

Appendices

Appendix 1: Bid to Climate Challenge Fund for Local Food Production

Programme 2 – Local Food

Sustainable Uist wishes to promote the production of local island foods through community action so that a steady reduction in food related CO₂ emissions will result.

Activities

In a new Local Food programme, SU will:

1. Raise the awareness of the community of the now proven growing techniques on the machair soils which allow west side growers to successfully raise their own crops. Work will be based on demonstration plots showing the best crop raising techniques through regular open days, two sets of winter evening classes, 4 day long workshops and new developments with the island growers' forum already established.
2. Demonstrate and promote one of the key elements of year round local food - winter salad production - using the 100m² sustainable greenhouse in which day length is increased using LED lighting powered by a small wind turbine. This aims to raise 2,000 lettuces over the winter of 2011/12. All food produced is offered free of charge to the public at open days and other events.
3. Respond to the east side island community (40% of population) who correctly pointed out that the 2010/11 Lionacleit trials did not address their completely different soil types. We have agreed a location to carry out trials on ground that has been cultivated for many years and has an organic content of only 10% (from local lab analysis). We will encourage future growers to use only pre-cultivated sites, thereby avoiding losses of carbon from peat soils.
4. Establish a new community greenhouse (funding recently secured) to be ready for its 8 tenants by the end of April 2011. The work here will be primarily educational, but the project also seeks to establish a model for a network of these community projects across Uist in the next 10 years.
5. Host a local food event in September 2011. Before, during and after this event SU wishes to gain a full understanding of local food chains and networks, and the current inhibitors which are stopping the development of a local food market and the substantial community benefits and associated CO₂ reduction.

Outcomes

- Food imports and food mile CO₂ emissions will fall.
- Awareness of the food miles issue will be increased.
- More island householders will start to grow their own food.
- A model will be established for community protected cropping facilities.
- Techniques will be established for larger scale community growing schemes.
- A greater self-sufficiency in island food production

Appendix 2: Detailed crop results from 2010 – 2011 trials

Crop Report: *Leguminosae*

Legumes – Peas and beans

Varieties were chosen for small size, ability to grow in poor soils and rapid growing characteristics to offset the short season and windy weather. Peas were not sown as it was thought the timing was too late.

Type	Variety	Supposed Characteristics	Direct sow /plant	Sowing Date	Plant out Date	Harvest Date	Best Result	Crop Comments
Dwarf French Bean	Speedy	quick growing	one seed per pot	21-May	11-Jun	<i>6-Aug</i>	<i>Plot 6</i> Needs lots of shelter but does best out in open for pollination. Covers abrade growing tip.	Reasonable if thin crop. Nearly all the pods were curved. Constant
Dwarf French Bean	Maxi	good on poor soils	one seed per pot	16-May	04-Jun	-	Did not thrive anywhere, but went out very early. Wind damage from June gales from north	Poor crop, few pollinated.
Broad beans	Sutton Dwarf	dwarf variety	Direct	12-Jun		<i>Sept</i>	<i>Plot 6</i> Needs lots of shelter but does best out in open for pollination. Covers abrade growing tip.	Poor crop – sown too late. Very few pods developed properly
Runner Bean	Hestia	dwarf variety	one seed per pot	26-May	18 June	<i>6-Aug</i>	<i>Plot 6</i> Needs lots of shelter but does best out in open for pollination. Covers abrade growing tip.	Poor crop – few pollinated and curved and short length despite good flowers

General comments

All the bean crops did poorly. They simply didn't thrive at all. Best crops were behind the fences where pollination was reasonable as opposed to almost non-existent under the covers. One issue was their position next to the wind fencing (see drawing XX) as this caused shading during the afternoons. This may have also affected pollination rates as flower crops were generally OK. Outside the fences/covers they were literally killed by the first gale. Nutrition was also an issue and low potash levels may have been the cause as legumes typically need 60-100kg/ha of K and not much P which conversely is in good supply on machair soils. This may also account for them doing better in the Growmore fertilised plots where a more consistent K supply is delivered.

Strategy

Beans need to be behind good fences, but not in the shade. Early crop not possible outside, so leave planting out till late June. Sowing date 1-7 June. Need plenty of K. Try more vigorous varieties and allow space to be laid out horizontally.

Crop Report: *Chenopidaceae*

Beets – Real/leaf spinach, leaf beet, chard, New Zealand spinach¹, beetroot

Varieties were chosen for ability to grow in high pH soils and resistance to bolting.

Type	Variety	Supposed Characteristics	Direct sow /plant	Sowing Date	Plant out Date	Harvest Date	Best Result	Crop Comments
Chard	Rainbow	long growing season	2 seeds per pot	17-May	03-Jul	<i>24-Aug</i>	<i>Plot 8</i> Seems to prefer organic fertiliser, but quick to bolt	Signs of chlorosis in leaves
Chard	Swiss	long growing season	1 seed per pot	17-May	03-Jul	24-Aug	<i>Plot 8</i> Seems to prefer organic fertiliser	
Beetroot	Boltardy	tested on high pH soils	3 - 5 seeds per pot	21-May	11-Jun	<i>6-Aug</i>	<i>Plot 6</i> Did better in open with 7:7:7, but no roots of any size	High number of non-true plants. Not much flavour.
New Zealand Spinach		good on poorer soils not frost hardy	1 seed per pot	17-May	02-Aug	-	Did not thrive anywhere	
Spinach	Palco F1	reliable on high pH soils	Direct	12-June	12-Jun	<i>23-Jul</i>	<i>OK in all protected fertilised plots.</i>	Went to seed very quickly everywhere and leaves easily damaged.
Leaf Beet	Erbette	less hardy	2-3 seeds per plug	21-May	11-Jun	<i>28-Jul</i>	<i>Plot 8</i> Seems to prefer organic fertiliser	High number of non-true plants

General comments

All the beets struggled in the challenging conditions. The deep rooted types - chards and leaf beets were raised inside in modules, but got off to a very slow start when planted out. In good conditions these crops develop very quickly and are considered along with beetroot to be one of the earliest crops to be harvested. This slow development most likely to be a nutrition issue and again low potash seems the most likely cause though the chlorosis suggests an Mn or Fe problem as well. It was noted that towards the end of the season the deep rooted beets did better showing perhaps that surface nutrients are more depleted than at lower levels. Bolting was a constant problem for all the beets and almost certainly caused by long day-length. All the crop leaves were susceptible to wind damage mainly in the form of tip burn and this was exaggerated under the covers where cover movement in the wind caused abrasion. Some of the seed used was poorly graded with a high level of rogue plants especially beetroot and leaf beet. No discernable difference between fertilisers, but low fertility is a clear issue again and beet K requirement is also high at 100 – 180kg/Ha so applied nutrients may well have been insufficient.

Strategy

Beets need to be behind good wind fences rather than under covers, and bolting susceptible types will do better in the shade. Better all round nutrition required, especially K and deep dug for deep rooted types, and Fe and possible Mn. Crops may do better direct seeded rather than as plants as higher nutrition levels needed for module raised plants, though weeding is then an issue with seedlings. Definite need to research other beetroot varieties.

¹ Not actually a member of the Chenopidaceae – an annual *Tetragonia tetragonioides* from the *aizoaceae* (iceplant) family

Crop Report: *Brassicaceae*

Cabbages, Calabrese, PS Broccoli, Brussels sprouts

Varieties were chosen for ability to withstand bad weather and poorer soils eg dwarfing, hardy etc.

