Arctic Development

Toward Inuit Food Self-sufficiency In The Keewatin District, N.w.t.
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1.0 INTRODUCTION

There are many issues and problems inherent in the evolution and development of the Inuit people. Their transition from a "stone age" economy to a "space age" one has been and will continue to be a difficult one. One particularly important problem in the transition has been that of food.

The Inuit diet once consisting mostly of meat obtained by hunting and fishing and containing adequate amounts of all essential nutrients has changed. Now a full variety of foods imported from the south is available but not all of these foods provide adequate nutrition. In general this change has caused diet related diseases (obesity, cardiovascular diseases, hypertension, tooth decay) in Inuit common to the low socio-economic segments of southern North American society (Draper, 1977). Furthermore the high import cost and inequitable availability of nutritious southern foods create regional and local food disparities (Schaefer, Steckle, 1980).

1.1 Objectives

The three components of the Inuit food problem are nutrition, availability and cost. This paper is based on the hypothesis that food self-sufficiency through regional and local harvest, production and distribution initiatives will solve the problem. The general objective of the paper is:

- to discuss how to increase or newly create regional and local food self-sufficiency in the Keewatin District.

The specific objectives of the paper are:

- to discuss food harvest, production and distribution alternatives and their contribution to food self-sufficiency in the Keewatin District.
- to identify the socio-economic and environmental considerations in implementing food self-sufficiency strategies in the Keewatin.
- to develop a framework for achieving food self-sufficiency in the Keewatin.

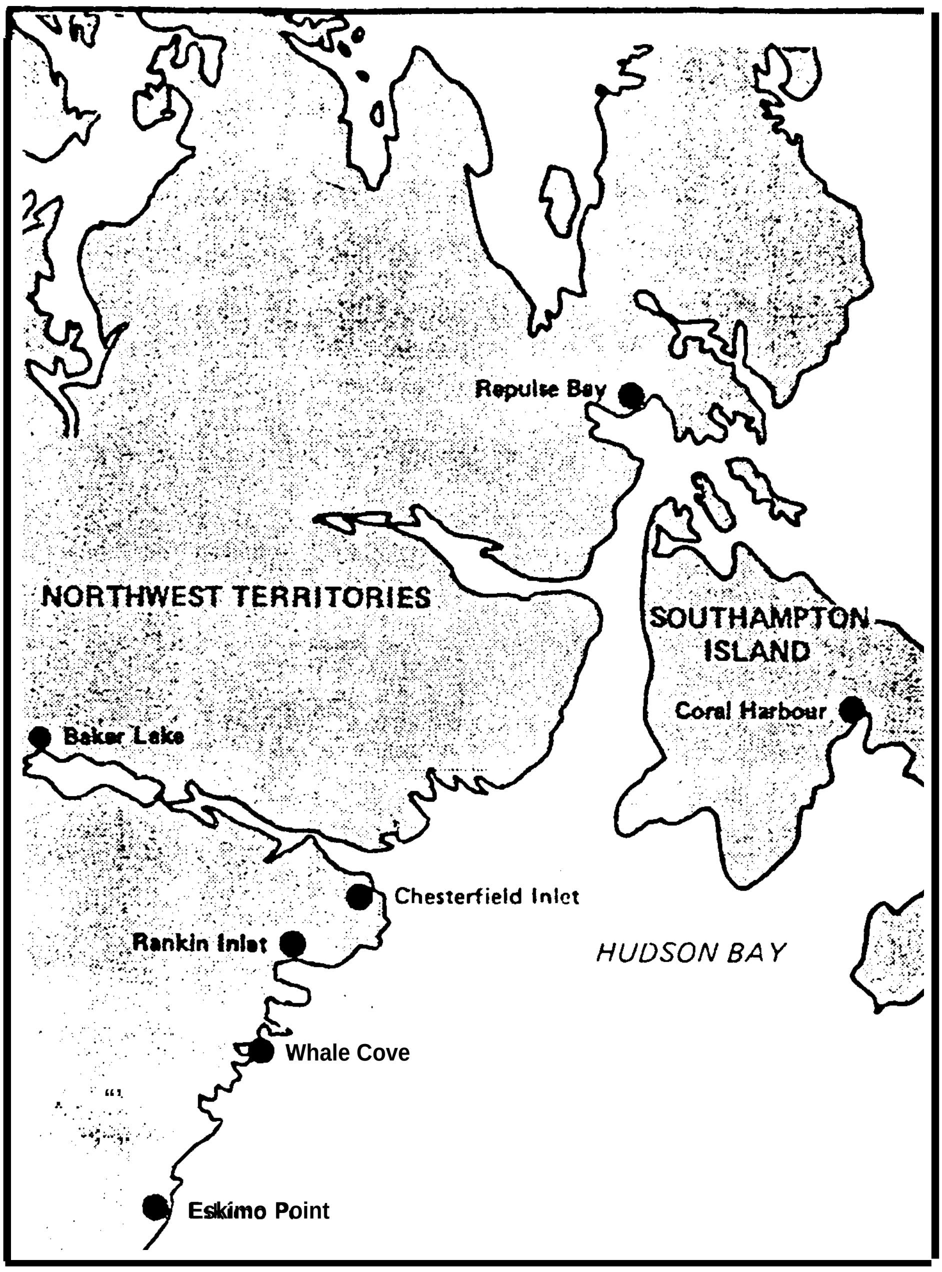
1.2 Study Area

Although the subject of this paper may be of universal importance to most communities north of the 60th parallel, I have focussed the discussion on the area shown in Map 1.

This area is known as the Keewatin District and was often called the barren lands. The landscape is rolling tundra having eskers, beach ridges and being punctuated by many small lakes. The land is underlain by continuous permafrost and is considered a part of the Canadian Shield physiographic region. The vegetation is of two tundra types: dwarf shrub heath and stony sedge-moss lichen. The tundra of the Keewatin originated and is maintained by a combination of forces. Glaciation caused the general pattern of rolling terrain with many lakes. The climate characterized by a July daily mean of IO°C and a January daily mean of -32°C gives rise to the permafrost and the “stunted” vegetation. The growing season ranges from 60 - 100 days with temperatures above

MAP 1

KEEWATIN DISTRICT
N.W.T.



