Sustainable Uist
Uibhist Sheasmhach

Uist Local Food Project

2011-12

Final Report

A Climate Challenge Fund project carried out between April 2011 and March 2012

It's our future

natural scotland
SCOTTISH GOVERNMENT

Foreword

Despite being a community based largely on agriculture, when compared to other rural areas of Britain, Uist has a very poorly developed local food industry. In fact it is estimated that 95% of all food consumed on the islands is imported from the mainland and, because of the distances and ferry crossing involved, the related food miles and CO_2 emissions are consequently much higher than elsewhere. This is a huge contrast to a time still within living memory in the years after WWII when the islands were still self-sufficient in many of their foodstuffs.

To meet this challenge Sustainable Uist has developed a long term strategy of bringing forward proposals to help Uist meet 50% of its food requirements from local sources by 2030.

In the past 2 years it has carried out a number of local food projects to help achieve this goal:

- Liniclate Field vegetable and salads trials – first and second phases
- Liniclate winter salads project – first and second phases
- Liniclate Community Greenhouse
- Blackland (peatland) vegetable and salads trials on Grimsay
- Evening classes and local growers' forums
- Uist Food Event Weekend September 2011
- 2010 Farm Shop Market Survey

This report outlines how the 2011-12 projects were implemented and the wide range of useful results that were achieved.

As I write this foreword, Sustainable Uist is working on proposals for two new community enterprise projects - a farm shop and a commercial salad and vegetable production unit. When up and running these facilities will be another step in delivering our 2030 50% local food target and will hopefully make an economic contribution to island life as well.

The Local Food research work completed over the past two years has been an important precursor to these projects and has given our organisation the confidence to move from 'thinking' to 'doing' and to start a new chapter in making these remote islands more self-sufficient.

Steve Carter
Chair, Sustainable Uist, March 2012

Acknowledgements

- Aphra Morrison and Jamie Fry for their support from CCF.
- Murdo MacPherson and Marie Campbell from Comhairle nan Eilean Siar who helped source funding for the two greenhouses.
- Community Energy Scotland who funded the second greenhouse lighting turbine.
- Stephen Peteranna and the Morrison family for allowing us to use parts of their crofts.
- All my colleagues at Sustainable Uist who have given support throughout the past two years.
- The S3/S4 Crofting Course students at Sgiol Lionacleit who put in a lot of physical effort down at the field, and particularly Sandy Davidson and Matthew MacIsaac who gave up part of their summer holidays to help in the field and build the two greenhouses.
- Neil MacPherson who organised the field set ups and had good advice to offer on just about anything to do with growing on the Uist machair.
- Ally Menzies, without whom the greenhouses would never have been built.
- Everyone from Uist who has shown interest in the project, and the many growers who have given good advice throughout the past two years.
- And finally my wife Jean who proof read and edited the final document.

David Newman, March 2012

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Abbreviations

CCF	Climate Challenge Fund
CnES	Comhairle nan Eilean Siar (Council of the Western Isles)
CLRDP	Community Land Resources Development Programme
CES	Community Energy Scotland
TRADA	Timber Research and Development Association

Section A: Executive Summary

Sustainable Uist is a community organisation which promotes sustainable lifestyles in the southern Outer Hebrides. In April 2011 it was awarded around £30,000 by the Climate Challenge Fund to continue the Uist Local Food project started a year earlier.

In the few decades since WWII the food economy of Uist has been transformed from one of 90% self-sufficiency to one of 95% dependence on imports. Because of the islands' remote location, the resulting food miles and CO_2 emissions are amongst the highest in Britain.

The Sustainable Uist Local Food Project seeks to reduce this dependency by 50% over the next two decades by promoting the production, processing and retailing of a wide range of foods that are sourced from the islands.

The Horticulture Research Project at Croft 22 Liniclate set out initially in 2010 to persuade more Uist residents to grow their own vegetables and salads. The work continued in 2011 by repeating the successful trials results from 2010 so that the ideas developed for improving crop results through action on protection, soil fertility and seasonality could be confirmed. In addition some of the crop failures from 2010 were repeated using different techniques to check these results too.

The results provide assured husbandry techniques for growing a wide range of horticultural crops for a good part of the year and the results were good enough to demonstrate that it would be possible to grow these crops at a commercial scale. However, a few, particularly some types of beans, spinach and squashes seem to be just about impossible to grow outside in the local conditions.

Two Open Days, two workshops and five growers' forums were held during the growing season and a 24 page leaflet entitled 'Growing Vegetables and Salads in Uist machair Soils' was published and widely distributed at the end of the project.

During 2010 a self build 100m^2 greenhouse was built at the Liniclate site. The aim was to look at the benefits of growing crops inside in the short Uist growing season. In particular an experiment was carried out looking at whether this could be extended by growing crops under artificial lighting using a wind turbine to supply the electricity. The first phase of work was completed in the spring of 2011 and as that project has never been fully reported on, the implementation and results from this are included in this report.

As some of the results from the 2010-11 trial looked positive, particularly for some varieties of lettuce, the work was repeated on a larger scale during 2011-12. This involved installing an upgraded turbine and more lighting. Initial results were excellent with several hundred good quality lettuce being harvested in the early autumn of 2011, but the exceptionally mild and wet weather which had continued right through the summer and autumn of 2011 brought about a combined pest and disease problem where an infestation of aphids carried the root fungal disease *pythium* throughout the crop and by mid December every lettuce was dead. However by late November noticeable differences in growth rates were recorded

between the lit and unlit crops and this idea does therefore hold out some hope for the future.

Following a request from a number of islanders living and gardening on the peat soils on the east side of the Uists, a vegetable growing trial, parallel to that at Liniclate, was carried out on a croft on Grimsay Island, North Uist. This set out to establish a similar set of guidelines for growing vegetables and salads in this very different soil type.

Due to a combination of unusual prolonged wet weather in the late spring and early summer of 2011, poor site drainage, and wrongly selected soil cultivation technique the project got off to a difficult start. However by adopting the lazy bed technique, used by the local crofters for generations, good growing conditions were eventually established by mid-summer and a number of brassica, legume and beet crops were successfully grown. Unfortunately the results were not sufficiently complete to permit any reliable conclusions to be drawn, but the work is to be continued by the croft owners in 2012.

Sustainable Uist had looked at possible community allotment projects during 2010, but for a variety of reasons these had to be abandoned. However it was able to obtain funding for a community greenhouse at the Liniclate trials site and a community group was established to use this during the 2011 growing season.

A wide range of crops were successfully grown and help and support given to both individual community members and the group to develop their skills and the management of the group in the future. The project should be able to act as a model for similar ventures in years to come.

Sustainable Uist recognised early on that one of the main barriers to developing a local food market on Uist seemed to be the lack of access to some kind of central facility where producers and consumers could be brought together. Occasional Farmers Markets had been tried over several years but seemed unsustainable. To see if there was real demand from both groups Sustainable Uist carried out a consumer survey in 2010 and interviews with a number of local food producers and the conclusions were unambiguous – both liked the idea of a Farm Shop.

To test the survey results Sustainable Uist decided to hold a local food event over a weekend and see if sufficient local producers would bring their produce forward to sell and consumers turn out to buy. Events in North and South Uist were held over a single weekend in September 2011 and as well as a wide range of producers attending, hundreds of island consumers turned out to sample and buy the food on sale. The events were far more successful than had been expected, but fully confirmed that the potential for a buoyant food market existed.

The conclusions from the five projects confirmed that not only a wide range of foods could and were being produced on Uist, but that there was real demand for these from consumers. The results pave the way for a new direction for Uist Local Food where direct action can be taken with confidence to develop the local food economy in the future.

