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Chetroiu, Rodica and Calin, Ion

University of Agronomic Sciences and Veterinary Medicine Bucharest, University of Agronomic Sciences and Veterinary Medicine Bucharest

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THE SYSTEM OF INDICATORS OF ESTIMATION THE ECONOMIC EFFICIENCY IN THE PRODUCTION OF GOAT MILK

CHETROIU RODICA[1], CĂLIN ION[2]

Abstract: *The analysis of economic efficiency is the main method of economic systems analysis. This concept is the most important qualitative indicator of the economic development, essential factor in accelerating the economic growth and is also one of the criteria for scientific substantiation of decisions. Applied in the milk production domain, represents the obtaining of maximum quantity of milk per animal, with minimal expenditure of manpower and materials. Regarding determining the economic efficiency of goat milk production, the most used indicators are: total physical production, average production, value of total production (total revenue), production costs, material costs, cost per unit, profit, rate of return, breakeven point etc. The paper presents the calculation method of indicators and their average values for 2014.*

Keywords: *economic efficiency, indicators, milk, goat, rate of return*

INTRODUCTION

The determination economic efficiency of goat milk production requires the development and use of a system of indicators that quantify both the efforts made to obtain the production and the effects resulting from these efforts. In this way, it can be performed a complex analysis and conclusions can be drawn regarding the directions of increasing economic efficiency (Parmacli D., Stratan A., 2010). Decisions taken in the production activity depend on information on the performance of the allocation factors in different sectors of activity, which affects the quality of the estimates and the perception on different needs and problems of the activity components (J. Johnson, K. Baum, R. Prescott, 1985).

MATERIAL AND METHOD

Indicators are numerical expression of an economic process or phenomenon, defined in time and space (Rodica Tănăsescu, 1997) and are characterized by:

- absolute measures (numerical expressions);
- relative measures (percentage);
- average measures (arithmetic averages, weighted averages, geometric averages);
- indices (with fixed base or chained base);
- coefficients (ratio between two absolute measures).

Absolute measures (concrete numerical expressions) reflect the size of the studied phenomenon and underlie determining the indicators derived: relative measures, average measures, indices and coefficients. These absolute measures can express cultivated area, livestock, material resources, financial resources, human resources, production, costs, revenues, profit etc., having specific units of measure: hectares, heads, kg, hl, pieces, days, hours, RON, etc.

The relative measures result by dividing two absolute measures, are expressed as a percentage and can show the intensity or structure of the phenomena studied. Intensity relative measures indicate how returns per unit of measure, 100 or 1,000 units of the second measure. Thus, these measures can show the economic development level of the company (interest rate, costs per 1,000 RON income, income per 1000 RON costs etc.).

Relative measures of the phenomena structure are: surface structure, livestock structure, costs structure, income structure etc.

[1] PhD Candidate - University of Agronomic Sciences and Veterinary Medicine Bucharest, 59 Mărăşti Bvd, sector 1, e-mail: rodigeo7@yahoo.com
[2] Prof. PhD - University of Agronomic Sciences and Veterinary Medicine Bucharest, 59 Mărăşti Bvd, sector 1, e-mail: icalin63@yahoo.com

Average measures represent generalizing ways of presentation in a synthetic form of statistical data related to the studied phenomenon. These can be: simple arithmetic average, weighted arithmetic average, geometric average. Using the average values, there can be determined: the average yield per hectare or per animal, the production value / worker, the average selling price etc.

Indices are ratios between two absolute measures and are used to show the evolution of a phenomenon (fixed base indices) or annual growth of the phenomenon (chained indices). Their use allows comparing indicators across time and space, showing the trend of the phenomenon under study, so their interpretation is helpful both to achieve a retrospective analysis of the activity, as well as for previewing of it.

The coefficients are ratios between two absolute measures, indicating the usability degree of the various factors in the production process (coefficient of utilization production capacity, coefficient of utilization equipment etc.). (Jilăveanu Ciulinaru I. Denisa Carmen, 2005).

