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REDUCING THE SIDE EFFECTS OF ENERGY SECURITY ACTIVITIES IN CONJUNCTION WITH INCREASING FOOD SECURITY - CASE STUDY HUSNICIOARA - MEHEDINŢI COUNTY

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Abstract: *Ensuring the desired level of security for a country involves a mix of components to be achieved, each with a certain weight. While different activities have both a financial and social component, the costs of reaching, the desired level for each of these components are generated by the specific activities carried out and by the social phenomena associated with social perceptions of those activities. The paper describes new technologies to reduce the side effects generated by the energy system, in convergence with a bunch of measures designed to increase food security through regeneration of the sterile surfaces produced by the activity of the thermal power plants and their conversion into agricultural lands. Using the case study of Mehedinţi County of ensuring energy security can be overcome through agricultural technology and how a lot of associated social phenomena can be avoided, with great benefits for the national security system.*

Keywords*: security; (inter)cultural sensitivity; social phenomena*

1. INTRODUCTION

The issue of *security* can be addressed from a multisided perspective within interdisciplinary, multidisciplinary and transdisciplinary settings. More often than not, mainstream literature in different fields (social sciences, political sciences, communication sciences, intercultural studies, agricultural sciences, environmental sciences, etc.) favours the associative engineering of *security* with *nation*, *identity* and *ethics* in an attempt to raise further awareness and build security-oriented priorities. From sociolinguistic and intercultural points of view, *security* occurs in contexts triggering widespread concern rather than empowerment. In this climate of opinion, we propose an ecology of security, more specifically in relation to energy security and food security, as reverberating socially and culturally. We plead for a holistic definition of *security* and for the positive effects it can generate: celebration of core human values, global vision of social development, solidarity, concerted actions, increased agency and accountability, and, last but not least, well-being.

Another mention concerns the fact that we envisage security as *praxis* rather than a theoretical construct, grounded in reflective and action-oriented approaches, furnishing attitudes about what is appropriate, beneficial, feasible and sustainable, and useful not only for evaluating but also for guiding socio-cultural, economic and (norm-regulated) political behaviour. Attitudes to security should be linked to identity from a relativistic and pluralistic perspective - in this respect, Domenici and Littlejohn (2006) endorse an identity continuum consisting of *personal identity*, *relational identity* and *community identity* (a kind of meta-ethnicity with no specification of the community size - ethnic group, nation, etc). Accordingly, the ethics of difference and context sensitivity may be restated in terms of "for whom", "for what", "for when", "for where" and "from whose point of view" (Lee, 2007), further raising the questions of the authorisation (authority of beliefs, tradition, custom, policy making or law) and rationalisation (main goals and uses of institutionalised knowledge and action - notably, van Leeuwen, 2007) of security.

2. FOOD SECURITY AS ECONOMIC, SOCIAL AND CULTURAL SECURITY

2.1 The missing link. To our best knowledge, studies integrating energy security, food security and socio-cultural concerns are scarce or not widely disseminated. Furthermore, our study is intended to give more prominence to the Romanian research within the European context, as well as to

highlight the degree to which localisation (requiring higher specialisation due to adaptation work) and globalisation strategies (as integration of economies, industries, markets, cultures and policy making across countries) apply.

Dorin *et al*. (2014) embed the Romanian policy of energy security to the larger context of EU vision considering coal deposits as a top ranking source of sustainable renewable energy and drawing attention to long-term planning of coal energy production, use and economy in order to reduce the vulnerability of Europe against the energy crisis. In line with Cocheci (2016), we add that interconnectedness between economic efficiency, social cohesion and environmental balance lie at the heart of the EU policy.

Godfray *et al*. (2010) dwell on the wide variation in crop productivity across regions even in similar climates, explaining the differences in terms of the "yield gap" as the optimal exploitation of the current genetic material and available technologies. We agree, but, on the other hand, this site-specific productivity powered by agricultural policies should be complemented by the examination of economic and socio-cultural variables, especially because of the multilayered nature of *food security:* availability of food; access to food and to healthy food (underlying volatility of prices, too); basic component of social, economic and national security of a country. To put it in a nutshell, food security is closely linked to economic growth and social progress, as well as to political stability and peace.