Type	Variety	Supposed Characteristics	Direct sow /plant	Sowing Date	Plant out Date	Harvest Date	Best Result	Crop Comments
Bruss Sprouts	7 Hills	stands well in bad weather	1 seed per pot	16-May	14-Jun	<i>Early Dec</i>	<i>Plot 7</i> Unaffected by CRF and preferred 7:7:7	Didn't grow big enough to harvest properly, but a better variety than Nautic. Good flavour.
	Nautic F1	new variety	1 seed per pot	26-May	30-Jun	Jan	<i>Plot 7</i> Unaffected by CRF and preferred 7:7:7,	Not as good as 7 Hills
PS Broccoli	Early	hardy	1 seed per pot	28-May	20-Jul	<i>Feb</i>	<i>Plot 9</i> , but never really developed properly – too late	A few small florets in late February
Calabrese	Fiesta F1	later variety	1 seed per pot	21-May	15-Jun	<i>Late Aug</i>	<i>Plot 7 quite small plants but good curds</i>	Plants quite small
Cabbage	January King	late sowing	1 seed per pot	16-May	15-Jun	<i>Dec</i>	Best was a survivor of CRF in <i>Plot 6</i> otherwise <i>Plot 7</i>	Generally Ok and stood well. Heads a little loose.
	Celtic F1	hardy	1 seed per pot	16-May	14-Jun	<i>Nov</i>	<i>Plot 9</i>	very leggy and many don't have proper heads
	Greyhound	Early dwarf	1 seed per pot	21-May	14-Jun	<i>Early Sept</i>	<i>Plot 7</i> though good in 9 and fair in 5 too.	Lovely early cabbage which did best of all the cabbages
Kale	Dwarf Green	suitable for light soils and	1 seed per pot	16-May	14-Jun	<i>Late Jul</i>	<i>Equal in 7 and 9</i>	Quite small and tougher than expected, but grew out of CRF attack in unprotected plots
	Nero di Toscani	hardy	1 seed per pot	21-May & 17 Jun	13-Jul	<i>October</i>	Didn't thrive anywhere, but best in 9	Went out too late (original plants affected by CRF)
	Red curled	slower growing	1 seed per pot	26-May	14-Jun	<i>Early Aug</i>	<i>Plot 8</i> where CRF survived.	Most consistent brassica in all plots though tough eating
	Red winter	hardy	1 seed per pot	16-May	14-Jun	<i>Late Jul</i>	<i>Plot 7</i> though fair across protected beds	Affected by a leaf miner in non-covered plots
Radish	Rudolph	good early cropper	Direct	30-June		<i>End July</i>	<i>All plots</i> OK 1-9	OK
Swede	Marian		Direct	30-June		<i>End Oct</i>	<i>All plots</i> OK 1-9	Needs thinning. Small size.
Turnip	Purple top Milan	does well on high pH soils	Direct	30-June		<i>Early Oct</i>	<i>All plots</i> OK 1-9	Best turnips came from plot 1!!

General comments

Leaving aside the problem of cabbage root fly, the brassicas did best of all the crops grown, despite their high nutrition requirements. They clearly like the high alkalinity, and their vigorous, competitive habit fights off weeds and accesses whatever nutrients are available. Even where no fertiliser had been used, reasonable kale and cabbage crops developed. Wind protection needed for all crops except kales. Turning to CRF it was a big problem. The first generation became apparent very early on in June and in fact disrupted NdT plants being raised at Ardivachar Croft. A second generation affected PSB when it was planted out in July. In the fenced and open beds around 85% of plants were lost due to CRF, though some of the kales did recover later on. Clearly protection from CRF is a vital component of brassica growing on Uist. The good news is that the high alkalinity soils mean that no signs were seen of clubroot, and although the odd cabbage white was seen in the air no caterpillars were noted on the plants². There was also no flea beetle, even on the rocket which is usually so susceptible. A leaf miner was noted on the Red Winter kale, but it was never properly identified. The Brussels sprouts were disappointing. Probably a combination of insufficient nutrition and competition as they were a bit crowded in by kales and cabbages on either side. Other varieties – more vigorous older ones have been recommended. PSB was hopeless – too late. Calabrese was OK, if small – this is one of the most demanding of crops and needed more nutrition. The cabbages were all good. January King probably went in a bit early which caused the leggy open growth. All the kales were fine. They could probably go in slightly later too and soil water needs to be kept up to prevent the leaves becoming tough. Radish swede and turnip did fine, but swedes needed thinning to produce better sized roots.

Strategy

Timing of plant raising is crucial – all plants except kales and JK to be sown early May and out by mid June; Greyhound and calabrese could be two weeks earlier. Others sown by mid May and out by late June. Mesh protection from CRF is vital and crops do better behind fences too. Solution will be fences and covers with covers coming off after CRF risk passed in early September. More nutrition needed for leaf brassicas probably both N & K and the second application might be better earlier. Keep soil water up during plant development. Thin swedes.

² They are reported a problem elsewhere on Uist.

Crop Report: *Apiaceae*

Umbellifers – Carrots, parsnips and parsley

Varieties were chosen for later sowing and autumn/winter cropping.

Type	Variety	Supposed Characteristics	Direct sow /plant	Sowing Date	Plant out Date	Harvest Date	Best Result	Crop Comments
Carrot	Autumn King	does well on high pH soils	Direct	12-Jun	-	Late Sept	Did equally well in several of the protected plots including plot 4, unfertilised	Slow germination because of drying winds in June. Little forking of roots.
	Rothild		Direct	12-Jun	-	Late Oct	Did equally well in several of the protected plots, but plot 6 prob best.	Slow germination because of drying winds in June. Little forking of root.
Parsnip	Gladiator	does well on high pH soils	Direct	12-Jun	-	Late Oct	Not defined	Never really came to anything after very late germination
Parsley	Moss curled	long growing season	1 plant/pot	21-May	13-Jul	Late Oct	Equal <i>plots 6 and 9</i>	Equal beds 6 and 9
	Plain leaf		1 plant/pot	21-May	13-Jul	Late Oct	<i>Plot 6</i>	Bed 6

General comments

Carrots got off to a slow start because of poor germination conditions in mid June – a long dry spell with cold drying winds. After that they did OK, as would be expected in the light sandy soils – a traditional favourite for commercial carrot growers. A little small but a very good flavour with both varieties, and both stood well into January. No root forking noted. An early variety is worth trying with a sowing date in late April. No carrot root fly seen at all despite reports on other parts of the islands, but some other growers don't get it either. It must be at the limit of its range and probably dislikes strong winds. As a result it's not necessary to grow carrots under covers and they did better behind fences. Tops of carrots not under mesh were damaged by salt and wind so any carrots sold would have to be topped. Parsnips again got off to a slow start, but never really got going. Alkalinity/fertility could both be issues, perhaps variety and they could have been thinned and weeded more attentively. Worth trying a more vigorous non F₁ variety and again, sowing earlier with more nutrition. Also try pelleted seed as some seeds were lost in blowing sand. No canker seen which was good. Parsley worked OK, plain probably slightly better performing than curly. Best behind fences.

Strategy

Carrots – in earlier and try earlier variety. Parsnips – in earlier and try more vigorous variety; thin and weed correctly. Parsley OK – not really needed for next trial.

