Evaluation of the effectiveness of intensification costs

Hodnocení efektivnosti intenzifikačních nákladů

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Abstract: The article concerns an evaluation of intensification costs in an agricultural enterprise. Intensification cost dynamics are evaluated in comparison with the in-kind production volume. Using unit cost, unit intensification cost, unit non-intensification cost, unit intensification differential cost, and unit differential cost as indicators, the effectiveness of intensification costs is assessed. The effectiveness is expressed through absolute and relative changes in costs and in the economic results. The said changes include production expansion effect, relative change in costs and economic results due to unit intensification cost, relative change in cost and economic results due to unit non-intensification cost, and relative change in costs and economic results due to unit cost. The individual changes are arranged into a pyramid and, after the supplementation of the change in average market price, they can be used for comprehensive appraisal. The evaluation of the dynamics of individual indicators and interrelations thereof provides an integrated view of the subject in question. As the individual alternatives are rather extensive, only the growing and constant effectiveness of intensification costs are evaluated within the article. The decreasing effectiveness of intensification costs will be discussed in a separate study.

Key words: economic result, production dynamics, cost dynamics, unit cost, unit intensification cost, unit non-intensification cost, in-kind production unit price, production expansion effect, relative and absolute change in costs, relative change in costs due to unit cost, due to unit intensification cost, pyramidal model of indicators

Abstrakt: Článek se zabývá hodnocením intenzifikačních nákladů v zemědělském podniku. Je hodnocena dynamika intenzifikačních nákladů k naturálnímu objemu produkce. Pomocí ukazatelů jednotkový náklad, jednotkový intenzifikační náklad, jednotkový neintenzifikační náklad, jednotkový přírůstkový náklad intenzifikační a jednotkový přírůstkový náklad je posuzována efektivnost intenzifikačních nákladů. Tato efektivnost je vyjádřena pomocí absolutních a relativních změn vlastních nákladů a hospodářského výsledku. K uvedeným změnám náleží efekt z rozšíření výroby, relativní změna vlastních nákladů a hospodářského výsledku vlivem jednotkového intenzifikačního nákladu, relativní změna vlastních nákladů a hospodářského výsledku vlivem jednotkového neintenzifikačního nákladu a relativní změna vlastních nákladů a hospodářského výsledku vlivem jednotkového nákladu. Jednotlivé změny jsou sestaveny do pyramidy a po doplnění změny průměrné realizační ceny mohou sloužit pro komplexní posouzení. Hodnocení dynamiky jednotlivých ukazatelů a jejich vzájemných vztahů dává ucelený pohled na danou problematiku. Poměrná rozsáhlost jednotlivých variant způsobila, že je vyhodnocena rostoucí a neměnná efektivnost intenzifikačních nákladů. Klesající efektivnost intenzifikačních nákladů bude předmětem samostatné studie.

Klíčová slova: hospodářský výsledek, dynamika produkce, dynamika vlastních nákladů, jednotkový náklad, jednotkový intenzifikační náklad, jednotkový neintenzifikační náklad, cena naturální jednotky produkce, efekt z rozšíření výroby, relativní a absolutní změna vlastních nákladů, relativní změna vlastních nákladů vlivem jednotkového nákladu, vlivem jednotkového intenzifikačního nákladu, pyramidální model ukazatelů

The saturated agricultural products market together with the introduction of price liberalisation led to a decreased demand for agricultural products and thus the economic issue of optimum production intensity was re-opened.

West-European countries use two methods to solve the above-mentioned issue:

a) The route of extensive development of production connected with low intensity as well as adjusted low technological and constructional costs.

b) The route of high intensity using, in particular, the effect of high production utilisation of intensification and non-intensification costs.

Most certainly, foreign countries have not chosen the mean course of average production intensity with relatively high requirements for intensification investments.

The selection of the right economic strategy for the solution of the optimum production intensity must be built on good theoretical knowledge of the economic consequences of the intensification process, which we

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believe has not been solved sufficiently in the economic theory. To solve the issue, basically two questions must be answered:

a) What is the minimum production intensity needed to ensure the required profitability?
b) What is the effectiveness of further growth in production intensity?

The minimum production intensity has already been discussed in this journal (Střeleček 2002).

This contribution is particularly devoted to the theoretical aspects of the growth effectiveness of intensification costs.

DEFINITION OF INTENSIFICATION AND NON-INTENSIFICATION COSTS

Intensification costs are costs the change of which is in a causal relation to production volume. Intensification costs are usually increased in order to achieve an increased production volume. Intensification costs constitute the principal part of variable costs in each area. For example, plant-production intensification costs include seed and seedling costs, costs of fertilizers and manures, variable costs of labour, and costs of chemical and biological agents. Regarding livestock production, the main intensification costs include the costs of feed, variable costs of labour, and costs of breeding and the utility value of livestock.

Intensification cost effectiveness is measured directly or indirectly. *Direct intensification cost effectiveness* is partly composed of the economy of expending the costs and partly a result of the relationship between the intensification cost dynamics and production volume dynamics. *Indirect intensification cost effectiveness* is given by mediated consequences that are in particular due to changes in production volume. These include relative changes in the non-intensification costs due to production volume changes and changes in the economic result volume due to production volume changes.

