginning in 2004 with a DEFRA policy document 'Making Space for Water'. As one Environment Agency manager explained recently, "the supertanker can only turn slowly". The day when farmers, as custodians of the largest areas of any catchment receiving rainfall, might take full responsibility for this resource are not quite here, but there is already much that can be done, with help coming from a variety of sources.

A farm that is under Biodynamic management will already be addressing a main goal of water sustainable practice by looking after the soil. Maintaining soil fertility involves protecting or increasing soil humus (or carbon) content, which enables a range of key benefits. Every additional 1% of soil carbon is estimated to increase rainwater holding capacity by up to 200,000 litres per hectare.

Note "up to" – these water retaining properties are

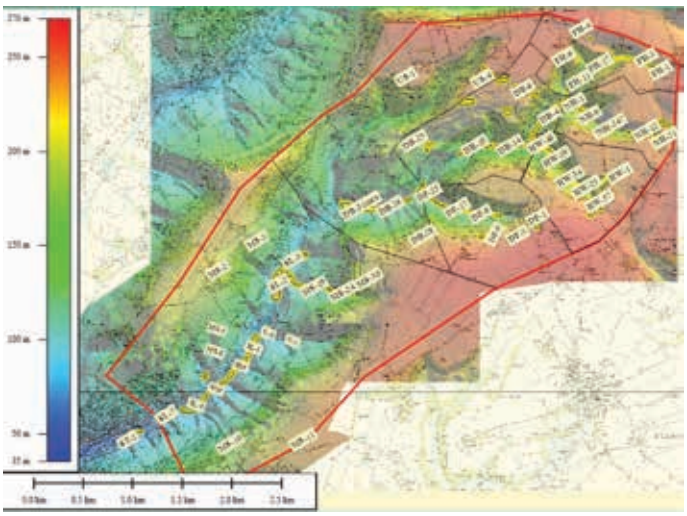

Fig 3. Flood water attenuation scoping study in a 14 sq Km catchment; over 300% capacity for a 1 in 75 storm event and much opportunity for increased farm productivity. (Anett Szabo, Water21).

temperature regulated according to capillary action, further determined by soil type, cropping regime and topography (or land form). This high variability shows mainly in seasonal changes and is not in any way regulated for by Defra just yet; but change is underway, with a growing focus on soil.

Speaking at the 2014 Savory Institute conference in London Patrick Holden of the Sustainable Food Trust conceded a recent lack of understanding soil science within the organic movement; but by 2015 (the UN Year of Soil) a French Minister of Agriculture proposed a reasonable 0.4% annual increase in soil carbon content as a policy target. This French proposal was tabled at the Paris COP21 climate talks ('4‰ Initiative: soils for food security and climate'). Rapid change in soil consciousness will translate soon enough into policy and practice.

Meantime, storing water on the farm (roof water in tanks, field runoff in ponds, lakes & swales etc.) can also go a long way towards restoring the pre-human intervention level of water balance in the landscape, vital for many reasons including biodiversity. According to the Wildfowl & Wetlands Trust, 25% of the UK landscape was once covered by wetlands – in the present era it is less than 2%. In planning water storage areas for any single farm (or complete river catchment) the work of Water21 and others, including The Flow Partnership with Newcastle University & James Hutton Institute,[3] suggests a 5% of total land area for seasonal water storage will suffice to control most storm events.

Devising a completely balanced water plan for any farm or wider river catchment is important to control ever escalating flooding and its resulting costs – in household insurance terms alone these recently incurred a 10% surcharge on all policies to meet the increasing costs.

Another useful planning metric for any farm is to determine the volume of rainfall for a 1 in 75 year storm event falling over the total farm area, then attenuating or temporarily storing this volume in dispersed locations across a farm, which is the level required to protect householders downstream from raised insurance premiums.

Stored rainwater on the farm can be used for a variety of purposes, from watering stock, washing down yards and dairies to irrigating crops for greater yields, guaranteeing seed germination, extended growing seasons and diversifying cropping, or for horticulture. One farm's water storage can enable another farm's flood protection further downstream. A series of economic 'win-wins', enhancing and protecting crops and properties from flooding while reducing water supply costs. Such measures can assist with the transition from chemical agriculture to more benign or Biodynamic practices where the economics may otherwise appear marginal.

The switch from conventional hard engineered concrete flood defences to soft engineered dispersed landscape solutions is taking longer than we might hope, as civil engineering corporations still enjoy the bulk of flood protection expenditure.

In arid regions storing rainwater against dry weather has been pioneered in the present era by Rajendra Singh in Rajasthan[4], Peter Andrews & P A Yeomans in Australia[5,6], amongst many others, including Bill Mollison founder of Permaculture. These practitioners have transformed the farming prospects in otherwise hopelessly unproductive areas, and this all holds great promise for restoring the huge areas, over half of the planet's land surface, that have been aridified by the mismanagement of ecosystems by humans over the past millennia.

Yeomans' 'Keyline Farming System' is notable, which includes the use of large earth-walled irrigation dams, ponds, chisel ploughs and deep subsoil aerating rippers, with novel contour ploughing techniques and strategic forestry. Yeomans perfected a system of amplified contour ripping with strategic ploughing that controlled rainfall runoff and enabled gravity irrigation of undulating land without the need for terracing.

As new techniques of rainwater harvesting/storage in the landscape become widely deployed, further business opportunities will arise that can assist farm incomes

Fig 2. A large constructed wetland being constructed by Churchdown Council, Gloucestershire to enable untreated sewer water diversion and reduced local flooding. (Tamas Borondi, Water21)

and diversification. The 'Natural Monopoly' concept that underpins the water company business of municipal water and sewerage services is also ripe for change.

There is little that is natural about sewage disposal or the vast transfers of water required for public water supply. Farming landscapes where water (and soils) are properly managed will quickly enable better aquifer recharge and improve water resource availability thus opening up opportunities for competition, from farmers. There are still many residual Private Water Supplies operating in the UK, in some locations supplying whole villages – these will become feasible once again. It will also become preferable to have a local spring water supply on tap rather than buying spring water in bottles.

The breaking up of sewerage monopolies into smaller hydraulically-manageable units is a huge challenge, but a vitally important one. The present situation is only possible due to the lack of any public health standards, as our sewers are allowed to leak pathogenic sewage into rivers and seas during rainfall from the thousands of 'storm overflows' – a deficiency meaning the 25,000 weirs on UK rivers often spew sewage particulates into the air during rainfall, carrying it for many miles on the wind.

It was bitter experience with meningitis outbreaks during the 1980s that caused the development of 'SUDS', or sustainable drainage; a method of "soft engineering" or constructed wetlands to capture and treat storm-sewer surcharges. These 'living machines', very often using reedbeds, offer lower construction costs than conventional sewage engineering, together with higher treatment standards, and they are ideally owned and operated by farmers.

Already, Water21 has engineered the diversion and sewer disconnection for one client, a Local Authority, who are saving substantial surface water drainage charges by diverting roof and carpark runoff into an adjacent constructed wetland (see figure). Surface drainage charges are becoming very expensive via water companies; these costs can in some situations be recouped in only a few years by siting a wetland to receive runoff. Farmers adjacent to new built developments, including housing estates, should explore such opportunities.

However, caution is required in design and construction – most reedbeds are built using sharp-sand or gravel, and while this is fine for surface drainage, for nutrient rich sewage, a more sophisticated soil planting medium and selective aquatic plant cultivars are required to ensure longevity of operation and reliability. ■

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Further information

Water21: www.water21.org.uk