Most scholars and practitioners agree that the threats to food security are numerous, mainly including: global warming, desertification and land degradation; inappropriate exploitation of an area or country agricultural potential at the expense of excessive imports; inadequate national food security strategy or lack of coherent policies in this regard; the global economic crisis; disparities regarding the development of different regions and countries; lack of immediate action; lack of control and traceability of the food chain; lack of control and practical action at global level; lack of independence of food security - metaphorically speaking, we witness the snowball effect.

2.2 A hands-on approach. Case study. In 70% of the cases, the exploitation of coal for the purpose of energy production takes place through surface or "daily" quarries, a technological process which is extremely pollutant and which affects the natural balance, mainly on account of waste dumps. They result in the replacement of fertile soils on large surface areas - it is also the case of many agricultual areas in the Mehedinţi County, which have been turned into genuine "lunar landscapes", where vegetation will grow after a long period of time.

Recent research shows that the reactivation of the land and the transformation of these dumps into crops is far more expensive than the value of the extracted coal; the recovery speed of the natural balance on the degraded lands is slower than the speed of their productivity decrease. Under the circumstances, the recultivation of waste dumps seems to be a must, and it implies urgent measures so as to bring the "industrial wasteland" back to the previous state, to create a new landscape, optimally organised, i.e. there is need for an ecological reconstruction of these degraded lands (Mocanu *et al*. 2004). The experiment was carried out on an uncovered dump in the Husnincioara quarry, Mehedinţi County, the main aim of biological recultivation being to increase the content of organic matter and nutrients, which can sustain crops, to be achieved by using organic and chemical fertilizers.

Thus, within a three-year rotation of maize, sunflower and chickpeas, organic fertilizers such as compost and minerals (nitrogen and phosphorus) were selected. The experiment was based on the method of plots, subdivided into 3 repetitions for statistical calculation, and fitting into the existing surface area, the size of the rectangular plots being of 2.1 m width and 8 m length, which correspond to the ratio of 1:5. The maize crops were fertilized with cattle compost prepared at the Research and Development Unit of Caracal (SCDA Caracal) (made up of solid waste, liquids, bedding, feed, straw and special cultures of bacteria undergoing fermentation at the right temperature and humidity), in doses of 10, 20 and 30 t/ha at a time interval of 1, 2 and 3 years. Having in mind the chemical composition of wet compost in relation to the established doses, the following amounts of nutrients were introduced into the waste dumps as follows: 10t compost/ha annually: 105.4 kg N, 44.7 kg P_2O_5, 9.5 kg K_2O, 18.6 kg CaO, 5.1 kg Mg; 20t compost/ha annually: 210.8 kg N, 89.4 kg P_2O_5, 19.0 kg K_2O, 36.2 kg CaO, 10.2 kg Mg; 30 t compost/ha annually: 316.2 kg N, 134.1 kg P_2O_5, 28.5 kg K_2O, 55.8 kg CaO, 15.3 kg Mg. For the mineral fertilisation ammonium nitrate of 33.5% N was used, in doses of 60 and 120 kg N/ha, keeping a constant amount of 60 kg P_2O_5/ha. The sowing took place in the second half of April at a distance between lines of 70 cm, acdepth of 6-7 cm and a density of 40,000 plants/ha. The harvesting took

place in late September. The application of the fertiliser was done for compost and phosphorus in autumn under base furrow and for divided nitrate, for sowing 1/2 of the required area, and the rest for the second manual hoeing. The number of hoeings applied was larger than normally for the control of herbage because herbicides were not used, not knowing their effects on such lands. During the experiment, the following parametres were analyzed and interpreted: the height of the plants (cm), the production (kg/ha) for the humidity of 15.5%, the volume of 1,000 grains and the hectolitre mass, statistically calculated through the method of variation analysis and interpreted according to the degrees of freedom with a margin of 5%, 1% and 0.1%.

