

FORAGE BALANCE AS A BASIS FOR PLANNING ANIMAL HUSBANDRY DEVELOPMENT

BILANCA KRME KAO OSNOVA U PLANIRANJU RAZVOJA STOČARSTVA

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Pregledno znanstveni članak

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SUMMARY

Taking into account a considerable share of meadows and pastures (grazing land) the total Slovene agricultural land, it does not come as a surprise that livestock production and cattle raising in particular, represent the predominant production orientation in Slovene agriculture. If we want to keep the existing agricultural land cultivated, a special emphasis in the development of animal husbandry should be given to the domestic production of forage. The lack of appropriate data in evaluating forage supply requires modelling approach and estimates to be made. A variety of different factors must be considered in feed production (availability of land, the level of the intensification of production, crop structure on the fields, rotation of crops, etc.) and past animal production as well (the number of livestock, the level of the intensification of production, various production systems, different production orientations, feeding requirements, etc.). The obtained results of the model could significantly contribute to the discussions concerning further development of animal production, and may as such subsequently provide reliable indices in designing agricultural policy.

Introduction

The first forage balance for the territory of Slovenia was made by Dr. Lavrič in the year 1953. At the Agricultural Institute of Slovenia the first complete forage balance was made on the basis of the food balance made in 1981. When preparing "Development Strategy of Slovene Agriculture" (1992) the analysis of development potentials was made by means of a simulation production model of Slovene agriculture where forage balance matters a constituent part. The results of the balance and its analysis are the subject of this paper.

Preparation of forage balance for the whole country is based on the classical balance principle. It means the comparison of quantities of available forage (produced and net imports) with the consumed quantities. In this process the entire country is taken as single economy. In order to achieve better control of the results all the forage has been expressed as dry matter (DM), starch value

(SV) and digestible crude proteins (DcP). We are aware of the inaccuracy of the chosen units for energetic and protein value of forage, however, cattle breeding as a prevailing animal husbandry specialization in Slovenia makes the choice acceptable.

Forage balance represents a certain missing link between the analysis of plant production and the analysis of animal husbandry production. Technological advisers in Slovenia are as a rule specialists in plant or in animal husbandry production which causes about discrepancy between the produced and the required forage even on the farm. Concerning the congruity forage quality poses a problem. Incongruous forage balance has a negative economic effect on the successful manage-

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ment of entire economy, therefore it is necessary, especially in development planning, to pay appropriate attention to the analysis of forage balance.

The danger of incongruous development is in fact greater at the country level, than at the level of a particular farm. In the countries where agricultural policy is based on interventionism (practically all the Western European countries) the influence of state on the development of particular agricultural specializations is great (interventions in production). In case of inadequately balanced intervention policy the development can soon become incongruous, considering and even more serious consequences than at the level of a particular farm. Hence, forage balance is an important analytical instrument in all the developed economies, either in the analysis of effects of intervention policy or in the creation of future agricultural policy.

FORAGE BALANCE IN THE REPUBLIC OF SLOVENIA IN THE YEAR 1992

In order to understand better the forage balance it is necessary to give at least briefly the major characteristics of agriculture in Slovenia.

Table 1. Forage balance of Slovenia for the year 1992.
Tablica 1. Bilanca krme u Sloveniji za 1992. god.

	Distributed forage in tons of dry matter Distribucija krme u tonama suhe tvari			
	Roughage Zelena krma	Milk Mlijeko	Concentr.(1) Konzentrat(1)	Total Ukupno
Pigs - state farm breeding Svinje - državne uzgojne farme	0	0	143.738	143.738
Pigs - priv. farm breeding Svinje - privatne uzgojne farme	45.378	815	77.687	123.881
Pigs total - Svinje ukupno	45.378	815	221.425	267.619
Poultry - state farm breeding Perad - državne farme	0	0	253.810	253.810
Poultry - barnyard breeding Perad -domać uzgoj	5.578	0	36.763	42.342
Poultry total - Perad ukupno	5.578	0	290.574	296.152
Horses and sheep - Konji i ovce	47.265	0	3.507	50.772
Cattle - Goveda	1,403.575	9.255	169.271	1,582.101
All animals total - Sve životinje ukupno	1,501.796	10.071	684.777	2,196.644
Available forage total-Raspoloživa krma ukupno	2.501.796	10.071	668.020	2,179.887
Difference-Razlika	0	0	-16.756	-16.756
Index (available/total) Index(raspoloživa/ukupno)	100	100	98	99
Necessary forage Potrebno krme	1,678.947		589.821	2,278.839
Difference (available-necessary) Razlika(raspoloživa/potrebna)	-177.151		78.199	-98.951
Index (available/necessary)	89		113	96