Crop Report: *Salads*

Salad leaves – Lettuce and rocket³

Varieties were chosen for diversity of short/long day, colour and type.

Type	Variety	Supposed Characteristics	Direct sow /plant	Sowing Date	Plant out Date	Harvest Date	Best Result	Crop Comments
Lettuce	Belize (oakleaf)	open leaf	1 plant/pot	26-May	30-Jun	<i>Early Aug</i>	<i>Plots 6 & 8</i>	OK but slower than L Gem. Seem to prefer open air. Held well.
	Fristina	open leaf	1 plant/pot	26-May	30-Jun	-	-	Went straight to flower – presumably a day-length problem
	Romaine		1 plant/pot	04-Jul		-	-	Failed to germinate – bad seed
	Little Gem	quick growing	1 plant/pot	21-May	11-Jun	<i>Mid Jul</i>	<i>Plot 8</i>	Some tip burn under covers – caused by salt?
Rocket	wild	does well on high pH soils	Direct	30-Jun		Early Sept	Did well in all plots but best out in open	A crop that will thrive in any conditions
	rucola	long season grower	Direct	30-Jun		Mid Aug	Did well in all plots but best out in open	A crop that will thrive in any conditions
	esmee	quick growing	Direct	30-Jun		6-Aug	Did well in all plots but best out in open	A crop that will thrive in any conditions

General comments

Rocket worked well anywhere. Successional sowings required. There were plenty of lettuce but a successional strategy using the right varieties is required. Lettuce did best behind fences as the covers damaged leaf tips. Lettuce needs plenty of K (150kg/Ha) so this may have affected development. Also the correct soil water. Avoid non-hearting varieties like Fristina.

Strategy

Work out continuous cropping strategy for a set amount per week using varieties that should work. Try Maserati, an iceberg and a loose leaf type, plus LG and sow at two week intervals from early March. Improve nutrition and look after watering more carefully. Grow behind fences with maybe a cover in April/early May.

³ Known to be a brassica, but does not generally transmit P&D to others – apart from flea beetle which was not observed on Uist

Crop Report: *Alliaceae*

Alliums – Salad onions and leeks

Varieties were chosen for late planting times and reliability.

Type	Variety	Supposed Characteristics	Direct sow /plant	Sowing Date	Plant out Date	Harvest Date	Best Result	Crop Comments
Salad onion	White Lisbon	quick growing	5 seeds per pot	21-May	30-Jun	-	Never really thrived anywhere	
	White Lisbon Wint	crop right through	5 seeds per pot	4-Jul		February	Greenhouse	Transferred to greenhouse see protected cropping trials report
Leek	Bandit	Late harvest	Bare root	26-May	13-Jul	February	Bed 8 , but small	Never really thrived – leeks known not to like high pH soils
	Musselburgh	Reliable Scottish variety	Bare root	21-May	13-Jul	February	Bed 8 , but small	Never really thrived – leeks known not to like high pH soils

General comments

The allium results from the field were disappointing, though it can be reported that overwintered salad onions and garlic are doing very well in the greenhouse. This suggests that it's a fertility/protection issue rather than a high pH one. Also timing – both crops need to go out earlier. Also need to ask around for best performing leek varieties on the islands.

Strategy

Try again. Reduce pH and improve fertility with seaweed application. Alliums need two fertiliser applications especially in sandy soils. Leeks need high soil K values – Index 2 recommended so need ~ 170kg/Ha.

Crop Report: *Cucurbits*

Courgettes

Variety was chosen for reliability and fruit set.

Type	Variety	Supposed Characteristics	Direct sow /plant	Sowing Date	Plant out Date	Harvest Date	Best Result	Crop Comments
Courgettes	Defender F1	early variety- may be too tender	1 seed per pot	21-May	15-Jun	2-Aug	<i>Bed 9 though 6, 7 and 8 did OK too.</i>	Did surprisingly well. Timing good.

General comments

Courgettes did far better than expected. They needed more nutrition as the plants weren't that big, but fruiting was good. Fruits were a little susceptible to mould at the flower end. (Note that courgettes do not need high nutrition levels.). Plants in shade of fences didn't do quite so well.

Strategy

No change. Remove flowers as soon as fruits set. Best behind fences in full sun.

Crop Report: *Green Manures*

Green Manures –

Varieties were chosen for nitrogen fixing ability and flowers for attracting pollinating insects.

Type	Variety	Supposed Characteristics	Direct sow /plant	Sowing Date 1	Sowing Date 2	Maturity Date	Best Result	Crop Comments
Buckwheat		Fast grower	Direct	12-Jun	31-Jul		12-Jun	First sowing did well where protected from wind. Useful insect attractant esp hoverflies.
Clover Alsike		Good in all soils inc acidic, hardy, N fixer	Direct	12-Jun	31-Jul		31-Jul	Did not like high pH conditions at all
Crimson clover		Good in sandy soils, N fixer	Direct	12-Jun	31-Jul		31-Jul	Did not thrive but flowered late September
Field beans		Overwinters OK, N fixer	Direct		31-Jul			Sowed later but looked OK. Flowered early October then destroyed by wind.
Vetch		Hardy, good on alkaline soils, N fixer	Direct	12-Jun	31-Jul		Both dates	Did best of all including second sowing. This is the best N fixer of all green manures.

General comments

As regards N fixing, the best green manure strategy is an overwintered crop ploughed in in the early spring, but none of the crops survived the snow, frost and wind. The clovers didn't germinate well in June due to the sandy dry soil so took time to get going. Alsike is clearly no use in the high pH conditions. Crimson performed OK, but it needs to be cut before flowering and it was noted that few root nodules were formed. Field beans ditto. Vetch did best of all and good nodules were seen, but it won't overwinter. Buckwheat did OK behind the fences and proved a very useful insect attractant but was killed where it was unprotected by the August gale.

Strategy

The difficulty on Uist is that the traditional overwintered N fixing and ground covering GM won't work because it can't survive the winter weather conditions. In addition, an early season GM, incorporated for a later planted overwintered crop such as cabbages or sprouts, can't be sown early enough to have time to develop, a problem compounded by the need to get overwintered crops in earlier. What to do?? Buckwheat is no use as an insect attractant outside fences. Try something hardier such as phacelia or borage or buckwheat inside. Also plant nearer crops that need it such as courgettes and beans.



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Hard to Treat Housing Project

SUSTAINABLE Uist held two Open Days at its two 'Hard to Treat Houses' pilot projects in Daliburgh and Kildonan last month. Visitors were shown round the two houses where the installation of insulation was just about completed, but where areas of work had been left open so that the make-up of the different insulation systems could be observed.

