RESULTS ON THE SUSTAINABILITY EVALUATION OF VEGETABLE CULTIVATED SOIL IN THE TÂRGU FRUMOS CONDITIONS

REZULTATE PRIVIND EVALUAREA SUSTENABILITĂŢII SOLULUI CULTIVAT CU LEGUME ÎN CONDIŢIILE DE LA TÂRGU FRUMOS

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Abstract. *The research was carried out in the vegetable ecosystem of Târgu Frumos microregion in 2009 and 2010. The sustainability was assessed according to soil fertility based on the main physical, mechanical and chemical characteristics, expressed by the global agrochemical index (IAGF). Values of IAGF varied between + 31.06 and +41.91 and classified the soil in the +1 group of potential global fertility. The results reveal a high fertility, soils having a pronounced anthropogenic character, wich provides a high sustainability.*
Key words: sustainability, assessment, soil fertility

Rezumat. *Cercetările au fost efectuate în cadrul ecosistemului legumicol al microzonei Târgu Frumos, în anii 2009 şi 2010. Sustenabilitatea a fost evaluată în funcţie de fertilitatea solului, exprimată prin indicele agrochimic global al fertilităţii potenţiale (IAGF), valorile IAGF au variat între +31,06 şi+41,91 solul fiind încadrat în grupa +1 de fertilitate potenţială globală ridicată. Rezultatele demonstrează un grad mare de fertilitate, pentru culturile sustenabile a legumelor în microzona Târgu Frumos, ceea ce asigură o mare pretabilitate privind sustenabilitatea.*
Cuvinte cheie: sustenabilitate, evaluare, fertilitatea solului

INTRODUCTION

First of all, the sustainable agriculture involves the development of soil systems to meet the growing quantity and quality of people's current needs without compromising requirements or options for future generations and also without causing irreversible damage to wildlife (Puia, 2000).

Around Târgu Frumos city is known a traditional microregion growing vegetables for over 100 years, in a system that can be considered intensive or very intensive.

In these circumstances the question arises whether this mode of operation will be efficiently, without affecting the soil fertility potential, a vegetable crops as long as possible, that they ensure the sustainability of vegetable production.

Therefore, the goal of the research was to determine scientifically the extent to which vegetable farms in the area are sustainable or not.

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MATERIAL AND METHOD

The research was conducted in 2009-2010 in the microregion vegetable ecosystem of Târgu Frumos.

Physico-chemical study of the main characteristics of the soil were made by observations and measurements related to some physical, mechanical, chemical and biological properties of soil resources.

The soil samplings was done with the drill, according to the systematic collection of agrochemicals applied in Romania. The weight of the samples collected depended on the purpose (the number and type of analysis performed) and the minimum weight provided its representativeness.

The samples were taken from a stationary well-established for research, from the microfarm Maxim up to two times, March and July.

In March, the plastic tunels were planted with onions, lettuce, orach, and spinach salad, and in July, the same land was cultivated with tomato (Granadero F1) cultivar, tomato (Caliope F1) cultivar, pepper (Maradona F1) cultivar and cucumbers (Merengue F1) cultivar.

The results obtained from the soil analyses were interpreted using the global agrochemical potential fertility index (IAGF) determined on the basis of eight indicators agrochemical namely: pH - the soil, Nt (total nitrogen), PAL (phosphorus), KAL (potassium), C / N (ratio of carbon to nitrogen), T (cation exchange capacity), V (base saturation level) and H (humus) (Avarvarei et al., 1997).

Following the recommendations of the literature (Stanley et al., 1997) values are coded according to the agro-chemical indicators of size, coding into five groups namely:
– 2, – 1, 0, +1 and +2, where the value 0 (zero) is the normal state of fertility.

Coded values are calculated using the global agrochemical potential fertility index, according to the formula:

$$IAGF = \frac{\left(pH + Nt + P + K + \frac{C}{N} + T + V + H\right)}{n}$$

where the significance of the indicators is previously mentioned and n = number of agrochemical indicators used.

By summing the algebraic values of the coded values are obtained IAGF agrochemical indicators that have the following meanings valori între –100 şi –120 = fertilitate potenţială globală scăzută;

-values between -26 and 10 = middle total fertility potential;

-values between 25 and 25 = overall normal fertility potential (satisfactory);

-values between 26 and + 100 = high overall fertility potential;

-values between + 100 + 200 = very high overall fertility potential

RESULTS AND DISCUSSIONS

The results of analysis of the soil samples, respectively the assessment of main physical-mechanical and chemical characteristics of the soil samples from vegetable ecosystem in terms of Târgu Frumos are shown in table 1.

