PREVENTING OVERSUBSIDISATION OF EU FARMERS

Field Area Checks Using GPS

The area of agricultural fields within the European Union (EU) are checked against claims to ensure that farmers receive the right amount of subsidies. This measure, stemming from EU Common Agricultural Policy reform in the early 1990s and aimed at preventing fraudulent use of taxpayersâ€™ money, is now supported by GPS, in addition to the long existing use of remote sensing data. In this first of two features the author sketches the history of GPS in this context.

In 2004, remote-sensing checks covered over 160,000 of the approximately five million farms receiving subsidies across the 25 EU member states. But these are not the only checks made; inspectors visit just as many farms on foot. Many member states have steadily been adopting handheld GPS receivers as the quickest and most effective means of measurement for their land-based teams.

Selective Availability

In the early 1990s there were few instruments well adapted to this task. The most likely equipment was the wheel with attached meter, the â€˜topofiâ€™, or a meter with a bobbin of string that unwound as the inspector stumbled across the furrows. There was even use made of the simple â€˜calibrated stepâ€™; the inspector knew just how long his or her stride should be. As any surveyor knows, these are at best approximate tools, and only really suited to linear measurements. However, most fields in Europe do not feature straight sides and do not lie on flat ground. It was therefore not so easy to get good measurements â€“ and yet that was what was required to satisfy the inspection services, financial auditors and Europeâ€™s taxpayers that farmers were not being overpaid.

Early Hand Receivers

In 1994, therefore, we began to examine how we could use GPS to tackle the problem. GPS at that time was mainly considered a tool for surveyors. As a navigation tool it was still a coarse instrument, providing positions with errors of up to 100m. Nevertheless, early handheld receivers were appearing on the market that provided sufficient capability when used in pairs; a simple differential operation could be established by leaving one receiver as a â€˜base stationâ€™ and moving around the field with the other â€˜roverâ€™ receiver. Upon collection, both instruments were linked to a portable computer for post-processing of the data; the results were quite satisfactory, relative positions to the base stations being around 5 to 10m, 95% of the time. However, the kit cost over â‚¬ 5,000 and required trained operators. Several member states invested in such equipment but used it mainly for special cases in which a farmer was expected to challenge findings.

Area Not Map

Studies commissioned by us in the late 1990s provided some refinements. The system functioned well across the EU, field tests having been done from Finland to Portugal, and a number of specialist companies emerged willing to provide customised equipment. Empirically it was found that the most effective data collection was a constant-rate measurement every second or so, with the operator not stopping so long as enough satellites remained visible (if not, you stopped for lunch!) This quick and pragmatic mode effectively â€˜averages outâ€™ the errors just as most systems now offer a static, point-averaging mode. For many surveyors the approach is counterintuitive: the boundary is imprecise. However, the area integrated within the polygon is surprisingly correct, and because the EU checks require not a map of a field but rather the area, the approach fits.

Thank You, Bill

For the Geomatics community, at least, it may be that Bill Clintonâ€™s most significant act as US president was removing â€˜Selective Availabilityâ€™ (SA) mode from GPS. This began an amazing movement towards better and better fixes with handheld instruments. Since May 2000, many sectors of the community and society as a whole have seen an enormous trend towards integrated spatial positioning in their working lives, and farm inspectors are no different. Instead of requiring two receivers to measure fields we now needed one; in place of complex software, competing firms within the sector began to produce customised programs, quickly exploiting the potential of Personal Digital Assistants (PDA) and off-the-shelf hardware. Immediately after SA was turned off, non-differential positional accuracy improved by an order of magnitude, to less than ten metres, 95% of the time. Today, the raw GPS signal is even more stable, performance monitored by the United States Federal Aviation Authority being under 3m 95%, and with most systems able to give an instantaneous fix of better than 5m 95%. This means that the technical performance of ten years ago is available in real time, with an instrument costing a mere few hundred euros.

Farm Management

The consequences have been profound; in 2004 GPS became the tool of choice for field checks across the EU. All four hundred inspection-teams in Italy were equipped with an integrated GPS/PDA/digital camera that records time and date of measurement, a photo of the field, and area and track data associated with field measurement. In Poland, where some 75,000 farms were visited and around a million fields measured in 2004, GPS was the tool preferred by the 2,400 contracted inspectors. The systems used there were mostly off-the-shelf receivers, ranging in price from â‚¬300 to â‚¬3,000 according to their application (better receivers are usually used for quality

control). But it is not only inspectors who benefit from this equipment: for farmers too it is a very useful tool. Whilst a farmer will probably measure his or her fields only once, the GPS (usually on a PDA) can still be used for other purposes: helping record where work has taken place, application of fertiliser or simply keeping a list of waiting tasks. Some GPS-enabled farm management systems are also linked to GIS tools that help manage logistics on the farm.

Getting Lost

Some of the earlier disadvantages of GPS have now been largely overcome; with a full constellation of satellites in open spaces the receiver usually â€˜seesâ€™ nine or even ten satellites at a time. A signal may still be disturbed, of course, such as by dense forest at the edge of a field, but the experienced operator learns where this can cause problems. Better receivers are less prone to such difficulties and there will often be enough satellites visible towards the other side. At times, signal loss results; customised software packages permit the recording to be paused and the obstacle passed by. Early handhelds had difficulties with batteries, but these too are becoming less frequent, although any surveyor knows that spare batteries and cables in the car are a must. Similarly, screens used to be difficult to use outside but are now becoming brighter and more readable.

Situation Today

The choice of instruments today is wide. It ranges from â€˜commercial off-the-shelfâ€™ handhelds intended for the consumer navigation market, through to custom-packaged PDAs with bespoke software for the CAP field measurement approach, often translated into various national languages and capable of utilising national coordinate systems and spheroids. Many major manufacturers offer a GIS-style package with certain software adaptations and high-quality, robust equipment design. This great diversity is a huge asset, giving each stakeholder, whether farmer, contract inspection service provider, member-state quality assurance team or EU auditor, an equal opportunity to equip themselves appropriately to ensure that no farmerâ€™s field need ever be overpaid.