6°C (Naysmith, 1977).

The population of the Keewatin District is about 10% of the total population of N.W.T. (48,000). This includes Inuit and white people. Rankin Inlet is the largest community and is the administrative centre for the district. Baker Lake is the only non-coastal Inuit community in North America.

2.0 THE FOOD PROBLEM

2.1 Traditional Nutrition

The traditional diet of the Inuit consisted primarily of meat and fish from both land and sea. On land the major food source was caribou. Musk-ox, Arctic hare, ptarmigan, Arctic ground squirrels and lemmings were additional food sources. From inland lakes Arctic char, grayling, whitefish and other species were taken. In nesting areas and along flyway resting and feeding areas eggs and meat were obtained from ducks and geese and were seasonally important foods. From the sea,hunters took fish, seals, walrus and whales as food (Schaefer, Steckle, 1980).

A poorly documented source of food is vegetable matter. Inuit people frequently ate berries, herbs, roots, marine algae and the contents from the stomachs of their animal prey (Rodahl, 1950; Schaefer, Steckle, 1980).

Despite the restricted composition of the Inuit diet relative to general North American dietary variety it was capable of providing essential nutrients when prepared and consumed traditionally (Draper, 1977). The most significant findings from studies on the traditional Inuit diet are the high protein intake, the surprisingly low fat intake (Table 1) and the high vitamin content of meats and plants eaten (Draper, 1977; Rodahl, 1950; Schaefer, Steckle, 1980). The traditional diet was fully nutritious, a fact supported by reported low levels of malnutrition related diseases.

From Table 1 it can be seen how in each of the three countries (Canada, United States and Greenland) the diet deteriorated, with protein decreasing and carbohydrate and fat increasing with increasing modernization and consumption of imported foods.

2.2 Present Nutrition

The modern Inuit has for the first time the opportunity to choose from an extensive array of “exotic” imported foods. Being without personal experience and education about the nutritional value of most of these foods the Inuit too often choose badly (Draper, 1977).

Health and Welfare, Canada in its 1975 Nutrition Canada: The Eskimo Survey reported that the dietary intake of Inuit in Eskimo Point, Frobisher Bay, Coppermine and Pelly Bay, N.W.T. was inadequate (Table 2). Dietary inadequacies leading to biochemical disturbances and clinical abnormalities (malnutrition) were recorded with a large enough frequency to warrant concern. Table 3 provides an interesting

TABLE 1

COMPARISON OF AVERAGE PER CAPITA DAILY CALORIC INTAKE AND PROPORTIONAL CONTRIBUTION BY PROTEIN, FAT& CARBOHYDRATE (CH0)

Place and year of Study (Author and Ref.)	Total Calories	% of Caloric Intake As Protein	Fat	CH0
Cumberland Sound 1965 (Schaefer[500]) (Trad)•	2770	46	17	37
Holman Island 1965 (Schaefer[50]) (Trad)	2750	41	26	33
Coppermine 1965 (Schaefer[50]) (Trad)	2510	43	23	34
Lake Harbour 1967 (Kemp[32]) (Trad)	2700	44	23	33
Frobisher Bay 1964 (Schaefer[50]) (Mod) •	2040	25	25	50
Alaska Diet Survey 56-61 (Heller-Scott[25]) (Trad)	2000	28	37	35
North Alaska 1971/72 (Draper[13]) (Mod)	2500	20	39	41
N.W. Greenland 1955 (UHL[73]) (Trad)	N.A.	36	25	39
N.W. Greenland 1974 (Bang et al.[2]) (Mod)	2832	26	37	37
USDA Urban Household Consumer Survey, 1955[12]	3200	13	43	44

[a] Data arranged progressing for each area from relatively "'traditional'" (Trad.) to more "modern" living or more recently examined (Mod.) groups. Data in bottom iine cite for comparison findings of USDA Consumer Survey 1955.

Source: Schaefer, Steckle, 1980

TABLE 2

DIETARY INTAKE OF INUIT
IN FOUR COMMUNITIES

Eskimo Point)
Frobisher Bay) 346 sampled
Coppermine)
Pelly Bay)

	Caloric Intake		Vitamins					Irc
	Energy Balance	Protein	TRN	C	A	E	D	
Infants and children	high	satis-factory	sat	low	low	sat	low	lc
Adolescents	low	high	sat	low crit	low crit	--	low	lc
Adults	low	sat	high	low crit	low	--	low	sa
Senior Adults - most vul-nerable	low	low	--	low crit	low	--	low	lc

- dietary intake inadequate
- a number of biochemical disturbances and clinical abnormalities (malnutrition) were recorded with sufficient frequency to warrant discussion

Source: Canada Department of National Health and Welfare, 1975. Nutrition Canada: The Eskimo Survey Report. Bureau" of Nutritional Sciences, Ottawa,

TABLE 3

PROTEIN & FAT CONTENT OF COMMONLY-EATEN MEATS'
g/100 g Edible Portion - Uncooked

Alaskan Eskimo Diet			United States Diet		
Item	Protein	Fat	Item	Protein	Fat
Caribou	27	1.2	Veal Side	19	12
Moose	26	1.1	Chicken	20	13
Seal	32	1.8	Pork Side	12	45
Whale	24	0.7	Lamb Side	16	28
Oogruk	27	0.4	Beef Roast	17	23
Polar Bear	26	3.1	Beef Steak	16	25
Walrus	27	12.0	Hamburger	16	28
Whitefish	25.8	1.3	Frankfurter	14	21

(Trout and char similar; dried fish has about twice the protein and fat content)

Note that in general game meat and fish are much richer in their nutritionally important protein content (almost double) while having much less potentially harmful fat interspersed in their muscle fibers than the meat of domesticated animals.