(1) Concentrates are determined with regard to available quantity and quality of roughage (irrespective of the available quantity of concentrates)

(1) Koncentrat je određen s obzirom na dostupnost zelene krme po količini i kakvoći (neuzimajuć u obzir raspoloživu količinu koncentrata).

Table 2. The structure of used and available forage in food balance of Slovenia in the year 1992.
Tablica 2. Struktura upotrebijene i raspoložive krme u bilanci krme u Sloveniji u 1992. god.

	Structure of use acc. to animal species Struktura upotrebe dodatka po životinjskim vrstama		Share of roughage in total use Udio zelene krme u ukupnoj upotrebi	
	Roughage Zelena krma	Concetr. Koncentrat	Energy energija (SV)	Protein Bjelančevine (DcP)
Pigs - state farm breeding Svinje - državne uzgojne farme	0,0	21,5	100,0	100,0
Pigs - priv. farm breeding Svinje - privatne uzgojne farme	3,0	11,6	69,0	70,7
Pigs total - Svinje ukupno	3,0	33,1	86,0	89,1
Poultry - state farm breeding Perad - državne farme	0,0	38,0	100,0	100,0
Poultry - barnyard breeding Perad - domaći uzgoj	0,4	5,5	90,0	95,1
Poultry total - Perad ukupno	0,4	43,5	98,6	99,5
Horses and sheep - Konji i ovce	3,1	0,5	14,0	12,2
Cattle - Goveda	93,5	25,3	18,9	23,8
All animals total - Sve životinje ukupno	100,0	102,5	46,1	53,5
Available forage total Raspoloživa krma ukupno	100,0	100,0	45,6	51,1
Share of domestic forage in % Udio domaće krme u %	100,0	36,6		

Generally, it can be said that the forage balance of Slovenia has been relatively congruous which is proved by the adequacy of methods used. An interesting item is the comparison between "necessary" and available roughage showing that in the year 1992 less roughage was produced than needed for the rational feeding of cattle. According to our estimations the insufficient production of roughage was caused the consumption of about 70 000 tons of concentrates over the necessary amount can be partly attributed to the dry year but there were some mistakes in the feeding technology.

In Slovenia about 55 % of energy and about 50 % of protein requirements are fulfilled with roughage. Most of the concentrates are used in poultry production for which practical the forage is all imported. Therefore the degree of self-sufficiency in concentrates is markedly low (36 %).

FORAGE BALANCE AS A BASIS FOR PLANING ANIMAL HUSBANDRY DEVELOPMENT

Analysis of development possibilities together with the analysis of the potential are most important in long-term planning. The unchangeable potential in agriculture is land. If agricultural land is chosen as a starting

point for analysis of development potentials, then the forage balance can be used as a missing link between the estimated plant production and the, volume of animal husbandry, in this case the method of preparation of forage balance can be used as a simulation to be slightly expanded. Then there is the limitation in the plant production that has to be made, i.e. between the amount intended for human nutrition and the other intended for forage. Following such a concept can bring us finally to a complete simulation model necessary for the estimation of volume of agricultural production.

This method has been used in the analysis of development potentials of agriculture made within the "Development Strategy of Slovene Agriculture". The results of this work will be briefly presented further in this paper.

The analysis of development potentials of agriculture in Slovenia proceeded mainly from the basic production factor, i.e. the agricultural land. As there are many possibilities and ways of using the agricultural land, various national-economic concepts of agricultural development (different degrees of liberalization and/or state interventionism in agricultural policy) were set as limiting factors and the market potentials of production proceeded from them.

