Vegetable landrace inventory of England and Wales: first steps

Defra project code: IF0164

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Presentation objectives

- Project aims and objectives
- Context in terms of the longer-term aims
- Outline of the methodology:
 - Experts' meeting
 - Definition of a landrace
 - Database design: descriptors and structure
 - Strategy for accessing landrace information
- Overview of preliminary results
- General conclusions and recommendations



Project aims

- To systematically inventory English and Welsh vegetable landraces to provide the baseline data needed to identify conservation needs
- Where possible, to initiate the *ex situ* safety duplication of landrace accessions



Project objectives

- 1. Collate vegetable landrace information
- 2. Create a database to manage landrace information
- 3. Provide access to landrace information available via the Defra Information Portal on Genetic Resources for Food and Agriculture (http://grfa.org.uk/)
- 4. Where possible, initiate safety duplication of landrace accessions *ex situ*



Included so far: cereals + forages

Project objectives cont'd

Include all main vegetable crop groups:

- Legumes (e.g., broad bean, French bean, pea, runner bean)
- Root crops (e.g., beet, carrot, parsnip, potato, swede, turnip)
- Brassica spp. (e.g., broccoli, Brussels sprout, cabbage, cauliflower, kale, rape)
- Salad crops (e.g., celery, lettuce, pepper, radish)
- *Allium* spp. (e.g., onion, leek, chives)



Long-term aims (beyond this project)

- Produce a fully comprehensive inventory of UK vegetable and fruit landrace diversity
- Systematically conserve landrace diversity ex situ and in situ (on farm/home garden)
- Collate local traditional (indigenous) knowledge associated with UK landrace diversity
- Establish self-sustaining regional networks of local food (vegetable and fruit landrace) resources
- Stimulate local landrace production and use by breeders
- Educate and raise public awareness of crop landrace diversity



Methodology: experts' meeting

- Invitation sent to members of the UK PGR Group
- Attended by 10 participants representing:
 - The University of Birmingham, Warwick HRI, Science and Advice for Scottish Agriculture (SASA), the John Innes Centre, the Institute of Biological, Environmental and Rural Sciences, and the Heritage Seed Library of Garden Organic
- Objectives:
 - Discuss the proposed project strategy
 - Share knowledge (contacts, literature sources, NGOs, commercial companies, genebanks)
 - Review procedures for obtaining germplasm samples for *ex situ* conservation
 - Provide examples of existing landrace conservation projects and the use of landrace diversity in formal crop improvement
- Report circulated to PGR Group

Methodology: Iandrace definition

Main landrace characteristics (Camacho Villa et al., 2006):



- Historical origin
- High genetic diversity
- Local genetic adaptation
- Recognizable identity
- Lack of formal genetic improvement
- Associated with traditional farming systems
- Associated with the traditional uses, knowledge, habits, dialects, and celebrations of the people who developed and continue to grow it (Negri, 2005)

Methodology: landrace definition cont'd

- Distinction between a 'landrace' sensu stricto and a 'traditional variety' or 'old variety' is not always clear-cut
- Keep an open definition to capture as wide a range of vegetable diversity in the inventory as possible
- Most importantly, we need to know:
 - Where landraces are grown
 - Who is maintaining landraces

Regardless of whether the crop is considered a landrace sensu stricto



Methodology: database design

Database structure:

- Crop maintainer (name, contact details, business or private, interest in conservation etc.)
- Crop nomenclature (scientific name, vernacular name, approved maintenance etc.)
- Socio-economic data (crop use, type, hectarage, source, country of origin, time grown, qualities etc.)
- Site geographic data (coordinates, descriptive location using NUTS and ISO standards)

Existing landrace database

»	Iandraces MS		
	Field Name	Data Type	
	id	Number	
	podlet_id	Number	
	cropname	Text	
	genus	Text	
	species	Text	
	subtaxa	Text	
	spauthor	Text	
	description	Text	
	image_id	Number	
	accessname	Text	
	uk_use	Text	
	location	Text	
	no_farmers	Number	
	est_area	Number	
	lat_long	Text	
	xcoord	Number	
	ycoord	Number	
e	year	Number	
Par			

