



Out of Asia

the spread of agriculture

Agriculture probably spread from western Asia into Europe in a 'stop-go' process, with rapid take-up interspersed with long delays in adoption, say **Glynis Jones, Caitlin Buck, Mike Charles, Tom Higham and Sue Colledge.**

Around 10,000 years ago on the fertile crescent – the foothill regions of modern Iran and Iraq, as well as Syria and the Levant – the shift from hunting and gathering to agricultural production marked a key moment in human history. Prehistoric archaeologists have long recognised the importance of this transition, and its subsequent spread into Europe, and have sought to understand the processes involved. Our project, the first to date this spread entirely on cereal grains – the actual product of agriculture – indicates that cereal cultivation spread rapidly along the Mediterranean coast to Italy and into Iberia, and was certainly established by about 7750 BP (before present). But these cereal grains show that the much-debated spread inland occurred in fits and starts. It seems agriculture arrived in the Balkans around 7950 BP then halted for approximately 800 years before spreading rapidly to north-west Europe, arriving with near synchronous dates in the Czech Republic and the Netherlands.

The events surrounding the spread of domesticated crops from

south-west Asia across the diverse landscapes and societies of early Europe, from the arid Mediterranean to the temperate shores of north-west Europe, involved a complex set of interconnected changes in lifestyle but in virtually all cases ended with land coming under the plough. Archaeologists don't fully understand the nature of the transition in the disparate regions, but if we did, it may well offer clues to the reasons why farming based on the cultivation of a handful of plant species became the dominant way of life across Europe and the rest of the world.

Possible explanations for the delays in agricultural spread could be a slow uptake of agriculture by existing human populations due to the relative success of the hunter-gatherer lifestyle; or a reflection of the time taken for crops to adapt to alien climatic conditions. Some recent attempts to interpret existing radiocarbon dates for early European farming sites have, however, cast doubt on suggested pauses in agricultural advance while others have upheld the notion of an interrupted spread; most have also drawn attention to the lack of available dates from some regions. This has left researchers debating the causes for variation in the rate of agricultural spread when the timing and uniformity of that spread is itself a subject of debate.

Existing dates for the spread of agriculture in Europe are largely based on wood charcoal, collected from sites classified as Neolithic (the period associated with early farming) on the basis of artefacts such as pottery or other cultural evidence found at the sites rather than on the products of agriculture itself. These are poor measures of agricultural spread. The earliest appearance of cereals at sites throughout Europe provides a better marker to chart agricultural progression. Advances in radiocarbon dating

techniques such as Accelerator Mass Spectrometry (AMS) mean that we can date much smaller quantities of organic material – individual cereal grains as opposed to large pieces of wood. Archaeobotanical work in the latter half of the 20th century has generated a large resource of charred crop remains suitable for this purpose. Recent work has led to a database of cereal records for early Neolithic sites in Europe. Approximately 150 of the sites have samples containing domesticated cereals but, of these, we have less than 15 percent with AMS radiocarbon dates based on cereals.

We conceived the Sheffield University ‘Out of Asia’ project to

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remedy this. The first phase of the project focused on providing approximate dates for the arrival of cereals in five geographic regions: the Balkans, south-central Europe, central Europe, north-west Europe, and Iberia.

In some respects, these results support previous work indicating that cereal cultivation arrived in Greece from the fertile crescent region of south-west Asia, and then spread rapidly into the Balkans by around 7950 BP. Subsequent movement across Europe followed two major routes. The apparently rapid spread of agriculture along the Mediterranean coast may reflect the relatively uniform climate

and, though it has been suggested that here too agricultural spread was an interrupted process, our results provide no evidence for this. The second route through the interior of Europe is hotly contested with some researchers seeing the spread of agriculture slowing when it reached central Hungary, before again moving rapidly through the Danube and Rhine valleys, while others assert a more uniform rate of spread from the Balkans to north-west Europe. Our results support the first hypothesis.

The next phase of the project will date cereal grains from as many sites as possible to provide a much better coverage of sites across Europe. We will interpret the improved dataset with tailor-made statistical tools developed as part of the project. These tools will use Bayesian statistics (a model-based framework in which all questions are answered using probability statements) which will allow us to interpret new data alongside other important information such as topography and geography of the European landscape. We will thus model the spread of agriculture across the continent and provide a much better picture of when and where domesticated plants first became established and how quickly they spread. ■

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