MUSKOKA SOIL & CROP IMPROVEMENT ASSOCIATION

PROJECT COMMITTEE'S PROGRESS REPORT

PHASE 1 1991

NUTRITIONAL PROJECT

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The Muskoka Soil and Crop Improvement Association Project Committee is pleased to present our Nutritional Project Report to the Association and all interested parties.

The following report will focus on:

Reason for Project
Description of Project
Explanation of Tables
Conclusions to Date
Introduction to Phase II

Reason for Project

On April 20th, 1990 our Association received a proposal to begin a comprehensive study of soil fertility of all producing farms in Muskoka. This would include as many aspects of agriculture production as possible.

Although we have on file a 1985 Soil Test Summary and Recommendations; also a Range Analysis of major nutrients for 1986-1987 for Muskoka, these reports deal mainly with the N.P.K., manganese, magnesium and pH ranges.

With the increasing emphasis on the importance of micro-nutrients for successful crop production and forage, your committee chose to include the micro-nutrient testing with the usual N.P.K., organic matter and pH tests. By expanding the testing to include some of the more important micro-nutrients, it was felt that a broader picture would emerge as to our soil's health and nutrient reserve.

In the original proposal, a second study on the "nutritional value of produce grown" was suggested. This was to follow the completion of the soil testing programme.

Your committee felt that it would be advantageous to include this phase with the soil testing. As a result, leaf samples were gathered from plants that were growing in the same soil from which soil samples were taken.

The leaf analysis, testing for major and micro-nutrients, corresponds closely with the soil analysis as to the Nitrogen, Phosphorous and Potassium (N.P.K.) and micro-nutrient content. With a comparison of nutrient content in corn leaves for example, against the nutrient content of the soil in which these corn plants were grown, it may be possible to get a general idea to what degree soil reserves are being depleted.

An indication as to the amount of N.P.K. transferred from the soil to a particular crop is shown in Bulletin 463 "Soil Management and Fertilizer Use" (Ontario Department of Agriculture). For example:

75 bushels of grain corn is estimated to contain:

71.2 pounds of nitrogen;
28.7 pounds of phosphate; and
18.7 pounds of potash.

It was felt that micro-nutrient removal should also be shown through leaf analysis.

Description of the Project

Thirteen members responded to this proposal of which seven were vegetable growers, five were livestock producers, and one cranberry grower. Each co-operator put $30.00 towards the cost of this project. It was estimated that approximately $100.00 per co-operator would cover the cost of this project. The Northern Ontario Development Program Committee approved 75% support for the project as an educational program, to cover the remainder of the project cost. They asked for a project report which will be presented at their annual meeting in March, 1992.

In order to reduce the risk of contamination, a stainless steel soil testing tube was used on all soil tests. Each co-operator had one soil test taken from a field or garden of his/her choice. Leaf samples were taken at the same time from the area of which soil samples were removed. Six to twelve soil core samples were taken from each field; depending on the size of the area, mixed together in a plastic pail from which a sample was packed for shipment.

Approximately 200 grams (7 ounces) of top new grown leaves were collected for each leaf sample, washed with distilled water, air dried and shipped. An exception was corn where it was requested that 30 leaves be sent. Each leaf being a "feeder leaf" which is the leaf next to or at the base of the cob.

With regards to our "Hay-Pasture" co-operators, core samples were taken from bales at the same time soil samples were taken. The core samples were used to determine a Livestock Feed Analysis.

All samples were shipped via courier to Agri-Food Laboratories in Guelph. With the exception of the Feed Analysis, samples were tested under "AFL-COMPLETE" for soil and "AFL-COMPLETE" plus Zn, Mn, Cu, Fe, B" for leaf tissue.

With regards to our cranberry co-operator, only leaf samples were taken. It was decided that because of the thick stem matting, bog conditions and damage to developing berries, soil testing would be postponed until another time.

Explanation of Tables - Soil Results

Tables 1, 2, 3 and 4 deal with soil analysis only. Instead of scattering tables throughout this report, the complete soil results of all co-operators are shown in Tables 1, 2 and 3. The thirteen co-operators have been shown under "Farm No." The word "Farm" with regards to this report implies an area from approximately 3,000 square feet up to 20 acres or more.

