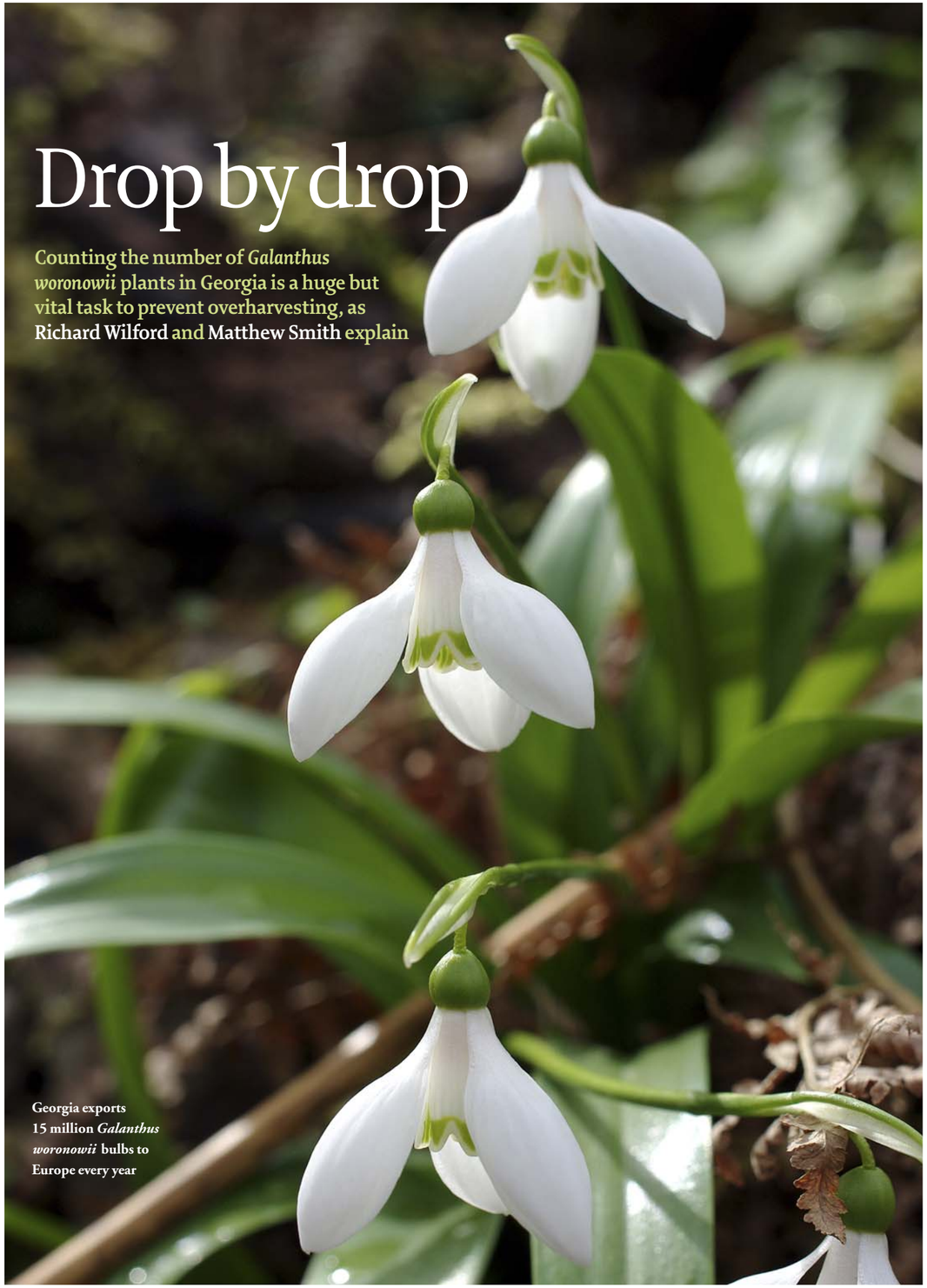
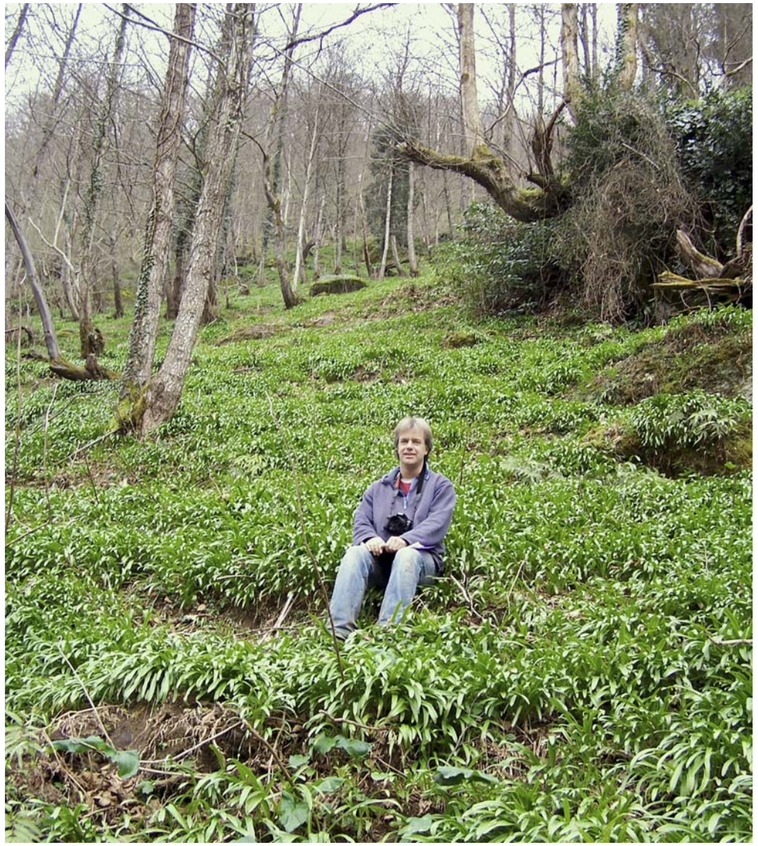
Drop by drop

