black walnut and ash reveals that the production cycle of ash can be viewed as shorter and its production higher than that of black walnut.

Our experience with black walnut cultivation hitherto confirms a satisfactory growth of this tree species in the conditions of South Moravian river valleys. Judging by the health condition of the stands and the current situation in the timber market, we can say that the ideal rotation period in our conditions is 130–140 years.

Translated by T. Vybíralová

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Hrib M., Kneifl M., Kadavý J.: **Růst ořešáku černého** *(Juglans nigra* L.*)* **v podmínkách lužních lesů LZ Židlochovice.**

V lesích jižní Moravy je v porostech pěstován druh introdukované severoamerické dřeviny – ořešák černý (*Juglans nigra* L.). I když se ořešák černý na jižní Moravě pěstuje od počátku 19. století, jeho současné nejstarší porosty byly založeny umělými výsadbami přibližně před 120 lety.

Práce se zabývá detailní vertikální a horizontální letokruhovou analýzou vybraných vzorníků ořešáku černého (*Juglans nigra* L.) na LZ Židlochovice (Lesy české republiky s.p.). Byly analyzovány tři vzorníky z jednoho z nestarších porostů ořešáku černého. Práce detailně analyzuje podíl kůry u jednotlivých stromů a distribuci její hmoty v závislosti na výšce stromu, zabývá se výškovým, tloušťkovým a objemovým růstem vzorníků. Konstatuje, že ani ve věku 108 let nebyla nalezena kulminace objemového přírůstu, neklesající přírůst tloušťky, a tím i kruhové plochy do věku 108 let, popisuje morfologii jednotlivých vzorníků a následně srovnává objemový růst ořešáku černého s dřevinami dubem a jasanem. Konstatuje, že ořešák černý dosahuje vyšší produkce, než zmíněné dvě dřeviny.

BIOENERGY PRODUCTION OF AGRICULTURAL SOILS COVER

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Abstract

Vilček J.: Bioenergy production of agricultural soils cover. Ekológia (Bratislava), Vol. 22, No. 2, 177–182, 2003.

Soil energetic effectivity knowledge through biomas produced by plant can be one of the decisive parameters of their production capability assessment as well as categorization for their potential use. Based on the crops production soil parameters were selected and potential of bioenergy production of Slovak soils was derived. Energetically most productive are the soil types like Chernozems (88.6 $GJ.ha^{-1}$) and Mollic Fluvisols (76.14 $GJ.ha^{-1}$). The least energy amount generate Gleys, Organosols, Solonetzes and Lithosols (31.63 $GJ.ha^{-1}$). The highest assumption for energy production (79.11 $GJ.ha^{-1}$) is upon the soils located in the climatic region very warm, very dry, lowland. According textural composition most energy (56.98 $GJ.ha^{-1}$) was produced by loamy soils, do not threaten by wate erosion (73.25 $GJ.ha^{-1}$), by sloping to 3° (66.61 $GJ.ha^{-1}$) and skeletonless soils (68.57 $GJ.ha^{-1}$). According tu selected scale of plant biomass production assessment on farm land, the soils high and very high productive (above 212 $GJ.ha^{-1}$) are located mostly in plains. Energy accumulated in farmland exploitability by plants cropped is variable depending from soil representative and its properties. The lowest exploitability was found at Cambisol (0.7–1.8%), the highest at Regosols (3.1–7.0%).

Key words: soil energy parameters, energy production, soil production potential

Introduction

Soil is one of the ecosystem compounds, essential and inseparable part of biosphere and therefore its energetic characteristics should be based on biological and soil forming processes complexity. Through plants microorganisms and humus considerable amount of transformed solar energy is accumulated in soil, this energy is being consumed for continous development of soils and their productivity. Biogeocoenoses as selfregulated systems represent energetic unity of mutual reactions among the lowest atmosphere layer, plant, soil, microorganisms and animals. I.e. if we want to regulate useful biomass synthesis (food, fodder, etc.), we must know basic rules of energy flow and transformation in particular natural biocoenoses and agro-coenoses. Bioenergetics significant advantage is the possibility to express various changes and actions by energetic units (J, kJ, GJ and similar).

Soil bioenergetic topic is not a new problem. To more significant works in this region were included previous publications – Volubjev, 1974a,b; Alijev, 1975; Kovda, 1971; Kudrna, 1978; Novák, 1966 as well as newer ones – Čislak, 1990; Fazekašová, Liška, 1995; Pospišil, 1996; Vilček, 2000. Also based on their findings, though they are not complete, we can approach to solution of some practical tasks of soil productive capability assessment, by total energy consumption for soil forming processes, for energy accumulated in humus, produced biomass energy, and its energetic balance, etc.