Each co-operator can identify his/her analysis by the name of corp grown with regards to vegetables. Likewise, "Hay-Pasture" co-operators, by a comparison to their analysis report. For example:

> By reading down the same column in Tables 1, 2 and 3, we see that under Peas - Farm 1, the soil pH is 7.6 and organic matter is 5.7.
>
> Continuing down the same column to the bottom of Table 3 we find that the micro-nutrient Boron, is low.

Of the twelve farms tested, Table 4 shows how many farms out of the twelve fall within each of the five nutrient ranges. Example:

> Three of the twelve samples taken were deficient in phosphorous. Five in potash, etc..

TABLE 1: SHOWING CROP GROWN
SOIL pH AND ORGANIC MATTER IN PPM

CROP GROWN	PEAS	ST.BERRY	SQUASH	TOMATO	POTATO	MID-CORN	LATE CORN	CRANBERRY	HAY-PASTURE	HAY-PASTURE	HAY-PASTURE	HAY-PASTURE	HAY-PASTURE	
FARM NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	AVERAGE
Soil pH	7.6	5.6	5.8	6.1	5.7	6.1	5.0	SAMPLE	5.8	6.8	6.1	5.8	6.2	6.3
Organic % PPM Matter	5.7	4.5	4.8	6.0	4.7	4.7	4.3		4.7	4.7	5.4	5.2	4.4	5.15 PPM

TABLE 2: ACTUAL % BASE SATURATION OF CEC

Potassium	5%	5%	1%	6%	3%	5%	1%		1%	1%	2%	2%	1%	3.5%
Magnesium	7%	12%	5%	28%	11%	33%	24%	NO SOIL	16%	34%	25%	22%	18%	19.5%
Calcium	32%	77%	28%	55%	21%	47%	24%		21%	57%	54%	37%	61%	49. %
Soil CEC	16	20	11	10	13	8	21		17	15	6	18	6	13.5

TABLE 3: MAJOR AND MICRO-NUTRIENT ANALYSIS

Phosphorous	ADEQ.	EX	EX	XTRA	ADEQ.	ADEQ.	LOW		DEF	DEF	DEF	LOW	ADEQ.	KEY
Potassium	ADEQ.	XTRA	DEF	ADEQ.	ADEQ.	ADEQ.	LOW		DEF	DEF	DEF	ADEQ.	DEF	Deficient - DEF
Magnesium	ADEQ.	ADEQ.	LOW	XTRA	ADEQ.	XTRA	XTRA		XTRA	XTRA	ADEQ.	XTRA	ADEQ.	Low - LOW
Calcium	ADEQ.	EX	LOW	ADEQ.	LOW	LOW	ADEQ.		LOW	XTRA	LOW	ADEQ.	LOW	Adequate - ADEQ.
Zinc	ADEQ.	EX	EX	EX	ADEQ.	ADEQ.	LOW	NO SAMPLE TAKEN	ADEQ.	DEF	ADEQ.	LOW	XTRA	Extravagant - XTRA
Manganese	XTRA	XTRA	EXTRA	ADEQ.	XTRA	XTRA	XTRA		ADEQ.	ADEQ.	XTRA	ADEQ.	ADEQ.	Excessive - EX
Copper	ADEQ.	XTRA	DEF	ADEQ.	DEF	DEF	ADEQ.		ADEQ.	DEF	ADEQ.	ADEQ.	ADEQ.	
Iron	XTRA	XTRA	XTRA	EX	XTRA	XTRA	EX		XTRA	XTRA	XTRA	XTRA	XTRA	
Boron	LOW	ADEQ.	DEF	LOW	DEF	DEF	DEF		LOW	DEF	DEF	DEF	DEF	
FARM NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	KEY

TABLE 4

SHOWING NUMBER OF FARMS EITHER DEFICIENT, LOW, ADEQUATE, EXTRAVAGANT OR EXCESSIVE IN THE NINE ELEMENTS TESTED

NUTRIENT RANGE	PHOS	POT	MAG	CAL	ZINC	MAN	COP.	IRON	BORON	NOTE
Deficient	3	5	0	0	1	0	4	0	8	No cranberry soil tests taken.
Low	2	1	1	6	2	0	0	0	3	
Adequate	4	5	5	4	5	5	7	0	1	
Extravagant	1	1	6	1	1	7	1	11	0	
Excessive	2	0	0	1	3	0	0	1	0	