COMPARISON OF COMMONLY. EATEN DOMESTIC VEGETABLES AND FRUITS WITH EDIBLE GREENS

per 100 grams

Garden Vegetables	Wt. A (I.u.)	Ascorbic Acid (mg)	Wild Vegetables	Vit. A (i.u.)	Ascorbic Acid (mg)
Cabbage	130	51	Bistort		158
Celery	240	9	Dandelion	800.14,000	30-66
Spinach	8,100	51	Fireweed	18,708	220
Green Peppers	420	128	Lyme Grass		43
Peas (raw)	640	27	Mountain Sorrel	8,900	40
Carrots (raw)	11,000	8	Rose Root	4,106	68
Beets (boiled)	20	6	Lambs Quarter	11,600	80
Potato (boiled cooked)	trace	16	Scurvy Grass	4,546	111
Tomato (raw)	900	23	Sea Purslane	5,753	42.5
Orange	200	50	Willow Leaves	18,300	190
Apple	90	4	Violet Leaves	8,258	210
			Cloud Berries	210-235	158-475

Source: Schaefer, Steckle, 1980

comparison between traditional and modern foods.

2.3 Food Availability and Costs

Certain traditional Inuit foods were seasonally and cyclically unavailable. However, in spite of deaths by starvation the Inuit did not suffer from chronic malnutrition. Nutritious foods were available and costs were simply the energy and time consumed by hunters.

Schaefer and Steckle (1980) outline the practices of food sharing between groups in a region and families locally. Hoarding and food preservation were also common. These traditional social activities alleviated regional and local disparities in food availability.

Presently the Inuit population of the N.W.T. does not exceed that estimated for pre-contact times (15,000-18,000). This argues against the suggestions that Inuit have outgrown the potential of the traditional resource base. The absence of dog teams which consumed one third of the meat and fish taken further supports the contention that all native and perhaps most non-native inhabitants could be provided with protein from local sources without danger of resource depletion. In fact sea mammal protein alone could probably do this (Schaefer, Steckle, 1980).

The availability of imported food resources is dependent on existing facilities for incoming transport, preservation, storage and on regional or local distribution. The costs of imported foods increase with means of transportation, distance and market conditions (Schaefer, Steckle, 1980). Table 4 exemplifies the food problem with regard to availability, cost and nutritional value of imported foods. While imported food is not the subject of this paper, its doubtful role in the modern Inuit diet and its inequitable cost and distribution make regional and local food self-sufficiency more attractive.

3.0 NATURAL RESOURCE BASED FOOD STRATEGIES

3.1 Country Food System - Protein

Given the availability of country food resources (Schaefer, Steckle, 1980) discussed earlier these could supply the major portion if not all of the protein requirement for the population of the study area. Table 5 documents the correlation between current harvest, potential additional harvest and the potential supply of protein. Table 6 shows demand for protein by the 1980 level of population. The potential supply of 6,425,000 exceeds the 1,600,000 lb. demand. However, Fuller and Hubert (1981) suggest that double the population could be supported by potential supply. They estimate this population will be reached by 2001.

These estimates and predictions raise some important questions. What must be done to achieve protein self-sufficiency from country food? What will happen when the population and protein demand have increased to the level of potential protein supply?

TABLE 4

AVAILABILITY, COST AND NUTRITIONAL VALUE OF IMPORTED FOODS
KEEWATIN REGION (WINTER 1978/79)

Product	Serving Size[a]	Nutrient Contribution /Serving	Cost/Serving and Availability -							
			Rankin Inlet (Hudson's Bay)		Coral Harbour	Baker Lake	Repulse Bay (Co-op)	Whale Cove	Eskimo Point	Average
Vitamin C										
Milk, fresh homo	250 ml	2 mg	40	O/S	0/s		N/A	N/A	O/S	
Trimilk (83 mL undiluted)	250 ml	2 mg	N/A	N/A	N/A		N/A	N/A	N/A	
Evaporated milk, whole (undiluted)	250 ml	35 mg	N/A	49	.36		.36	N/A	44	
Powdered skim milk	250 mL (25 ml powder)	1 mg	.09	O/S	N/A		.06	N/A	,10	
Dry. whole milk	250 mL (25 ml powder)	1,7 mg	16	N/A	,16		N/A	.18	.15	
Oranges. fresh	1 orange (180 g)	66 mg	.37 (each)	O/S	.60 (each)	.49 (each)	.60 (each)	N/A	O/S	
Potatoes. baked	100 g	20 mg	.11	O/S	.16	,13	.23	N/A	O/S	
Potatoes. cooked with peel	100 g	22 mg	11		.16	.13	.23	N/A	O/S	
Potatoes. cooked without peel	100 g	20 mg	11	0/s	.16	.13	.23	N/A	O/S	
Cabbage, raw	74 g	44 mg	10	0/s	.22	.18	.24	N/A	.13	
Green Pepper. raw	74 g	94 mg	.64 (each)	O/S	.30	.33	1.00 (each)	N/A	.63 (each)	

[a] Suggested by Canada Food Guide.
From N.W.T. Nutrition Liaison Committee Survey (1979). See reference #43. ref. #43

Key: N/A = Not Available
O/S = Out of Stock

Source: Schaefer, Steckle, 1980

TABLE 5

Some Estimates of the Protein Content of Current and Potential Harvests of Fish and Mammals Used as Food