Three very different approaches to insulating houses have been used:

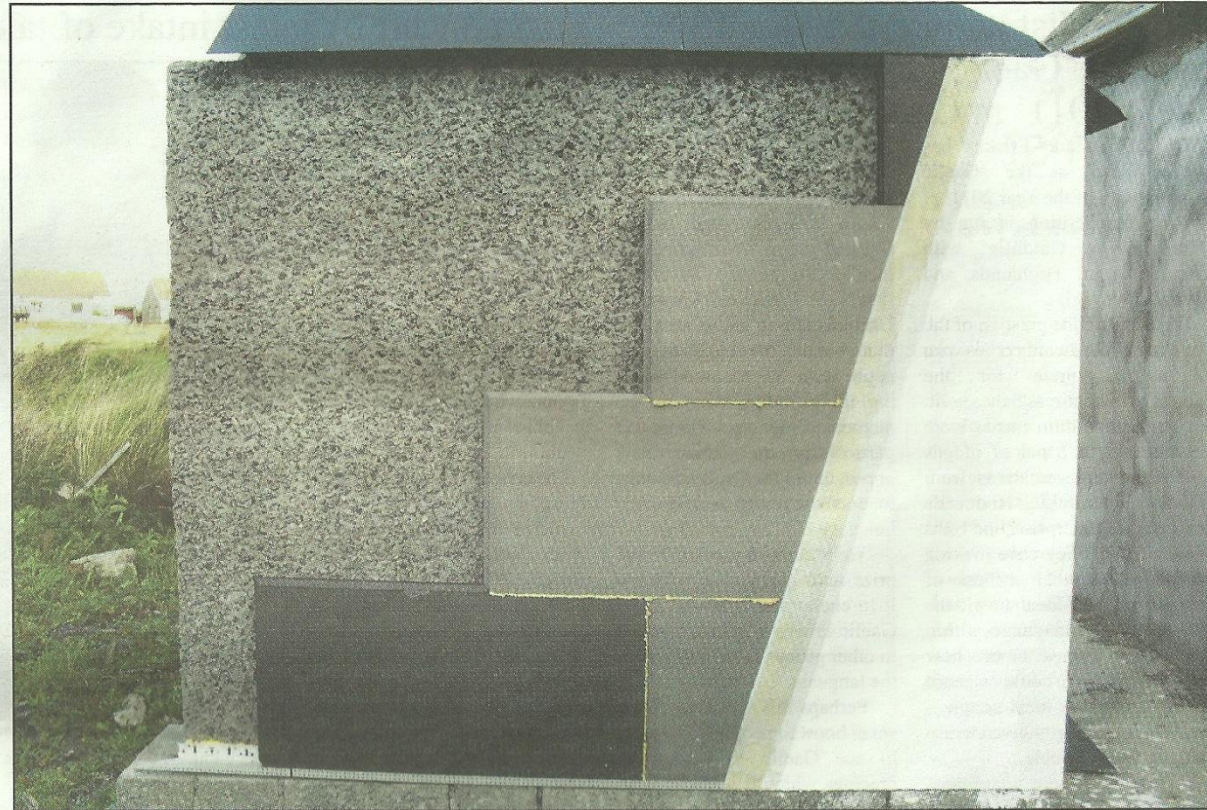
1. A standard method where foamed resin boards supplied by Kingspan Ltd have been installed in the floor, walls and roof. This system effectively seals the walls as the materials are not vapour permeable.
2. The preferred Historic Scotland method which uses breathable insulation materials such as wood fibre and open pored calcium silicate blocks, finished with lime plaster. The super-insulating properties of Spacetherm Aerogel insulating mats were also

floor, front door and dormer window cheeks.

3. A different method proposed by Locate Architects from Dunblane which uses a combination of vapour permeable materials and airtightness techniques. The main difference with this system is that the walls aren't insulated at all (less expensive and less disruptive) and a great deal of effort put in to sealing every material joint so that heat losses due to draughts are reduced to zero.

Also being demonstrated were:

Glaze 'n Save - a new and novel secondary glazing system developed by Proctor Group Ltd from Blairgowrie. This uses clear plastics sheeting and magnetic fixings allowing the glazing to be easily removed at any time. This is for use with both older windows that might not be very well sealed, and more recently installed double glazing where the extra layer will improve the insulating value of the double glazing even further.



External wall insulation demonstration panel at 232 Daliburgh.

Sto Ltd from Paisley. This system is particularly suited to the poured concrete houses built in the 1950s and 60s and uses polystyrene insulation boards bonded to the outside of existing rendered walls. To this is applied a plastics reinforcing mat and layers of synthetic render. This system has the added advantage of not only providing a new durable outside finish, but causes no disruption inside.

All of these insulation

as tested for their insulating properties and the results will be published early in 2012. All can still be seen at the demonstration houses until March 2012. If you would like to arrange a visit, please phone the Sustainable Uist office on 01870 603 863.

Visitors were also given information on the UK Government's 'Green Deal' project which aims to help all householders improve their house's energy efficiency and

the next decade. Sustainable Uist has now produced a leaflet about the Green Deal. If you would like a copy please phone the Sustainable Uist office.

Winter Lettuce Trials

21st September was the date for officially switching on the lighting in the winter lettuce project greenhouse. The greenhouse will be lit between dusk and 9pm and 3am and dawn every day now until next April.

The lighting is very visible

strange purple glow down on the Lincilate machair near the base of the wind turbine – that is what it is!

Field Trials Open Day

THE last Open Day of the current growing season will be held at the Lincilate Field on Saturday 22nd October from 2-5pm.

As well as looking at autumn vegetable and salad crops, we will be publishing some of the first results from this year's field trials. Teas and cakes and

Appendix 4: Leaflet – July 2011 Open Day



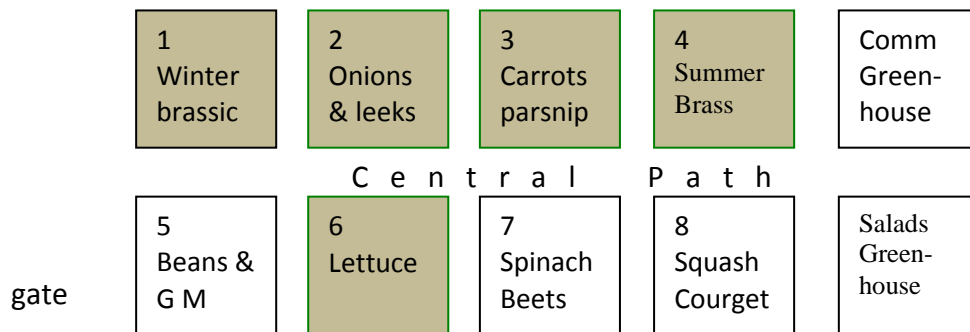
Welcome to Croft no 22 Liniclate and Sustainable Uist's Crop Trials project.

Following the completion of the project last year, Sustainable Uist received a second round of funding from the Climate Challenge Fund for the 2011/12 season to prove the best of the first year results in practice. (A copy of the 2010/11 results can be found in Liniclate Library or is available to download at www.sustainableuist.org.)

The project this year is therefore testing the best varieties and best growing methods from last year, to prove that the results were correct.

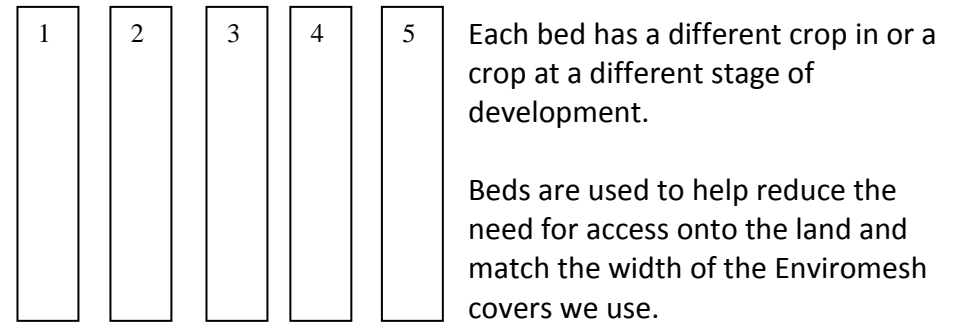
In addition careful financial records are being kept to establish the viability of a full scale vegetable growing business on Uist. The aim is to make the islands self sufficient in seasonal vegetables and salads within 10 years.