TOTAL FARMS TESTED - 12

TABLE 5

LEAF ANALYSIS RESULTS

CROP GROWN	PEAS	STRAWBERRY	SQUASH	TOMATO	POTATO	MID-CORN	LATE CORN	CRANB
FARM NO.	1	2	3	4	5	6	7	
NITROGEN %	HIGH*	DEF.	MED*	HIGH	DEF.	HIGH	MED.	MED
PHOSPHOROUS %	MED.*	LOW.	MED*	HIGH	MED.	LOW	LOW	LOW
POTASSIUM %	LOW*	MED.	LOW*	HIGH	HIGH	HIGH	MED.	LOW
MAGNESIUM %	LOW*	LOW	MED*	HIGH	HIGH	HIGH	MED.	MED
CALCIUM %	MED*	MED.	HIGH*	MED.	HIGH*	LOW	LOW	HIG
ZINC PPM	HIGH*	DEF.	MED*	HIGH	LOW	LOW	LOW	HIG
MANGANESE PPM	LOW*	HIGH.	HIGH*	LOW	HIGH	LOW	MED.	HIG
COPPER PPM	LOW*	LOW	MED*	HIGH	LOW	MED.	HIGH	HIG
IRON PPM	MED*	HIGH	HIGH*	HIGH	HIGH*	MED.*	HIGH*	LOW
BORON PPM	LOW*	DEF.	LOW*	HIGH	MED.	DEF.	LOW	LOW
FARM NO.	1	2	3	4	5	6	7	8

* MICHIGAN STATE UNIV. NUTRIENT RANGE BULLETIN NO. E486/1981
REPLACING UNKNOWN CANADIAN VALUES

NOTE: MICHIGAN TEST VALUES MAY VARY SLIGHTLY FROM CANADIAN VALUES.

TABLE 6

NUMBER OF TESTS SHOWING EITHER DEFICIENT - LOW - MEDIUM OR HIGH VALUES IN LEAF ANALYSIS

NUTRIENT RANGE	NIT	PHOS.	POT.	MAG.	CAL.	ZINC.	MAN.	COPPER	IRON	BORON
DEFICIENT	2	0	0	0	0	1	0	0	0	2
LOW	0	4	3	2	2	3	3	3	1	4
MEDIUM	3	3	2	3	3	1	1	2	2	1
HIGH	3	1	3	3	3	3	4	3	5	1
TOTAL TESTS	8	–	–	–	–	–	–	–	–	–

TABLE 7

FEED ANALYSIS FOR FARMS 9, 10, 11, 12 & 13

	FARM 9			FARM 10			FARM 11			FARM 12			FARM 13		
	1ST CUT MIXED HAY			HAY SILAGE			ROUND BALE HAYLAGE			1ST CUT MIXED HAY			1ST CUT MIXED HAY		
	ANALYSIS		EXPECTED	ANALYSIS		EXPECTED	ANALYSIS		EXPECTED	ANALYSIS		EXPECTED	ANALYSIS		EXPECTED
	AS FED	DRY MATTER	RANGE	AS FED	DRY MATTER	RANGE	AS FED	DRY MATTER	RANGE	AS FED	DRY MATTER	RANGE	AS FED	DRY MATTER	RANGE
Moisture %	13 -			51.9			69.4			12.5 -			12.0		
Dry Matter %	87.0 -			48.1			30.6			87.5 -			88.0		
Crude Protein %	7.50- 8.62		8.68-15.64	4.99-10.40		10.05-15.89	3.29-10.80		12.17-19.43	10.23-11.70		8.68-15.64	8.13- 9.25		8.68-15.64
Calcium %	.32- .37		.51- 1.27	.30- .64		.40- 1.04	.14- .48		.79- 1.62	.61- .70		.51- 1.27	.45- .51		.51- 1.27
Phosphorous %	.11- .12		.17- .27	.10- .21		.20- .30	.06- .22		.21- .31	.22- .25		.17- .27	.17- .19		.17- .27
Magnesium %	.14- .16		.15- .31	.12- .25		.17- .28	.07- .25		.14- .31	.22- .26		.15- .31	.23- .26		.15- .31
Potassium %	1.33- 1.53		1.39- 2.33	.76- 1.60		1.65- 2.85	.64- 2.10		1.75- 2.79	1.96- 2.24		1.39- 2.33	.90- 1.02		1.39- 2.33
Acid Det. Fibre %	37.41-43.00		33.00-41.00	16.32-34.00		34.00-42.00	12.59-41.30		33.00-42.00	30.15-34.59		33.00-41.00	31.91-36.30		33.00-41.00
TDN (Est.) %	46.56-53.52		55.29-62.59	30.23-62.99		54.59-63.00	16.79-55.07		54.40-62.59	53.53-61.25		55.29-62.59	52.40-59.61		55.29-62.59
Net Energy (LAC)	1.03 1.19		1.23- 1.40	.68- 1.42		1.21- 1.41	.37- 1.23		1.21- 1.41	1.21- 1.38		1.23- 1.40	1.18- 1.34		1.23- 1.40
CA:P Ratio	2.95:1			3.04:1			2.18:1			2.82:1			2.65:1		

