

A06.1

Creating a national dataset of Agricultural Land in Wales

Nadia Cummins, GIS Officer, Welsh Assembly

Purpose

The purpose of this paper is to outline the process the National Assembly for Wales Agriculture and Rural Affairs Department undertook to develop an accurate and topologically correct dataset of all current registered land across Wales (and parts of England) and to outline key lessons learned as part of the process.

Background

The majority of land in Wales is in agricultural production. There are currently about half a million fields registered with the National Assembly for Wales under the Integrated Administration and Control System (IACS) – a requirement for obtaining subsidy from the European Union's Common Agricultural Policy schemes. The average size of registered fields is around 2.8 ha with many fields less than 1 ha – larger fields are in excess of 300 ha. Fields, in general, are permanently bounded by a fence or hedge. There are around 17,000 holdings currently registered under the IACS scheme.

History

Part of the history of setting up the IACS scheme is that each registered field should have a unique identifier. A combination of the Ordnance Survey sheet number and a field number which uses eastings and northings to locate a point on the sheet which falls in the centre of the field. This information was held in a database and used to verify the amount of subsidy available to farmers.

Mandate

The European Commission (EC) introduced legislation in July 2000 which requires all paying agencies to hold all EC funded scheme information in a way which will enable ease of cross-checking between schemes by January 2003 and to create a land parcel identification system which includes making a geographic information system part of the Integrated Administration and Control System by January 2005.

A project was established using PRINCE 2 project management techniques in July 2000 to manage this process.

Method

At that time, the National Assembly for Wales Agriculture and Rural Affairs Department had limited Geographic Information System expertise. It was therefore necessary to identify the actual requirement and to define suitable approach for creating the Land Parcel Identification System, which could be tested through a number of pilots. In addition, without exception, it's probably fair to say that everyone involved in the project had a different perception of what a GIS is and what was required!

A clear set of requirements and a business case was therefore defined and mandated by the Project Board before the project was formally initiated. This approach, which took two months, helped to focus everyone's minds on what was actually required. The result of the requirements definition clearly pointed the need to capture a robust dataset and highest priority over the introduction of GI software – this was quite a radical concept for the Project Board as the desktop solution had probably been seen as the main requirement before the requirements definition process.

Defining an approach

The primary stage of the project was to define an approach for data capture. However, we had limited experience of how this should be undertaken. To establish a pragmatic way forward, we established a short data capture pilot, which involved drafting a brief statement of service requirement and a set of standards. We had no mechanism for carrying out the data capture in house so we let a short contract to digitise 300 farm holdings in two discrete areas of South West Wales. We were also keen to put the successful contractor under similar time / quantity / quality pressure that a contractor would be under for a full data capture process. We therefore sought for all fields to be captured digitally and maps produced within 3 weeks. The pilot was not a success – the contractor did not manage to finish the work in time, the quality was poor and there were a large variety of interpretational errors. However, a requirement of the contract was that the contractor should complete a report of their lessons learned from the process that proved extremely valuable. We also thoroughly checked each map and listed a variety of issues that we set about trying to correct with the contractor. At the end of the pilot we had a large number of lessons learned and a much clearer idea of a way forward for the project.

Learning from others

We were also fortunate to be able to learn from our colleagues in Scotland – who were one of the first paying agencies to establish a Land Parcel Identification System. The approach taken in Scotland was to mail maps to farmers and for farmers to make their own corrections which would then be captured by their contractor. There were a number of issues with this approach – farmers in some instances did not return maps; some returned maps with boundaries marked in thick pen or with unclear instruction; a number of farmers went through an iterative process of field boundary adjustment which in some cases took years to resolve. There were also issues with base mapping which had not been updated for some time. To correct these issues, colleagues in Scotland became pioneers in the use of Global Positioning Systems (GPS). Their advice to us was to try to get the data capture right-first-time.

Corporate Vision

The data capture approach was also to be heavily influenced by our corporate vision. The National Assembly for Wales Agriculture and Rural Affairs Department had initiated a significant change programme called JIGSAW (Joint Initiative for Government Services Across Wales). The key themes of this programme is to improve the way in which we deliver services to our customers, become more customer focussed and to seek to deliver other services to our customers through our front-office service.