Section B: Sustainable Uist

Sustainable Uist is a community organisation established in 2009 by a group of island residents who, after seeing the film 'The Age of Stupid', decided to ensure that as far as possible, the forecast effects of climate change on the islands could be mitigated by promoting sustainable lifestyles. The organisation is a not for profit company and currently has 150 members, 7 volunteer directors and 5 full time and two part time employees.

Two major awards from the Climate Challenge Fund in 2010 and 2011 amounting to £242,000, and several others from a wide range of organisations and companies such as the Council of the Western Isles, Historic Scotland, Community Energy Scotland and Zero Waste Scotland totalling a further £100,000 have allowed Sustainable Uist to undertake a wide range of community based projects relating to renewable energy, home energy, transport, waste and local food.

The organisation has a website at www.sustainableuist.org where further details of the organisation and its activities can be found.

Home Energy Event August 2011

Local Food Event September 2011

Liniclate Open Day October 2011

BBC filming at HtT Pilot house 2011

Section C:
Uist Local Food Project Background

C1 Proposed Project

The bid that Sustainable Uist made to the Climate Challenge Fund (CCF) to fund its proposed Uist Local Food Project is given in **Appendix 1**. A summary of the five projects which were approved for funding is given below:

1. To build on the findings of the vegetable growing research completed in 2010-11 by repeating the growing techniques which delivered the best results on a larger scale. Also to try new ideas for those crops which failed. The results to be disseminated through Open Days, Evening Classes, Growers' Forums and a project leaflet entitled Growing Vegetables on Uist Machair Soils.
2. Demonstrate and promote one of the key elements of year round local food - winter salad production - using the 100m^2 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.
3. To repeat the preliminary growing trials already carried out on the machair soils at Liniclate on the peaty black soils of central and eastern Uist.
4. To build a new community greenhouse which would be set up as a test allotment arrangement for up to 8 tenants.
5. To host a Uist Local Food event, the primary purpose of which would be to see if there is an unfulfilled need for a local food supply chain.

The staffing requirement was a full time Local Food Officer for 8 months starting 1st. May 2011 and a part time Project Manager for the whole year.

C2 Staffing

The job description for the Local Food Officer was as follows:

The purpose of the post is to demonstrate the potential for local food production in Uist and to encourage residents to produce their own food through demonstration and training.

Liniclate Trials Field

- *Assist with preparation of project plan*
- *Liaise with contractor on cultivations and seaweed applications*
- *Liaise with Crofting Course Manager on erection of wind fences and covers*
- *Carry out the production of all crops, seed purchases, plant raising, programming, irrigation, weeding etc*
- *Carry out weather recording*
- *Record all crop outputs*
- *Organise 4 Open Days*
- *Attend island games and show events with SU team*
- *Prepare a report on the project outcomes on completion*

Extended Season Crop Trials (Based at Liniclate)

- *Assist with preparation of project plan*
- *Carry out cultivations and seaweed applications*
- *Organise fitting of new lighting system*
- *Carry out the production of lettuce crops, seed purchases, plant raising, programming, irrigation, weeding etc*
- *Carry out temperature recording*
- *Manage the wind turbine and LED lighting system*
- *Record all crop outputs*
- *Prepare a report on the project outcomes on completion*

Dark Soil Trials (Based on Grimsay Island)

- *Assist with preparation of project plan*
- *Liaise with crofter on cultivations and seaweed applications*
- *Organise all infrastructure works and purchases of materials*
- *Help carry out production of all crops, seed purchases, plant raising, programming, irrigation, weeding etc*
- *Organise 4 Open Days*
- *Prepare a report on the project outcomes on completion*

Community Greenhouse (Based at Liniclate)

- *Assist with management/completion of building project*
- *Organise internal facilities including marking out, water supply, storage facilities*
- *Help prepare management plan for the 8 community members*
- *Organise and run monthly member meetings*
- *Organise three training days*
- *Assist members with crop plans and crop raising*
- *Monitor use and help resolve disputes if and when they arise*

Uist Food Event

- *Work with the team on the major Uist Local Food event which is being planned for September this year.*

This post was designated as full time at 35 hours per week,although the issue of seasonality was recognised with longer weeks expected to be worked during the summer and shorter in the winter. Evening and weekend working was also anticipated.

Marion Ferguson was appointed to the role. Marion had some experience working on community horticulture projects in Glasgow and was also a walk guide for RSPB on Uist so was very used to dealing with and talking to members of the public. Marion left this post in August 2011 to take up another role, and thereafter, part-time support was provided by Lisa Palmer. Lisa is a keen gardener and attended the Sustainable Uist Evening Class series over the winter of 2010-11. As well as helping with general maintenance items on the vegetable growing projects, Lisa continued the important work in the lettuce experiment greenhouse at a critical time.

In overall charge of the Uist Local Food Project was David Newman. After a career working as an architect in Oban and the Inner Hebrides and then as a director of a large leisure company, David studied Organic Crop Production at Lackham Agricultural College in Wiltshire and established his own organic vegetable business on the Wiltshire/Dorset border outside Salisbury in 2000. The company was sold to new owners in 2007 and continues trading successfully. He moved to South Uist in 2008.

The Uist Local Food Event was managed by Joanna Peteranna, the senior Project Manager at Sustainable Uist. The Benbecula and North Uist Community Account Managers (HIE) officers, Neil Campbell and Elaine Cleary, were also very involved.

C3 Project Implementation

From this CCF project proposal and management structure, the project distilled into five main elements:

1. *Liniclate crop trials:* This work is described in **Section D** of this report.
2. *Extended season cropping trials:* This work is described in **Section E**.
3. *Peatland Vegetable Growing Trial:* This work is described in **Section F**.
4. *Community Greenhouse:* This project is described in **Section G**.
5. *Uist Local Food Event:* This project is described in **Section H.**

The summary conclusions for each element of the overall project are given in **Section I**.

Section D: The Liniclate Crop Trials

Proposals

The 2011-12 crop trials were designed around the results from those carried out the previous season. These are described in full in the report from that year which is available at Liniclate Library or as a .pdf download from the Sustainable Uist website[1]. The detailed crop results from those trials are included for reference as **Appendix 2**.

The general plan was to:

1. Grow successful 2010-11 crops at a larger scale using the best techniques recorded.
2. Repeat trials of crops that were moderately successful using different techniques.
3. Try some additional new varieties.

In each case the sowing/planting/harvesting dates would be recorded together with all inputs and crop outputs. It was felt this additional information could be useful to local crofters considering growing vegetables at a larger scale.

In summary this work required:

- The 2,000m^2 trials field which was already fenced.
- 8 trial plots to grow different types of vegetables in different pre-determined conditions.

Trial Implementation

D1 Land

Land for the trials project was already available at the Sustainable Uist Trials Field which had been set up in 2010 on the machair at Liniclate on Benbecula. The enclosed area measures approximately 65m x 30m (about ½ an acre). The field location plan and a Google Earth image and general view of the field are shown at d1, d2 and d3. There is vehicular access to the site via a track which starts in the Dark Island Hotel car park.