Material and methods

When assessing potentially possible crop bioenergy production, depending from soil representatives and characteristics, our starting point was natural phytomass production (overhead part and roots) of plant associations recalculated to energetic units. In particular expression following procedure was used:

- database was primary background, it included real assumptions of ten main crops grown in Slovakia on arable land and yields of grassland determined for the soil quality indexes – Bonited Pedo-Ecological Units BPEU (Vilček et al.,1999)
- based on typical cropping structures by the BPEU (Vilček, 2001) and mentioned real biomass production assumptions recalculated for dry mass (Preininger,1987), for every of BPEU was calculated its bioenergy productivity potential for whole crop production
- by the codes into the BPEU characterizing adequate soil properties, by help of software filters by use of arithmetic mean, productivity energetic parameters were calculated for the soil types, sloping categories, stoniness, texture and climatic regions, respectively.

Results and discussion

Soil live organic compounds energy is assessed by biological C cycle in the ecosystems of biosphere. From former empiric calculation is resulting , every organic C kg is corresponding to energy supply 41868 kJ in average, whereby there are considerable differences in the particular ecosystems. This energy is a result of many complicated photosynthesis processes and activities of organisms. This introduces only 2 to 5 % energy used by green plants at photosynthesis, i.e. approximately 0.01 to 0.02 % of solar energy coming to soil surface. With died organic remains enters soil energy in the form of chemical structures in organic compounds. At the humification coefficient value 0.4 this represents annual energy accumulation in soil humus approximately $8.37.10^6$ to $41.87.10^6$ $kJ.ha^{-1}$. Just this value of inner energy is annually supplemented into soil due to biological substance exchange between soil and organisms. Contemporarily with humus formation part of the organic matter is mineralized, this is associated with energy release (Sotáková, 1982).

When assessing, 1 gram of soil humus contains 19.22 kJ energy (Strašil, 1989), for the soil types can be determined their approximate energetic potential as follows:

Soil type	$GJ.ha^{-1}$
Regosol	770–1730
Luvisol	1630–3650
Solonetz	1350–2880
Haplic Luvisol	2300–3460
Rendzina	1920–4230
Fluvisol	2880–6730
Cambisol	2880–7690
Chernozem	3460–5960
Mollic Fluvisol	3840–11500

These values are approximately presenting energy accumulated in soil through soil humus. So they are potential energy source fore plant ecosystem and soil edaphon. It is logical, in the process of soil organic matter formation is not consumed all the energy accumulated in soil. Energy amount transformed through soil into plants is in various soil and climatic conditions variable. According energy amount accumulated in crops, in this way it is possible to assess production and bioenergetic soil potential.

Real soil productivity potential in Slovakia in association with implemented system of farming – primarily structure of cropping system structure and soil use in given types of land, expressed through crop biomass, is for every soil other. Principally can be stated, that with increasing soil fertility is increased bioenergetic potential, too.

In particular expression, based on our recalculations on farmland, most bioenergy from the crops grown was produced on soils of chernozemic type (88.06 $GJ.ha^{-1}$) and Mollic Fluvisols (76.14 $GJ.ha^{-1}$). Least bioenergy was produced in Gleys, Organosols, Solonetzes and Lithosols (31.63 $GJ.ha^{-1}$) (Fig.1).

One of a decisive criteria at energetic balance assessment of soil and crop production are climatic conditions. Climatically most benefitial conditions significantly affect bioenergy

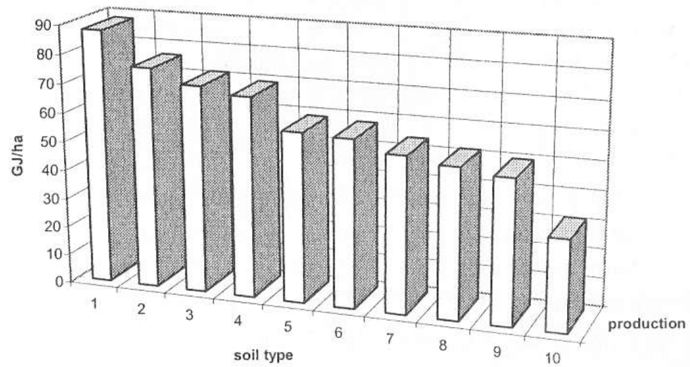

Fig. 1. Real bioenergy production of plants by soil types. Legend: 1 – Chernozem, 2 – Phaeozem, 3 – Fluvisol, 4 – Orthic Luvisol, 5 – Albic Luvisol, 6 – Pseudogley, 7 – Regosol, 8 – Cambisol, 9 – Rendzina, 10 – Gley, Organosol, Solonetz, Lithosol, Podzol.

production by crops grown. With decreasing temperatures and precipitation growth, decrease in generated energy by the crops. In this aspect the most energetically effective region in our country is climatic region very warm, very dry, lowland. From analyses is resulting, in this climatic region are assumptions of highest energy production (79.11 $GJ.ha^{-1}$). The least energy amount was produced in regions – cool, moist or very cool, moist (approximately 42 $GJ.ha^{-1}$).

