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**ITE** has administrative headquarters north and south, and the geographical distribution of its 250 staff in six Research Stations throughout Britain allows efficient use of resources for regional studies and provides an understanding of local ecological and land use characteristics.

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#### **ITE NORTH**

**Edinburgh Research Station**  
(Admin HQ for ITE North)  
Bush Estate  
Penicuik  
Midlothian EH26 0QB  
Tel: 031 445 4343; Telex 72579  
Fax: 031 445 3943

**Banchory Research Station**  
Hill of Brathens  
Glassel  
Banchory  
Kincardineshire AB31 4BY  
Tel: 033 02 3434  
Fax: 033 02 3303

**Merlewood Research Station**  
Grange-over-Sands  
Cumbria LA11 6JU  
Tel: 05395 32264; Telex 65102  
Fax: 05395 34705

#### **ITE SOUTH**

**Monks Wood Experimental Station**  
(Admin HQ for ITE South)  
Abbots Ripton  
Huntingdon  
Cambs PE17 2LS  
Tel: 048 73 381; Telex 32416  
Fax: 048 73 467

**Bangor Research Unit**  
University College of North Wales  
Deiniol Road  
Bangor  
Gwynedd LL57 2UP  
Tel: 0248 370045; Telex 61224  
Fax: 0248 355365

**Furzebrook Research Station**  
Wareham  
Dorset BH20 5AS  
Tel: 0929 551518  
Fax: 0929 551087

The ITE Research Marketing Officers for ITE North and South are based at Banchory and Monks Wood, respectively.

INSTITUTE OF TERRESTRIAL ECOLOGY

(NATURAL ENVIRONMENT RESEARCH COUNCIL)

Project T0202<sup>2</sup>5M5

Quarterly Report to the British National Space Centre

## COUNTRYSIDE SURVEY 1990

Mapping the land cover of Great  
Britain using imagery: A  
demonstrator project in remote  
sensing

R M Fuller, A R Jones, G B Groom & A G Thomson

Environmental Information Centre  
Institute of Terrestrial Ecology  
Monks Wood Experimental Station  
Abbots Ripton  
Huntingdon  
Cambs PE17 2LS

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## INTRODUCTION

This is the third report, in a quarterly series, covering this project (see First Quarterly Report, Fuller & Jones, September, 1990; First Interim Report, Fuller *et al.*, December, 1990). This and the next two quarterly reports are intended as brief accounts of progress, to be followed by a detailed account in the Second Interim Report at the end of 1991.

## AIMS OF THE PROJECT

1. To compile a digital map of land cover in Great Britain, based on a hierarchical classification of major land cover types.
2. To make quantitative assessments of accuracy of end products.
3. To integrate the map with other topographic and thematic data in a GIS environment. This will include the production of demonstrator output in vector format.

## METHODS

The methods were outlined in the First Quarterly Report (Fuller & Jones 1990) and described more fully in the First Interim Report (Fuller *et al.* 1990). They are summarised in Figure 1.

## SCHEDULE OF WORK

The schedule of work and progress to date are summarised in Figures 2 & 3. The following paragraphs give brief descriptions of the currently active elements shown in Figure 2.

### Choice of imagery

Since the last report, we have examined all new quick-looks of Landsat imagery for the winter of 1990/1. Cloud cover and heavy snow falls have obscured land cover on almost all scenes and no new imagery has been identified to fill any gaps in present winter-coverage.

### Image search

The image search continues, using quick-looks sent from the National Remote Sensing Centre (NRSC). However, there is little shortage of summer images,

so it will be next winter before additional imagery is acquired to significantly improve the present situation. In the meantime, we will direct our searches to Scotland (hitherto delayed to prioritize DoE interests). It is expected that images currently in stock (Figure 3) and those available for Scotland will supply adequate cover to last until winter 1991/2 cover becomes available. Failing this, we will need to identify second quality cover, but suitable for classification.

#### **Geometric correction and image co-registration**

Figure 3 shows scenes which have been geometrically corrected to date. All summer scenes except 201-023 and 201-024 were corrected by NRSC. Most of the remainder were corrected by ITE. In either case, correction was better than one pixel root-mean-square error at control points.