The indicators are tools for monitoring, evaluation, forecasting and decision support. The main quality of indicators is the ability to express in a concise manner the complexity of the phenomenon. They also have the property to describe the links between the nature of the production system and its characteristics, in terms of vulnerability and sustainability (Penot E., Marie Bar, Hélène David-Benz, 2013).

RESULTS AND DISCUSSIONS

In order to assess the economic efficiency, are used a large number of indicators, according to the analyzed domain. Regarding determination of the economic efficiency of the goat milk production, we consider that the most used indicators are:

- **Total physical production**
- **Average production**
- **Value of total production (total revenue)**
- **Production costs**
- **Material costs**
- **Cost per unit of product**
- **Profit**
- **Rate of return**
- **Breakeven point etc.**

Total physical production is one of the indicators that measures the effects of the activity, and in raising goats, represents the total amount of products obtained of this species, in terms of time and place determined.

The main production (goat milk) is the main purpose pursued by the production technology applied and material and human resources allocated to production activity and is expressed in physical units (natural), gravimetric or volumetric: tons, or hl.

The secondary production represents total products obtained simultaneously with the main product, by applying the same technology and the same resource allocation, as a result of the biological characteristics of the animals (I.C.E.A.D.R.-P.S. 211/2011, Stage 3).

The average production per animal is the ratio between total gross production (main or secondary) and the number of animals from that production was obtained to or the average number of animals fed.

$$q = Q / Na$$

In which:
q – average production per animal
Q – main total production
Na – average number of animals fed

The average production is also a level parameter that indicates the magnitude order of the elements ensemble of the random variable represented by production. In this respect, it is an

abstract value that provides information about the central tendency of the variable values. It is a theoretical value that can probably substitute any value in the range of values it represents (Ghe. Sandu,1995). Due to the fact that between animals there are differences in productive capacity, to determine the total herd average production level, it can use the weighted average method, by relation (Margareta Oancea, 2003):

$$qm = \frac{\sum_{i=1}^{m} n_i \times q_i}{\sum_{i=1}^{m} n_i}$$

in which:

qm – farm average production;

ni – number of animals from a certain productive group;

qi – average production per animal from i group.

Value of total production (total revenue)

Total revenue is an indicator of effect (Dinu E., www.biblioteca-digitala.ase) and its analysis is of particular importance because it allows the assessment of the production unit place in its sector of activity, its market position and skills to develop different activities profitably. Concomitantly, the variation of total revenues is reflected on the effectiveness of the activity.

Total revenue (value of total production) is the sum of the earnings from selling products obtained. Value of total production VQ = main production value VQp + secondary production value VQs:

$$VQ = VQp + VQs$$

The main production value VQp is obtained by multiplying the selling price per unit of product (p) by the amount of the main production (milk) obtained (Qp):

$$VQp = Qp \times p$$

The secondary production value VQs similarly results by applying the same formula for each of the secondary products (kid, manure, reforms) with economic value:

$$VQs = Qs \times p$$

Production costs

The elements of economic effort that expresses one of the aspects of the economic efficiency are the costs. According to the definition given to this term by Cârstea Gh., Călin O., the cost represents „the monetary expression of the consumption of material resources, labour and money made to meet the needs of productive, unproductive, individual or social consumption". Production costs represent the expenses reflecting productive consumption of resources incurred in carrying on production (Gherasim A., 2007).

In structure, the cost of production include:

- **variable costs;**
- **fixed costs**

The calculation formula is:

$$ChT = ChV + ChF$$

In which:

ChT – total production costs

ChV – variable costs

ChF – fixed costs

Variable costs are directly influenced by the changes in production volume. They start the production process and ensure its deployment (Chiran A., Gîndu Elena, A. Banu, 2002). The main variable costs in the production of goat milk are:

- feeding costs Chf;
- biologic material costs Chmb;
- electricity and fuel costs Cee;
- medicines and veterinary costs Chmed;
- other material costs Cham;
- supply costs Chap;
- animal insurance costs Chas.