1. The height of the maize plants under the influence of the organic fertiliser was bigger compared to the unfertilised variant, with different doses of compost in all these 3 years of experimenting (Table 1). On an annual basis, the growing of the plant height for the same doses was due to the lasting effect of the compost applied to the previous crops. The average values during the targeted period of time were similar. The increase of compost variation compared to control is different and highly significant. The application of compost for different periods of time led to differences in the maize height (Table 2). The annual use of compost led to bigger size, as compared to the other variants with the application every 2 or 3 years. The negative value differences with regard to control were highly significant in the first year, significant and highly significant in the second year and significant in the third year. For the variants fertilised every 2 and 3 year, compared to the negative control, the average values of the maize plant height ranged, statistically, within the limit of 1%. The mineral fertilization with different doses of nitrogen on a constant basis of P_{60} positively influenced the growing of the plants (Table 3). The unfertilized variant recorded a slight increase of the plant size in the second year as a result of the accumulation and decomposition of the vegetal waste from the previous culture. Through the continuous application of nitrogen doses, the height of the plants grew steadily, but the differences were sharp, the highest one being at the maximum dose of N_{120}. The calculation of the average for these 3 years indicated differences between the variants fertilised with nitrogen and control, which were highly significant. The maize was the crop that reacted positively to the factors included in the experiment involving the plant size.

2. The maize yield was directly influenced by the application of compost and mineral fertilisers, the results being proportional with the dose and the period of time in which they were used. The production yielded by using organic fertiliser increased from the control variant to the one with the maximum dose of 30 t/ha compost during the 3 years of experimentation (Table 1). The differences of production between the unfertilised variant and the ones which received different quantities of compost, including the average values, were of 2, 3 and 4 times higher than for the control variant, all of them being highly significant. Analyzing the influence of the period of time of the application of the biological fertiliser, we can see that the annual use led to high and constant amounts of maize (Table 2). The every 2 or 3 year application led to a progressive diminishing of the waste dump in time, the values of production being extremely high and very significant. The value of average yields showed the same tendency with some differences between variants, statistically ranging between 5 - 1%, the low significance being determined by the high variation of production for the variants fertilised for 2 and 3 years during experimentation. Mineral fertilization, also, positively influenced the increased production of maize (Table 3). For the unfertilised variant, the maize yield was influenced by the fertilised variants with which it was combined, the increase being higher every year as a result of the effect of the previous crop. Both for the 3 years and average values, the differences between the control variant and those minerally fertilised were significant, the last being statistically highly significant. The maize yields in the experimental field of Husnicioara for the experimental variants were equal or even higher than those of the plots of land cultivated by the local farmers.

3. The volume of 1,000 maize grains was influenced by fertilisation. When compost was applied to the control variant (with no organic matter) the lowest value of this parametre was recorded, the production increasing simultaneously with the increase of the doses of organic fertiliser from 10t/ha to 30t/ha (Table 1). During the 3 years of the experiment, the unfertilised variant displayed a constant value of the MMB (202.6 – 203.3 g), while the other variants recorded increased values, similar to the average of the compost doses, the differences regarding the control variant being highly significant. Examining the influence of the period of application of the biological fertiliser, the positive effect of its annual

use is obvious for the whole period of application, and the differences in value were higher in the third 3 year (Table 2). The average values calculated for the period of experimentation were the highest in the case of the annual application and decreased with the duration of use for the other two timelines. Through the use of different doses of chemical fertilisers, the volume of 1,000 grains showed close values for the whole period of the cultivation of maize for the chemically unfertilised control variant, recording an easy tendency to increase on account of the contribution of the previous crop. For the other variants for which we doses of N_{60} and N_{120} were applied against a constant background of $P_{60,}$ the MMB increased, especially for the maximum dose (Table 3). The value differences per year are highly significant for the maximum dose and average ones, the same being true for the variant with the fertilisation $N_{60}P_{60}$.