Counting the number of *Galanthus woronowii* plants in Georgia is a huge but vital task to prevent overharvesting, as Richard Wilford and Matthew Smith explain



Georgia exports 15 million *Galanthus woronowii* bulbs to Europe every year



Left: Richard Wilford with wild *G. woronowii*, its broad, dense leaves carpeting the ground

Below: *G. woronowii* is often seen in open woodland growing with *Cyclamen coum*

The Land Rover hauled us up the slopes of the Lesser Caucasus Mountains, in south-west Georgia, our driver skilfully negotiating the potholes and hairpin bends. We reached a field sloping down from a farmhouse high above the valley, covered with a couple of inches of freshly fallen snow.

After being introduced to the landowner, we carefully made our way down the steep, slippery incline and brushed away the snow to reveal a carpet of snowdrops. The wide, shiny leaves and occasional flowers identified this species as *Galanthus woronowii.* This was the plant we were looking for and here it was being grown as a crop on this remote Georgian hillside.

Galanthus woronowii is one of the most common species of snowdrop in Georgia. Its natural range extends from north-east Turkey to eastern Georgia, but it's especially abundant in western Georgia, in the Autonomous Republic of Adjara, where the climate is damp and humid for much of the year. It has a typical snowdrop flower, with a green mark covering the lower third or less of the inner petals, but the most distinctive feature is the leaves, which are wide, glossy and mid- to light green.

Snowdrops are popular garden plants, and bulbs of *G. woronowii* are exported from Georgia to the horticultural industry in western Europe. This commercial trade is regulated by CITES, the Convention on International Trade in Endangered Species of Wild Fauna and Flora. All snowdrops are included in CITES Appendix II, which lists plants that are not threatened with extinction at present but may become so if trade isn't monitored and regulated. This is vital to ensure that wild populations aren't overharvested, and quotas for export are set in order to limit the numbers leaving the country.

The Georgian quota for *G. woronowii* is currently 15 million bulbs a year, but until recently there has been little information regarding the full extent of this species in Georgia. However, that situation is changing, as Georgia is conducting surveys to clarify the status of its wild and cultivated snowdrop populations.

PHOTOGRAPHS: RICHARD WILFORD, MATTHEW SMITH

Kew was invited by the Georgian authorities to help with the assessment of fields where this plant is cultivated, which is why we found ourselves shuffling around in the snow on a Georgian hillside in March. As part of the CITES Scientific Authority to the UK Government, Kew is involved in a number of CITES projects, including, since the late 1980s, research on the sustainable harvesting of snowdrops for international trade.