When balancing soil energetics significant role plays textural soil composition, too. From soil fractions size is reeled energy absorption by active particle surfaces. Calculations show, that the most energy was produced by loamy soils (56.98 $GJ.ha^{-1}$) and silty soils (55.41 $GJ.ha^{-1}$).

Energetic balance interesting results offers soil categorization of soil erodibility. While on soils without erosion hazard or with low hazard, even 73.25 GJ energy can be produced on 1 ha area (energy gain is 53.22 $GJ.ha^{-1}$), on strong erodible soils it is only 34.67 GJ (energy gain is only 27.22 $GJ.ha^{-1}$).

Bioenergy production by crops significantly correlated also with sloping of land. While in lowlands or slopes to 3° is possible to generate 66.61 GJ energy, with increasing slope energy generation decreases. In slopes over 17° this value is only 35.20 $GJ.ha^{-1}$.

Energetic processes in soils are somehow determined by stoniness. With this aspect energetically most effective were skeletonless soils, where can be calculated with 68.57 $GJ.ha^{-1}$. With increasing skeleton level was this value gradually lowered. Bioenergetic potential of strongly skeleted soils was 35.06 $GJ.ha^{-1}$.

From the results is obvious, analysis of bioenergy balance materialized in crops was significantly affected also by soil quality. Therefore is more than obvious, energetic flows level in crop production subsystem reflected soil productivity potential level.

Newer soil information trend in Slovakia is sacrified to the spirit of geographic information systems (GIS) use. Also at analyses and predictions of Slovak soils energetic parameters, in the Soil Science and Conservation Research Institute (VÚPOP), this system plays important role, particularly at spatial required parameters visualization, as well as at its databases formation. Today is used geographic information system ARC INFO in VÚPOP Bratislava, which through vectorized borders and soil quality indexes codes (BPEU) enables to form required database for every BPEU data including energetic soil parameters. An example is e.g. the map "Farmland Categorization by Plant Bioenergetic Production", where farmland is divided into following groups:

- bioenergy very low production (under 141 $GJ.ha^{-1}$) – 29 % farmland
- bioenergy low production (141–176 $GJ.ha^{-1}$) – 24 % farmland
- bioenergy medium production (176–212 $GJ.ha^{-1}$) – 20 % farmland
- bioenergy high production (212–247 $GJ.ha^{-1}$) – 20 % farmland, and
- bioenergy very high production (above 247 $GJ.ha^{-1}$).

VÚPOP ows and utilizes also completed databank, in which to every of BPEU is associated potentially possible supplemental energy deposit from the biomass produced (Fig. 2).

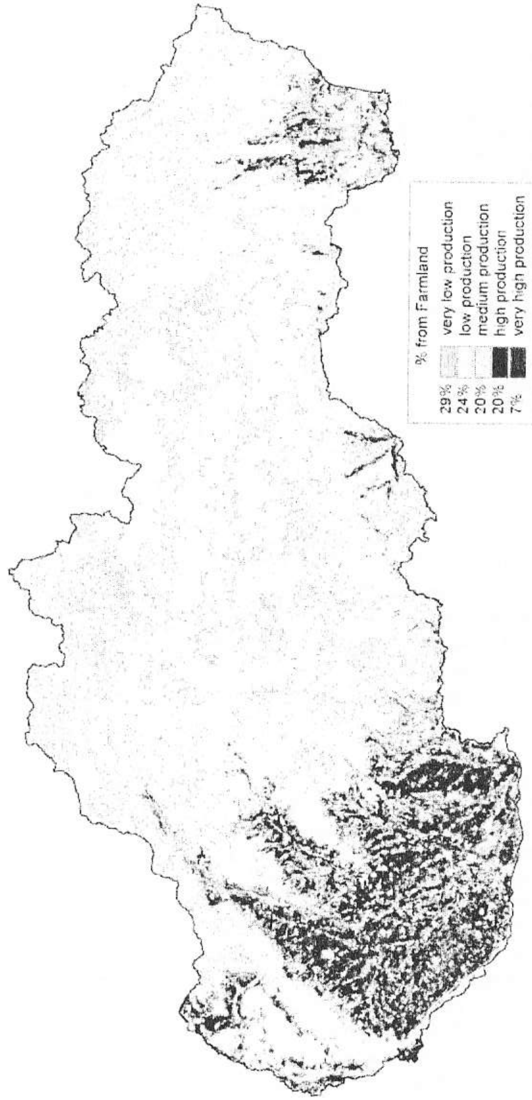

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Fig. 2. Farmland categorization according to plant bioenergy production.