4. The hectolitre mass of maize, based on the recorded values, highlighted the influence of fertilisers applied to seeds. The application of different doses of compost triggered the progressive increase of the hectolitre mass of the unfertilised variant compared to those for which the amounts of organic matter became higher (Table 1). The situation remained the same in the next years as a result of the long lasting effects. The increase of values in relation to the hectolitre mass of the unfertilised variant ranged between 5 - 0.1%, highly significant being the values obtained through composting amounts of 30t/ha. The average values of the 3 years showed differences between the control variant and the other variants within the limit of 0.1%. The period of application of the biological fertiliser also determined differences in the hectolitre mass of maize (Table 2). Negative differences between the control variant and the other variants for which the period of time was longer than 1 year went up to highly significant, being the same as in the case of the average of the 3 years. The last factor, the effect of mineral fertilisation on the value of the hectolitre mass was constant for the unfertilised variant in the 3 years and increased for those to which different doses of nitrogen were applied (Table 3). The average values presented highly significant differences between the variants.

Table 1 The influence of compost fertilisation on the analysed parameters

Compost fertilisation	Height (cm)	Production (kg)	MMB (g)	MH (kg)
Unfertilised	114.6	914	203.0	70.4
10 t/ha	123.7	2,600	211.8	71.4
20 t/ha	128	3,325	234.6	72.6
30 t/ha	132	3,793	242.9	73.9

Table 2 The influence of the application interval of the compost on the analysed parameters

Composting interval	Height (cm)	Production (kg)	MMB (g)	MH (kg)
Annual	132.4	4,696	247.5	73.9
Every 2 years	123.0	2,297	230.0	71.8
Every 3 years	118.6	1,499	218.8	71.6

Table 3 The influence of mineral fertilisation on the analysed parameters

Mineral fertilisation	Height (cm)	Production (kg)	MMB (g)	MH (kg)
N_0P_0	123.0	1062	201.3	70.3
$N_{60}P_{60}$	124.8	2445	217.4	72.1
$N_{120}P_{60}$	126.2	2949	236.4	72.9

The research findings (quantitative data interpretation) can be best summarised as follows:

1. the positive influence of the compost on the height of plants, the average values for the 3 years constantly increasing for the unfertilised variant compared to those having received organic matter.

2. the annual application resulted in the biggest size and progressive diminishing with the increased period. Also, the application of mineral fertilisers led to the increase of the biometric size of the control variant.

3. in terms of crop yield, the organic fertilisation led to larger quantities compared to the control variant were no grains were obtained (the quantity was, in fact, due to the effect of the chemical fertilisers, in combination with this factor).

4. the annual composting of the waste dump of Husnicioara contributed to high and constant yields and their decrease with the increase of the duration of the application of organic matter.

5. the chemical fertilisers applied resulted in the production increase (for the unfertilised variant there was no yield at all), but quantitatively it was smaller than in the case of using the compost.

6. the volume of 1,000 grains was constantly influenced by the amount of the applied organic

matter and the period of use and, to a smaller extent, also by the mineral fertilisers used.

7. the hectolitre mass showed increasing average values for the uncomposted variant compared to those which having received different doses, constant in the case of annual fertilisation, and decreaseing values in the case of application every 2 and 3 years. The use of mineral fertilisers determined, evidently, values that became higher with every dose applied.

8. waste dumps are poor in organic matter and nutritive elements, but good results are secured through the provision of nutritive substances under the form of compost, a biological fertiliser specially prepared, annually administered, or, in the worst case, every 2 years and with the mineral fertilisers annually applied. The effect of the compost is immediate, duet o the fact that the nitrogen from the organic compounds, as well as the other elements, become readily available, the process of mineralisation retracing much faster than in the case of manure annually applied, and the quantitites retained in durable humic substances are smaller.

Therefore, through the use of compost, the stimulation of the biological activity of the crop fields takes place, and when mineral fertilisers are applied, they amplify the effect more than manure, in reduced doses (considered as maximum in case of maize N_{120}). The effect was long-lasting, and, in conjunction with the one from the previous crop, it became even stronger in the conditions of the Enthiantrosoil of Husnicioara.

3. REFERENCES

The specific solutions must be fast, cheap and must enhance, as far as possible, the potential of the targeted area. We hope that the case study of Husnicioara - Mehedinţi County, focusing on the accurate identification of energy and food security-related problems in the area, will provide solutions which may be adjusted or re-contextualised beyond cultural barriers or territorial borders. It might be considered a showcase, even if a small-scale one, able to be replicated in order to create economic and socio-cultural impact and value.

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