The field is divided into 8 plots. Each plot is identified by a number label located by the central path. The layout is as shown in the plan below.



Plots 1, 5, 7 and 8 are surrounded by wind fences. Plots 1, 2, 3, 4 and 6 covered with woven polypropylene mesh.

Most plots are divided into 5 beds as shown in the plan below.



A total of 56 different types and varieties of vegetables and salads are being grown. A full list is given overleaf.

The soils are of the machair type. The test results from the Macaulay Institute in Aberdeen show a highly alkaline pH of 8.0 and an ultra low organic matter content of 3%. (Typical Uist peat soils are the complete opposite having a pH of under 5 and organic matter of 65%.)

As well as being poor retainers of moisture, machair soils show low levels of potash, and are prone to 'locking up' of trace elements such as magnesium, manganese and iron. The latter leads to 'chlorosis' in leaf crops which is particularly evident in beets – see plot 7.

Nutrition This year in March we applied seaweed (kelp/tangle) at the rate of 7kg/m² which represents a complete covering. The soil was then rotovated.

Before planting out organic potash fertiliser (15%K) has been applied at the rate of around 200g/m², and from time to time liquid feeds are used to keep leaf crops looking healthy.

Crops List 2011/12

PLOT 1	Brassicas 1 (winter)		PLOT 4	Brassicas 2 (Summer)	
	B Sprout 1	Early HT		Radish	Rudolph
	B Sprout 2	Nautic		Turnip	Purple TM
	Cabbage	Jan King		Swede	Helenor
	Cabbage	Vertus	PLOT 5	Beans	
	Cauliflow 2	Belot		Broad	Bunyards
	PSB	Rudolph		Broad	G Windsor
	Seakale	Lillywhite		Broad	Eleanora
PLOT 2	Onions/leeks/salad on.			Broad	Broad
	Onion W	Sturon		Runner	Kelvedon
	Onion R	Red Baron		Runner	P Lady
	Salad	Guardsmen		French	Canadian
	Leek	Musselb		French	Cantare
	Leek	Siegfried		Tares	(Vetch)
PLOT 3	Carrots and parsnips			Phacelia	
	Carrot 1	Nantes	PLOT 6	Lettuce	
	Carrot 2	Trevor F1		Lettuce	Maserati
	Carrot 3	Autumn K		Lettuce	Little Gem
	Carrot 4	Rothild		Lettuce	Belize
	Parsnip 1	Gladiator		Lettuce	Saladin
	Parsnip 2	Palace F1	PLOT 7	Spinach and beets	
PLOT 4	Brassicas 2 (Summer)			Beetroot	Detroit 6
	Red cabb	Marn Lag		Beetroot	Boltardy
	Cabb	Derby Day		Beetroot	Red Ace
	Cabb	Advantage		Leaf Beet	Erbette
	Cabb Red	Marner		Chard	Br Lights
	Calab 1	Belstar		Chard	Swiss
	Calab 2	Fiesta	PLOT 8	Cucurbits	
	Cauli 1	All Year Rd		Courgette	Defender
	Rocket 1	Salad		Squash 1	Sprinter
	Rocket 2	Wild		Pumpkin	Moschata

Plot 1: Crops are doing well, particularly the Brussels sprouts which are well advanced – a deliberate decision after late planting last year.

Plot 2: Onions are now harvested and the remainder can be seen laid out in the greenhouse. Good crops of both red and white onions. Good salad onions and leeks developing well, if a little short. Blown sand is an issue.

Plot 3: Despite carrot and parsnip sowings being delayed till early June because of wet weather in May, all doing well though parsnips a little small.

Plot 4: All summer brassicas did very well, particularly cauliflowers. A few red cabbage, swede and turnip left and some small wild rocket.

Plot 5: Poor results with all beans except one or two of the Broad Bean varieties though even these were very late. After two seasons of trials there seems to be no solution to growing these legumes outside.

Plot 6: All lettuce varieties have done very well with a continuous supply available from July to October. Production now moved inside.

Plot 7: As with beans it seems impossible to grow good spinach/leaf beet on the machair soils. Bolting and chlorosis are systemic & seem impossible to correct. Only beetroot have done well using a module system.

Plot 8: Courgettes have done OK, but the season seems too short for squash and pumpkins. Mildew on leaves was widespread.

Greenhouse 1 has been used very successfully by the new Liniolate Community Group this year. The season is now over.

Greenhouse 2 is full of lettuce and lighting. The project is going to plan so far with around 400 lettuce cropped, 1000 in the ground and 200 in trays.

Appendix 5: Leaflet – April 2011 Workshop



WORKSHOP 2

Advanced Vegetable Growing

9th April 2011

COURSE NOTES

Advanced Vegetable Growing Workshop

PART 1: ROTATIONS

Everyone knows about rotations, but let's be clear as to why they are good for vegetable growers.

Task 1:

List the rotation you use in your garden – if any. How many years? What family groups?

Years

Group 1

Group 2

Group 3

Group 4

Group 5

Crop Groups

The main crop groups are:

1. *Brassicaceae*
2. *Leguminosae*
3. *Umbelliferae*
4. *Chenopidaceae*
5. *Alliaceae*
6. *Cucurbitaceae*
7. *Solanaceae*

These are the groups we used at Liniclate last year – though we grew no potatoes and few onions.

A good rotation would also include a break or fertility building crop such as a legume like clover or tares, though these are difficult to grow on Uist.

Rotation Principles

The main reasons for using a rotation system for any cropping cycle are:

P & D control – pests and diseases don't persist without their host plants

Soil Fertility – plants need different fertility levels, some much lower than others, and it's possible to logically use up nutrients over a period of years before applying nutrients again. Remember that too much nutrient can be as harmful as too little, by encouraging P&D.

Weed Control – Large vigorous plants suppress weed growth so annual weeds are less prevalent after these crops are grown

The typical periods for vegetable garden rotations are three or four years, but the theory says that the longer the rotation the better chance it has to succeed.