The calculation formula of variable costs is:

$$ChV = Chf + Chmb + Cee + Chmed + Cham + Chap + Chas$$

Feeding costs

Have the largest share of total variable costs and are a lever through it can influence both the level of production on an animal and the cost of the main product. Feed expenses are calculated based on average daily intake, respectively fodder varieties included in the ration, the duration of the animal maintenance, delivery prices for each range of forage in the ration. For each element of the ration, forage quantity is multiplied by its price and adding up the results, according to the formula below:

$$Chf = \sum_{i=1}^{n} q \times pf$$

in which:
Chf – feeding costs;
n- no. of fodder varieties;
q – quantity of fodder variety;
pf – fodder price.

Biologic material costs represent the counterpart of the replacement and extending effort for the existing livestock, both from own breeding and through purchases from outside the farm (I.C.E.A.D.R.-P.S. 211/2011, Stage 3). In milk production, such expenditure shall be determined by taking into account the price of replacement heifers that is introduced into the breeding herd and of operation period. The calculation formula is:

$$Chmb = ptf / D$$

in which:
Chmb – biologic material costs;
ptf – price for a heifer;
D – duration of operation period, in years.

Electricity and fuel costs

Energy consumption is due to feed processing, lighting and warming shelters, manure removal, water supply etc. In determining the power consumption is taken into account: type and number of consumers, the installed capacity of each, aggregates power, number of hours of operation. Fuel consumption involves supplying with raw materials into the farm, transport of fodders inside farm, their distribution in the manger, transport of primary and secondary animal products etc. The amount of daily consumption of electricity and fuel indicates the yearly necessary per head. The calculation formula is as follows:

$$Cee = Tee \sum_{i=1}^{n} qeei \times Di$$

in which:

Cee = quantity of electricity;

Tee = tariffs of electricity;

qeei = quantity of electricity per consumer;

Di = duration of operation for each consumer.

Medicines and veterinary costs

Veterinary actions contribute to maintaining the health of livestock and require measures to detect and prevent cases of disease, disinfection and mandatory vaccinations etc. Veterinary medicines and materials are used to make mandatory and necessary treatments, for individualization animals, treating legs diseases, pregnancy detection etc. Their value per head is summed at the end of year, resulting in costs of veterinary medicines and materials.

The calculation formula is:

$$Chmed = Cho + Chn$$

in which:

Chmed - medicines and veterinary costs;

Cho – mandatory actions costs;

Chn – necessary actions costs.

Other material costs

These costs involve maintenance and repair farm machinery and equipment, labour protective equipment insurance, sanitary veterinary instruments, buckets, rub down instruments, chains, forks, shovels etc.

Supply costs

Supply costs are due to ensuring farm with fodders, veterinary medicines and transport of biologic material, as a share of these expenditure categories.

Animal insurance costs

The size of this category of expenditure depends on the total amount for which the animals were insured and on the insurance agent that insurance was made with.

Fixed costs include those expenses that are not directly dependent on the volume of production (Chiran A., Gîndu Elena, A. Banu, 2002) and include:

- labour costs Chfm;
- general costs Chg;
- depreciation costs Cha;
- interest on loans Chd.

The calculation formula is:

$$ChF = Chfm + Chg + Cha + Chd$$

Labour costs

Depend on the needs of the farm labour force, which are determined by the working norms, given the degree of mechanization and specific activities.

General costs are a variable share (about 2-3%) of the variable costs.

Depreciation cost is the cost of investment on stable place, shared to the operation period of the assets.

Interest on loan depends on the nature and duration of the loan, its source and size.