Source	Dressed Wt.	Protein Content	Current Harvest (1978/79) Number	Edible Wt.	Protein	Potential Additional Harvest (lbs.) Edible Wt.	Protein	Potential supply Protein
				000's lbs (kg)	000'S lbs (kg)	000"s	000's lbs	000's lbs
‘ish-freshwater’								
Domestic	Round x 0.8	0.258		2,000	516	8,320	2,150	3,885
Commercial	Round x 0.8	0.258		2,800	722			
Fish-marine[2]	Round x 0.8	0.258				800	206	206
Shrimp[3]	?	0.25				4,000	1,000	1,000
Total Fish				4,800 (2,200)	1,238 (563)	13,120 (5,952)	3,354 (1,520)	5,090 (2,310)
Seals[4] - ringed	31 lbs	0.32	20,601	640	205	NIL	NIL	204
harp	95	0.27	2,066	195	53	NIL	NIL	53
other	50	0.27	1,032	52	14	NIL	NIL	14
Beluga[5]	450	0.24	474	213	51	NIL	NIL	51
Narwhal[5]	425	0.24	472	200	48	NIL	NIL	48
Caribou[5]	100	0.27	20,367	2,035	550	360	97	650
Muskox[5]	200	0.25	252	50	13	NIL	NIL	13
Moose[5]	450	0.26	* 500	225	59	225	58	117
Bison’	510	0.25	± 30	15	4	622	156	160
Polar Bear’	i75	0.26	600	105	27	NIL	NIL	27
Total Meat				3,735 (1,700)	1,023 (464)	1,200 (548)	311 (140)	1,335 (605)
Grand Total				8,535 (3,878)	2,260 (1,028)	14,330 (6,500)	3,665 (1,660)	6,425 (2,915)

Source: Science Advisory Board, 1980

TABLE 6

Estimated Protein Demand for Human Population of N.W.T. in 1980

Age/Sex		Years	Protein Requirement (g/day) Min	Max	Med	No. in Cohort	Annual Demand (Tonnes) Min	Max	Med
Infants		0–1	7	15.4	11.1	1,348	3.44	7.58	5.46
Children		1–9	18	37	27.5	10,876	71.46	146.88	109.17
Adolescent	♂	10–19	38	54	46	5,623	77.99	110.83	94.41
	♀		38	43	40.5	5,339	74.05	83.80	78.92
Adult	♂	20–80	56	56	56	13,425	274.41	274.41	274.41
	♀(1)		41	41	41	10,886	162.91	162.91	162.91
	♀(2)		61	65	63	1,348	30.01	31.98	31.00
					Total:		694.27	818.38	756.28

Note: (1) Not pregnant or lactating
(2) Pregnant or lactating; arbitrarily equal to number of infants

Source: Freeman, 1981

The literature contains many recommendations for the development of a country food system. The major components of such a system would be information/education, resource management, harvest management and market management (Schaefer, Steckle, 1980; Schaefer, 1972; Science Advisory Board, 1980). In answer to the first question above, the following is a synthesis of the recommendations that I feel are realistic and if followed would result in optimal use of the country food resource.

Information/Education

- resource and human population information must be kept up-to-date.
- an information system must be developed to provide accurate up-to-date data on harvests by both domestic and commercial users.
- resource inventory and research should be conducted on factors contributing to natural variability and distribution of resource species so that the resource manager can estimate future productivity more accurately.
- a system of retrieval and integration of data and information on resource species from universities, industry and the Inuit should be developed.
- a training program to improve hunting and handling of game is required.
- an education program for children and adults about country foods, specifically the food system, nutritional value and cooking/ preparation methods, would help improve dietary knowledge and keep people informed about the country food system.

Resource Management

- management must be based on the research and information mentioned above and would include predator, disease and parasite management.

- there must be coordination between federal, territorial and Inuit agencies to promote the level of research, management and resource exploitation required to achieve a sustainable country food system.
- for both land and sea mammals a body similar to the Beverley-Kaminuriak Caribou Management Board could be the resource management authority.
- hunting effort must be spread over the entire range of a species if harvest is to be expanded without resource depletion.

Harvest Management

- must be directed by resource management authority.
- new research and development on rifles, nets, harpoons is required to improve hunter efficiency and reduction of waste.
- a hunting transportation system must be developed to enable hunters to get to the hinterland and bring resources to market.

Market Management

- a market system must be developed which will ensure adequate processing of raw product, availability of storage and freezer facilities and equitable regional and local distribution and pricing.
- the distribution system would use air and sea transport possibly owned and operated by the country food system participants.
- planning for long term supplies must incorporate data from the information/ education component.

A simple answer to the second question, above, is that when the limits of potential supply are reached either population control will be implemented or the role played by country food protein in the Inuit diet must diminish.

3.2 Plants

As was earlier pointed out plants played a role in traditional Inuit nutrition. In fact delicacies enjoyed by them were shown later to be high in Vitamin C (Rodahl, 1950). Romer (et al, 1981) make some compelling arguments for cultivating edible tundra plants. The nutritional content of these plants is quite high (Table 7). These northern native species are adapted to low ambient and soil temperatures and extended photoperiod. Using ameliorative techniques on temperature, soil and nutrients, enhanced production, up to 25 times normal, can be achieved (Romer et al, 1981).

There is little other information on the feasibility of using native plants as food on a significant scale. I favour greenhouse growing of temperate crops due to the obvious environmental impacts of enhancing the growth and harvesting of wild plants.

3.3 Husbandry

A resource based food but not a country food strategy having shown some success is reindeer herding. Nasogaluak (et al, 1981) reports that the Tuktoyaktuk herd has grown to be able to supply the local market with a cheap protein source and the export market with an exotic product. He also states “there is now a surplus of animals sufficient to allow new herds of economically viable size to be established elsewhere.”

TABLE 7

PRODUCTIVITY OF ARCTIC AND TEMPERATE PLANT SPECIES

	Natural Tundra Site	Nutrient/Temperature Ameliorated Cold Frame Gardens
Taraxacum lacerum	2.00	16.7
Oxyria digyna	0.38	10.2
Saxifraga cernua	0.27	1.6
Viking spinach	—	9.9
Buttercrunch lettuce	—	7.7

The final yields (grams dry weight) of arctic and temperate species in soil nutrient and temperature ameliorated cold frame plots and natural tundra sites in Rankin Inlet, N.W.T. during 1979 and 1980 (from Romer *et al*, 1981)

Source: Freeman, 1981

Remote sensing work is required to find adequate winter range (the crucial factor) in other areas. The change of attitude to move from hunting to husbandry must also start if this food resource was to be exploited (Masogaluak, et al, 1981). With the historically long term success of reindeer herding by the Samis of Arctic Norway, Sweden, Finland and the Soviet Union (Caribou News, 1982) one is led to be optimistic about reindeer herding in Arctic Canada.

