Advances in radio, battery and sensor technology now mean that it is possible to collect data from even the most remote locations

Gathering appropriate and actionable data about your farm and its operations is going to be increasingly vital in being profitable, sustainable, and environmentally responsible, driven not only by regulations, but by good business sense. The established technologies are not suited to remote locations – broadband goes to buildings and mobile coverage is inconsistent, if we want to deliver remotely, we need to include another technology in the mix - LPWAN (Low Powered Wide Area Network).

LPWAN underpins the explosion of Internet of Things and is most often seen in the press as "Smart Cities", but it is equally if not more applicable in rural settings. Whilst there are several "flavours" of LPWAN, they all have the same principal aim – to cost-effectively provide the means of gathering data and transmitting that data over long distances and then over the internet to where it can be used for alarms, analysis etc. The form of LPWAN that we are going to review here is LoRaWAN (**Lo**ng **Ra**nge **WAN**), but at the highest level they are all similar.

Over the last two decades the mobile phone war has led to massively improved battery and energy use technologies, shrinking size and falling prices. The "Peace Dividend" from this war means that you can now get devices (referred to as nodes) that sit out in the field for 5-10 years on their original batteries, sending data 10s of kilometres, to be picked up by a listening gateway, that helps you better manage your farm.

Underlying LoRaWAN is a very clever patented radio technology that allows small packets of data to be sent long distances using very little power and resistant to some of the problems that plague regular radio and WiFi – namely obstacles and reflections creating noise. Think of WiFi as a constant stream of conversation. If you have reflections and echoes of that conversation, they increase the background noise and reduce the amount of signal energy remaining that you receive, that is distinct, and you can listen to. In LoRaWAN the packets of data are transmitted with gaps in between, in such a way that they can also receive the echoes to remove their detrimental effect or even to reinforce the original signal. In some circumstances, this ability also allows it to be received around corners!

LoRaWAN is extremely low bandwidth, so it would take years if you were to use it to download a movie, it cannot even deal with voice traffic, but it is ideally suited in transmitting small secure data packets. The data packets are very small to save energy (think tiny SMS text) and the nodes themselves spend most of their lives asleep to further save energy, only waking up at a set time or triggered by an external event such as movement.

On top of the patented radio technology LoRaWAN defines the communication protocol and system architecture for the network, delivering reliable and secure communication for M2M – Machine to Machine systems – Node to Computer in this case.

The LoRaWAN communication protocol is defined by the LoRa Alliance, a non-profit technology alliance of more than 500 member companies. It is committed to enabling large scale deployment of Low Power Wide Area Networks (LPWAN) IoT through the development, and promotion of the LoRaWAN open standard, permitting inexpensive, long-range connectivity for IoT devices with particular attractions in rural, remote and offshore industries where long battery life devices are an advantage.