Material costs

In the total production costs, material costs are an important share. They are also called intermediate consumption and are part of variable costs. In their structure are included:

- fodders costs;
- biologic material costs;
- cost of medicines and veterinary material;
- other material costs.

The calculation formula is:

$$Chmat = Chf + Chmb + Chmed + Cham$$

in which:
Chmat – material costs;
Chf- fodders costs;
Chmb – biologic material costs;
Chmed - cost of medicines and veterinary material;
Cham - other material costs.

Cost per unit of product (unitary cost)

J. Stuart Mill, quoted by Şteliac Nela (www.oeconomica.uab.ro.), showed that the maximum limit under that the selling price of products cannot decreases is given by the production cost. This is one of the most synthetic indicators of economic activity, which reflects by its structure, the effectiveness degree of the farm activity (Postelnicu Gh., 1994). The production cost is the intrinsic value of the commodity, as it is the sine qua non condition of simple reproduction, of continuity of production (Popescu, Gh., 2002).

Production cost is not a given measure, has not a constant character, but it is influenced by a number of factors, such as: production volume, production structure, production factors prices, products quality and features, the quality level of labour and of technical equipments of production, production organizing etc. It can be reduced by optimizing the use of these factors (http://www.cuttingcost.wordpress.com).

This indicator highlights the total production costs incurred in carrying out a principal product unit (in this case, milk) and is the main indicator that influences the profit. Since in the case of milk production, in addition to the main production, is obtained a secondary production with economic value, the unitary cost is calculated by the remaining value method, like in the formula (Chiran A., Gîndu Elena, A. Banu, 2002):

$$Cp = ChT - VQs / Qp$$

in which:
Cp – unitary cost of production;
ChT – total production costs;
VQs – value of secondary production;
Qp – total main production.

Profit

The profit is a synthetic indicator of assessing the farm economic efficiency and represents the difference between revenues obtained and total production costs. This result is called *gross profit* or taxable income. Deducting tax from him, we get *net profit*.

The calculation formula of gross profit is:

$$Pb = VQ – ChT$$

in which:
Pb – gross profit;
VQ – total income;
ChT – total costs.

The capacity of a farm to obtain profit is called *profitability*.

Profitability is a complex economic category, which reflects in a synthetic form the efficiency of the entire production activity of a farm. In the market economy, is an essential condition for the existence of entities. Profitability involves obtaining higher revenues than expenses, after capitalization of production, understanding by this the capacity of the economic unit to get a financial surplus from activities (Andronic B.-C., 2000).

The profitability of a farm is a concept commonly used and generally expressed by the rate of return.

The rate of return is a relative value that expresses the degree to which the whole capital brings profit, being one of the most synthetic efficiency indicators of the farm activity (Gheorghiu Al., 2004). This indicator expresses the efficiency of production costs using, or more precisely, the gross profit for 100 RON related production costs. Rate of return, as an indicator of efficiency, can have different forms, as considering the gross profit or the net profit in the numerator, or reporting base that expresses the effort or cost of production process changes. The calculation formula is:

$$Rr = (P / Chp) \times 100$$

in which:
Rr – rate of return;
P – profit;
Chp – related production costs.

In the general form, economic efficiency is called return and if the ratio between effect and effort is expressed as a percentage, this is called rate of return (Zaman Ghe., Geamănu Marinela, 2006). The rate of return is a ratio between an indicator of results (profit or loss) and an indicator that reflects the resources consumed (Vâlceanu Gh., Robu V., Georgescu N., 2004).

Breakeven point

Breakeven point represents a modality of a farm activity risk assessment, depending on fluctuations in the economic environment. It is also called critical or equilibrium point, indicating the production extent to which total costs are equal to revenue, resulting in null. Up to this level of production, the farm register losses; activity becomes profitable after the breakeven point.

Breakeven point can be measured both in physical and value units. Formula for calculating breakeven point (PR) is (Zaman Ghe., Geamănu Marinela, 2006):

$$PR = ChF / MCV$$

in which:
CF – fixed costs;
MCV – variable costs margin;
MCV = VQ – ChV.