Process design

Valuable information gathered from the pilot, advice from Scotland and our corporate vision were pulled together with business requirements to assist in the design of the process. This resulted in a strategy for data capture in which we would work with the farmer to obtain the best and most representative boundaries of their field parcels. We also wanted to take this service to the farmer rather than summon the farmer to a central location – part of our customer focus initiative. We also needed to fit the data capture process into the narrow window available within the IACS timetable – 5 months between July and December! It would not be cost effective for us to visit every single farm so we decided to deliver this service to the farmer at local venues (village halls, etc).

The issue of base mapping being out-of-date also applies to Wales. It would not be feasible for each farm boundary to be walked and reviewed so we needed to establish a third party view of the land to provide the farmer with a level of confidence in the process. For this, we decided to procure aerial photography.

Farmers also needed to benefit from this exercise. Farmers are busy and their time is valuable so we needed to provide a way of encouraging them to participate. For this we decided to offer the farmer free map of their registered land together with up-to-date measurements of each field.

Engaging with a contractor

We now had an approach in place and a number of draft processes. We also developed, from our pilot, a rulebook for data capture and a set of standards. However, it was fundamentally important that we engaged in the right way with a contractor to make our vision a reality. We wanted to engage with a contractor in a non-commercial way but in a way where we could work together for mutual benefit. This also influenced the way in which we constructed the Statement of Service Requirement (SSR). When putting the document together we tried to put ourselves in the position of the contractors trying to bid for the work and tried to make it as comprehensive as possible and sought to remove any ambiguity.

The procurement process followed the traditional EC OJEC procurement process where we produced an advert for the journal from which we had 53 expressions of interest. These companies were sent questionnaires to complete. 18 responses were received which were evaluated and a shortlist of 4 respondents was drawn up. A Statement of Service Requirement was issued to each of the shortlisted organisations.

As part of our desire to engage with the contractors in the right way, each shortlisted bidder was invited to a meeting early in the bidding process where we “Sold” the project to the contractor. We also stated our intent to work with all bidders to help them put together the best possible bid for our work and we told them what they needed to do to “Win our Business”. We provided each bidder with the opportunity to present their thoughts to us and also made time for further clarification to be sought around the approach. We received high commendation from all bidding companies for this approach and for the thoroughness of our SSR – a surprise for the team as we had not written one previously! Each bidder was also encouraged to use innovation where possible and to bring their ideas and experience to the project. We also shared our lessons learned with bidders.

Bids were submitted and a vigorous evaluation period ensued. A consortium comprising of Infoterra, Landmark and RMSI won the contract. Their bid also included additional opportunities, benefits and innovative approaches that could be called off as required. Particularly impressive was the fact that they used our thorough Statement of Service Requirement to develop the actual data capture process and technology and demonstrated it in front of the evaluation team which gave us confidence in their ability to undertake the work.

Project issues

During the bidding process, there was an outbreak of foot and mouth and the original schedule for the project needed to be deferred for a year. In addition, part of the Integrated Administration and Control System for Common Agricultural Policy schemes involves an on-the-spot control check of land, which involves 5% of all applications. During the foot and mouth outbreak, it was not possible to carry out these checks on the farmland. However, it is an EC requirement that these checks are carried out before we were able to make payments. The EC make provision for these checks to be carried out using remote sensing techniques. The team, therefore needed to learn about remote sensing and introduce this requirement into the Statement of Service Requirement within two weeks. Infoterra carried out the remote sensing checks on our behalf and after starting 7 months behind schedule, the team (which includes Infoterra) managed to catch up and produce controls which met the EC standard and enabled us to make payments to farmers.

Creating the dataset

Infoterra (who performs quality control and consortium management), RMSI (system design and data capture) and the team worked together to identify the most appropriate map features and polygon closing routines to represent rural farmland. RMSI then used this information to autopolygonise OS LandLine®. Our IACS field centre points were then overlaid and a point in polygon matching process identified possible fields. Each field was then checked against aerial photography – which was obtained from Getmapping and, where necessary, corrections were applied. Each polygon had an indicator to show how much of the polygon is constructed from OS LandLine® or Aerial Photography or other means. Each point was then thematically coloured depending on the confidence of the field boundary being correct – black if the farmer’s declared measure was within 2% of the derived boundary measurement; red if the farmer’s declared measured area exceeded the derived boundary measurement by greater than or lesser than $\pm 2\%$; blue if multiple points were found in the same field where the total declared by the farmer for all fields were the same the measured boundary of the field but no internal boundaries could be found and a red square if the boundary of the field could not be mapped – usually because the field reference has become transposed as some stage and therefore displaced spatially.

