THE CHIBA SOLUTION

OUTPUT, INCOME AND PROFITABILITY ARE ALL IN DECLINE IN JAPANESE FARMING.
MIYUKI FUJII REPORTS ON HOW FARMERS ARE USING A LAND INFORMATION SYSTEM DESIGNED TO ADDRESS SOME OF THESE PROBLEMS

The most striking feature of Japanese agriculture is the shortage of farmland. Due to its topography, only 20 per cent of Japan’s land area is capable of cultivation. Much of the 13 per cent that is cultivated is dedicated to the intensive cultivation of rice in paddy fields.

Given the shortage of farmland and a growing concern with food security, it might seem perverse that each year in Japan, more and more arable land is left fallow and even abandoned. The reasons are complex. They involve land-reform policies, import tariffs on rice and even government efforts through the ‘gentan’ system to pay farmers not to produce.

However, at the heart of matter is the fact that profits from farming are low and falling. While the Japanese government explores national policy initiatives to address this, farmers associations are trying to improve efficiency and profitability by encouraging cooperative working. Increasingly, they are using GIS technology to support their cooperation. The GIS deployed by Midori-net Chiba is one example.

Midori-net Chiba
‘Midori-net Chiba’ is the branch in the Chiba prefecture of a national non-profit organisation called Midori-net. The name ‘Midori’ comprises the three Japanese characters meaning ‘water’, ‘land’ and ‘village’. These characters reflect the membership of the association, which comprises drainage and land consolidation authorities (the Federation of Land Improvement Associations), farmers and municipalities.

The prefecture of Chiba, which occupies the peninsula to the east of Tokyo, is home to over 6m people. Farming is important in Chiba. The prefecture ranks fourth in Japan for agricultural production and was once known as ‘Edo’s Pantry’, thanks to its abundant farmlands and close proximity to the capital, Edo (present-day Tokyo).

The farming economy in Chiba shares the same characteristics as farming elsewhere in Japan: falling incomes, falling output, falling profits, and small and fragmented plots. As profits and incomes from farming are declining, the children of farmers have been reluctant to succeed their parents in farming and aging couples have had little choice but to continue farming on their own. Statistics from 2008 revealed that 56 per cent of full-time farming households consisted of elderly full-time farmers with no males under the age of 65. Such farm households are not financially motivated to expand the acreage they cultivate and they allow land to go fallow. They also have little motivation to sell or lease their smallholdings.

Sharing water, sharing information
The irrigation and drainage systems that individual farmers depend on for farming rice only function when there is cooperation between neigh-
bouring plots. In fact the 'land improvement associations' set up after the Second World War were specifically aimed at providing the coordination that might otherwise have been missing following the land reforms in which large land holding were broken up and sold to households at low prices.

The same desire for coordination and cooperation was also behind the Ministry of Agriculture, Forestry and Fisheries (MAFF) initiative, the 'Farmland Information Utilisation Project', which was set up in 2006. Under the initiative, MAFF subsidised Midori-net Chiba to capture and record a wide variety of geographical information in the Chiba prefecture. This was information that would serve as a generic resource for all those involved in farming and farm policy in the prefecture.

In 2006, there was no relevant digital geographic information that could be shared amongst Midori-net Chiba members but thanks to the project, today, almost all geographic information has been captured in Chiba, with each municipality responsible for digitising the base data for the area under their jurisdiction, and according to an agreed data model.

Three categories of base data are involved:
- Topographic maps at scales of 1:2,500 and 1:5,000. These are maintained by the planning department in each municipality.
- Orthorectified aerial photographs, which are used particularly to identify water facilities, water courses, farm lots and irrigation infrastructures.
- Farmland information comprising farm boundaries and lot-number maps managed by each municipality and cultivation maps having boundaries captured against aerial photographs.

**From data capture to deployment**

In the second phase of the GIS project, which started in 2011, Midori-net Chiba set about deploying and sharing the geographic information
they had captured. The association contracted with Japanese IT vendor Informatix to provide the necessary GIS products and services. Informatix has deployed desktop GIS and web mapping applications based on localised versions of geospatial products from British software developer Cadcorp. These comprise several hundred licences for desktop GIS products and a deployment of an internet GIS and mapping product “WebGIS”, based on Cadcorp GeognoSIS technology.

The desktop products have been designed for database creation and to address the requirements of the more expert users in the municipalities of Chiba. Although most base-map information had already been captured by 2011, desktop GIS will remain in use in Midori-net as the main vehicle for updating the more dynamic business data involved in farming, such as changes to land use.

WebGIS on the other hand has been designed specifically for the non-expert user and access is currently available to 100-200 registered and authorised users. They can view topographic, cadastral and thematic maps, such as land-use and water facilities maps. They can also use web mapping as a generic window through which to search and query information about objects represented on screen (such as lot numbers), to measure lines and areas on-screen, and to print maps. Informatix has been able to meet these requirements by deploying generic Cadcorp SIS products, amended to support Japanese characters. In the case of both desktop and web GIS, Microsoft SQL Server is used as central repository of base maps and orthorectified aerial photography.

GIS in practice

Web GIS is making life easier for both managers and users of the system, as a Midori-net Chiba representative reports: “The GIS technology supported by a centralised spatial database allows many kinds of agricultural data to be quickly overlaid on the base-map, and then easily shared over the internet with other members of the farmland organisations in the Chiba prefecture. Previously, whenever a map was revised, we marked up the changes on a paper map and then faxed a copy of the changes to all the parties concerned. Now the WebGIS service enables members with little or no GIS knowledge to remotely access the latest data at any time. This not only saves us significant time and effort, but it also helps avoid introducing inconsistencies into the data. And being a web-based application, it is also very simple for us to install.”

The main users are those with greatest need to see the big picture – the Midori-net staff who are responsible for ensuring the drainage and irrigation facilities are in a good state of repair. For them, GIS is vital asset management tool. The map represents a window into the asset lifecycle of the facilities in their charge. It records the condition of plant and its maintenance and renewal history. The system is invaluable in helping staff construct repair plans when necessary.

The general public have access to WebGIS and regularly query the system to return information about land ownership and land use. Other agencies outside Midori-net can also request and share data in digital form. In many cases, their needs are being met by the staff of Midori-net using Cadcorp SIS functionality to create maps to their specifications, which they then deliver in digital and paper forms. The following are examples of maps generated by Midori-net as a service for other agencies:

- Maps showing the extent and schedule for planned spraying activities to control paddy-rice diseases and insect infestations.
- Maps showing income support by farms and by fields.
- Maps identifying and logging the location and extent of fallow and abandoned fields.
- Maps to be used in conducting field and farm surveys.

What the staff of Midori-net have discovered is that by providing easy access to a shared data source, where no shared data previously existed, they have generated new demands from new users. For example, organisations involved in forestry management in the prefecture of Chiba have been quick to recognise the value of having access to up-to-date orthorectified imagery from which they can create their own forestry maps. Building on this unforeseen take-up, Midori-net Chiba is now preparing for a second phase of their GIS project in which spatial data will be shared with more people, for more purposes, and using a variety of delivery mechanisms.

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