The breakeven point analysis is an instrument which highlights the point where the farm activity become profitable, determining the minimum level of income, needed to cover fixed and variable expenses. The fixed costs are lower, the faster it can reach the breakeven point, and then get profit.

In the year 2014, for goat milk, the indicators described above are illustrated in Table 1:

Table 1 – Budget of goat milk 2014

INDICATORS	***Average production 350 l/head***	
	Lei/head	***Lei/l***
A. VALUE OF PRODUCTION	900,00	2,57
$A_{1.}$ Of which main production	700,00	2,00
B. SUBSIDIES	38,20	0,11
C. GROSS PRODUCT	938,20	2,68
D. TOTAL COSTS	751,35	2,15
$D_{1.}$Of which for main production	551,35	1,58
I. VARIABLE COSTS	651,66	1,86
1. Fodder costs	532,20	1,52
2. Biologic material	60,00	0,17
3. Energy and fuel	17,13	0,05
4. Medicines and veterinary material	17,00	0,05
5. Other material costs + water	8,00	0,02
6. Supply costs	15,23	0,04

INDICATORS	*Average production 350 l/head*	
	Lei/head	***Lei/l***
7. Animal insurance costs	2,10	0,01
II. FIXED COSTS	99,69	0,28
- Labour costs	80,00	0,23
- General costs	12,69	0,04
- Interest on loans	4,00	0,01
- Depreciation	3,00	0,01
E. GROSS PROFIT	148,65	0,42
Taxes	23,8	0,07
F. NET PROFIT + subsidies	163,1	0,47
G. RATE OF RETURN (%)	27,0	27,0
H. RATE OF NET PROFIT + subsidies (%)	29,6	29,6
COST OF PRODUCTION	551,3	1,58
PREDICTABLE INTERNAL MARKET PRICE	700,0	2,00

The goat milk estimated budget for 2014 for an average of 350 l / head shows that within the total costs, variable costs represent the largest share (86.7%), the difference being of fixed costs. In the variable costs, the highest share is of feed costs (81.7%), followed by biological material costs (9.2%). Estimated cost per unit of product is 1.58 lei/ l milk, with a profit of 0.47 lei / l and a rate of return of 27%.

Table 2 – Breakeven point - Simulations of possible scenarios

Indicators	**Values**	**%**	**Breakeven point (profit 0)**	**Profit obtainable at an increase in the production value by 20%**	**Profit obtainable at a decrease in the value of production by 20%**	**Maintaining initial profit when fixed costs are reduced by 10%**
Value of total production	900	100	361	1080	720	863,87
Variable costs CV	651,66	72,41	261,31	781,99	521,33	625,50
Variable costs margin MCV	248,34	27,59	99,69	298,01	198,67	238,37
Fixed costs CF	99,69		99,69	99,69	99,69	89,72
Gross profit	148,65		0	198,32	98,98	148,65

Simulation from Table 2 indicates that for an increase / decrease in the value of production by 20%, gross profit increases / decreases by 33.4%, and if it keeps the profit value, while lowering fixed costs by 10%, total production value is about 96% of the initial. Breakeven point value for a production value of 900 lei / head is 361 lei / head.

CONCLUSIONS

Economic efficiency in the production of goat milk refers to the value of all inputs used. Of all the means of production technically efficient, it must be chosen the one that attracts the minimum amount of inputs, which involves economic efficiency.

Determination of economic efficiency must be based on knowledge of the elements that characterizes the production effort and has three main sources:

- Optimal use of resources;
- Rational use of labour;
- Production management.

Regarding the size of income from milk goats' operation activities, it depends on:

• production of milk obtained and the by-products;

- prices level;
- costs of production factors;
- interest on loans;
- forms of state support;
- economic, natural and biological factors that influence income.