Methodology: database design cont'd

	А	В	С	D	E	F	G
1	Vegetable landrace inventors of	England and Wales					
2							
3	TABLE/FIELD NAME	DESCRIPTOR	DATA STAP	DARD			
46	Crop_ID	Crop unique identifier	LR DB unique	D			
47	Mntr ID	Maintainer unique identifier	National list or	LR DB ur	ique ID		
48	Crop purpose	Crop purpose	own consumpt	ion. local	sale, natio	nal sale, s	seed pro
49	Crop use	Crop uses(s)	TDVG (Econo	mic Bota	nu Data St	andard)	
50	Crop tupe	Crop tupe	main crop. cat	main crop, catch crop, intercrop, mixed crop			
51	Crop bectarage	Cron bectarate	<0.5ha_0.5-2h	a 25-5ha	>5ha		
52	Crop source	Crop source	inherited anoth	ner drower	commer	cial seed :	source (
53	Crop orig	Crop country of origin (if known)	ISO				
54	Crop orig ontru code 2	Cron origin country code (2 letter)	ISO two letter of	ountruleo	des		
55	Crop orig optru code 3	Crop origin country code (3 letter)	ISO three letter	countrule	odes		
56	Crop_entru	Length of time group has been grown at the site	1-5 urs 6-10 urs	z 1120 urs			
57	Crop_sauing	Whether the maintainer saves seed/vegetative material from the cron	uestoo	o, in all gra	, reo gio		
EQ	Crop_seeing	Whether the maintainer pack and a conditioner that an infinite crop	yesho				
E0	Crop_exchange	Cree qualities	gesmo	lamand bi	istoria al in	toroghiltra	dition av
00	Crop_Quar Crop_LB_ctat	Crop (Jandrass) status	stong market o	ternanu, ni	weblook	terestrua thonour)	alcon, ye
00	Crop_Ln_stat	Crop (landrade) status	primary Lm (au	toenthone	Jusralloch	(nonous)	, second
01	Crop_cont	Whether maintainer plans on continuing to grow crop for the foreseeable ruture	gesmo				
62	Crop_snare	whether maintainer plans on passing the crop on to another grower	yesmo				
63	6						
64	Site_geographic_data						
65	Crop_ID	Crop unique identifier	LR DB unique	0			
66	Mintr_ID	Maintainer unique identifier	National list or	LH DB ur	iique ID		
67	Site_ID	Cropping site unique identifier	LR DB unique	D			
68	Site_lat	Cropping site latitude	decimal coord	inate syste	em -		
69	Site_long	Cropping site longitude	decimal coord	inate syste	em		
70	Site_location	Cropping site nearest village or town (if applicable)	Ordnance Surv	ey (UK) or	equivaler	it .	
71	Site_postcode	Cropping site postcode	Royal Mail (UK) or equiv	alent		
72	Site_NUTS_3	Cropping site area/city	NUTS (Nomer	iclature of	Territoria	l Units for	Statistic
73	Site_NUTS_2	Cropping site region/county	NUTS (Nomer	clature of	Territoria	l Units for	Statistic
74	Site_NUTS_1	Cropping site region	NUTS (Nomer	iclature of	Territoria	l Units for	Statistic
75	Site_ontry	Cropping site country	ISO				
76	Site_cntry_code_2	Cropping site country code (2 letter)	ISO two letter of	ountry co	des		
77	Site_ontry_code_3	Cropping site country code (3 letter)	ISO three letter	country o	odes		
78							
79	Site_environmental_data						
80	Site_ID	Cropping site unique identifier	LR DB unique	D			
81	Site_type	Cropping site type	field, orchard, h	nome gard	len, glassk	iouse, pol	lytunnel,
82	Site_elev	Cropping site elevation	<50m asl, 50-1	00m asl, 10	01-300m a	sl, 301-50	0m asl, 3
83	Site land	Cropping site landform	plain, basin, va	lley, platea	u, upland,	hill, moun	tain (Bio
84	Site aspect	Cropping site aspect	flat, N, S, E, V,	NE, NV, S	E, SV		
85	Site slope	Cropping site degree of slope	<10°, 10-30°, >3	30°			
86	Site soil test	Cropping site soil texture	sand, loarnu sa	nd. sandu	loam. loai	m íref for	more de
87	Site soil drain	Cropping site soil drainage	poorlu drained.	moderate	lu drained	well drain	ed (ref f
88	Site soil pH	Cropping site soil pH	acidic (< 6.6), n	eutral (6.6	-7.31 alka	line (>7.3)	fref for i
89					,		
90	Crop cultivation data						
91	Crop ID	Crop upique identifier	LB DB upique	n			
92	Site ID	Cronning site unique identifier	LB DB unique	in			
93	Matr ID	Maintainer unique identifier	National list or		iaus ID		
0.0	Crop. cov	From cowing date (given as month(s) of the year)	MANAC-MANAC	CH DB U	ique ID		
0F	Crop_sow	Crop sowing date (given as month(s) of the year)	nana(_nana)				
30	Crop_natV Crop_inite	Crop narvesting date (given as month(s) or the year)	relivi(-iviivi)				
35	Crop_img	Crop impation	none, moderat	e, neavy			
31	Crop_reit	Crop retailed type	organic, cnemi	cal, DOth			
38	Crop_pestod	Grop pesticide type	organic, chemi	cal, both, i	not used		
-99	Crop Funded	Eron fundicide tune	organic, chemi	cal both i	not used		