Although I feel a personal aversion to husbandry of native wild ungulate herds such as caribou this practice may be as justifiable as reindeer herding. Husbandry and management surely overlap and to argue for one and not the other may not be defensible. The Kaminuriak and Beverley caribou herds now said to be over 100,000 animals each are the subject of intensive research and management activity. The value of this resource in contributing to food self-sufficiency in the area cannot be overestimated.

4.0 TECHNOLOGY BASED FOOD STRATEGIES

4.1 Gardening

Gardening as it is known in the South is severely limited north of the treeline. Climatic and soil conditions are only marginally suitable for temperate crops. The climatic effects on the growing season as described earlier and the effects of permafrost (ie. shallow cold soil) are major limitations.

The furthest north that gardening reached along

Hudson Bay seems to have been Churchill. Moodie (1978) describes seeds of grain and garden crops being sent to York Factory as early as 1674. Apparently by the mid 1700's, carrots, onions, lettuce, parsley and potatoes were grown. Although the quantities were not that large the dietary role of these fresh foods in preventing scurvy and other vitamin difficiencies was significant (Moodie, 1978).

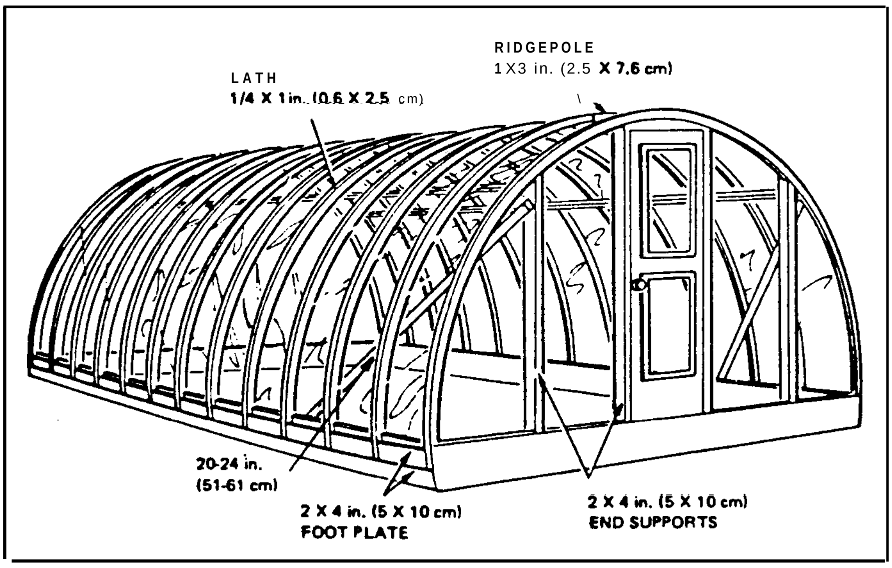
The potential for food production from gardening with present technologies is very low. Only quantum jumps in plant genetics research could produce domestic plants, related to today's vegetables, that would be productive under Keewatin climatic and soil conditions (Harris, 1980). This is not likely to become a priority research and development area.

4.2 Greenhouses

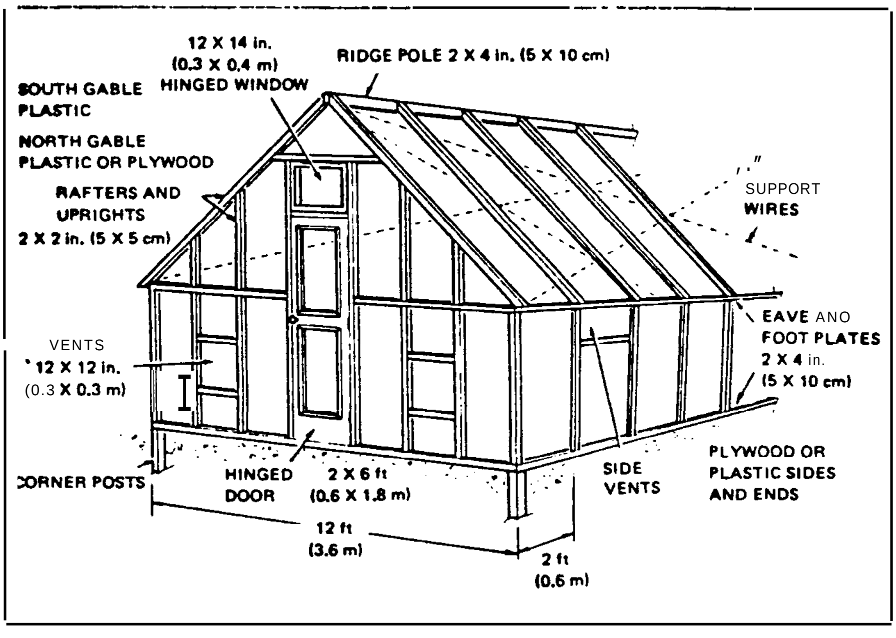
Greenhouses were first used in the north at Hudson Bay posts and at church missions. Father Eugene Faford, O.M.I. used greenhouses with great success from 1938 to 1962 in Arctic Quebec, on Baffin Island and in the Keewatin (Webb, 1977).

Figure 1 shows examples of simple low cost greenhouses. A third option would be a greenhouse attached to a dwelling with the appropriate orientation. Several factors important to the successful use of greenhouses are discussed below. The greenhouse must be built on a gravel pad of sufficient thickness to prevent permafrost melting and heaving.

FIGURE 1
TWO EXAMPLES OF GREENHOUSE STRUCTURES FOR NORTHERN USE



a) Quonset - laminated plywood rafters



b) Peaked-roof frame

Source: Agriculture Canada, 1976

4.2.1 Structural

The long axis should be oriented east and west (Britton, 1980). A double layered wall of clear plastic with an insulating air space between the layers is best. The north wall should be boarded up and insulated (Britton, 1980; Webb, 1977). These techniques allow the structure to be heated almost entirely (99%) by solar energy.