Discussion:

- *What are the main problems with rotations for garden based vegetable growers?*
- *How can they be overcome?*
- *What particular problems apply to Uist?*

The difficulty is that for normal gardens these groups have different space requirements, either because of plant size or the amount of crop required. Thus our 5 bed spaces were used as follows:

- Brassicas – nearly 2
- Legumes – $\frac{1}{2}$
- Umbellifers – $\frac{2}{3}$
- Beets and salads – 1
- Onions – only salad onions $\frac{1}{8}$
- Courgettes – $\frac{1}{4}$
- Potatoes – none grown

To get round this problem there are many different recommendations for grouping families together eg:

- All roots, including potatoes but excepting brassica roots
- Beans, beets and salads
- Beans and onions

It also has to be remembered that some plants suffer little from persistent P&D including courgettes, sweet corn, beets, lettuces and beans. Conversely brassicas, potatoes and onions really do need rotating over a 4 year period because the main P&D issues trying to be thwarted are:

- Club root in brassicas
- White rot (sclerotinia) in onions
- Blight in potatoes and tomatoes

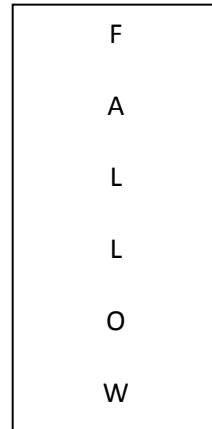
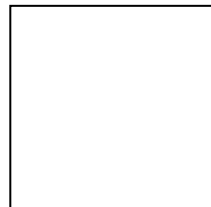
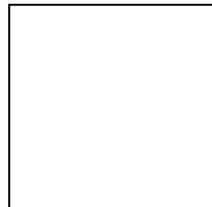
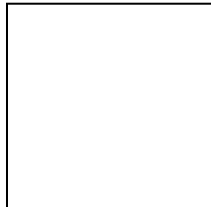
Whilst everyone seems to get blight, club root and white rot are not found everywhere, so if you don't have these diseases there is an argument which says it is OK to grow them on the same ground until they arrive. Also moving potatoes and tomatoes around won't prevent blight!

If your garden is very small the regime of a rotation may simply be impractical. A few years ago a theory was put forward that rotations were actually doing more harm than good by actually spreading soil borne pests and pathogens so you shouldn't worry too much!

Task 2:

Let's say you can divide your garden logically into four beds of equal spaces, and you decide you would like to leave one fallow every year. Devise groupings of plants for the four beds for the following crops

Potatoes	onions leeks	carrots	cabbages	calabrese	
Parsnips	marrows	lettuce	spinach	sprouts	rocket
Radish	parsley	salad onions	sweet corn	broad beans	



PART 2: CROP SELECTION

As growers you will have already established a set of crops you are happy with – they grow OK and you like to eat them! However, it's interesting to know what other people grow successfully too, especially if you have tried something which has persistently failed.

Task 3:

List your normal crops here:

List here the things you would like to grow or find difficult to grow

The things we found difficult to grow were:

- Leeks
- Salad onions outside
- Runner and French beans
- Purple sprouting
- All the beets which tended to bolt

Any suggestions?

Discussion

Varieties – keep trying different and new things

Look at commercial seed suppliers sites too

Trialling – try and make conditions equal so you don't get a false result.

Use modules – can extend season

Modules

Lots of different kinds

Growing media

Task 4 – Practical Task

To get ahead of the season we are going to grow more crops than one might normally expect in modules rather than sowing directly. This should enable us to get them established earlier and get a better crop as a result.

We need to sow:

Beetroot Red Ace (3 seeds per module) 2 trays

Beetroot Boltardy (3 seeds per module) 2 trays

Leaf Beet Erbette (3 seeds per module) 2 trays

Brussels Sprout Early tray

Cabbage Derby Day tray

Cabbage Advantage tray

Cabbage Marner Red tray

Calabrese Belstar tray

Cauliflower All Year Round tray

Leek Bandit (3 seeds per module) all

Leek Musselburgh (3 seeds per module) all

Seakale Lillywhite 18

You will see lettuce, salad onions and rainbow chard trays already seeded. We are sowing these at two week intervals to gauge the best time for putting them out.

PART 3: FERTILITY BUILDING

Good soil fertility is the key to good vegetable growing. On Uist it is rather overshadowed by the problems with wind, but without good soil conditions vegetables will just not thrive. Being mostly single year crop plants (though possibly biennials) vegetable crops need to develop quickly to maturity and don't have the luxury of settling in like perennials and developing extensive root systems over time to seek out the nutrients they require.

Task 5:

Quickly list the three main or macro nutrients that all plants require

Now list the three main micro-nutrients that plants require

Finally list the other trace elements that plants require, usually in very small quantities, to function properly.

Here are the official figures for the make up by chemical elements of a typical vegetable plant:

Major Elements	
Oxygen O	45%
Carbon C	45%
Hydrogen H	6%
Nitrogen N	1.5%
Phosphorus P	0.15%
Potassium K	1.5%
Trace Elements	
Magnesium Mg	0.2%
Calcium Ca	0.5%
Sulphur S	0.1%
Iron Fe	0.01%
Zinc Zn	0.002%
Copper Cu	0.0006%
Manganese Mn	0.005%
Boron Bo	0.002%
Molybdenum Mb	0.00001%

Task 6:

Describe how the crops in your garden get the nutrients they require:

O, C, H, N, P K

Ca, Mg, S

Fe, Zn, Cu, Mn, Bo, Mb

Task 4:

Describe the main symptom of a deficiency of each of the main nutrients

N, P, K, Ca, Mg, S, Fe, Zn, Cu, Mn, Bo, Mb

Here is a list of symptoms of deficiencies of the trace elements:

- Magnesium – yellowing between veins
- Calcium – tip burn, internal discolouration
- Sulphur – stunting and yellowing
- Iron – yellowing between veins
- Zinc & Copper – mottled yellow leaves
- Manganese - stunting and yellowing
- Boron – poor texture, ‘corkiness’
- Molybdenum – deformed growth, whiptail

How do we make sure our vegetables get the nutrients they need? Do we all understand that different vegetables have very different nutrient requirements?

Crop	N g/m²	P g/m²	K g/m²	Mg g/m²	Others
Potatoes	5-22	17	30	4	
Asparagus	12	5	5	5	500 Na
Sprouts	27	10	20	5	50 S
Cabbage	18-26	10	20	5	50 S
Cauliflower	23.5	10	15	5	50 S
Calabrese	16.5	10	15	5	50 S
Celery	7.5	15	32.5	5	375 Na
Peas	0	8.5	6.5	5	

Broad beans	0	10	7.5	5	25 S
French/Runners	12	10	7.5	5	
Lettuce	16	15	12.5	5	
Radish	8	7.5	12.5	5	
Sweetcorn	5	7.5	12.5	5	
Courgettes	10	7.5	12.5	5	
Onions	11	10	15	5	
Leeks	17	10	15	5	
Beetroot	24	10	17.5	5	
Swedes	7	10	17.5	5	
Turnips/Parsnips	10	10	17.5	5	
Carrots	4	10	15	5	200 Na

These figures are all taken from DEFRA document RB209 Recommendations for Fertilisers for Field Crops. You can download a copy at this website here:

<http://www.defra.gov.uk/publications/2011/03/25/fertiliser-manual-rb209/>

There is also a good nutrient management guide at:

<http://archive.defra.gov.uk/foodfarm/landmanage/land-soil/nutrient/documents/nutrient-manage-guide2011.pdf>

The numbers above reflect the nutrients that will be removed by each crop type. If you have a poor soil or a situation where you would like to leave nutrient for a follow up crop more needs to be applied.

The addition of salt and sulphur to crops is always a surprising recommendation, but it does help.

It should be noted that fertiliser applications, particularly of N, need to be judged carefully particularly for seeded crops or long term crops. In these cases initial applications of around 10g/m² should be followed by a dressing as the crop gets established.

Lastly let's just refresh our memories on what fertilisers contain.