The development of agriculture will to the greatest extent depend on:

- cultivated agricultural land area (production potential),
- production structure in agriculture (predominant specialization),
- production intensity (hectare yields, milking capacity etc.).

These are, at the same time, the elements most strongly influenced by market and measures of agricultural policy. The basic definitions of these three elements also represent the definition of the contents of the development scenario. All the development scenarios can be characterized by the following:

- The point of departure and the definition of agricultural land area is the evidence of categorization of agricultural land. According to this evidence there are somewhat less than 799 thousand hectares of agricultural land in Slovenia. The extent of the actual degree of cultivation of this land will depend on the degree of intervention, equalization of income with producers having different natural possibilities for production (the production is difficult in one way or another on 70 % of agricultural land in Slovenia).

- The production structure is defined by the use of agricultural land (fields, meadows, permanent plantations) and seeding structure found on fields (larger or smaller quantity of market field crops and/or forage plants). As the volume of animal husbandry production is defined by available forage (roughage for cattle, maize for pigs), the structure of animal husbandry is primarily the consequence of definitions for the use of land. Production structure is on a long-term basis significantly influenced by price relations and foreign trade policy.

- The volume of production is significantly influenced by production intensity. On a long term basis the producers tend to attain as great intensity as possible since intensification is one of the key elements of cost reduction. With regard to intensity the micro and the macro economic interests often contradictory. The principle is: if liberal market is the concept for agricultural development, the greater intensity can be expected.

In none of the development scenarios, restrictions proceeding from unfavorable size structure were considered. It was supposed that on a long-term basis adequate size structure was the first condition of a successful development of agriculture.

The basic specific points of discrepancy of the development scenarios presented are the following:

Scenario 1: It assumes the use of all the available land. At the same time, it could be said that it is focussed on the estimation of development presuming in Slovenia and in Europe continuation of development. The measures of regional, demographic and agricultural price policy ought to ensure the cultivation of entire land without any great influence by the government (similar to the situation up to now) either on production structure or restricting the intensity.

The result of such a policy would probably be a similar production structure as the present one along with the fast increase of production intensity. The early development of agriculture in western Europe was about the same.

Scenario 2. It assumes the liberal market concept of agricultural development. The state intervenes in agriculture only on the level of anti-dumping protection.

With regard to the greater share of agricultural land with more extensive production on account of natural conditions, a drastic reduction of cultivated agricultural land areas is to be expected. On the remaining land great intensity can be expected, both facts making the competitiveness with world prices possible.

Scenario 3: Represents the concept of guided agricultural development setting the implementation of wider national and economic interests (settlement, cultivation and cultivated aspect of landscape, ecological acceptance) before the production interests of agriculture. The state in its interest assures settlement and cultivation affecting at the same time the production structure and intensity.

The Scenario wants to answer the question how to ensure cultivation (settlement, cultivated aspect of landscape) at as low a pressure on environment and as small burdens on the budget as possible.

Table 3. Estimation of changes of agricultural land in use (in 000 ha)
Tablica 3. Procjena promjena iskorištavanog poljoprivrednog zemljišta (u 000 ha)

	Agric. land according to areas of difficult conditions - Poljoprivredno zemljište u skladu s težinom terena					
	Lowland Nizina	Hilly Bregovito	Mountain Planina	Karst Kras	Other Ostalo	Total Ukupno
Scenario 2	219	103	17	43	39	421
Scenario 1,3	224	216	168	104	88	799
Scenario 1,3=100	98	48	10	42	44	53

Table 4. Comparison of the main results of development scenarios
Tablica 4. Usporedba glavnih rezultata razvoja