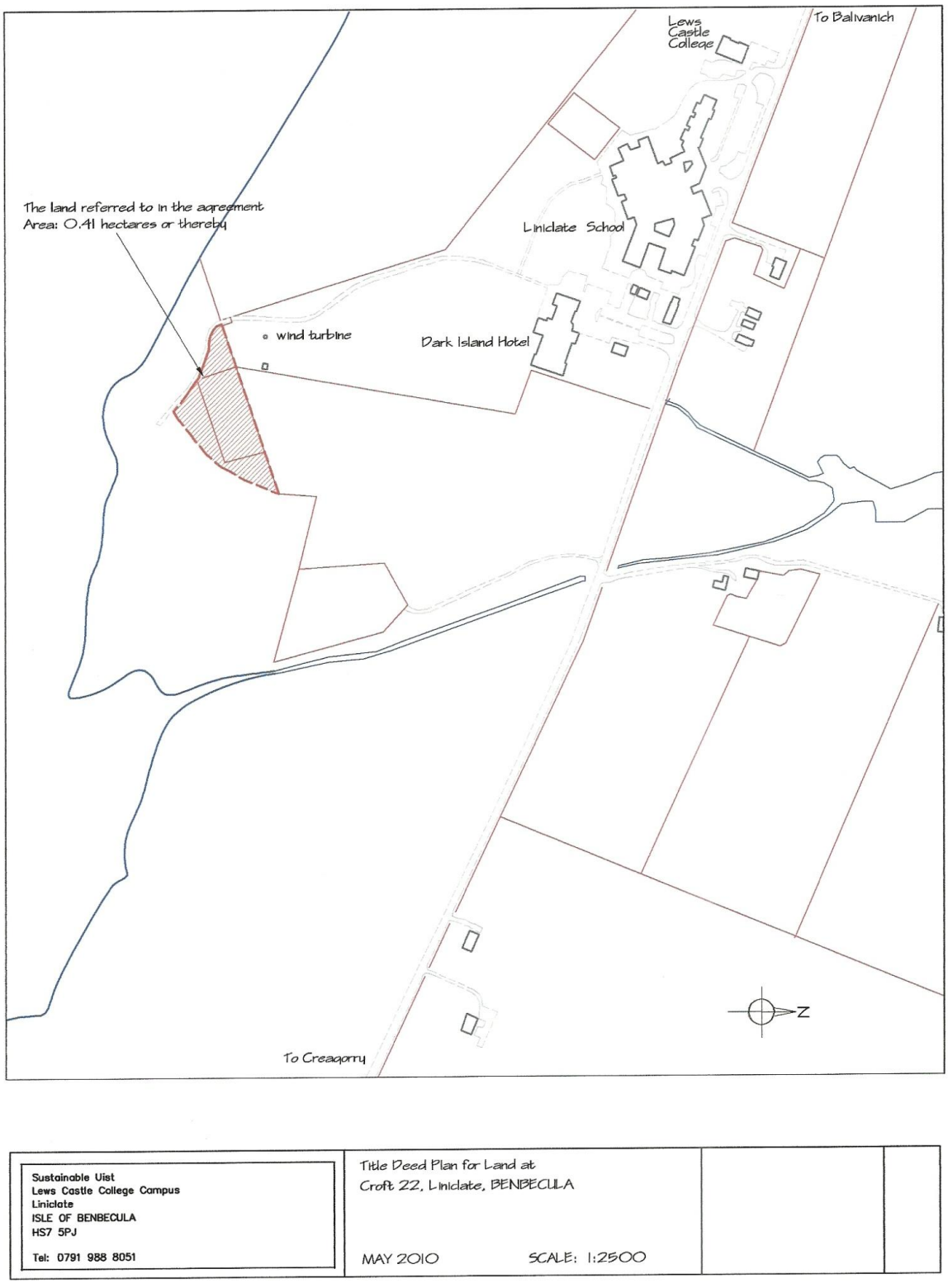
D2 Layout

The field layout is shown at d4. This shows the 8 main trial plots, plus the two greenhouses. Each plot is separated by a pathway and the two lines of plots and fences by 3-4m wide roads for vehicle access.

[1] www.sustainableuist.org

On the plan the grey shaded plots are those covered in mesh covers and those surrounded by a green dotted line are enclosed by wind fences. Plot 1 has both covers and a fence.

d1 Field Location Plan

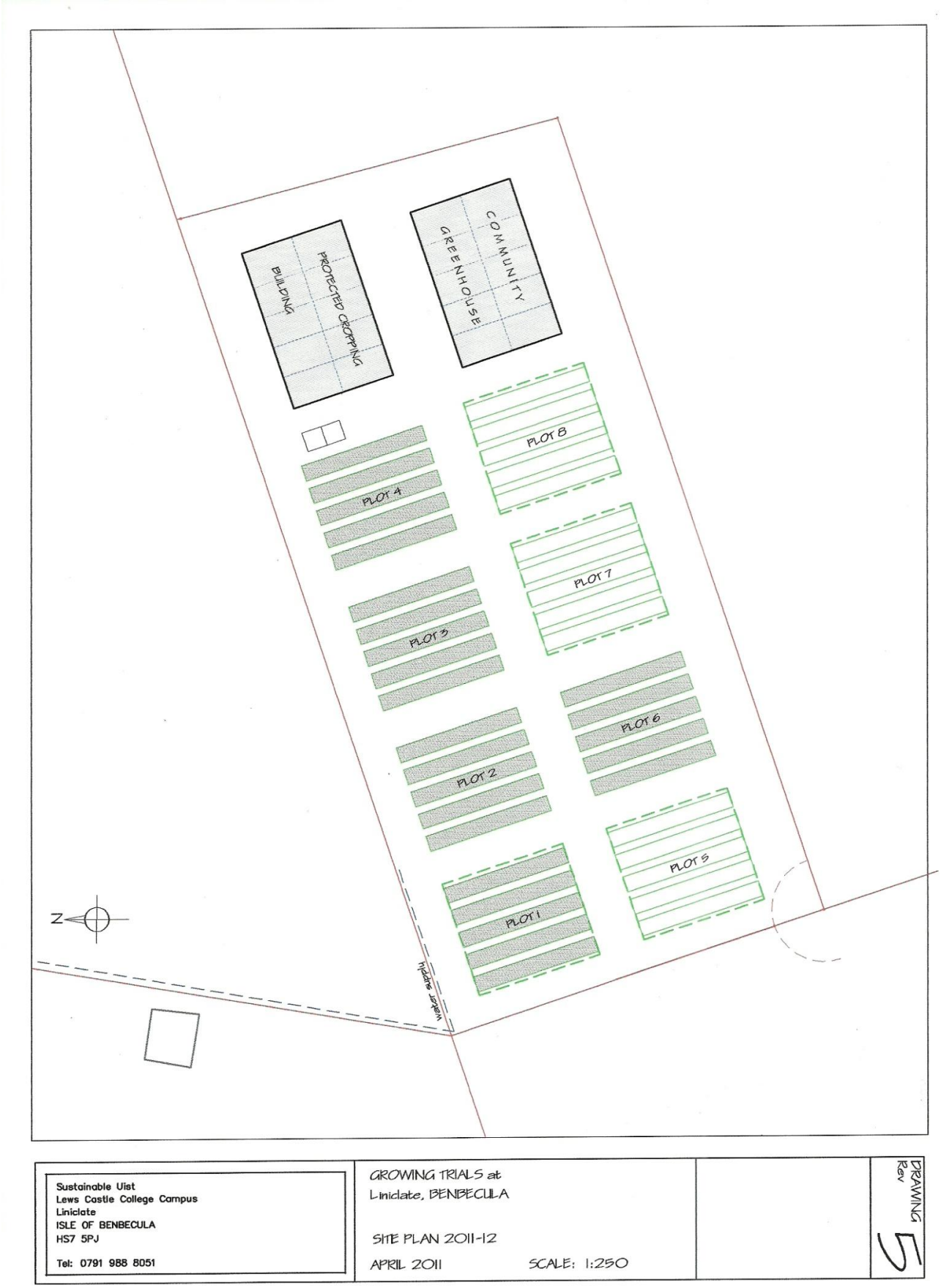


Sustainable Uist Lews Castle College Campus Liniclate ISLE OF BENBECULA HS7 5PJ Tel: 0791 988 8051	Title Deed Plan for Land at Croft 22, Liniclate, BENBECULA MAY 2010 SCALE: 1:2500		

d2 Google Earth Image with field fence lines shown in red.