#### **Class selection**

The choice of cover types (see First Quarterly Report Table 1) has been tested in the early stages of the classification. There has also been a limited consultation exercise with other surveyors and end users. A revised list of target classes and their detailed descriptions will now be circulated to those organisations nominated in the First Report.

#### **Ground reference data for 'training'**

The collection of ground data for training has become a routine technique. The procedure involves a preliminary classification based on visual interpretation of imagery, plus existing knowledge (including maps etc). This identifies unclassified areas on the classmap, and shows gaps in our knowledge of good training areas, thus directing our field reconnaissance. Photographic copies of images are annotated in the field with land cover information. A sample of such information is then used for further addition of subclasses and training areas. Ground data collection has taken place within all images identified as classified on Figure 3.

#### **Accuracy assessment**

Accuracy assessment involves two stages - a preliminary, approximate, check-stage and a final, fully quantitative, validation procedure. The check-stage uses ground reference data collected whilst gathering training data. These are used to score success rates in classification. Results from scenes 201-023 and -024 showed 79% success before subsequent retraining and knowledge-based correction, which will have taken accuracy to around the 85% target (to be confirmed). Checking is about to start for scene 203-023.

The final validation phase will use digitised map data of the 1 km squares recorded by field surveyors in the sample-based field survey of Countryside 1990. The first of these has been imported from the ITE Merlewood ARCINFO GIS to the Monks Wood Laserscan system. The vector map-data have been converted to raster and compared with the results of classification for that 1 km square. Preliminary results suggest an 80% success for this one square. However, it is necessary to ascertain how best to relate the detailed field list, with several hundred attributes, to the land cover list of 24 classes. With this in mind, a meeting will take place between the field survey project leaders and the remote sensing team on 31 May

1991. New software has also been developed which will greatly simplify the import of ARCINFO data and installation is expected soon. The routine procedures of validation will commence once these two stages have been completed.

#### **Building mosaic of full GB land cover**

Scenes 201-023 and 201-024 have been mosaicked together to demonstrate feasibility. Subsequent amalgamation of data will use 100 km square subdivisions of the British National Grid. These 100 km square 'tiles' may then be amalgamated to give the regional or national cover as required.

#### **Hard copy production**

A 25 x 25 cm Spectrascan negative has been written to film from tape. From this, large format prints which have been made and used for display and demonstration purposes. The negative is available to BNSC/DTI for reproduction for its own publicity purposes.

#### **GIS demonstration**

A raster map of land cover, 3000 x 2000 pixels (75 x 50 km), has been exported from the IIS image processing system onto the Laserscan GIS. There, it has been converted to vector format. Initial experience shows that the very detailed raster map may require greater simplification, especially the filtering out of small parcels, to facilitate handling in vector format. Alternatively, the classmap could be held in raster, and converted to vector as and where needed. Further research is need to ascertain the best procedures for handling such a large and detailed dataset once the full classification of Britain is complete. This research is scheduled for late 1992/3.

## FORWARD LOOK TO FOURTH QUARTER

The aims for the fourth quarter (1 April to 30 June 1991) will be to:

1. complete fieldwork and classifications of scenes 202-022, 202-025, 203-024 and 203-025
2. extract 100 km squares of above data
3. derive correspondence between Landsat classes and field survey attributes
4. test ARCINFO to Laserscan export software
5. continue to develop and test methods for quantitative validation
6. identify and order as many scenes as possible to provide processing for rest of financial year

## LIST OF FIGURES

- Figure 1. Diagram summarising methods used to produce land cover maps of Great Britain.
- Figure 2. Planned schedule of activities and progress to date (black bars), May 1991.
- Figure 3. Status of data processing, May 1991.

## REFERENCES

Fuller, R.M. & Jones, A.R. 1990. *Countryside 1990. Mapping the land cover of Great Britain using imagery: a demonstrator project in remote sensing. First quarterly report to the Department of Trade & Industry, 19 September 1990.* Institute of Terrestrial Ecology.

