

EVALUATION OF AGRICULTURE MANAGEMENT SUSTAINABILITY

HODNOCENÍ UDRŽITELNOSTI ZEMĚDĚLSKÉHO HOSPODAŘENÍ

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ABSTRACT

Sustainability analysis deals with system viability and probability of its survival. The goal of this work was to find sustainable trends, indicators and evaluation method. Sustainable trend means reduction material and energy consumption in ecological dimension. Employment represents agriculture support for regional community and indicates sustainability in social dimension. Profit represents sustainable trend in economical dimension. According to these trends were selected aggregate indicator for each dimension: i) material and energy costs, ii) personal costs, iii) profit. The indicators are at an appropriate level of aggregation, simple in order to make them useful for policy-decisions. Indicator values are in units CZK per hectare per year. The research evaluated 40 chosen farm systems and used data from Profit / Loss Accounts. The first step was determination of indicator intervals that were considered as intervals of sustainability. The second step was creation of a pyramidal model of agriculture system where dimensions were marked according to their dependency in system: ecological 3, economical 2, social 1. The third step was evaluation of all systems and sequencing of their sustainabilities. Sustainabilities of chosen systems ranged in interval from 27% to 63%. Advantage of proposed sustainability evaluation method is its simplicity and applicability, however it provides only general results.

Key words: sustainability, agriculture, management, indicator

ABSTRAKT

Výzkum udržitelnosti se zabývá životaschopností systémů a pravděpodobností jejich budoucí existence. Předmětem této práce je nalézt udržitelné trendy, indikátory a metody hodnocení. V ekologické dimenzi představuje udržitelný trend snížení materiálové a energetické spotřeby. V ekonomické dimenzi představuje udržitelný trend zvyšování zisku. V sociální dimenzi je udržitelným trendem zvyšování osobních nákladů. Podle udržitelných trendů byly vybrány indikátory pro každou dimenzi: 1) materiálové a energetické náklady, 2) provozní hospodářský výsledek, 3) osobní náklady. Indikátory jsou v požadovaném stupni agregace, jednoduché za účelem jejich použití při rozhodování o způsobu hospodaření. Indikátory jsou v jednotkách CZK / hektar / rok, případně EUR / hektar / rok. Výzkum hodnotí 40 vybraných zemědělských

systemů na základě dat z Výkazu zisku a ztrát. Prvním krokem bylo určení intervalů indikátorů, které považujeme za intervaly relativní udržitelnosti. Druhým krokem bylo vytvoření pyramidového modelu zemědělského systému. V modelu je dimenzím přiřazena váha podle jejich významu pro systém: ekologické 3, ekonomické 2 a sociální 1. Třetím krokem bylo porovnání systémů a vytvoření jejich pořadí podle relativní udržitelnosti. Zjištěná udržitelnost se pohybovala mezi 27% a 63%. Výhodou navrženého hodnocení udržitelnosti je jednoduchost a snadná aplikovatelnost. Jeho nevýhodou je, že poskytuje pouze obecné výsledky.

INTRODUCTION

Monitoring farm sustainability is based on environmental analysis and proposal of sustainable agriculture management indicators on the basis of accounting data. There is an aspiration to use information recorded originally for taxes purposes for sustainability analysis.

Sustainability is a system ability to multiply and interlace functions, to raise cohesion and probability of survival. Sustainability rises if system integrates more functions and more sphere are interconnected. It is possible to model structure of agricultural system like three-layer ball. Ecological sphere is prime resource and it is in model centre. Social sphere spread out whereupon ecological sphere. Economical sphere is upper class in model.

1. Agriculture sustainability

Sustainable trend in ecological sphere is represented by reduction of material and energy costs. Material and energy costs represent quantity of resources invested in machine, gasoline, fuel and oil, equipment, buildings and chemicals, which represents environmental disturbance in general. (Material and energy costs in farming in the CR were 14 327 CZK per hectare of agriculture land in 2000.) Sustainable trend in social sphere is represented by rising personal costs, which indicate how much agriculture supports regional social sustainability, especially employment rate. (Average gross annual wage in farming in the CR was 4 992 CZK per hectare of agriculture land.) Rising of profit represents sustainable trend in economic sphere. (Income in agriculture including subsidy was 21 370 CZK per hectare of agriculture land in 2000).

2. Research of sustainability

Environmental research should analyses ecological, social and economical dimensions simultaneously. The main goals represent: selection of indicators (one aggregate indicator for each dimension, values in the same units), analysis of data and evaluation of chosen farms.

Selection of indicators has been done according to sustainable trends. Sustainability indicators should meet the following criteria: policy-relevance, conceptual soundness, definition at an appropriate level of aggregation, effectiveness, statistical validity, analytical soundness,

technical soundness and cost-efficiency. Indicators should be limited in number and simple and easy interpret in order to make them useful for policy-decisions. [European Commission, 2001] Proposed indicators are: 1) material and energy costs, 2) personal costs and 3) profit (earnings before taxes). These indicators are easy to find out in Profit and Loss Statement.