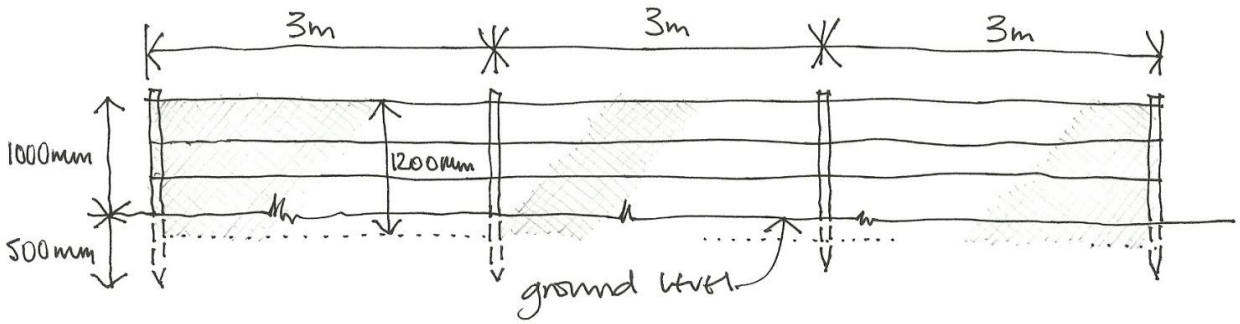
d3 General view of the site in February 2012

d4 Field Layout Plan 2011-12



D3 Infrastructure and materials

For ***wind breaks*** we used 1200mm wide woven recycled polyester wind break material supplied by the Organic Gardening Catalogue[2]. This is supported by 3 strands of 6mm polyester rope stapled onto fencing stobs projecting 1m above ground level, and the bottom 200mm is dug into the ground. (See d5 below). The windbreak is stitched on to the polyester ropes with orange fishing net repair line using a simple overhand stitch at 15 - 20cm centres. Builders' safety netting or old fish farm nets can be used instead of windbreak and all these materials are available on Uist. See photo at d7.

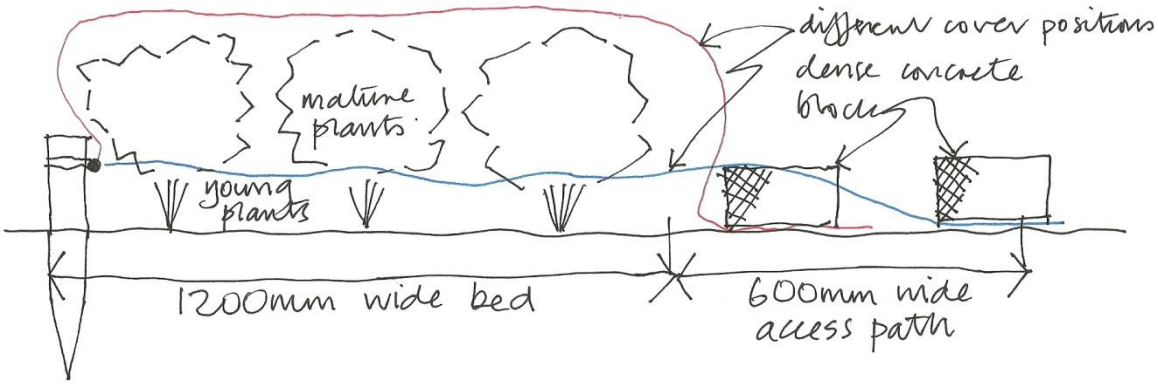


d5 Wind fences

The ***ground covers*** are 2100mm wide Enviromesh, also available through the Organic Gardening Catalogue. This is a recycled plastics product made in Germany. The threads are white and at about 2mm centres. This provides a light, well ventilated environment with hardly any increase in temperature as you would get with fleece type covers. Enviromesh is designed to protect plants against predators, mainly insects such as cabbage white, cabbage root and carrot flies. However, they also provide good protection against weather damage, particularly heavy rain and hail and wind. See photo at d8.

The mesh is secured by stitching one long side of each bed cover to a length of cord and tying this permanently to three posts at ground level. The free side is then weighted down with half concrete blocks. (See sketch 2 below). These are simply lifted off when access to plants is required. When in place they hold the covers without a problem, even in the strongest winds.

[2] www.organicgardeningcatalogue.co.uk



d6 Ground covers

d7 Wind fences in place

d8 Crop covers in place

As plants grow the covers are made looser as shown in the red line position on the sketch at d6. For very tall crops such as Brussels sprouts, allowance has to be made for this growth when setting out covers and row widths, although it is hoped that the danger of insect pests has receded by the time the plants reach full height in late autumn and winter.

D4 Trial Crops

The crops list is shown below. The plan was to grow examples from each of the main vegetable families, and where possible, two or more varieties of each type.

	Family	Type	Variety		Family	Type	Variety
1	Brassicas	B Sprout 1	Early HT			Radish	Rudolph
		B Sprout 2	Nautic			Turnip	PTM
		Cabb	Jan King			Swede	Helenor
		Cabb	Vertus	**5**	Beans/fallow	Broad	Bunyards
		Cauli 2	Belot			Broad	G Windsor
		Calab 2	Fiesta			Broad	Eleanora
		PSB	Rudolph			Broad	S Aquadulc
		Seakale	Lillywhite			Runner	Kelvedon
2	Alliaceae	Onion W	Sturon			Runner	P Lady
		Onion R	Red Baron			French	Canadian

		Salad	Guardsman			French	Cantare
		Leek	Musselb	**6**	Salads	Lettuce	Maserati
		Leek	Siegfried			Lettuce	Little Gem
3	Roots	Carrot 1	Nantes			Lettuce	Saladin
		Carrot 2	Trevor F1	**7**	Beets	Spinach	Boeing
		Carrot 3	Autumn K			Spinach	Firebird
		Carrot 4	Rothild			Beetroot	Detroit 6
		Parsnip 1	Gladiator			Beetroot	Boltardy
		Parsnip 2	Palace F1			Beetroot	Red Ace
4	Brassicas	Red cabb	Marn Lag			Leaf Beet	Erbette
		Cabb	Derby Day			Chard	Bright
		Cabb	Advantage			Chard	Swiss
		Calab 1	Belstar	**8**	Courgettes/squash	Courgette	Bambino
		Cauli 1	AYR			Courgette	Green Bush
		Rocket 1	Salad			Squash	Constellatio
		Rocket 2	Wild			Pumpkin	Pepita