4.2.2 Temperature

Research in 1976 at Frobisher Bay, N.W.T. has shown that growing can begin in April when the mean daily and mean nightly temperatures are -14°C and -19°C respectively. The night-time temperature inside the greenhouse must not fall below 6°C (Webb, 1977). There are several techniques for retaining the heat once it is trapped inside the greenhouse. Removable insulation to be put up at night is useful (Britton, 1980; Webb, 1977). The retaining of solar energy inside the structure can be taken one step further by using it to heat the plant beds. Webb (1977) describes using the oil drums from northern garbage dumps painted black and filled with water as a platform for the plant beds. Hot air from near the greenhouse roof can be blown between rows of these drum platforms. The water in the drums and the substrate absorb heat during the day and store it until night when it is released.

4.2.3 Substrate

The current literature recommends a sand based hydro-culturing technique for greenhouse vegetable growing (Webb, 1977; Fraser, 1980). Sand is very plentiful but soil in the Keewatin is not suited to temperate vegetable crops. The nutrients added to water which is passed through the substrate may be obtained from commercial fertilizers. The comporting of garbage and the use of sewage sludge have yet to be tested in northern communities.

4.2.4 Energy-Cooling, Lighting and Heating

It is sometimes necessary to dissipate heat from a greenhouse. The simplest way to accomplish this is to open doors or other openings designed into the structure. In the event that a more active system of cooling is required the question of energy efficiency arises. If exhaust fans were to be installed the cost of electricity might significantly impinge on the cost-effectiveness of the greenhouse. Webb (1977) stated that artificial light from a wind power electricity generator was being used as early as 1936. Wind energy technology is being researched in the north for domestic electricity applications. It is probable that wind generated electricity would be available in the near future for heating, cooling and lighting requirements.

4.2.5 Costs/Returns

Fraser, 1980 offers some figures in regard to erection and operating costs and returns from a greenhouse. For a 16,000 sqare foot greenhouse erection costs of less than $10.OO per square foot and operating costs of $4.50 per square foot are likely. At a production rate of 1-1 1/2 pounds/[illegible] a total product value of up to $6.00 per square foot is possible.

4.2.6 Feasibility

Greenhouses are economically and technically feasible for the north (Webb, 1977; Fraser, 1980). Construction, labour and operating costs may be reduced through increased research and development activity on greenhouse technology for the north. Research and development should also be increased to provide the best producing plant cultivars for northern greenhouse crops. A training/information/education program would be required to develop knowledge and expertise in all phases of greenhouse technology and produce handling, distribution and marketing practices.

5.0 STRATEGY IMPLEMENTATION CONSIDERATIONS

5.1 Socio-Economic

The major socio-economic factors effecting the implementation of food self-sufficiency are cultural identity/ well being, economic development and political development.

5.1.1 Cultural Identity/Social Well Being

In traditional societies the men were providers of meat and their initiative skill and success had a high value in society. Today in Inuit communities there is a lack of opportunity to play a valuable role especially among young men. Lack of training, lack of opportunities and relegation to menial tasks bring idleness, frustration and vulnerability to drugs, alcohol and anti-social behaviour.

The development of food self-sufficiency either from country food harvest or from technology based food production would greatly increase the opportunities for Inuit to play a valuable role in their communities. This would re-kindle their self-esteem and would likely decrease the above-mentioned social ills.

Many Inuit still live off the land and even those fully "urbanized" wish to retain the option of doing so if and when they choose (Science Advisory Board, 1981) . Seal meat was the single most important food resource in the Eastern Arctic (second only to caribou in the Keewatin). There is still a popular demand and taste preference for it (Schaefer et al, 1980) Certainly the same could be said for caribou meat. Therefore in addition to the previously discussed nutritional value of these meats and the contribution to social well being it could be said that the Inuit have a culture based need to hunt and eat traditional foods.

There may be a culture based limitation to the initial success of food self-sufficiency. In the area of animal husbandry and greenhousing the Inuit people may have some difficulty in making the shift from the age old practices of hunting to the relatively new practices of plant and animal husbandry. An information/education program in communities especially in schools would help in this regard.

5.1.2 Economic Development

A general benefit from the socio-cultural improvements arising from food self-sufficiency is that there would be a significant cost saving in legal, welfare and health expenditures by territorial and federal governments. The Inuit people would save money otherwise spent on high cost imported foods. Furthermore the food system would provide many employment opportunities as it evolved. There would be hunters, fishermen and country food transporters, processors, and distributors in every community. There would be greenhouse “technicians” and produce transporters, processors and distributors. There would also be spin-off employment opportunities for information/education personnel, and resource, harvest and market managers.

Initially government subsidies either visible or hidden may be required for transportation, distribution and marketing of harvested or produced food. Until the Inuit land claims are settled and possible self-government comes into existence these subsidies could be provided by the territorial and federal governments from their savings in legal, welfare and health costs and from increased tax revenue from more and higher Inuit incomes.

The development of food self-sufficiency represents economic development which is comprised of stable employment levels, cultural and economic security for the Inuit and sustainable economic activity. Coupled with political development, economic development as above will mean that the north will no longer be a place where southern resource exploiting industries are transported north for short term unsustainable gains. Non-renewable resource development may indeed play a role in northern economic development but certainly should not take precedence over development of food self-sufficiency.