BIBLIOGRAPHY

1. Andronic B.-C.,2000 – Performanţa firmei – abordare transdisciplinară în analiza microeconomică, Polirom Publishing, Iaşi
2. Chiran A., Gîndu Elena, Banu A., 2002 – Economia creşterii animalelor – teorie şi practică, Bucharest
3. Dinu E., Analiza economică şi financiară a firmei, Cap.5, www.biblioteca-digitala.ase.ro/biblioteca/carte
4. Gheorghiu Al., 2004 - Analiză economico-financiară la nivel microeconomic, Economică Publishing, Bucharest
5. Gherasim A., 2007 – *Perfecţionarea metodologiilor de analiză şi evaluare a eficienţei economice la nivelul firmei integrate în economia de piaţă,* PhD Thesis
6. Grodea Mariana, 2013 – *Piaţa laptelui în România – evoluţii şi tendinţe post-aderare,* publicată în Determinanţi economici, sociali şi instituţionali ai performanţelor şi securităţii alimentare, pag.301-3016, ISBN 978-973-27-2367-8
7. I.C.E.A.D.R., 2012 – P.S. ADER 211- *Determinarea indicatorilor tehnico-economici ai tehnologiilor de producţie la produsele vegetale şi animale aplicate în vederea creşterii performanţelor de mediu (costuri, productivitate, rentabilitate, marjă brută)*, Stage III – *Proiectarea metodologiei de estimare şi evaluare a activităţii din producţia vegetală şi animală*
8. Jilăveanu Ciulinaru I. Denisa Carmen, 2005 – Cercetări privind sporirea eficienţei economice a producţiei de cereale şi de plante tehnice în judeţul Călăraşi, PhD Thesis
9. Johnson J., Baum K., Prescot R., 1985 - *Error and limitations in economic indicators and agricultural policy analysis*, USDA, www.amstat.org/sections/srms/Proceedings/papers/
10. Oancea Margareta, 2003 – *Managementul modern în unităţile agricole*, Ceres Publishing, Bucharest
11. Parmacli D., Stratan A., 2010 – Eficienţa economică a producţiei agricole, IEFS Publishing Complex, Chişinău
12. Penot E., Marie Bar, Hélène David-Benz, 2013 - Use of relevant economic indicators for the evaluation of farming systems in terms of viability, resilience, vulnerability and sustainability: the case of the Lake Alaotra region in Madagascar, hal.archives-ouvertes.fr/.../penot_bar_benz_V3_IFSA_with_figures_viab...
13. Popescu, Gh., 2002 - Evoluţia gândirii economice, Edition II, George Bariţiu Publishing, Cluj-Napoca
14. Postelnicu Gh., 1994 - Economie politică, vol. I, curs litografiat, U.B.B. Cluj-Napoca
15. Proiect ADER 121 - Faza 9 - Studiu privind conservarea eficienţei economice a producţiei vegetale şi animale, în condiţiile intervenţiilor pentru creşterea performanţelor de mediu, Bucureşti, 2014
16. Sandu Gh., 1995 – Modele experimentale în zootehnie, Coral Sanivet Publishing, Bucharest
17. Şteliac Nela - Cheltuielile şi costurile de producţie – abordări conceptuale, (www.oeconomica.uab.ro.)
18. Tănăsescu Rodica, 1997 – *Analiza economică*, curs litografiat, U.S.A.M.V., Bucharest
19. Turek Rahoveanu A., 2006 – Forme de exploatare a terenurilor în condiţiile agriculturii româneşti – PhD Thesis
20. Vâlceanu Gh., Robu V., Georgescu N., 2004 - Analiză economico-financiară, Economică Publishing, Bucharest
21. Zaman Ghe., Geamănu Marinela, 2006 – Eficienţă economică, România de Mâine Foundation Publishing , Bucharest
22. http://www.cuttingcost.wordpress.com