d9 Crops list

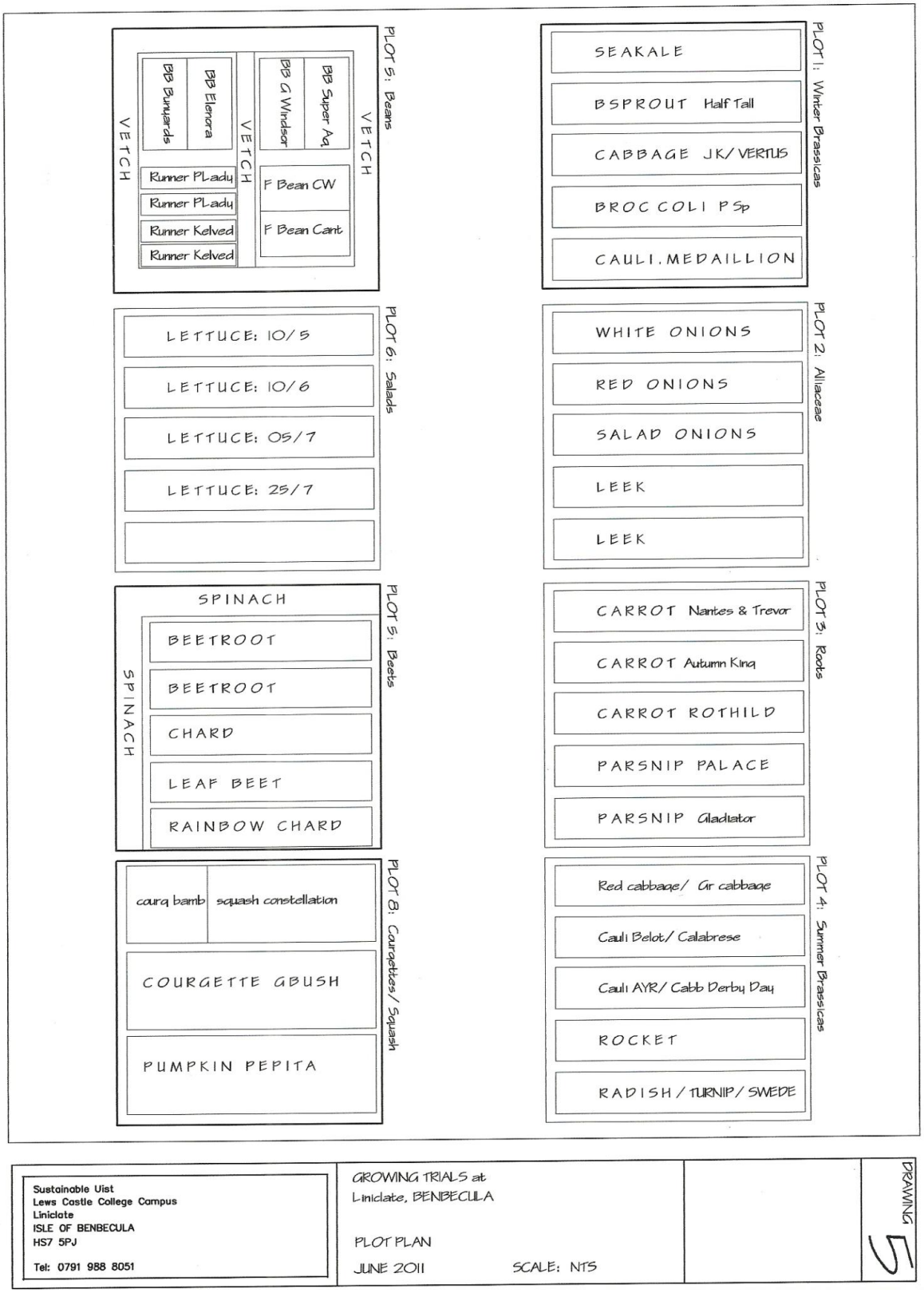
Potatoes were not included in the trial as these are already widely grown successfully across the islands.

Wherever possible, crops were raised as plants in modules in the greenhouse. Our own courgette/squash plants did not germinate well so these were bought from Croft Garden at Ardivachar. The layout of crops in all of the 8 plots is shown in the plan at d10.

The following crops tested in 2010-11 were not grown in 2011-12 for the reasons stated:

Crop	**Reason**
New Zealand Spinach	Did not thrive in any situation
Kales	Not considered to be a table vegetable on Uist
Parsley	Too short a growing season for outside cultivation

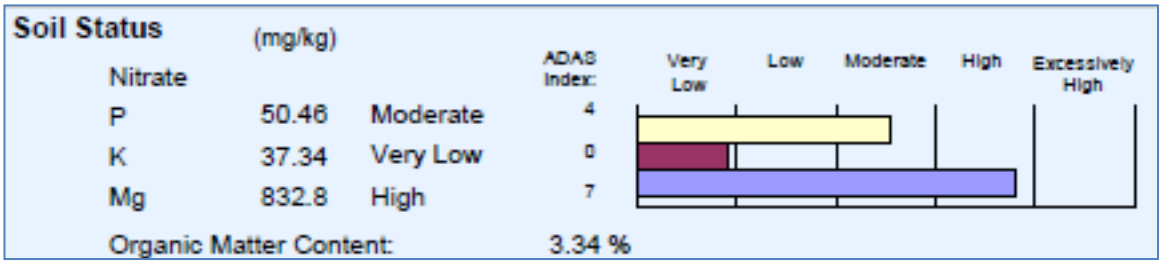
d10 Plot Crop Layout by plot



D5 Soils and Fertilisers

Machair soils are characterised by their light colour, loose sandy texture, very high pH and very low organic matter. Despite these unpromising characteristics they have been used for centuries to grow arable crops, potatoes and grass using seaweed and animal manures as fertilisers, though they have been susceptible to movement in times of high wind speeds sometimes with devastating results.

At Liniclate, soil testing was carried out before fertilisers were added for the original 2010 - 11 trials. The results were as shown below.



The clear result is low potash levels with phosphate and magnesium satisfactory. Nitrate was not tested as figures are not reliable for any period of time, but this would clearly have been low as the land had not been cultivated or fertilised for decades.

During the 2010-11 trials, different general fertilisers were applied in different areas, and where these were used, non-nitrogen nutrient losses would probably have been roughly neutral. Where they were not applied there would have been some depletion, but as crops in these areas were poor due to low nitrogen and low potassium, this would have been limited.

We took the view, therefore, that for the 2011 -12 trials, a good organic compost/manure application was required to deliver a wide range of nutrients and raise organic matter levels (which were exceptionally low at just over 3%), together with extra potassium which was clearly in short supply. We chose to use seaweed to top up nutrients across the board and an organic 16% high potash fertiliser supplied by Laws Fertilisers to deal with the low potassium.

Seaweed is a wonderful natural fertiliser resource for Uist crofters. The fronds are harvested from the shores soon after New Year when winter storms can bring in huge deposits to some areas. Two types are used – kelp (*laminaria*) or bladderwrack (*asco*). Kelp is rarely found on the east side of the islands preferring the conditions in deeper water on the west side where the Atlantic swell draws water over the fronds in a constant flow providing the nutrients it needs. Bladderwrack can be found all round the islands attached to rocks in the tidal zone, but it grows more profusely in the sheltered east coast bays and lochs. Seaweed is generally collected early in the New Year and then composted in large heaps for 2-3 months before application in the early spring.

On the general machair, where corn crops are being grown, applications are very light being probably less than 1kg/m^2 wet weight. On potatoes a good covering is applied, probably around the 8kg/m^2 level. These rates seem to be derived simply from tradition and the seaweed quantities available, but we were interested in knowing what they would deliver.

In the autumn of 2010 we had two seaweed samples tested for elemental content by the MacAulay Institute in Aberdeen. The results were as follows:

Sample	Barcode	Ca	Mg	K	P	Fe	Mn	S	Cd	Co	Cr	Cu	Hg	Mo	Ni	Pb	Se	Zn	C	N
		mg/kg																	%/wt	
Kelp	1043491	13260	6521	43270	5478	<0.5	<0.3	11470	0.16	0.12	1.15	2.03	<0.05	0.20	0.93	<0.10	0.20	40.81	34.23	1.11
Bladderwrack	1043492	10460	8824	30570	1648	<0.5	43.41	32170	0.55	0.41	1.37	13.64	<0.05	0.25	5.18	<0.10	0.21	124.3	34.95	1.23

The bladderwrack sample result is included for comparative interest – we used kelp.

Firstly it is worth noting the elements that <u>are not</u> present in any significant quantity – particularly the unwelcome heavy metals, but also elements that plants do need such as iron and manganese. Interestingly, it is deficiencies in these elements that can cause the chlorosis[3] problems with spinach and beetroot noted in both sets of trials.

Next, of those elements that <u>are</u> present – nitrogen at 1.1% is quite good, although it has to be explained that all the figures are dry weight proportions, and, because seaweed contains a lot of water, wet seaweed has concentrations probably around 1/6th of these figures. Potash is high. Phosphate is present in lower quantities, but the shell sand soil contains this naturally.