Table 1

The main physical and chemical properties of soil resources - Târgu Frumos 2009-2010

Ecope-dotop	Specifi-cation	Poro-sity %	pH in H_2O	Hu-mus %	Nt %	PAL ppm	KAL ppm	SB me	T me	V %
Tg-Frumos 18.03.10 Maxim microfarm, plastic tunels hortical antrosol 0-20 cm	Plastic tunel I onion	18	6,43	3,113	0,14	22	151	20,1	22,6	79
	Plastic tunel II lettuce row	15	6,37	3,042	0,15	28	168	22.3	24,4	78
	Plastic tunel III orach row	16	6,31	3,021	0,16	18	138	21,5	23,1	76
	Plastic tunel IV spinach salad row	13	6,27	3,117	0,15	35	143	24,8	26,8	75
Tg-Frumos 20.07.10 Maxim microfarm, plastic tunels hortical antrosol 0-20 cm	Tomato Granadero F1 row	12	6,43	3,226	0,13	18	135	13,5	18,2	78
	Tomato Granadero F1 between rows	16	6,85	3,282	0,16	31	178	16,2	19,6	85
	Tomato Caliope F1 row	18	6,64	3,174	0,17	24	142	20,1	23,1	77
	Tomato Caliope F1 between rows	11	6,89	3,201	0,19	30	176	24,5	26,7	82
	Peppers Maradona F1 row	16	6,35	3,004	0,15	23	167	21,4	25,3	85
	Peppers Maradona F1 between rows	10	6,43	3,215	0,18	31	181	26,8	30,6	88
	Cucumbers Merengue F1 row	16	6,73	3,156	0,18	18	148	24,1	31,4	86
	Cucumbers Merengue F1 between rows	8	6,96	3,212	0,21	27	168	30,5	35,8	88

In the stationary microfarm Maxim on 03/10/2010 to the plastic tunel crop, the aeration porosity values environmental determinant of 0-20cm soil depth in the plastic tunel are lower on the row of plants being between 11-18% at samples collected in March. The soil samples collected during the summer values among young vegetables are also being included in the range 12-18% and decrease by up to half (6-12%) due to fine soil texture and soil compaction due to the irrigation time.

The soil reaction values decrease slightly lower limit of weak acid, correlated with high levels of vegetable crops intensivisation stress and at risk due to technological factors.

Thus, soil reaction values indicates a weak acidic domain, ranging from 6.27 to 6.43 pH unit values in samples collected in March, and the values ranging from 6.35 to 6.96 pH units, at the samples collected in July. The content of humus in plastic tunels is generally medium to low so the samples collected in March in humus content values range from 3.021 to 3.117% and from those collected in July the soil organic matter content values ranged from 3.004 to 3.282%.

Total Nitrogen generally has medium values, in turn, somewhat higher that the interval between the lines, so the samples collected in March, soil total nitrogen content values range from 0.141 to 0.163% and the samples collected in July contained values between 0.130 to 0.212%.

Assimilable potassium content generally has medium values in samples collected in March, ranging from 138-168 ppm, and from those collected in July, resulting in values between 135-181 ppm. As regards exchange bases sum, the values of samples collected in March ranged from 20.1 to 24.8 me, while in July ranged from 13.5 to 30.5 me.

Total cation exchange capacity indicator has ranged between 22.6 to 26.8 me at the samples collected in March and ranged between 18.2 to 35.8 me at the samples collected in July. The degree of base saturation has values between 75-79% in samples collected in March, and values between 77-88% in samples collected in July 2010.

Following the calculation made for IAGF (global agrochemical potential fertility index) in order to highlight, the degree of fertility of soils and how they ensure a high suitability for sustainability, the results highlight the different values depending on their location.

Thus, in the pedological condition of microfarm Maxim in March 2010 the results are as follows:

- In the plastic tunel I onion the IAGF result obtained by calculating the values was 35.82 which falls within the class of high potential overall fertility;
- In the plastic tunel II lettuce resulted a value of 38.36 also fits within the class of 26 and 100 representing high overall fertility potential;
- In the plastic tunel III orach salad on row achieved a 36.34 value falling within the class of high potential overall fertility;
- In the plastic tunel IV spinach on row a value of 32.79 was obtained fits to the class of high fertility potential in overall.

Graphical representation of the values obtained in the ecopedotop farm on Maxim at 03/18/2010 is shown in figure 1.

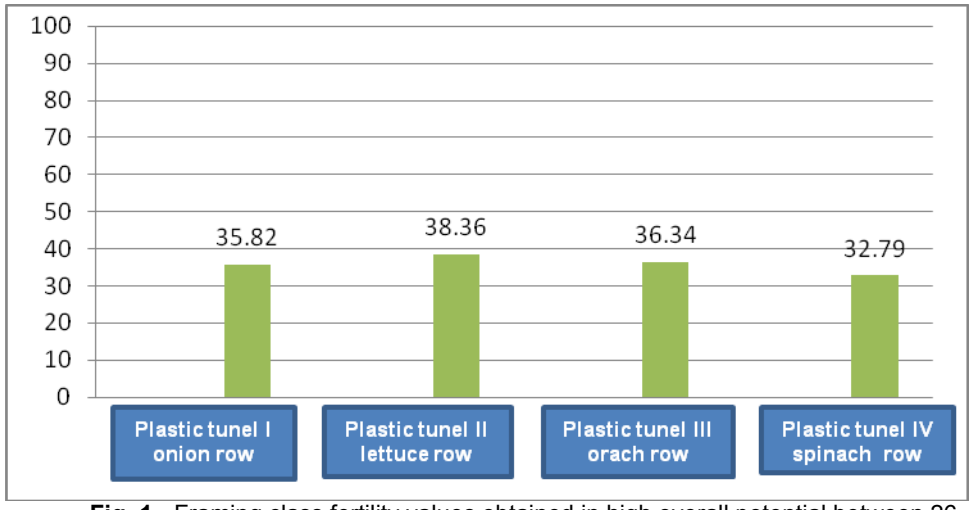

Fig. 1 - Framing class fertility values obtained in high overall potential between 26 and 100 for the Maxim farm ecopedotop 03/18/2010

