

## INTERNATIONAL WORK

### Climate Change in Peruvian Andes

WRA (Harvey Rodda) has been contributing to a research project run by Reading University which is looking at the impact of climate change on farming in the Peruvian Andes. The work has been on-going since 2019 and has included fieldtrips to study catchments in the Ancash region of Peru, workshops in Peru and Reading, and presentations at international conferences. The field trips have focused on collecting data including flow monitoring, soil surveys, mapping the extents of different cropped areas, and interviewing farmers and local groups. Study catchments have been set up in the Cordillera Blanca where glaciers and snow cover maintain dry season flows, and the lower and more arid Cordillera Negra (Fig 1). Farming is possible up to 4000m high where steep slopes have been terraced to allow a range of crops: potatoes, onions, maize, barley, peas and beans. During the dry season however, this is only possible with irrigation.

Measuring dry-season flows has been undertaken using dilution gauging or velocity area methods and the crop irrigation requirements have been estimated using the CROPWAT model from FAO. Initial model results show there is a significant irrigation requirement to make dry season cropping a viable option, with an average of 250mm (Fig 2) and the concern from the local farmers is that there is less water available from snow melt and glaciers with their retreat due to climate change. Work is ongoing to estimate the catchment water balance and to consider the changes to crop water requirements under climate change scenarios.



Figure 1 Farming areas in the Cordillera Negra

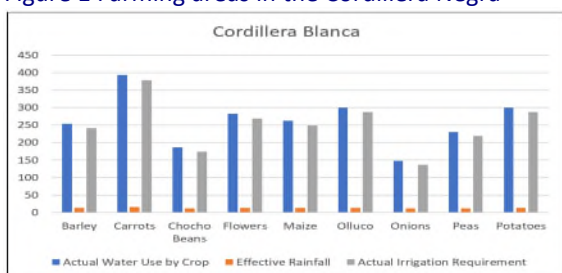


Figure 2 Water use calculated using CROPWAT

### Review of Rivers Impacting the Great Barrier Reef (GBR) Australia

WRA (Paul Whitehead) has contributed to an Australia Government and Queensland Government Project to review the hydrological and water quality modeling in 36 catchments draining onto the GBR. Paul spent 12 days working with researchers from Brisbane to Cairns, assessing the problems of modelling flow and water quality in order to assess flux estimates to the coasts. Nutrients and sediments damage the GBR and together with bleaching events, driven by climate change, can cause serious damage to the GBR ecology. Mitigation measures such as changed cropping patterns, reduced nutrient application and sediment controls all help to reduce fluxes to the coast. Lots of experiments were reviewed and assessments of the linkages between the Paddock to Reef water quality and ecological models reviewed.



Figure 3 Banana Plantation experiment to assess hydrology and water quality



Figure 4 Storm events generate high flows and potential for massive sediment flux to the coast.

## UK WORK

### Suds Design for Farm Complex

WRA provided a Surface Water Management Plan and Sustainable Drainage System (SuDS) design for a proposed development at Grove Farm, Chearsley, Buckinghamshire, of an agricultural barn and hardstanding covering 610m<sup>2</sup> in an area of greenfield land on an existing farm. Located within the catchment area of the Chearsley Brook, the site is underlain by impermeable Kimmeridge Clay.

#### Scope

A SWMP was required to ensure all of the surface water from the new impermeable surfaces can be discharged from the site at a rate not exceeding the current greenfield conditions. The water from the swale will be discharged into a ditch, the presence of the ditch and its outlet to the Chearsley Brook have been confirmed by a walk-over survey and photographic evidence.

The ReFH2 software was used to estimate the design greenfield and developed site flows and the topography was provided by spot height measurements and a 1m DTM. A design to attenuate the surface water including a 30m long swale was developed using ArcGIS Pro.

#### Results

The greenfield and developed site peak flows were calculated using ReFH2 software as 1.68 and 5.85l/s, including a climate change allowance of 40%.

The proposed SuDS has assumed 100% of the flow from the new building and hardstanding will be conveyed as surface runoff to give a worst-case scenario. It will therefore provide a robust solution to managing surface water and will ensure the risk of surface water flooding to downstream locations is not increased.

A maintenance plan has been included and in the unlikely event of a failure of the system through blockage, accidental damage or events exceeding the design rainfall, excess surface water will just drain away from the site onto the surrounding fields to the north-west and south-west, with no increased risk of flooding to any neighbouring properties.

### Flooding Issues for Homes

There continues to be a major need for flooding assessments of housing developments and individual householders. With serious groundwater flooding across the UK, rising groundwaters are causing serious problems and Harvey Rodda and Paul Holmes continue to undertake extensive flood risk studies and assess mitigation measures.

## WRA 30<sup>th</sup> Birthday Event



The 30<sup>th</sup> event will take place on June 21<sup>st</sup> in the Swan at Streatley next to the Thames. email PGW if interested in coming along.

### Other News – Oxford/WRA Reach Program wins the Vice Chancellors Prize

The Oxford University/WRA REACH program has been recognised by the Vice Chancellor of Oxford as the best project across Oxford and awarded first prize by the VC. This involved a team from WRA including Paul Whitehead, Giambi Busi, Cordelia Rampley, Harvey Rodda working with colleagues in Bangladesh including Prof Abed Hossain and Shammi Shawal.



Paul Whitehead receiving the Prize Certificate

### Next WRA Board Meeting

To be confirmed

The WRA Bulletin is a quarterly publication, and relies on contributions submitted by Partners, Associates and Consultants. The document is circulated by email, and published on the WRA web-site, aiming to keep the WRA network up-to-date with respect to current activities. Please email contributions for future issues to Paul Whitehead: [paul.whitehead@watres.com](mailto:paul.whitehead@watres.com)

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