	1991	Scen 1	Scen 2	Scen 3
Active agr. land area (000 ha) Površina aktivnog poljoprivrednog zemljišta	746(1)	799	421	799
- fields (hop plant.excl.) polja	244	245	178	266
- orchards voćnjaci	36	36	26	36
- vineyards vinogradi	22	33	19	33
- meadows livade	312	315	141	305
- pastures pašnjaci	130	158	55	158
Production intensity Intezitet proizvodnje	low slab	high visok	high visok	moderate umjeren
Share of forage plants in crop rotation (%) Udio krme u rotaciji usjeva	30,6	29,1	24,4	18,1
Total roughage yield (1991=100) Ukupna proizvodnja zelene krme	100	178	97	146
Share of field roughage (%) Udio zelene krme s polja	27	28	34	22
Concentrate yield (1991=100) Upotreba koncentrata	100	169	127	166
LU number (000 head) LU broj (000 grla)	806	1230	716	1014
Average number of cattle (000 head) Prosječni broj (000 grla)	502	916	474(2)	756
Average number of milk. cows (000 head) Prosječni broj mliječnih krava (000 grla)	...	303	154	224
Average milk. capacity of milk. cows (1) Prosječna mliječnost krava (1)	2705	4600	5000	4000
Livestock density (LU/ha): Gustoća stoke (LU/ha)				
- cattle, horses, sheep per feeding area, goveda, konji, ovce na hranidbenu površinu	0,72	1,38	1,64	1,21
- pigs, poultry per field area svinje na površinu zemljišta	2,33	2,44	2,21	1,66
- total/ha of agric. land ukupno/ha poljoprivrednog zemljišta	1,08	1,54	1,70	1,27
Value of agric. production (1991=100) Vrijednost poljoprivredne površine (1991=100)				
- gross value brutto vrijednosti	100	170	112	145
- net value netto vrijednosti	100	167	117	144
- net value without imports netto vrijednosti bez importa	100	184	129	163
of which animal husbandry koje su životinje uzgojene	100	192	119	155
cattle breeding uzgoj goveda	100	229	126	164
pig breeding uzgoj svinja	100	171	154	185
poultry breeding uzgoj peradi	100	106	71	98
Degree of self-sufficiency in food (%): Stupanj vlastitog suficita u hrani (%):				
- agriculture total ukupno poljoprivreda	93	120	83	105
- animal husbandry uzgoj životinja	111	140	86	109
milk ,mlijeko	129	196	109	124
beef,torna goveda	86	150	83	122
pork,svinje	82	91	75(3)	86(4)
poultry,perad	246	169	75(3)	100
eggs,jaja	93	85	75(3)	100
Degree of self-sufficiency in concentrates (%) Stupanj vlastitog suficita u koncentratu (%)	41	58	66	71
Net degree of self-sufficiency in food (%): Netto stupanj vlastitog suficita u hrani (%)				
- total,ukupno	78	111	77	99
- animal husbandry,uzgoj životinja	84	124	76	100

(1) Harvested area was considered- Požnjevena površina uzeta je u obzir

(2) Additional purchase of calves for fattening is planned-Dodatna nabava teladi za tov planirana je

(3) Production on the level of food security is considered-Proizvodnja na razini sigurnosti hrane uzeta je u obzir

(4) Calculated on the basis of available maize at 100% degree of self-sufficiency in poultry-Kalkulacija na osnovi dostupnog kukuruza pri 100% stupnju vlastitog suficita u peradi

The main characteristic of the results of scenario 1 is the great extent of production, primarily cattle breeding. The intensity of production has reached the level that has already been attained in the agriculturally developed European countries, but it also shows other characteristics of the present situation in certain Western European countries with a great share of grassland (Ireland). Such a development of agriculture would make the country face enormous milk surpluses (degree of self-sufficiency 196 %, more than 600 million liters of surplus) and great surpluses of beef, at the same time with the same ecological problems that western countries facing are now (the problem of nitrogen!).

The characteristic of the Scenario 2 is a drastic reduction: of cultivated agricultural land area. Production conditions (difficulties of production) in Slovenia are such that in many areas it is not possible to withstand the direct pressure of the world competition. The comparison of the expected change of agricultural land area due to price pressure according to quality classes, types of use, production areas and areas of difficult production conditions shows practically a complete abandon of production in the VI category of agricultural land, meaning that agriculture would in fact disappear from the entire mountain area.

In comparison with the present agricultural land area according to categorization (799 thousand hectares) by a liberal market concept of agricultural development it could be expected that the area of agricultural land would be reduced by one half (a reduction of 378 thousand hectares!).