At Liniclate the seaweed was applied in mid March (see photo at d11) having been composted for around 2 months. The rate averaged 8kg/m^2 and, on the basis of the figures from MacAulay, and the fact it was wet, the assumed equivalent application rates of nutrients are shown in table d12 overleaf. The two other great benefits of seaweed are its binding properties for sand particles which probably derives from the alginate[4] content, and its sulphur content which helps reduce the very high pH value.

d11 Spreading seaweed March 2011

[3] Chlorosis is caused by mineral deficiencies and manifests itself as pale green or yellow patches and prominent veins in leaves.

[4] Used as a gelatine type additive to many foodstuffs including ice cream

With this understanding we could now compare the content of different seaweed applications with what our crops would need.

Application	Unit	N	P	K	Ca	Mg	Fe	Mn	S
dry	mg/kg	11000	5500	43300	13300	6500	1	0	11470
wet (1/6th)	mg/kg	1833	917	7217	2217	1083	0	0	1912
8kg/m^2 wet	g/m^2	15	7	58	18	9	0	0	15
8kg/m^2	**kg/ha**	**147**	**73**	**577**	**177**	**87**	**0**	**0**	**153**
1kg/m^2 wet	kg/ha	15	7	58	18	9	0	0	15

d12 Seaweed nutrient values in kg/ha at application rates of 8 and 1 kg/m^2.

DEFRA publish a very useful Fertiliser Manual for farmers and growers called RB 209 which can be downloaded free of charge from the DEFRA website. This includes useful information on the main nutrition requirements for a wide range of field crops. The relevant figures for our vegetable crops are shown below.

Adas Index from soil	N	P	K	Mg	S
	0	*4*	*0*	*7*	*n/a*
Crop	**Application rate for index shown kg/ha**				
Winter brassicas	340	0	300	0	50
Summer	250	0	275	0	50
Legumes	0	0	200	0	25
Lettuce	200	0	250	0	0
Courgettes	100	0	250	0	0
Alliums	200	50	275	0	0
Carrots	100	25	275	0	0
Turnips	170	25	300	0	0
Beetroot	290	25	300	0	0
Potatoes	*150*	*0*	*360*	*0*	*0*
8kg/m^2	**147**	**73**	**577**	**87**	**153**
Oats[5]	*90*	*0*	*130*	*0*	*40*
1kg/m^2	*15*	*7*	*58*	*9*	*15*

d13 Nutrition requirements for field crops

It can be seen that in general seaweed delivers most of the nutrients that crops require with an exception being long term nitrogen for winter brassicas which have to stand for longer periods of time[6]. Potatoes are included for reference purposes and it is interesting to note that a good application of seaweed easily supplies all the nutrients the crop requires – a possible contributing factor as to why the crop became such a popular staple in the 18th and 19th centuries.

We also took account of the specific advice from RB209 for light sandy soils for the application of two particular nutrients, K and S:

[5] (We have also included the requirements shown in RB 209 for oats and compared these with the inputs delivered from a 1kg/m^2 seaweed application. This shows why oat and barley crops have to be sown at much lower densities on machair soils.)

[6] This was reflected in the winter cabbage results.

Potash (K): Sandy and sandy loam soils, together with other soils containing very little clay, have a limited capacity to hold potash. On such soils it is almost impossible to achieve the appropriate soil K Index level. Adding potash fertilisers to try to exceed these values will result in movement of potash into the subsoil where it may only be available to deep-rooted crops. On sands, it is preferable to apply and cultivate into the topsoil an amount of potash fertiliser each year to meet the potash requirements of the crop to be grown. As the starting index for potash on the site was zero we thought it best to apply additional K fertiliser and this was done at the rate generally of around 300kg/Ha.

Sulphur (S): Sulphur is an important element in plant nutrition, often ignored, as in the relatively recent past it fell in plenty onto soils in the UK via air pollution from motor vehicles and industry as acid rain. However in recent years quantities have fallen substantially as anti-pollution and sulphur reduction measures in motor fuels have been introduced and some crops are now showing signs of shortage. Luckily seaweed contains good quantities of sulphur so this issue was dealt with.

D6 Data

The following data sets were recorded during the course of the trial:

- Crop sowing date
- Crop planting out date
- Crop ready to harvest date
- Crop outputs – including failures and weights
- Crop quality report
- Pest and disease occurrence
- Crop condition photographs (monthly)

D7 Crops

Results for each crop grown are given in the following pages.

Crops are divided into groups, then type then variety. For each group a general introduction is given explaining the strategy for the varieties selected. For each variety the following parameters are given:

- Variety characteristic
- Direct sown or plants
- Sowing date[7]
- Planting out date
- Harvest date
- Commentary for each crop

[7] Sowing date for plants is the date the modules were seeded. For direct seeded crops it is the date the seeds were sown in the ground.

The reports finish with a general commentary and the best growing strategy identified for each crop.

Some photos are shown at the end of the section highlighting successes and difficulties.

d14 Crop Report: *Leguminosae*

Legumes – Beans

A wide range of varieties was chosen for trialling as none had been particularly successful in the first year of trials. Peas were not sown as they are not a realistic crop to grow commercially on a croft.

Type	Variety	Sowing Date	Plant out Date	Harvest Date	Crop Comments
Broad	Bunyards	30-May	N/A	Late Aug	Good
Broad	Green Windsor	30-May	N/A	Late Aug	Medium
Broad	Eleanora	30-May	N/A	Late Aug	Good
Broad	S Aquadulc	30-May	N/A	Late Aug	Medium
Runner	Kelvedon	03-May	12-Jun	N/A	Poor – plants OK if slow growing but many flowers not fertilised and beans curled. This is sometimes ascribed to water deficit (unlikely this year) or excess drying winds (possible).
Runner	Painted Lady	03-May	12-Jun	N/A	
French	Canadian	06-May	12-Jun	N/A	Poor – did not thrive at all. Pods that did form also susceptible to end rot.
French	Cantare	06-May	12-Jun	N/A	

General comments

It has to be said that in view of the very adequate fertility inputs none of the beans did particularly well and the most likely reason is the very high soil pH. Whilst most vegetables prefer slightly acidic soils (pH sub 7) beans are noted as preferring a pH of nearer 6 than 7. However, lack of pollinating insects and wind damage are the main factors inhibiting French and Runner bean pod development and there is little more that could be done to change this.

Strategy

It is not realistic to grow either French or Runner beans outside on Uist. Whilst Broad beans can be considered to be a useful crop commercially, they are not widely used as a table vegetable these days so would need to be thought about carefully.

Vetch

Following trials in 2010-11 Vetch or Tares was found to be the best fallow legume crop with good nitrogen nodule formation in the roots. We sowed in late May and had a good ground cover by late August with no flowers at which point it would normally be ploughed in for an autumn sown crop to follow. The best would probably be a Hungarian rye grass which is known as a good N holder over-winter.

d15 Crop Report: *Chenopidaceae*

Beets – Real/leaf spinach, leaf beet, chard, beetroot

Whilst beetroot did OK in 2010-11 none of the other spinach beets grew well, mostly because they immediately bolted. The possible causes of this include long day length in summer, manganese and iron deficiency, drying out and poor soil fertility at depth. As the results were so poor the trial was repeated in 2011-12, but the same results were observed.