On this occasion we were here to see how local farmers grew and propagated snowdrops, whether the fields were clearly distinct from wild populations, and get a rough idea of the potential harvest from these fields. If a significant number of bulbs can be collected from the cultivation fields, it could provide valuable extra income for local growers.

We travelled many miles through the hills and valleys of Adjara, sometimes finding snowdrops grown among cabbages or in mandarin plantations, but mostly they were planted with maize. The maize is cut in autumn and replanted after the snowdrops have been harvested in May.

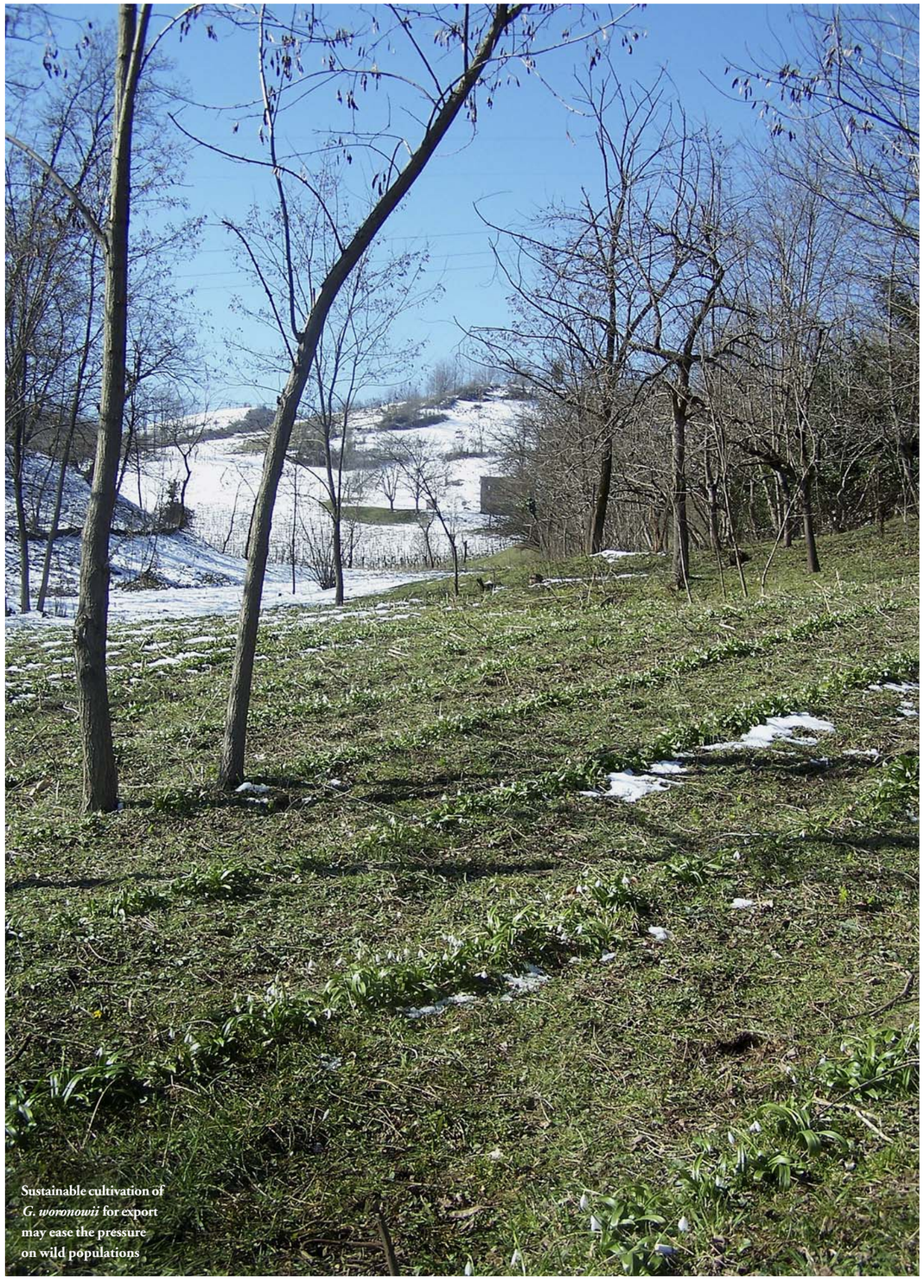
Unfortunately, neither of us could speak the Georgian language but our institutional partner and host for this trip, Grigol Deisadze, from the Tbilisi Botanical Garden and Institute of Botany, did a fantastic job of interpreting our often detailed questions and handling the even more detailed answers. He also did well to regulate the legendary Georgian hospitality, ensuring we had enough time to visit a wide range of cultivation sites during daylight hours.