Fuller, R.M., Jones, A.R. & Groom, G.B. 1990. *Countryside 1990. Mapping the land cover of Great Britain using imagery: a demonstrator project in remote sensing. First interim report to the British National Space Centre.* Institute of Terrestrial Ecology.

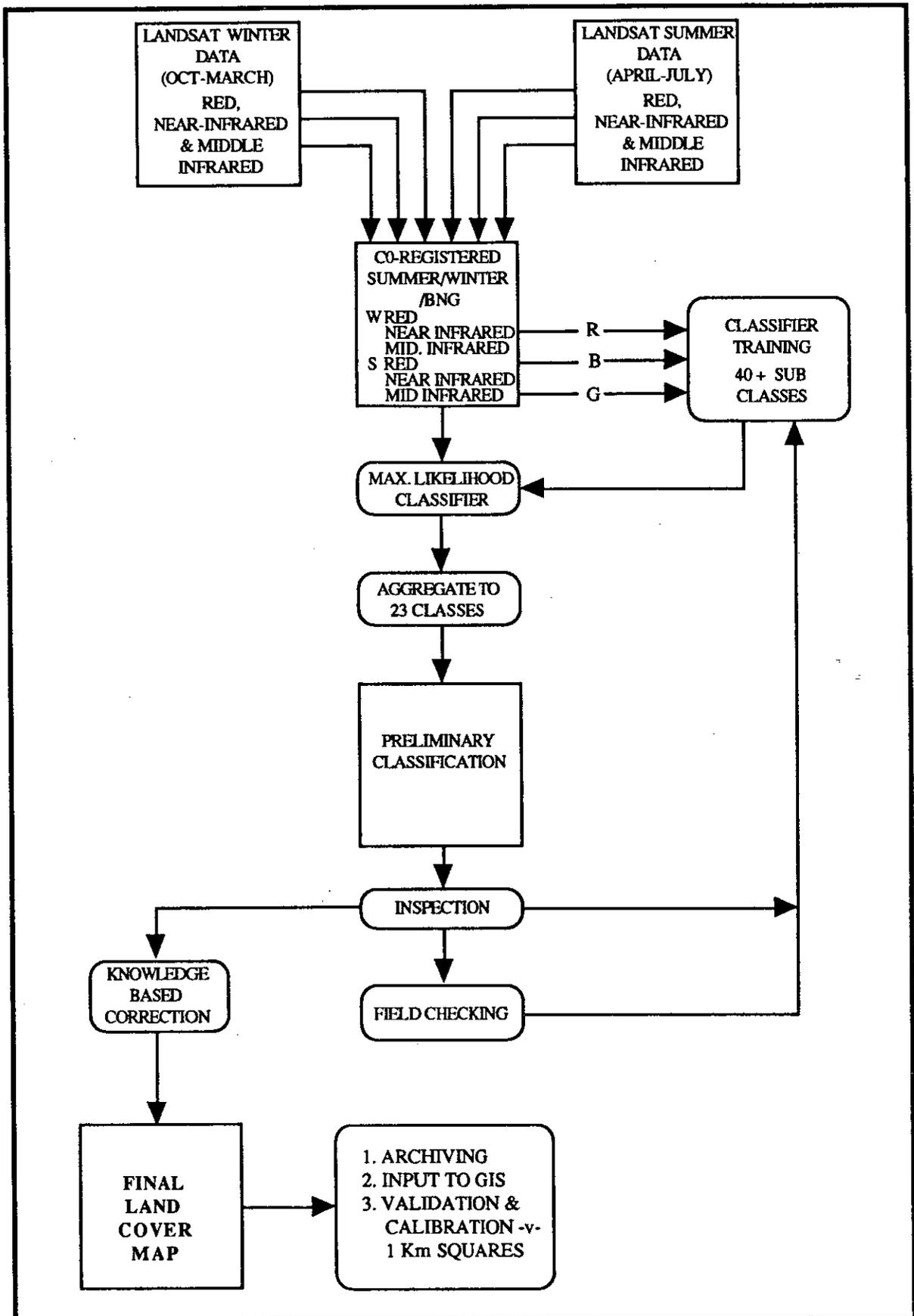


Figure 1. Diagram summarising methods used to produce land cover maps of Great Britain.