Type	Variety	Sowing Date	Plant out Date	Harvest Date	Crop Comments
Spinach	Boeing	24-May	N/A	N/A	Poor – went straight to seed at a very small size
Spinach	Firebird	24-May	N/A	N/A	Poor – went straight to seed at a very small size
Beetroot	Detroit 6 Rub	19-Apr	03-Jun	Late July	Fair
Beetroot	Boltardy	09-Apr	03-Jun	Late July	Fair
Beetroot	Red Ace	03-Jun	N/A	N/A	Poor – sown direct and never really developed properly
Leaf Beet	Erbette	09-Apr	03-Jun	Late July	Poor – every plant bolted with few harvestable leaves; chlorosis
Chard	Bright Lights	18-Mar	03-Jun	Late July	Poor – 90% of plants bolted with few harvestable leaves; chlorosis
Chard	Swiss	09-Apr	03-Jun	N/A	Poor – never really thrived; chlorosis initially

General comments

The beet family do not really thrive in high alkalinity soils and all suffer from leaf chlorosis and, with the exception of beetroot, a strong tendency to bolt. This makes all the leaf spinaches a risky crop. They should do better on peat soils, and one island black land grower says an early April sowing of leaf spinach will produce a small crop suitable for salads. Beetroot do OK, but seem to do better if planted into modules rather than sown direct as they have longer to develop.

Strategy

It is not realistic to grow spinach as a vegetable crop on Uist machair soils. Beetroot do OK. Bolt resistant varieties should be used and roots will develop to a good size using the module planting method if sown inside in mid April.

d15 Crop Report: *Brassicaceae – summer varieties*

Cabbages, Red Cabbage, Cauliflowers and Calabrese

A single variety of red cabbage, cauliflower and calabrese, and two varieties of summer cabbage were chosen for trialling based on results from 2010-11.

Type	Variety	Sowing Date	Plant out Date	Harvest Date	Crop Comments
Red cabbage	Marner Lagerrot	09-Apr	19-May	Late July	Excellent – a very good crop which matured over a long period of time. Largest heads weighed over 2kg and were of top quality. Very big plants.
Cabbage	Derby Day	09-Apr	19-May	Early August	V good – a good crop with good sized heads. Some losses to cabbage root fly.
Cabbage	Advantage	09-Apr	19-May	Late July	V good – a good crop with good sized heads. Some losses to cabbage root fly.
Calabrese	Belstar	09-Apr	19-May	August	V good – a good crop of main heads with side shoots producing right through to November
Cauliflower	All Year Round	19-Apr	19-May	September	Excellent – some huge heads – up to 4kg which matured in turn over a few weeks. Did not stand for very long once flowered. Need to take care with making sure fertilisers are evenly spread to avoid wide size variation.
Radish	Rudolph	04-Jun		Late July	Good – susceptible to CRF.
Turnip	Pur Top Milan	04-Jun		September	Good – susceptible to CRF but steady succession of good roots through careful thinning.
Swede	Helenor	04-Jun		September	Good – kept developing till early December

General comments

The summer brassicas could not have done better. There were a few losses due to cabbage root fly which either got to the young plants in the greenhouse or under loose covers, but these could have been avoided. All plants were large and the red cabbage and cauliflower overwhelmed some of the smaller summer cabbages planted nearby. Spacings and row set ups therefore need to be considered carefully in advance. When young plants are planted out the spacings look completely wrong, but it is not helpful to be tempted to reduce the distances.

The brassica roots all did well and were noted for not being affected by flea beetle. These roots seem to be popular locally.

Strategy

Summer brassicas are a viable commercial crop on Uist, though the covers are a necessity and are not cheap. It would be good to carry out more variety trials and planting dates to enable the cropping season to be extended further into the autumn. Roots all do well with little extra fertility, although need covering.

d17 Crop Report: *Brassicaceae – winter varieties*

Cabbages, Brussels sprouts, Cauliflowers, Calabrese, Purple Sprouting Broccoli and Seakale

A single variety of cauliflower, calabrese, PS Broccoli and two varieties of winter cabbage and Brussels sprouts were chosen for trialling based on results from 2010 - 11. Sea-kale was also trialled as a longer term crop, but it is not harvested in its first year.

Type	Variety	Sowing Date	Plant out Date	Harvest Date	Crop Comments
Brussels Sprout	Early HT	23-May	05-Jul	Late Feb	Very small plants and small sprouts that weren't ready till late Feb. Obviously suitable as a later crop – small size may have been linked to long term low fertility issue.
Brussels Sprout	Nautic	09-Apr	19-May	Late Nov	Excellent crop over three month period. A1 performer both picked and as stems.
Cabbage round	Jan King	23-May	05-Jul	Late Nov	Developed well initially but matured to small size almost certainly due to lack of N. May be a question about this variety and air temperature too.
Cabbage Savoy	Vertus	23-May	05-Jul	Late Nov	Developed well initially but matured to small size almost certainly due to lack of N.
Cauliflower	Belot	19-Apr	05-Jul	January	Flowered well but small size almost certainly due to lack of N.
Calabrese	Fiesta	04-Jun	25-Jul	October	Excellent heads and very good secondary stems till early Dec. Started shooting again in Feb, but florets missed at right stage.
Purple S Broccoli	Rudolph	23-May	05-Jul	Mid Nov	Good initially, but tender stems and florets were sand blasted during gales. Not possible to leave covers on for protection because of abrasion damage. Some plants redeveloped in late Feb.
Seakale	Lillywhite	09-Apr	19-May	N/A	Grew very well, but is not harvested in first year. Re-sprouting well by 1st March.

General comments

The winter brassica results were more varied, though the problem is clearly identified – a loss of long term nutrient supply in the soil. Winter brassicas need two if not three fertiliser applications at 2-3 monthly intervals and it is likely that if this had been done all crops would have done better. Despite that sprouts, PSB and calabrese did very well. JK cabbage never developed well in either trial year, so it may be that the absence of frosty conditions normally associated with this variety, are preventing it from developing properly. The relatively mild weather caused brassicas to start going to seed earlier than would be expected elsewhere.

Strategy

Winter brassicas are a viable commercial crop on Uist, though both wind fences and covers are a necessity so protection costs are high. Need to trial better protection for PSB and different cabbage varieties. Also it should be possible to select other early spring varieties of cabbages and cauliflowers to deliver crops in March and April.

d18 Crop Report: *Apiaceae*

Umbillifers – Carrots and parsnips

Varieties were chosen from successful trials in 2010 and testing alternatives too. The main issue with these crops is getting them in early enough in the challenging early spring conditions.

Type	Variety	Sowing Date	Plant out Date	Harvest Date	Crop Comments
Carrot Early 1	Nantes	30-May	N/A	Late Aug	Good – could have been sown earlier, but soil conditions poor.
Carrot Early 2	Trevor F1	30-May	N/A	Late Aug	Good – another early carrot which could have been harvested a month earlier
Carrot Main 1	Autumn K	30-May	N/A	Late Aug	Good – tops died back in early winter gales and started regrowing quite early with extensive secondary root growth by mid Feb.
Carrot Main 2	Rothild	30-May	N/A	Late Aug	
Parsnip 1	Gladiator	03-Jun	N/A	November	Medium – all quite small, probably because of delayed sowing date, and imperfect thinning. Some canker noted this year, but not serious.
Parsnip 2	Palace F1	03-Jun	N/A	November	

General comments

The machair soils should be considered ideal for both carrots and parsnips, though their inability to warm up in the spring and susceptibility to blowing around in dry windy periods makes sowing date and germination an issue. Best policy would be to increase organic matter substantially. Sowing dates need to be staggered more.

Strategy

Add substantial organic matter to soils in late winter and cover before sowing as early as possible.

d19 Crop Report: *Salads*

Salad leaves – Lettuce and rocket[8]

Lettuce varieties were chosen for suitability for growing outside in the summer, colour and leaf type.