Database structure cont'd:

- Site environmental data (elevation, landform, aspect, soil texture, drainage, pH etc.)
- Crop cultivation (sowing/harvesting dates, irrigation, fertilizers, pesticides, propagation, selection criteria etc.)
- Crop conservation status (*ex situ* and *in situ* conservation status)

Methodology: strategy for accessing landrace information

- Information sources:
 - PGR experts, governmental documents, NGOs, commercial companies, genebanks, websites, literature, and landrace maintainers
- Key sources of existing data:
 - 'B' List of the United Kingdom National Lists of Varieties of Vegetable Plant Species (mainly traditional varieties in existence pre-1970s)
 - UK genebanks with major vegetable collections: WHRI, SASA, HSL, JIC

Methodology: strategy for accessing landrace information cont'd

- Novel landrace data:
 - Registered varieties (who is growing them, where, on what scale, under what environmental conditions etc.)
 - Unregistered varieties (may or may not already be maintained *ex situ*)
- Methods used to access novel data:
 - Media releases
 - Advertisements
 - A questionnaire
 - Internet searches
 - Email correspondence and telephone calls
 - Face to face meetings

Methodology: strategy for accessing landrace information cont'd

Media coverage:

- Media releases from UOB and WHRI
- Editorial and advertisements in key agricultural and horticultural periodicals (e.g., Farmers' Weekly, Horticulture Week and The Vegetable Farmer), plus the Grower Bulletin
- Local newspapers in key vegetable growing regions
- Radio 4 (Farming Today)



The number of traditional vegetable varieties has dramatically decreased in recent years. To help maintain vegetable diversity, the Universities of Birmingham and Warwick, funded by Defra, are creating an inventory of traditional vegetable varieties grown in the UK as a basis for their conservation. These varieties are of historical and cultural value but could also have as yet unrealized potential for underpinning future food security, particularly in the light of climate change.

If you regularly grow vegetables and save the seed for the next growing cycle and would like to ensure your variety is conserved for future generations we are interested in hearing from you.

For more information:

Email s.kell@bham.ac.uk or telephone 01297 678117

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Methodology: strategy for accessing landrace information cont'd

Questionnaire:

- Simple design to collect the minimum data needed for the landrace inventory
- Available as hard copy and online
- Meets requirements of the Data Protection Act 1998
- Approved by the Defra Survey Control Liaison Unit
- Advertised in key agricultural and horticultural periodicals
- Made directly or indirectly available to at least 1000 recipients (including 'B' List maintainers, other commercial companies, various grower associations and networks)

nformation will be processed by the Un	iversity in accordance with the provisions of the D	Data Protection Act 1998.	o acore.
 Your contact details (No identifiable complete the 'county' field so that w 	e personal data will be published. However, if yo ve can identify the approximate location at which	u do not wish to provide your full contact o your traditional vegetable varieties are grov	details, pl vn.)*
Title (e.g., Mr., Mrs., Ms., Dr., Prof.)	Family name		
Business name (if applicable)			
Address			
City or town	County	* Postcode	
Telephone	Fa	x	
Mobile	Ema	a	
. Do you grow vegetables for bu private purposes?	siness or Business Private	Both business and private]
What type of land do you gr vegetable crops on?	Home garden Allotment	Market garden Smallholding	Farm
I. Are your vegetable crops grow above location?	n at the Yes No	Some yes, some no]
If any of your vegetable crops are n at the above location, please give	ot grown Village, town or city the	r County	

Methodology: strategy for accessing landrace information cont'd



- Internet, email, telephone and meetings:
 - Extensive internet searches
 - Contact with a wide range of organizations and individuals by email and telephone
 - Pre-arranged face to face
 meetings and impromptu
 interviews (e.g., at seed-swap
 events)

Results: 'B' List vegetable varieties



Results: 'B' List variety maintainers

- 40 companies listed as maintainers of B' List varieties
- 20 based in the UK (including SASA)
- 15 based in other European countries
- 2 in Japan and 3 in the USA
- Some non-UK based companies have agents in the UK



Results: 'B' List vegetable variety maintainers cont'd



A recent review of the 'B' List revealed that some former maintainers had either gone out of business or no longer wanted to maintain the varieties. SASA took on maintenance of the varieties for which they had samples in the reference collection.