Conclusions to Date

It is apparent from the foregoing results that insofar as the twelve soil samples relate, there is a wide range of nutrient content both in major and micro-nutrients here in Muskoka.

For example, we see in Table 4 where seven out of twelve tests show manganese levels as extravagant and eleven out of twelve tests showing deficiency or low levels of boron.

In areas such as Muskoka where different soils and soil structures almost overlap on some farms, it may be to the producer's advantage to either start or continue nutrient testing on all fields and in some instances field sections, over a period of years depending on crop removal. By doing so, excesses and deficiencies could, over a period of time, be brought to an adequate level so far as the particular crop to be grown is concerned.

Your committee feels that "Leaf Analysis" and "Feed Analysis" reports are as necessary for crop and nutrition improvement as soil results for the individual producer.

To help our co-operators and interested producers to understand some important aspects of the above results, a seminar will be held as early in 1992 as possible. Speakers will be on hand to discuss soil activity and plant nutrition. Some examples may be an understanding of C.E.C. (Cation Exchange Capacity) or Relative Responses of Muskoka Crops to micro-nutrients, etc.. Also, it is hoped that any questions relating to individual test results can be explained.

Time and place of this seminar will be forwarded to all interested parties when arrangements are finalized.

Should this project bring forth more questions than immediate answers, then your committee would feel the project has been successful. Not only by the information acquired, but by the fact that questions indicate interest and interest shows that Muskoka producers realize there is a lot more to good soil and plant health than meets the eye.

Introduction to Phase II in Brief

Phase II of this project will begin with the seminar early in 1992 re discussions on 1991 analysis results. Through 1992, results from 1991 recommendations will be studied by soil tests and leaf analysis. More co-operators will be encouraged to enter this project.

Because soil and plant health depend not only on major and minor nutrients, but also soil micro-biological life such as aerobic bacteria and actimomycetes, consideration should be given to include these in soil tests for 1992.

Preparation of a soil nutrient map for Muskoka which would be updated as results warrant is planned.

With the possible interests of our fruit and vegetable producers in mind, the committee contacted Dr. S.W. Gunner, Bureau of Nutritional Sciences in Ottawa for recommendations for two laboratories which specialize in vitamin analysis. Micro Chem Laboratories in Mississauga and Diversified Laboratories in Toronto were recommended. These were contacted and information pertaining to vitamin analysis of fruits and vegetables from these laboratories are now on file at the Agricultural Office in Huntsville. Although vitamin analysis is a costly operation, it was felt that future interest and funds may make it possible to include these tests with our soil and leaf testing.

Finally, special thanks must be given to all persons who assisted in getting Phase I of this project through the 1991 season. Namely:

Northern Ontario Development Committee	For their interest and support.
Glenn Miller, Regional Director for O.S.C.I.A.	Acquisition of stainless steel soil tube.
Gordon Mitchell, Agricultural Representative	Hours spent in consultation and travel. We had fun!
Walker Riley, Project Committee	For his ideas, suggestions and expertise through out.
13 Co-operators	Without them, this project would only be a thought.

Respectfully submitted,

Gord McLaughlin