Figure 2. Planned schedule of activities and progress to date (black bars), May 1991.

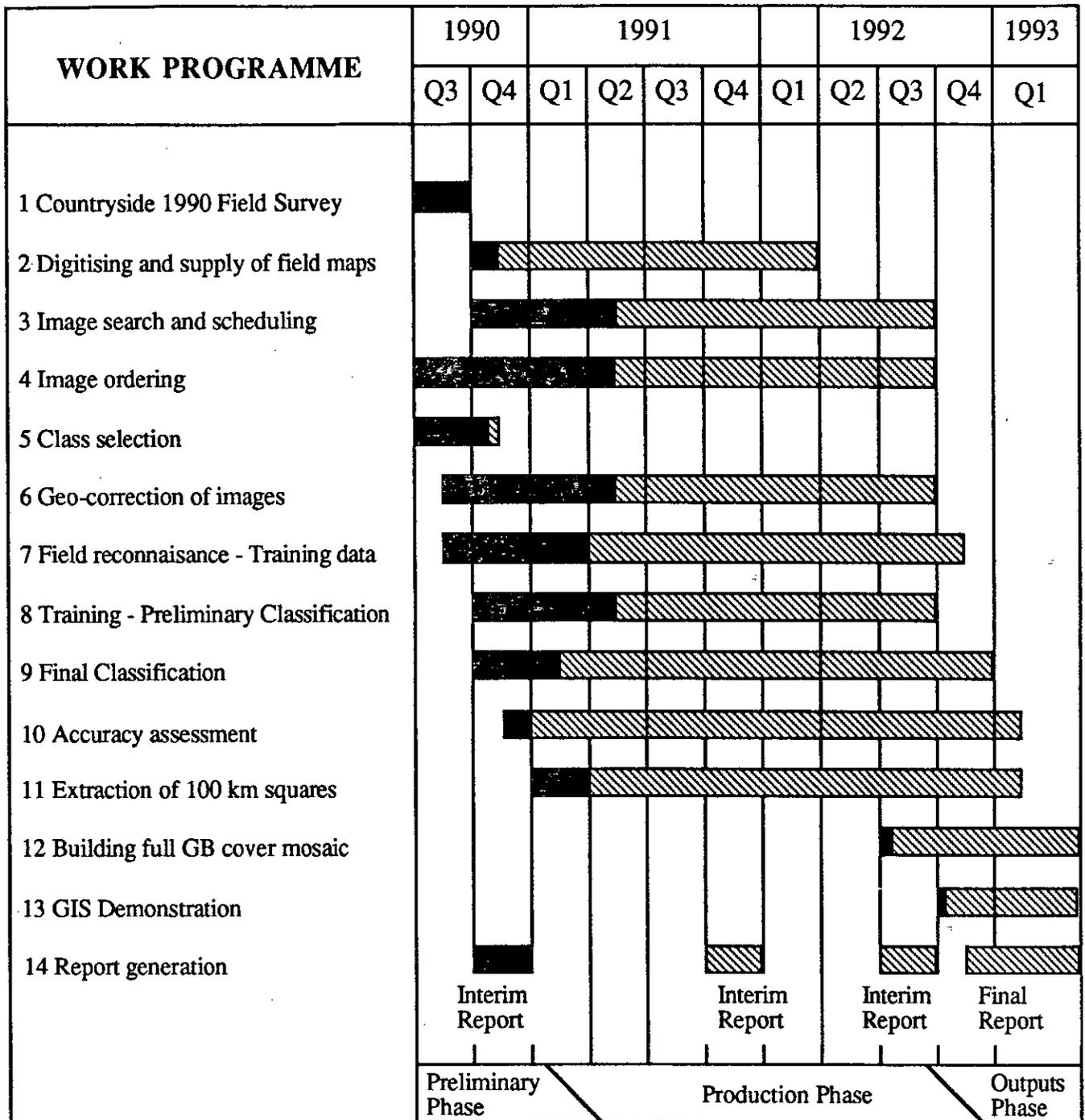


Figure 3. Status of data processing, May 1991.