Tab. 1: Proposal of indicators

DIMENSION	TREND	INDICATOR	UNIT
Ecological	Stabilisation of environment	Material a energy costs	CZK / hectare / year
Social	Stabilisation of community	Personal costs	CZK / hectare / year
Economical	Stabilisation of firm	Earnings before taxes	CZK / hectare / year

3. Results

Analysis of agriculture sustainability has been done for 40 chosen farms. Main results are summarised in table 2. 50% of chosen farms have material and energy costs from 10 300 to 15 300 CZK, personal costs form 6 100 to 8 600 CZK and earnings before taxes from –2 300 to 1000 CZK. (Department of Agriculture Economy Brno provides farm accounting data.)

Tab. 2: Results of analysis of 40 farms

Indicators	Minimum	Maximum	Average	Median
	1000 CZK / hectare / year			
Material and energy costs	5,1	101,7	16,9	12,7
Personal costs	2,8	61,6	9,1	7,5
Earnings before taxes	-7,7	26,8	0,1	-0,5

4. Evaluation of chosen farms

Evaluation sustainability of each farm can be in relation to the average values analysed from the group of 40 farms. The second way how to evaluate farm sustainability is to compare 2 farms. The following table 3 shows comparison of high sustainability of farm A and low sustainability of farm B.

Farm A is more sustainable in ecological dimension then farm B. Material and energy cost of farm A are under average (5 300 CZK /he / year). Farm A represents higher sustainability in social dimension then farm B. Farm A expends more many on payment to workers then on material and energy consumption. Farm A is profitable. Farm shows loss and it means lower sustainability in economical dimension.

Tab. 3: Comparison of 2 farms

Indicators	Farm A		Farm B	
	1000CZK	1000CZK/he	1000CZK	1000CZK/he
ECOLOGICAL DIMENSION				
Material and energy costs	6306	5,3	16719	12,5
Fertilisers and plant protection	1318	1,1	3172	2,4
Gasoline, Fuel and Oil	1197	1,0	3398	2,5
Electricity	777	0,6	694	0,5
Repairs and Maintenance	529,00	0,4	1597	1,2
SOCIAL DIMENSION				
Personal costs	6782	5,7	6283	4,7
Payload costs	5015	4,2	4898	3,7
Personal costs / total costs (%)	52		27	
ECONOMICAL DIMENSION				
Earnings before taxes	338	0,3	-4905	-3,7
Products and services taking	14213	11,9	33208	24,8
Subsidy	2113	1,8	997	0,7

5. Conclusion

The advantages of indicators proposal are: high level of aggregation, simple concepts from accounting, “recycling” of exists data, usage of data guaranteed by firm, control of data provided by revenue office. Sustainability indicators from accounting data are very close to government subsidy politics because of their monetary value. The proposed indicators have a few disadvantages: applicability only for agriculture, indicators are not able to measure sustainability of region, indicators do not indicate final use of costs, no difference between of energy and material sources.

Monitoring of sustainability is possible to use for decision making which kind of agriculture management support. Farmers and consumers determine the ways of land management by shopping machine, chemicals and foodstuff. State influences the way of agricultural management by subsidy politics. Czech Republic has surpluses of foodstuff and therefore subsidy for production is redundant. Support that decline material and energy costs, raise personal costs and reach profit is very important.

LITERATURE

BRUNDTLAND, G. H.: Our Common Future. Oxford : Oxford University Press, 1987.

EUROPEAN COMMISSION: A Framework for Indicators for the Economic and Social Dimensions of Sustainable Agriculture and Rural Development. Brussels : EU, 2001.

- FILIP, J., TOMAN, F.: Trendy slibující setrnější zásahy do krajiny. EKOTREND : Trvale udržitelný rozvoj. Ceske Budejovice : JU, 2000.
- HANUS, L., ULCAK, Z.: Navrh hodnocení udržitelnosti vztahu producent – spotřebitel v ekologickém zemědělství. In: EKOTREND : Trvale udržitelný rozvoj. Ceske Budejovice : JU, 2000.
- CHAMBERS, N., SIMMONS, C., WACKERNAGEL, M.: Sharing Nature's Interest: Ecological Footprints as an indicators of Sustainability. London : Earthscan, 2000.
- JILEK, P.: Koncepce „Ekologické stopy“ jako indicator udržitelnosti. Diplomová práce. Brno : Ustav krajinné ekologie AF MZLU, 2001.
- LEVINS, D.: Monitoring Sustainable Agriculture with Conventional Financial Data. Minnesota: Land Stewardship Project, 1996.
- MEADOWS, D.H., MEADOWS, D.L., RANDERS, J., BEHRENS, W.: The Limits to Growth. New York : Universe Books, 1972, ISBN 0-87663-165-0.
- PERVANÇHON, F., BOCKSTALLER, C., GIRARDIN, P.: Assessment of energy use in arable farming systems by mean of agro-ecological indicators: the energy indicator. Agricultural Systems, 2002, 72, p. 149 – 172.
- POMEROY, A.: Social Indicators of Sustainable Agriculture. Situation and Outlook for New Zealand Agriculture. Wellington : MAF Policy, 1997.
- ULCAK, Z., PALL, J.: Indicators of Agricultural Sustainability - Blessing or Punishment?. In Acta Univerzitas Carolinae, 1999, 13, p. 111-118.
- WACKERNAGEL, M. REES, W. E.: Our Ecological Footprint: Reducing Human Impact on the Earth. New Society Publishers, Gabriola Island, BC, 1996.