Type	Variety	Sowing Date	Plant out Date	Harvest Date	Crop Comments
Lettuce red oak	Maserati	04-Mar	17-May	Late July	All did well. Covers left on throughout season.
Lettuce cos	Little Gem	04-Mar	17-May	Late July	
Lettuce iceberg	Saladin	04-Mar	17-May	Late July	
Lettuce gr oak	Belize	04-Mar	17-May	Late July	
Lettuce	All	18-Mar	10-Jun	Early August	All did well. Covers left on throughout season.
Lettuce	All	31-Mar	05-Jul	Late August	
Lettuce	All	18-Apr	25-Jul	Late Septemb	
Rocket 1	Salad	04-Jun	N/A	Late July	Did well, but grew out reasonably quickly. No flea beetle seen.
Rocket 2	Wild	04-Jun	N/A	August	Did well and kept going until early December

General comments

Plants raised in the greenhouse in modules. Works well as a summer crop on Uist machair soils, but late to first harvest compared to S England. Problem noted with losses from damping off (*pythium*) with plants inside. There is no treatment for this so new trays required each year.

Strategy

Try an earlier sowing and warming soil surface with peat mulch and covers on two weeks before planting out.

[8] Known to be a brassica, but does not generally transmit P&D to others – apart from flea beetle which was not observed

d20 Crop Report: *Alliaceae*

Alliums – Salad onions and leeks

Varieties were chosen for

Type	Variety	Sowing Date	Plant out Date	Harvest Date	Crop Comments
Onion W (sets)	Sturon	N/A	16-May	Late July	Generally a good crop, rather variable in size. Whites stored well, reds less so. Some sand was blown into the necks.
Onion R (sets)	Red Baron	N/A	16-May	Late July	
Salad onion	Guardsman	18-Mar	30-May	Late July	Good crop
Leek	Musselb	09-Apr	10-Jun	November	Not planted correctly so stems short. Medium crop, variable in size. Stood well right through winter with covers on. A lot of sand blown into the stems so careful washing needed.
Leek	Siegfried	09-Apr	10-Jun	November	

General comments

Generally much better crops than 2010, probably due to the much higher soil K which alliums need. Size variability is due to very poor inherent nutrient content of soil which makes evenness of seaweed and K fertiliser distribution difficult to control. Leeks would have been good if they had been planted at the correct depth.

Strategy

Satisfactory

d21 Crop Report: *Cucurbits*

Courgettes

Varieties were selected without particular criteria in mind, and some were bought in. Courgette variety had been used successfully in 2010.

Type	Variety	Sowing Date	Plant out Date	Harvest Date	Crop Comments
Courgette	Bambino	Bought	15-Jun	Late July	Good – fruits susceptible to end rot so important to remove flowers as soon as fruit set.
Courgette	Green Bush	Bought	15-Jun	August	
Squash	Constellation	Bought	15-Jun	N/A	Fair – so called 'patty (sic) pan' variety with different colours. Quite slow to ripen
Pumpkin	Pepita	Bought	15-Jun	N/A	None. Plants never developed properly either soil pH or temperature or combination of both

General comments

All these plants take up a lot of space and nutrition so need to work perfectly to make them viable commercially. Over two years we have found that courgettes do OK (but not as prolific as in the south of England), but the other cucurbits are not really viable on Uist

Strategy

Stick with corgettes only. Pick flowers as soon as fruits set.

d22 Crop Report: *Photos*

Carrots Plot 26th August

Carrots 27th rd September

Carrots under covers 26th August

Broad beans 26rd August

Runner beans 27th September

French beans 26th August

Cauliflower, calabrese, salad onions and red oakleaf lettuce 16th August

Show quality red cabbage 26th August and Brussels sprouts 1st December

Iceberg and green Oakleaf lettuce 26th August

Lettuce under covers 27th September

Beetroot August 26th

Leaf beet 26th August

Leaf beet 27th September

Courgettes and 'patty pan' squash August 26th

Vetch in September

and in early November

and in December

D8 Results Dissemination

8.1 Newspaper Articles

The Uist community newspaper Am Paipear was used regularly to update residents on progress with the trials and publicise events such as Growers' Forums, open days and workshops. A typical article is reproduced in ***Appendix 3***

8.2 Open Days

Two open days were held during 2011 on 30th July and 22nd October

The first was held on a lovely summer's afternoon and the promise of free produce and a concentrated marketing campaign brought well over 100 visitors during the afternoon. The weather for the second was not so good. In fact it rained heavily for most of the morning on the day so numbers were very limited – around 20 in total. For each event a set of signs was erected alongside the trial plots identifying them by number and treatment and a leaflet highlighted the results from each one. The leaflet for the July event is reproduced in ***Appendix 4***. Visitors were shown round the field, questions answered and points discussed. Tea and cakes were served and free produce was handed out.

8.3 Workshops

Two workshops were held. The first was on April 9th 2011 where the subject was 'Advanced Vegetable Growing' – a follow up to the beginners' workshop held the previous December. The paper handed to that class is reproduced in ***Appendix 5*** and the 8 attendees were introduced to a number of more complex subjects including rotations, crop selection, advanced nutrient theory and pests and diseases on Uist. The second event was entitled 'Winter Salad Production' and was given by the Local Food Officer Marion Ferguson on 13th August. This was designed to demonstrate the work being done in the winter salads greenhouse and encourage gardeners with greenhouses to consider using their protected cropping facilities all year round.

8.4 Evening Classes

It had been intended to run the evening class series for a second year during November and December 2011, but this was not possible as the Food Officer moved to another post at the end of August, and as a result the project was under-staffed.

8.5 Growers' Forums

A series of five 'Growers' Forums' was held in February and March 2012 – one for each of the main Uist islands. Lasting 1½ hours and held in local community halls, existing and new local growers were encouraged to come along and discuss vegetable growing topics. Each forum started with a short presentation about Sustainable Uist and its activities and this was followed by a brief talk on the results of the growing trials in 2011-12. A typical presentation is shown in ***Appendix 6***. Attendance numbers were Eriskay 3, South Uist 4, Benbecula 3, North Uist 1 and Berneray 4.

8.6 Advisory Leaflet

To complete the two years work and put the results into a format that was easily accessible a 24 page A5 pamphlet was produced entitled '***Vegetable and Salad Growing in Uist Machair Soils'.*** As well as including general background on subjects such as nutrition, seasonality and protection, detailed advice was given as to how to achieve the best results for 6 sets of different crops based on the results of the two years of trials work. A preview of this is shown in ***Appendix 7***. 200 copies were printed and distributed throughout the Uist community in March and April 2012. It was also posted as a .pdf on the Sustainable Uist website.

D9 Project Review

Trials: The trials worked well and the results originally sought from the work were obtained.

Community: It has been difficult to assess the community response at this stage. There has been keen interest in the advisory leaflet and it is hoped that more people will grow more produce as a result in the coming growing season. The community survey produced some positive signs, but the poor response to the Growers' Forums and second Open Day shows that the initial interest expressed in growing vegetables in the original 2009 Sustainable Uist community survey may not be as widespread as originally thought.

CO_2 emission reductions: The reductions to be delivered by the trial itself were delivered. It has been more difficult to assess the extent of those in the community, but they are clearly limited. The main result will be in the future as the now established possibilities for raising vegetables and salads commercially starts to make a structural change in the quantity of food imported into Uist with the very high associated food miles carbon emissions.

D10 Project conclusions

The trials established that it is possible to grow a wide range of vegetable and salad crops on the islands for a good part of the year.

The potential CO_2 emission savings from developing this local food industry are significant and have a good chance of becoming permanent and therefore structural.

The community response suggests that despite thinking that growing vegetables and salads at home is a great idea, in practice relatively few people are willing to get actively involved.

Sustainable Uist is reviewing the possibilities of setting up a medium scale vegetable and salad production unit based on some form of Community Enterprise.