Extra time in the field was especially important because we and Grigol were to be the first to actually count how many plants were there. We undertook this more arduous task to help us assess potential harvest levels and make comparisons with wild populations. Obviously we didn't count every plant – to make the surveys manageable we counted the number of plants in twenty 50cm by 50cm squares in each field. This was enough to estimate abundance with reasonable accuracy.

It's hard to imagine what the farmers thought of two British visitors coming all this way to kneel down in their fields and count snowdrop plants, but the figures and subsequent analyses have given us a much clearer

Below: assessment is tricky at high altitudes, where the fields are steep and snow covered

Bottom: Matthew Smith counts the number of plants in a 50cm by 50cm square



Sustainable cultivation of *G. woronowii* for export may ease the pressure on wild populations

PHOTOGRAPHS: RICHARD WILFORD, MATTHEW SMITH

picture of the potential harvest of cultivated *G. woronowii* from Georgia.

We also saw some wild populations and began to appreciate how abundant this species can be in the region. Often growing under trees, it could be found along with scillas and *Cyclamen coum*. In some places we saw it growing as densely as bluebells in an English woodland, its clumps of broad leaves crowding out virtually all other plants.

The separate task of surveying wild populations was led by David Kikodze of Tbilisi Botanical Garden and Institute of Botany, with the help of several other Georgian botanists. Over the whole spring, almost all known populations of *G. woronowii* in Georgia were studied. 'For the survey, 41 populations of this species were visited in different parts of Georgia, with 25 found in Adjara,' says David. Some populations were huge, covering more than 20 hectares, while others were much smaller. 'The total area of the 41 studied populations is about 429 hectares.' The information gathered is probably one of the best examples of a comprehensive national survey of the abundance of a wild plant.

This information will help ensure that harvesting of *G. woronowii* is sustainable and, with the data on cultivation sites, has transformed the way the Georgian bulb harvest is understood. However this also presents new challenges. Processing the information to help set quotas is complex, but with the help of the Computational Ecology and Environmental Science group at Microsoft Research in Cambridge we hope to develop, with our Georgian colleagues, basic tools that could be applied to other harvesting systems around the world. It would be great if the harvesting and management of *G. woronowii* in Georgia could become a shining example of how to harvest wild resources for the sustainability of both the wild plants and the livelihoods of those involved in the industry.

Richard Wilford is Kew's Hardy Display collections manager, Matthew Smith is a scientist at Microsoft Research, Cambridge

You can see Galanthus woronowii *in several locations on Kew's Rock Garden, flowering from late January and throughout February*

By producing offset bulbs, *G. woronowii* builds into large clumps that farmers can sell

Snowdrop cultivation in Georgia takes place mainly in the hills and valleys of the south west

How to grow snowdrops

- Plant snowdrops in dappled shade, under deciduous trees and shrubs or in the partial shade of a wall or hedge. Most of the commonly grown snowdrops, including *Galanthus woronowii*, prefer soil that is well drained but not completely dry in summer.
- It's a good idea to buy snowdrops after flowering in spring, when they're sold with leaves (known as 'in the green'). This way you know they haven't been left for weeks to dry out on the garden centre shelf.
- If you do buy dormant bulbs, buy them early (from about August) and plant them straight away.
- Snowdrops increase by producing new bulbs as offsets, so clumps gradually build up over time.
- Sometimes a clump may stop flowering – if this happens, divide up the clump and replant the bulbs further apart.
- Although they do produce seedlings, snowdrops hybridise easily so these may differ from the parent plant, especially if you have other varieties nearby. To keep a named variety true, propagate using offset bulbs rather than seeds.

PHOTOGRAPHS: RICHARD WILFORD, HINA JOSHI