The result of a fierce competition would also be reflected in high production intensity (intensive use of mineral fertilizers and plant protection products) and greater livestock density (1,64 LU of cattle, horses and sheep and goats per hectare of forage producing areas: 2.21 LU of pigs and poultry per hectare of fields: on the average 1.7 LU per hectare of agricultural land) which would undoubtedly cause ecologic difficulties. At such intensity Slovenia could secure, even by drastically reducing its production area, at least minimum food and the food produced in such conditions would undoubtedly be the cheapest.

The characteristic of the Scenario 3 is the moderate intensity assuring rather equal food balance and cultivation of entire agricultural land. This ecologically acceptable agriculture (less intensive use of chemicals moderate livestock density) also ensuring good quality food for the entire population. This Scenario shows the desired development requiring at the same time active participation the state and relatively large sums of

money. As for food price it cannot stand the comparison with Scenario 2, however, its concept could be cheaper than according to Scenario 1.

For Scenarios 1 and 2 it can be said that they are extremes spacing the two poles. Within this span, very many solutions are possible as regards the agrarian policy points of departure, one of them being Scenario 3.

The Parliament of the Republic of Slovenia discussed the "Development Strategy of Slovene Agriculture" in spring 1993 and adopted the development Scenario 3 as the so-called "target scenario" which in fact represents the concept of long-term development of agriculture in Slovenia.

CONCLUSION

The classical forage balance is a relatively simple method intended in the first place for the estimation of technology adequacy and congruence of production and consumption of forage. In this sense it can be best applied on the level of particular agricultural economy.

Forage balance used as a simulation method could be applied as a strong analytical instrument in planning agricultural production. Such method enables either a quick estimation of probable volume of animal husbandry production, by taking into account different assumptions of plant production, or the estimation of necessary forage production at the assumed volume of animal husbandry production. The method can be used both on the level of particular agricultural holding as well as on the level of the state as a whole.

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SAŽETAK

Zbog znatnog udjela livada i pašnjaka u ukupnom poljoprivrednom zemljištu Slovenije ne iznenadjuje činjenica da uzgoj životinja, naročito stoke predstavlja pretežno proizvodno usmjerenje slovenske poljoprivrede. Ako se želi obradivati postojeće poljoprivredno zemljište mora se u razvoju stočarstva posebno istaknuti proizvodnju krme. Zbog pomanjkanja pravih podataka u bilanciranju krme potreban je modelni pristup te mnogo procjena. Kod toga je važno uzeti u obzir niz čimbenika u proizvodnji krme (raspoložive površine, intenzitet proizvodnje, sjetvena struktura zemlje, izmjenjivanje usjeva, itd), a tako i u uzgoju životinja (broj životinja po vrsti, intenzitet proizvodnje, usmjerenje proizvodnje, potrebe za krmom itd). Dobiveni rezultati modela mogu znatno doprinijeti daljnjem razvoju proizvodnje životinja te djelovati na poljoprivrednu politiku.

POVZETEK

BILANCA KRME KOT PODLAGA ZA NAČRTOVANJE RAZVOJA ŽIVINOREJE

Zaradi velikoga deleža travinja v strukturi kmetijske zemlje v Sloveniji, je živinoreja, zlasti pa govedoreja, prevladujoča proizvodna usmeritev v slovenskem kmetijstvu. Če želimo zadržati vso zemljo obdelano, je pri načrtovanju razvoja živinoreje ključna bilanca krme, s posebnim poudarkom na možnem obsegu domače pridelave krme. Pomankanje ustreznih podatkov zahteva pri bilanciranju krme modelni pristop in velik delež ocen. Pri tem je potrebno upoštevati celo vrsto dejavnikov na strani pridelave krme (razpoložljive površine, invenzivnost pridelave, setvena struktura njiv, kolobar ipd.) kakor tudi na strani živinoreje (število živine po vrstah, intenzivnost proizvodnje, tipi reje, proizvodne usmeritve, potrebe po krmi ipd.). Rezultati modelov lahko pomembno prispevajo k odločitvam glede nadaljnjega razvoja živinoreje, posledično pa določajo tudi smeri delovanja kmetijske politike.