Hobart (1981) in his paper on the imPacts of industrial employment on Inuit hunting remarks:

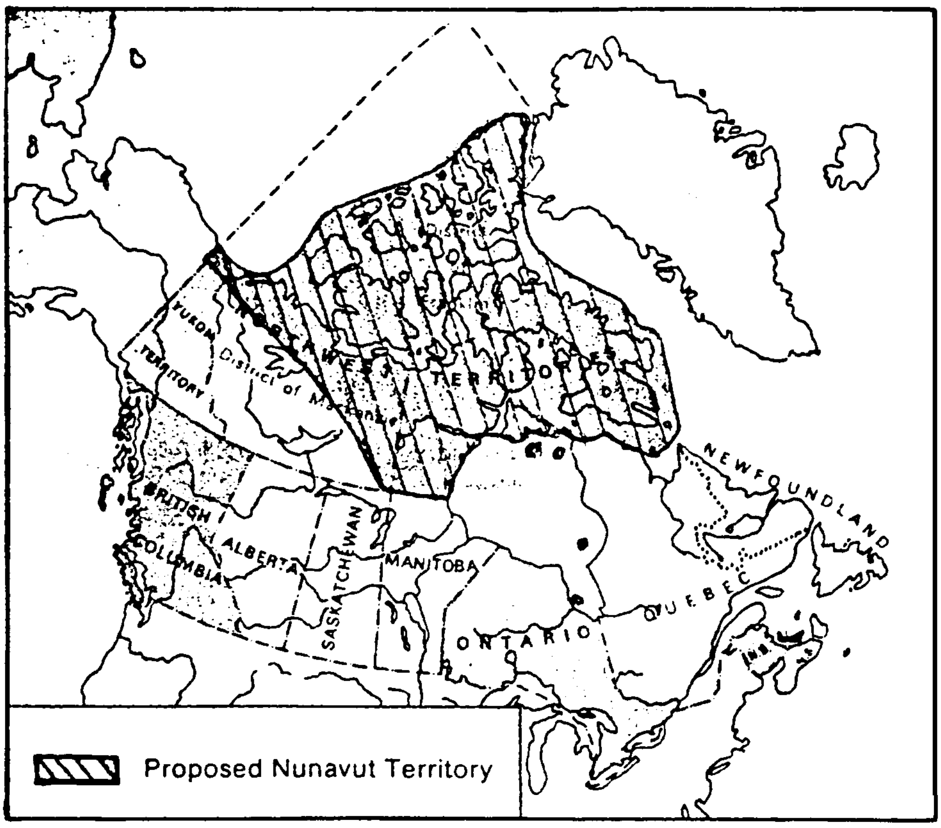
> "There can be no questioning the seriousness of interest and the depth of commitment of most northern native people to perpetuating the resource harvesting and essential aspects of the country-based life style which has such profound economic and symbolic significance for them. There is growing evidence that in many communities these interests may be most effectively and persistently pursued where the availability of rotation employment provides both the means of acquiring needed equipment, and the necessary blocks of leisure time, without undercutting traditional interests and symbolic identifications."

5.1.3 Political Development

The District of Keewatin is included in the Nunavut proposal which the Inuit Tapirisat of Canada approved in 1979 (Map 2). Nunavut is a proposed territory resulting from a division of the existing N.W.T. essentially along the treeline.

MAP 2

PROPOSED NUNAVUT TERRITORY



The basic reasoning behind such a proposal is that the N.W.T. is far too large to be governed from a capital, Yellowknife, so strongly influenced by its location in the McKenzie Valley (Jull, 1982) . The Nunavut proposal is by no means a separatist proposal as non-Inuit living in the region would be full partners,through rights guarantees,in political and economic development of the area. However there always was and still is a large majority of Inuit people in Nunavut.

Just as the Yukon and the N.W.T. of today are moving toward provincehood so would Nunavut move, completely within the context of the Canadian Constitution (Jull, 1982).

Such political development in the north could only help in the socio-cultural and economic development of the Keewatin District. Given the importance of renewable natural resources in this development, it is fundamental that political control of the resources be in the hands of those who will bear costs and benefits from them.

5.2 Environmental

The basic constraint on country food harvest or food production in the north is radient energy. The sun's energy governs the abundance and productivity of plant and animal populations. The short growing season, permafrost and cold soils all have limiting effects on food self-sufficiency (Fuller, Hubert, 1981) .

A further constraint especially on country food self-sufficiency is the gaps in knowledge about distribution, abundance, population structure and dynamics and the impact of harvest and hunting losses on wildlife (Science Advisory Board, 1980). If northerners are to maintain and increase current protein harvest, careful management of the resource is essential.

As the country food system is developed the resource base will have to be carefully monitored along with the harvest activities to ensure that little or no irrevocable damage is done to the environment. This may mean that an "optimum sustainable yield" policy which is somewhat conservative will be required (Davis, "et al, 1980).

6.0 FRAMEWORK FOR FOOD SELF-SUFFICIENCY

6.1 Policy Makers

The federal government at present plays a large role in northern resource policy development and implementation. A major role is possible for each of four federal departments in moving the Keewatin District (and all of the N.W.T.) toward food self-sufficiency: Indian and Northern Affairs, Environment Canada, Agriculture and Health and Welfare. The N.W.T. territorial government through its Renewable Resources and Economic Development and Tourism departments would also have important input. The Inuit organizations, Inuit Tapirisat at the national level and its affiliate, Keewatin Inuit Association, must play an integral role. The community councils would act as the grassroots managers of the food system and would therefore play a vital role in policy making. Eventually the private sector through community co-ops and other marketing businesses would be consulted. Political development, in particular, the dividing of N.W.T. may change the role of some policy makers but advice and assistance will still be required from a broad range of sources.