Pilot process

As the main data capture process would involve meeting with around 17,000 farmers over a 5 month period to review the boundaries of half a million fields, it was agreed that all parts of the process needed to be thoroughly tested and evaluated. Although a significant amount of work had gone into simplifying the production process as far as possible, it was still complex and relatively untested. The process involved, RMSI producing plot files for the maps, aerial photography prints and data tables, which would be printed by Landmark in Exeter. These maps would then need to be couriered to the relevant venue where a consultation took place with the farmer. The farmer’s changes were marked up on the map and the changed maps would be forwarded to Landmark who would scan the amended maps and transmit the images to RMSI who would digitise the changes, produce a final plot file which would be sent to Landmark and Landmark would print and issue the final maps to the farmer.

This major, complex procedure, which would involve a significant number of our customers, would need to be tested. For this purpose we ran three pilots involving 300 actual customers. These pilots provided the opportunity to test the processes, gather measurement information about the process and provide experience to staff in readiness for the main data capture process. The pilots were successful. We had a 97% attendance rate which, coupled with very positive feedback from customers, proved our approach. We were also able to use the thematic mapping of the field centre points to work out the estimated length of time for each consultation.

Continual Improvement – a Digital Mark-up System

However, although the pilots were a success we could still see room for further improvement. One of the major improvements came from a chance visit to one of the consultations by colleagues from RMSI. In their bid, the consortium had proposed that an electronic “Mark-up” system might prove more efficient than marking up paper maps. This was not seriously considered at the process design stage, as there was a concern that village halls would not be able to cope with a high level of technology – however our pilots had demonstrated otherwise. Within 3 weeks RMSI had built and demonstrated a prototype “Digital Mark-up System” which proved to be an immediate success and would significantly reduce the potential for Mark-up error and would provide operators with access to full maps and aerial photography for the whole of Wales – rather than confining the consultation to a map of the holding (during the pilot, a large number of maps needed to be printed at the venue because the extent of the map did not enable additional fields to be captured).

The Digital Mark-up System has proven to be an overwhelming success with operators, farmers and now even our field and divisional staff who use it to capture the results of field inspections or reported changes to field boundaries.

Data Capture process launch

July 22, 2002 saw the launch of the data capture phase of the project. During this phase, which lasts five months, 36 staff – split into four geographic teams – will meet with over 16,000 farmers and review half a million fields using the Digital Mark-up System. Consultations are being carried out at 30 venues across Wales and farmers are sent an appointment time, duration and the location of the venue for their consultation. Lengthier consultations (over 2 hours) are being handled by mobile officers who will visit the farmer on-farm and carry out the consultation over the kitchen table. Smaller holdings or those which have been recently mapped are sent copies of their maps and asked to drop into their nearest venue at their convenience where any changes are captured.

The process has been well received by farmers and their unions – indeed at the launch we were inundated by the level of interest and we had to draft in many more operators and machines to carry out a demonstration.

Lessons learned

This project has been extremely challenging and not without its difficulties. However there were some techniques we learned along the way that we would like to share:

- Spend time establishing what is actually required and educating all those involved. Many people think that GI is about the software on the desktop and not about the data;
- Test approaches as far as possible and always seek to improve your approach;
- Use a robust project management technique which is also flexible enough to deal with change – PRINCE 2 is ideal for this type of project because detailed planning for the next stage is only done at the end of the previous stage so it is possible to change track whilst maintaining project control;
- If using contractors, provide as much information as possible and do your thinking up front. Also try to engage with them in the best way for both parties involved – its possible to get more out of the relationship than what the contract states!
- Learn from others wherever possible – we were very fortunate that our colleagues in Scotland had already gone through this process and readily shared their lessons with us;
- Don't be afraid to innovate – the Digital Mark-up System has proved to be a real benefit – not only to the project but to other parts of the business and its changed the way we now think about data capture;
- Try to identify and sell the benefits to the customer as far as possible; and
- Invest time in reviewing and evaluating the effectiveness of the process – in projects of this scale, minor changes to the process can have a major effect.

If you would like to know more about our project – please contact:

Operational Manager - Nadia Cummins (01267) 225465
nadia.Cummins@wales.gsi.gov.uk

Technical Manager - Louise Clarke (01970) 621452
louise.Clarke@wales.gsi.gov.uk

Project Manager – Graham Rees (01970) 621452
graham.rees@wales.gsi.gov.uk