Results: 'B' List variety maintainers cont'd

- Some companies are only listed as official maintainers of one or a few 'B' List varieties but also maintain other 'B' List varieties for which they are not listed as official maintainers (e.g., Church of Bures)
- Conversely, E.W. King & Co. Ltd. are official maintainers of 70 'B' List varieties, not all of which are now commercially viable they continue to maintain some varieties that they no longer produce commercially in trial plots (P. Miller, E.W. King & Co. Ltd., pers. comm., 2009)

Results: 'B' List variety maintainers cont'd

- Much wholesale seed production is contracted out to overseas companies
- E.W. King & Co. Ltd. contracts out most seed production to overseas companies in other parts of Europe and in Asia and South America; stock seed is maintained in the UK in small plots—selection is carried out in the UK and mother seed is sent to growers overseas for regeneration
- Church of Bures (Suffolk) still produce the majority of their seed within the UK (in Norfolk, Essex, Suffolk and Cambridgeshire)
- Market sectors for wholesale seed:
 - Small packet seed companies
 - Small commercial growers
 - Home gardeners and allotment-holders
 - Agricultural production in low economy countries

Cheaper seed, good taste, disease resistance, tradition, no gluts

Results: UK genebank holdings



Results: Small-scale commercial companies

- At least 1000 unregistered vegetable varieties are being sold in the UK (J. Edgeley, Defra, pers. comm., 2009)
- Are these of interest? Yes, if they are of UK origin or imported varieties being subjected to grower selection and seed saving in the UK—especially those that have been maintained here for a significant period
- Many small-scale commercial seed companies maintaining landrace diversity (e.g., Thomas Etty Esq., Seeds by Size, The Real Seed Catalogue, Roguelands Vegetable Seeds Company, Carroll's Heritage Potatoes) (small seed packet market)
- Some seed production contracted out to overseas companies; for example, Thomas Etty Esq. contracts out to companies in other parts of Europe and N. Africa (R. Warner, Thomas Etty Esq., pers. comm., 2009)

Results: NGOs and individual farmers

- Many networks and groups maintaining vegetable landraces; including:
 - Garden Organic and HSL Seed Guardians
 - Biodynamic Agricultural Association
 - Dyfi Valley Seed Savers
 - Seedy Sunday
 - National Association of Allotment Gardeners
- Individual farmers:
 - F. Watkin & Son (Suffolk)
 - B. Lever (Cambridgeshire and Norfolk)
 - P. Brinch (E. Sussex)
 - E. Cormack (Dorset and Hampshire)
 - Elderly potato farmer (Gloucestershire)



Climbing French bean 'Melbourne Mini' trial Sophie Holdstock



Conclusions: challenges in accessing landrace information

- Landrace identification in UK genebanks
- Different people have different definitions of landraces
- Crop variety name is not a reliable indicator of its source
- Country of origin does not necessarily mean a landrace was developed in the UK
- Commercial sensitivity and concerns about legal repercussions over unregistered varieties
- Insufficient time and resources for businesses to respond

These challenges are not insurmountable! Lessons learned from this pilot study can be used to inform future research

Conclusions: landrace loss and new beginnings

- We know that many old landraces have been lost, mainly due to replacement with modern, high-yielding varieties—it is not known how many
- Commercial varieties are still being discontinued (e.g., E.W. King & Co. Ltd. – c. 20 traditional vegetable varieties discontinued in recent years because of competition from overseas companies as well as a fading market) (P. Miller, E.W. King & Co. Ltd., pers. comm., 2009)
- However, much vegetable landrace diversity is still being maintained in the UK
- Resurgence in interest in growing traditional varieties and in grower-based breeding amongst both amateur and professional growers—new landrace diversity in the making!

Conclusions: looking ahead

- A comprehensive inventory of UK vegetable (and fruit) landraces is critically needed to provide the baseline data needed to initiate appropriate conservation action
- Inventorying who is maintaining landraces is probably as important as inventorying the crop varieties themselves



- Most growers of landraces are interested in their long-term conservation and keen to be involved in this research
- Opening and maintaining dialogue with key groups and individuals will be critical for the effective, long-term conservation of landrace diversity

Conclusions: looking ahead cont'd

- Further collection of landrace diversity is needed to ensure representative samples are maintained *ex situ*
- Fresh samples of existing varieties should be collected where possible in order to capture genetic adaptation
- Some old varieties are being improved through grower-based selection and seed-saving—these should be collected to enhance existing collections
 - The initiation and implementation of a landrace protection scheme in England and Wales, following the model used in Scotland (the Scottish Landrace Protection Scheme), would help to open and maintain dialogue between growers and genebanks, and ultimately in the conservation of landrace diversity

Acknowledgements

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- Neil Munro, Garden Organic's HSL
- Mike Ambrose, JIC
- Gavin Ramsey and John Bradshaw, SCRI
- Maria Scholten, SAC
- Ianto Thomas, IBERS
- Chris Fawcett, ADAS

Vegetable landrace inventory of England and Wales

Thank you for listening!



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