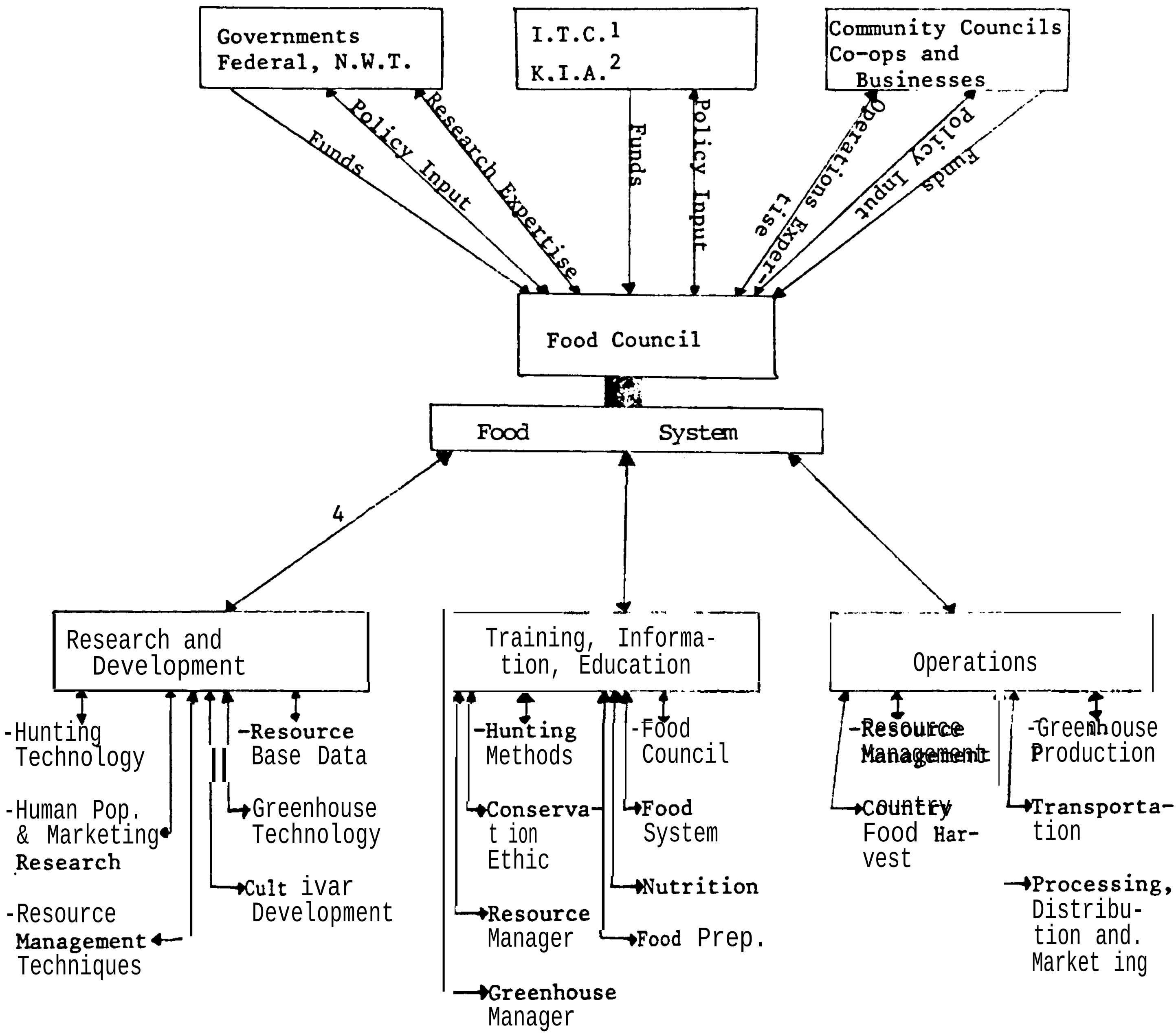
6.2 Policy Issues

This paper has discussed the role of regional and local food resources in developing food self-sufficiency. It should be clear from the discussion that many issues must be addressed in the development process.

Firstla general policy issue is the complexity of the task of integrating all the factors involved in such a food system. I propose that a central body, the Keewatin Food Council (Figure 2), be set up, possibly with offices and facilities in Rankin Inlet to integrate inputs and coordinate all activities of the food system. Figure 2 identifies another three major policy issues (Research and Development; Training, Information and Education; Operations) that must be resolved and illustrates some of the workings and inter-relationships of components and players in the food system. A fifth major issue is funding generally for the Food Council and specifically for the components of the food system.

FIGURE 2

KEEWATIN FOOD COUNCIL AND THE FOOD SYSTEM



1. I.T.C. - Inuit Tapirisat
2. K.I.A. - Keewatin Inuit Association
3. Research Expertise - National Research Council (NSERC)
   - Science Council
   - Northern Food and Agriculture Institute
   - Universities for Northern Studies
4. Double headed arrows - indicate full feedback and communication at all points in the food system

6.3 Issues Resolved

6.3.1 Eco-Development

The Keewatin Food Council must pursue a policy of eco-development of the food system if a sustainable level of food self-sufficiency, with all of the related socio-economic benefits and no irrevocable environmental costs, is to be achieved. The four criteria describing eco-development (Roots, 1981) are as follows:

i. are the key needs of people being better met;

ii. is human potential of the region being nurtured and utilized;

iii. is self reliance in the use and management of resources increasing;

iv. is a true symbiosis between humans and the environment being maintained.

These criteria would be more than satisfied by the implementation of the food system described with integrated policy and planning and coordinated management provided by the Food Council.

6.3.2 Research and Development

The Food Council's most important role will be to implement a research and development program. To this end several authors recommended that some form of renewable resource research institute be established in and for the north (Romer, et al, 1981; Mair, 1981; Agriculture Canada, 1981). This research body would concentrate funds and expertise on establishing first a data base on natural food resources and human population trends. Secondly new or improved resource harvest and management techniques would be developed. Lastly greenhouse technology and vegetable cultivar development and improvement would be researched and developed.

The success of the training, information and education and the operations components of the food system directly depends on the research and development component. Lewis (1981) recommends that:

> - A coordinated effort should be made to raise additional funding for northern research in general and for cooperative research in particular. Possible sources which should be explored include royalties on industry, tax credits, user fees, private foundations as well as government agencies and research councils.
>
> If research is to become more responsive to northern concerns, recipients of funds from funding agencies must be given greater discretion to modify their research plans. We suggest particularly the modification of time limits associated with grants to permit the full involvement of Natives in the planning, execution, analysis and publication of research projects, as well as to allow southern researchers to gain experience in the northern setting. Funding agencies must recognize the additional costs involved in cooperative research with northern people. These include the costs of travel, communication, translation and personnel.

If the key issues of funding and research and development can be resolved as suggested the rest of the food system would be expected to generate enough income to be economically sustainable.

7.0 CONCLUSION

Inuit food self-sufficiency is feasible in the Keewatin. It will begin with the implementation of the Keewatin District Food System under the management of the Keewatin Food Council. This would represent an environmentally and economically sustainable natural resource development and significant improvement in the socio-cultural milieu in which it would operate.

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