Fertiliser	N % by weight	P % by weight	K % by weight
Naturally in the soil	Varies – find out by testing and budgeting		
Rain	0.3-0.7g/m ² /yr	none	4ppm
Animal manures	1-2%	1-2%	1-2%
Compost	1%	1%	1%
Growmore garden fertiliser	7%	7%	7%
Seaweed	1%	0.5 – 1.5%	3-4%
Wood ash	none	none	1-7%
Bonemeal	3-4%	5 – 22%	none
Blood and bonemeal	3-4%	8%	0.5%
Bloodmeal	12-14%	0.5%	none

Hoof and horn meal	13%	none	none
Rock potash	none	none	10-16%
Rock phosphate	none	30%	none

Task 7

Just a little maths test here – if you have a very low potash reading in your soil ie zero, how much rock potash fertiliser do you need to add per square metre for a crop of potatoes? Our fertiliser is 15% (150g/kg) potash by weight.

- Potatoes require 30g/m²
- Fertiliser is 150g of potash per kg
- So 1 kg of fertiliser will do 5m² or 200g / m²

Seaweed contains around 43g of potash per kg dry-weight or 11g per kg wet weight. How much wet seaweed would you need to put on for potatoes?

- Potatoes require 30g/m²
- Wet seaweed is 11g of potash per kg
- So 3 kg of seaweed is needed per square metre.

Seaweed details below

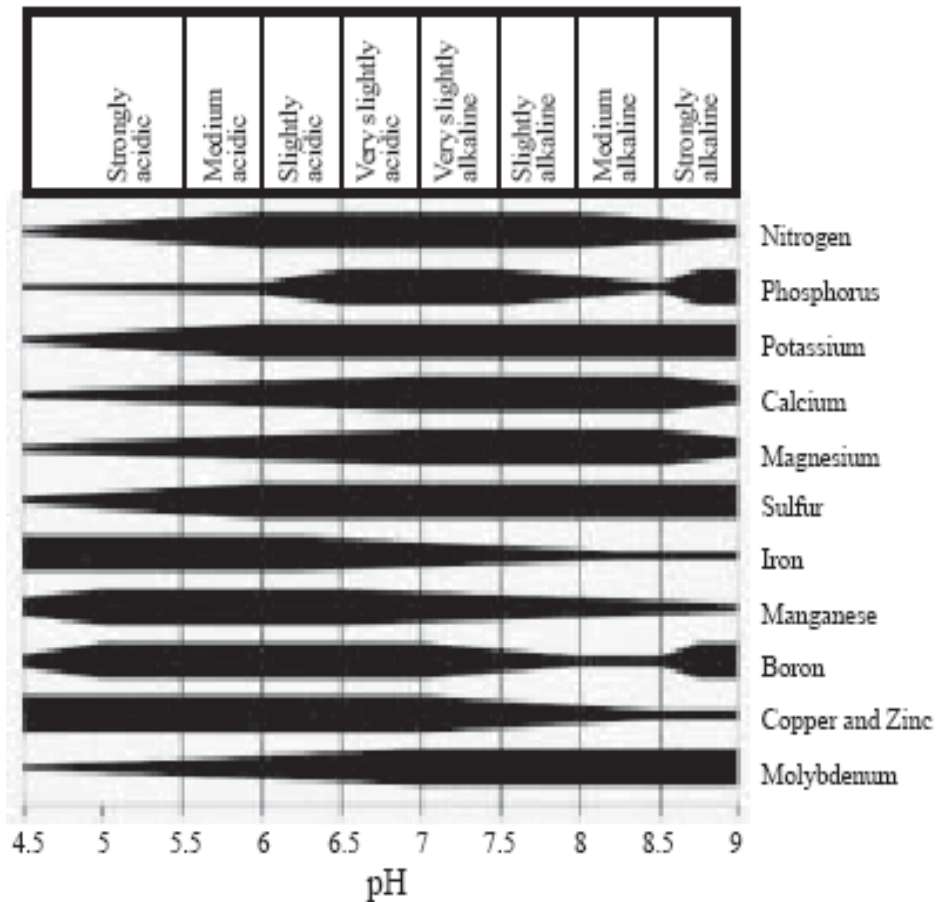
Sample	Barcode	Ca	Mg	K	P	Fe	Mn	S	Cd	Co
Kelp	1043491	13260	6521	43270	5478	<0.5	<0.3	11470	0.16	0.12
Bladderwrack	1043492	10460	8824	30570	1648	<0.5	43.41	32170	0.55	0.41

(Nutrients in dried seaweed measured in mg/kg thus 43270 mg of K in kelp equals 43g/kg of weight. Wet seaweed is about 4 times heavier so a typical kg of wet seaweed contains around 11g of K.)

How much seaweed do crofters normally use on their:

Potatoes?

Oat fields?



Finally remember that soil pH affects the availability of nutrients so if you have extremes of pH some nutrients might get 'locked up'.

PART 4: PEST AND DISEASE MANAGEMENT ON UIST

Task 8

List here all of the Pests and Diseases that regularly affect your garden

Discussion

What are the main P&D affecting vegetable crops on Uist?

Are they universal?

Are there measures to counteract them all without resorting to chemicals?

Here is a list of the problems we had at Liniclate last year:

- Cabbage root fly
- Bean pod mildew
- Lettuce damping off – probably *Botrytis* (Grey mould)
- Sand flies in cabbages
- Courgette flower mildew - probably *Botrytis*
- Broad bean blackfly

This is a remarkably small list and many problems which make life very difficult for mainland growers don't seem to exist here eg flea beetle, cabbage white X 2, club root, carrot root fly, parsnip canker, lettuce mosaic virus, brassica bacterial head rots, cutworms, pigeons, leek moth, onion mildews,

PART 5: ORGANIC PRINCIPLES

Increasing biodiversity through rotations, intercropping and habitat management

Integration of environmental, economic and socially sustaining systems

A focus on soil fertility through the use of organic composts and fertilisers

Other systems

Biodynamic

Permaculture

Appendix 6: Presentation – Growers’ Forum

Presentation Bernery - Microsoft PowerPoint non-commercial use

Home Insert Design Animations Slide Show Review View Developer

Normal Slide Sorter Notes Page Slide Show Slide Master Handout Master Notes Master

Ruler Gridlines Message Bar Show/Hide

Zoom Fit to Window Zoom

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Macros

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Sustainable Uist Projects 2011-12

1. Uist Hard to Track Housing Survey
2. Uist Hard to Track Housing Pilot Projects
3. Uist Home Heating Study
4. Research into reducing CO₂ emissions in waste management
5. Research into reducing CO₂ emissions in transport
6. Uist Local Food Project

Uist Local Food Project

1. Long term aim to reduce Uist's dependency on imported foods.
2. 40% self-sufficiency by 2030

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1. Long term aim to reduce Uist's dependency on imported foods.
2. 40% self-sufficiency by 2030
3. Increased food security
4. Reduce food miles and carbon emissions
5. Economic benefit

Local Food Project 2011-12

1. Field trials of 2010-11 vegetable growing project
1. Field trials of 2010-11 vegetable growing project
2. Vegetable growing trial on the peat lands

Local Food Project 2011-12

1. Field trials of 2010-11 vegetable growing project
2. Vegetable growing trial on the peat lands
3. Large scale trial of 2010-11 extended season protected cropping project
4. Uinialata Community Greenhouse

Local Food Project 2011-12

1. Field trials of 2010-11 vegetable growing project
2. Vegetable growing trial on the peat lands
3. Large scale trial of 2010-11 extended season protected cropping project
4. Uinialata Community Greenhouse
5. Uist Food Event