At the same ecopedotop in July 2010 the results show that:

- culture of tomato (Granadero F1 cultivar) at a time of 31.60 was obtained assigning value to high potential overall fertility class;
- at the same hybrid tomato (Granadero F1 cultivar), but the range was obtained by calculating the value of 39.56 also fits to the class of high fertility potential in overall;
- for the soil cultivated with tomato hybrid (Caliope F1 cultivar) the value of all global agrochemical fertility potential index was 34.90 and was within the same class of high overall fertility potential;
- the value obtained from the calculation of tomato (Caliope F1 cultivar) the interval was 40.05 indicating a high overall fertility potential;
- the culture of peppers for the hybrid (F1 Maradona cultivar) turn the value obtained was 38.57 giving the class of high fertility potential overall;
- the same culture sample taken from the interval between rows of plants representing the result class was 41.91 potential overall fertility rate;
- for the soil cultivated with cucumber (Merengue F1 cultivar) value of 37.06 was achieved on all classified as high class fertility potential overall;
- the value obtained from the same culture but samples from the interval between rows of plants is 40.85, ranging also fits class high fertility potential overall.

Graphical representation of the values obtained in the farm Maxim on 18/03/2010 is shown in figure 2.

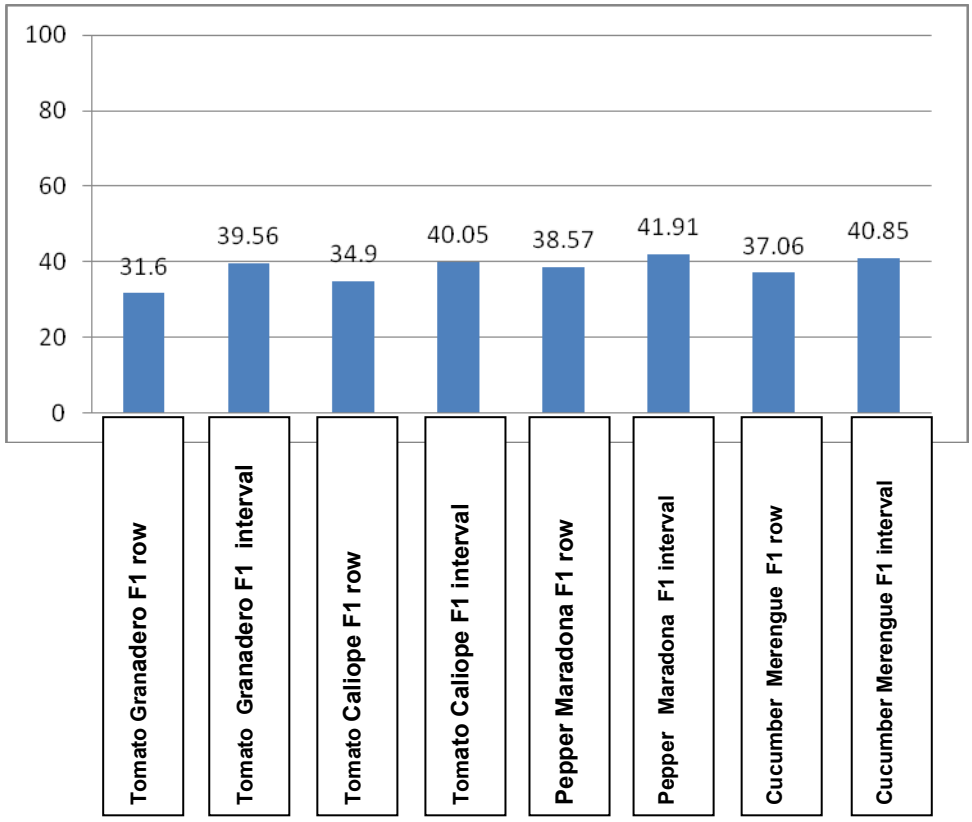

Fig. 2 - Framing class fertility values obtained in high overall potential between 26 and 100 for the farm Maxim ecopedotop 07/20/2010

CONCLUSIONS

1. The research conducted within March and July at Maxim farm highlight classification in the range of values obtained 26 and 100, while indicating high fertility potential overall;

2. The high fertility of soils and their assertive nature anthropogenic ensure the successful practice of sustainable agriculture in terms of Târgu Frumos.

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