It seems, that exploitability of energy accumulated by crops in farmland is variable, depending from soil representatives and soil characteristics. The lowest exploitability was observed at Cambisols (0.7–1.8 %), the highest one at Regosols (3.1–7.0 %), this is corresponding with the recently published works (2–5 %).

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Vilček J.: **Produkcia bioenergie pôdneho pokryvu poľnohospodárskych pôd.**

Poznanie energetickej efektívnosti pôd cez biomasu vyprodukovanú rastlinou môže byť jedným z rozhodujúcich parametrov hodnotenia ich produkčnej schopnosti i kategorizácie pre ich potenciálne využitie. Na základe produkcie pestovaných plodín sme pre vybraté pôdne parametre odvodili potenciál produkcie bioenergie poľnohospodárskych pôd Slovenska. Energeticky najviac produkčné sú pôdy typu černozemí (88,06 $GJ.ha^{-1}$) a čiernic (76,14 $GJ.ha^{-1}$). Najmenej bioenergie vyprodukujú gleje, organozeme, slance a litozeme (31,63 $GJ.ha^{-1}$).

Najvyšší predpoklad produkcie energie (79,11 $GJ.ha^{-1}$) je na pôdach nachádzajúcich sa v klimatickom regióne veľmi teplom, veľmi suchom, nížinnom. Podľa zrnitostného zloženia najviac energie (56,98 $GJ.ha^{-1}$) vyprodukujú pôdy hlinité, vodnou eróziou neohrozené (73,25 $GJ.ha^{-1}$), na svahu do 3° (66,61 $GJ.ha^{-1}$), bez skeletu (68,57 $GJ.ha^{-1}$). Podľa zvolenej škály hodnotenia produkcie biomasy rastlín na poľnohospodárskych pôdach sú pôdy vysoko a veľmi vysoko produkčné (nad 212 $GJ.ha^{-1}$), lokalizované prevažne v nížinných oblastiach.

Využiteľnosť energie naakumulovanej v poľnohospodárskych pôdach pestovanými plodinami je rôzna v závislosti od pôdnych predstaviteľov a vlastnosti pôd. Najnižšiu využiteľnosť sme zistili u pôdneho typu kambizeme (0,7–1,8 %), najvyššiu u regozemí (3,1–7,0 %).

NEW APPROACHES TO THE INTEGRATION OF ECOLOGICAL, SOCIAL AND ECONOMIC ASPECTS IN LAND-USE PLANNING

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Abstract

Belčáková I.: New approaches to the integration of ecological, social and economic aspects in land-use planning. Ekológia (Bratislava), Vol. 22, No. 2, 183–189, 2003.

The paper is intended to deal primarily with the current trends in the assessment of ecological, social and economic impacts in land-use planning in relation to sustainable development needs. Ultimately, the need for integrating planning, particularly land-use planning, and impact assessment, is also a matter of discussion. Strategic environmental assessment (SEA) is inevitable to be part of each land-use system in land-use planning processes in order to search for common basis of the topic of the integration.

It aims to address the issue of integration of ecological, economic and social issues in land-use planning and how impact assessment, especially Strategic environmental assessment (SEA) can help that process. The most important function of SEA in land-use planning is its contribution to a stronger environmental orientation in land-use planning. On one hand SEA directly joins the process of planning and decision-making and on the other hand it can meet those impacts that interfere above the framework of the actual decision-making process in land-use planning.

Key words: strategic environmental assessment, land-use planning, integration of ecological, social and economic aspects

Introduction

The ecologisation of spatial organisation of landscape is aimed at an ecologically optimum spatial organisation, utilisation and protection of landscape. It results in a proposal for the most suitable localisation of required human activities within a given territory and successively in a proposal of necessary measures ensuring the ecologically correct operations of those activities in a given locality. This can be achieved by several instruments when integrating into land-use planning but where practice evidently shows that it is still lagging behind (Hobbs, 1997; Ružička, 1996; Žigrai, 2000).