Local Food Project 2011-12

Field trials of 2010-11 vegetable growing project

Local Food Project 2011-12

Field trials of 2010-11 vegetable growing project

Local Food Project 2011-12

Vegetable growing trial on the peat lands

Local Food Project 2011-12

Large scale trial of 2010-11 extended season protected cropping project

Local Food Project 2011-12

Large scale trial of 2010-11 extended season protected cropping project

Local Food Project 2011-12

Large scale trial of 2010-11 extended season protected cropping project

Local Food Project 2011-12

Some Peasall

Local Food Project 2011-12

Uinialata Community Greenhouse

Local Food Project 2011-12

Uist Food Event

Sustainable Uist Website

www.sustainableuist.org

2011 Field Trials: Protection

2011 Field Trials: Fertiliser

* Soil Testing

2011 Field Trials: Fertiliser

* Scarwood @ 8kg/m²

2011 Field Trials: Winter Brassicas

2011 Field Trials: Alliums

2011 Field Trials: Roots

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36 Sustainable Uist Website
www.sustainableuist.org

37 2011 Field Trials: Protection

38 2011 Field Trials: Fertiliser
• Soil Testing

39 2011 Field Trials: Fertiliser
• Seaweed @ 5kg/m²
• Organic Potash fertiliser tek
• Mirelo-Dia liquid food

40 2011 Field Trials: Winter Brassicas

41 2011 Field Trials: Alliums

42 2011 Field Trials: Roots

43 2011 Field Trials: Summer Brassicas 1

44 2011 Field Trials: Summer Brassicas 2

45 2011 Field Trials: Beans and Tares

46 2011 Field Trials: Salads

47 2011 Field Trials: Beets

48 2011 Field Trials: Courgettes & squash

49 2011 Field Trials: Results

50 Uist Local Food Programme: Farm Shop

51 Uist Local Food Programme: Community Greenhouse

52 Seaweed as Fertiliser

53 Seaweed as Fertiliser
ADAS INDEX FOR P, K and Mg

54 DEFRA Fertiliser Guide

55 Seaweed as Fertiliser

56 Wind protection
• Vertical 100m² = £145
• Walls 4300 x 11
• Walling 4300 x 0
• Fences 4300
• Horizontal 100m² = £135
• Walls 4300 x 8
• Walling 4300
• Fences 4300
• Cornwall Green 43

Wind Protection
• What is happening when wind made a force?
• High wind zone
• Low wind zone
• Low wind zone
• Penetration?
• Area saving

Wind Protection - Other Ideas?
• Big fences
• Hoops and mats
• Polytunnels and mats
• Hit and miss boarding
• Fish mats
• Hedges and tree belts
• Others??

Wind Protection
Enviromesh from OGC

Blackland Soil Test

Appendix 7: Preview – Vegetable and Salad Growing in Uist Machair Soils



Vegetable and Salad Growing
in Uist Machair Soils



butterfly. For both it's the larval (caterpillar) stages that attack plant roots and leaves. The best method of protection is to use mesh crop covers and these should be put on and kept on from the day the plants go outside, including hardening off.

Types and varieties

Cabbage: 'Derby Day' (early round) and 'Advantage' and 'Greyhound' (early pyramidal) all worked well. Cabbages stand well so can be cut over a period of weeks. In general summer cabbage cannot be stored outside a fridge after cutting.

Calabrese: The summer version of broccoli. 'Belstar' is an early flowering type, 'Fiesta' later. F₁ varieties will all flower around the same time so don't plant out too many of the same variety. When the heads form, cut the main central head as high up the stem as possible and you should get secondary side shoots forming for 2-3 months afterwards. Calabrese does not store well outside a fridge, but does freeze well.

Cauliflower: We found that cauliflowers do particularly well on machair soils. We grew 'All Year Round' and had huge heads to cut for our Uist Food Event in September – one weighed nearly 4kg! Cauliflowers don't stand for long in the field so need to be cut immediately they are ready. Plants can be big so wide spacings are essential. 'Snowball' also reported to do well.

Red cabbage: Red cabbages are another hungry crop – we grew 'Marnier Lagerrot' and had excellent results with big plants and dense heads weighing up to 4kg. Red cabbages develop slowly and last well if left on the plant for weeks into the autumn. They can also be stored in a cool dark shed for 2-3 months over the winter. Potentially the biggest brassica plants – up to 1.2m across - so they need plenty of space. 'Red Rodima' also reported to do well.

Seakale: A wild perennial brassica native to Britain, Seakale grows along chalk sea cliffs in southern England. The cultivated variety was grown widely in Victorian gardens where over winter the plants were forced, much like rhubarb, by covering them with clay pots. The plants will produce a crop of young shoots in the early spring which are reported to be rather like asparagus. It is reputedly difficult to grow from seed, though we succeeded with our first attempt. If you have difficulty it is possible to buy root stock from specialist nurseries. Plants should be replaced and moved to a new location every 4 years.

Roots

There are two main types of root vegetables – those related to the umbellifer (parsley) family such as carrots and parsnips, and those which are brassicas such as swedes, turnips and radishes. Commercial growers prefer sandy soils for all these crops so the machair should be (and is in many respects) perfect! As with growing most vegetables on Uist, if the conditions are right it is possible to get good results.



General Guidance

Seed or plant: Direct sowing of seeds is the best option for all roots.

Timing: In the south of England most summer root crops will be sown out in the open from late

March to early May, but we have never found conditions suitable on Uist at that time of year, though these dates can be achieved if cloches are used.

Mid to late June seems to have been our optimum time, but other growers report that sowings in April and May can work OK. Soil temperature is the main factor and carrot and particularly parsnip seeds will simply not germinate if the soil is too cold, though brassica roots are less fussy.

Spacing: Follow guidelines on seed packets for sowings. However, the most important husbandry task for roots is correct thinning of young plants once they are established. If they are too closely spaced you will simply get small roots, so thin plants out to a spacing matching the size of root you imagine. This should be done as soon as possible after the seedlings start to grow as, if the plants get too big, the ones left will have their roots disturbed as the others are pulled out and this can interrupt growth.

Nutrition: Roots don't require a lot of fertility particularly the brassica types.

Protection: Swedes and turnips are the only crops we grew successfully without any wind protection, but they do need it against pests (see below). Carrots and parsnips do benefit from covers particularly in the autumn when gales can kill the leaves and stop development.

Water: Root seeds need just the right amount of water and drying out of the sandy soil can be a problem in the dry spells that seem to occur in June. Lines of seed should therefore be watered before and after sowings and re-



Further Reading

There are dozens of books available on growing vegetables and salads. Recent ones tend to be glossy, faddish and include cookery tips too! Our favourites are:

The Organic Garden Book by the late Geoff Hamilton – out of print, but second hand copies available online. Buy this if you can – it's the best all round gardening book written for many years.

The Vegetable and Herb Expert by Dr D G Hessayon – from the Expert Books series. Good basic information.

Grow your own Vegetables by Joy Larkcom – lots of practical advice.

They are all available in Liniclate Library.

Sustainable Uist

Sustainable Uist is a community organisation dedicated to making the Uist islands more sustainable. In particular it is working to reduce CO₂ emissions from all aspects of islander's lives including waste, transport, energy and food. Its long term aim is to make Uist carbon neutral by 2030. If you wish to become a member you can do so through our website at www.sustainableuist.org or phoning 01870 603 863.

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