Non-intensification costs are costs the presence of which in the production process is necessary to a certain degree; however, the increase of such costs is not in a causal relation to the production intensity and thus is undesirable from the viewpoint of the economics of the production process. As regards acceptability, non-intensification costs have the character of fixed costs. With the growing volume of production, their share in production unit usually declines.

Non-intensification cost effectiveness is given partly by the economy of the consumption thereof and partly by the maximum production utilisation thereof, which involves the achievement of maximum production compared with the respective value of the non-intensification cost.

The definition of intensification and non-intensification costs is affected by many factors. An exact definition of them is rather difficult so we usually focus on the evaluation of decisive cost items in our assessments.

AGGREGATE LEVEL OF INDICATORS

Intensification cost effectiveness is *a term pertaining to the economics of the individual agricultural production areas.* Even though this category can be defined and described in general, its actual behaviour and actual evaluation will always be connected with a particular agricultural production branch. That is why the evaluation of basic cattle feed effectiveness will be used for illustration hereinafter.

Intensification cost effectiveness can be assessed *at various organisational and time levels.* Most frequent is the assessment of the results of the entire production unit for a certain period. We then speak about the intensification cost (feed) effectiveness of a livestock stable for the whole economic year. However, it is very inconvenient to make an inter-company comparison of these data. Therefore it is more effective to use a so-called *comparable production base,* i.e. one part of the average annual state, one hundred feeding days, or one feeding day. The results of the whole livestock stable (farm) are then multiples of the results within the comparable production base. The costs of such a production base will be hereinafter referred to as *production base cost/revenue rate.* Similarly, it is useful to define the production base production intensity, i.e. milk yield per one dairy cow of the average annual state or milk yield per 100 feeding day doses or per 1 feeding day. However, it is always necessary to define the production base expense rate and the production base production intensity in the same manner in order to be able to compare the results.

INDICATORS USED

The following indicators will be used for the evaluation of effectiveness of intensification costs.

Q_1, Q_0 — In-kind unit production volume in the compared (1) and basic (0) periods

C_1, C_0 — Average price of an in-kind production unit in the compared and basic periods

VN_1, VN_0 — Costs in periods 1 and 0

HV_1, HV_0 — Economic results in periods 1 and 0

ΔVN — Absolute change in costs

$$\Delta VN = VN_1 - VN_0$$

jN_1, jN_0 — Unit cost in periods 1 and 0

$$jN_1 = \frac{VN_1}{Q_0} \qquad jN_0 = \frac{VN_0}{Q_0}$$

jdN — Unit differential cost

$$jdN = \frac{VN_1 - VN_0}{Q_1 - Q_0}$$

$\Delta VN/Q$ — Relative change in costs due to a production volume change

$$\Delta VN/Q = jN_0\,(Q_1 - Q_0)$$

$\Delta VN/jN$ Relative change in costs due to unit cost change

$$\Delta VN/jN = (jN_1 - jN_0)\, Q_1$$

VNI_1, VNI_0 Intensification costs in periods 1 and 0

VNN_1, VNN_0 Non-intensification costs in periods 1 and 0

jNI_1, jNI_0 Unit intensification cost in periods 1 and 0

$$jNI_1 = \frac{VNI_1}{Q_1} \quad jNI_0 = \frac{VNI_0}{Q_0}$$

$jdNI$ Unit differential intensification cost

$$jdNI = \frac{VNI_1 - VNI_0}{Q_1 - Q_0}$$

jNN_1, jNN_0 Unit non-intensification cost in periods 1 and 0

$$jNN_1 = \frac{VNN_1}{Q_1} \quad jNN_0 = \frac{VNN_0}{Q_0}$$

$\Delta VN/jNI$ Relative change in costs due to unit intensification cost change

$$\Delta VN/j\mathrm{NI} = (jNI_1 - jNI_0)\, Q_1$$

$\Delta VN/jNN$ Relative change in costs due to unit non-intensification cost change

$$\Delta VN/jNN = (jNN_1 - jNN_0)\, Q_1$$

ABSOLUTE AND RELATIVE CHANGES IN COSTS

The effectiveness of costs can be expressed through the absolute change in costs, relative change in costs due to unit cost change, and relative change in costs due to production volume change.

Absolute change in VN is given by

$$\Delta VN = VN_1 - VN_0$$

The relative change in costs due to unit cost change is built on the assumption that identical production volume is produced with different unit costs. This change is given by the equation

$$\Delta VN/jN = (jN_1 - jN_0)\, Q_1$$

A growing unit cost is linked to a relative excess of costs; a decreasing unit cost is linked to a relative saving of *VN*.

The production volume being constant, the relative change in costs equals the absolute change in costs. The production volume varies proportionally based on the cost volume, the unit cost remains constant and thus the relative change in costs is zero within the absolute change in costs. Production volume changes that are non-proportional to the change in costs lead to both absolute and relative changes in costs.

Relative change in costs due to production volume change

This change is based on the proportional relationship between the production volume and costs. It is given by the equation

$$\Delta VN/Q = jN_0\, (Q_1 - Q_0)$$

Total change in VN is the sum of the relative change in costs due to production volume change and due to unit cost change

$$\Delta VN = \Delta VN/Q + \Delta VN/jN$$

Let us suppose for the purpose of further considerations that cost items can be, more or less accurately, distinguished as intensification costs and non-intensification costs.

$$VN = VNI + VNN$$

A similar equation also applies to unit costs

$$jN = jNI + jNN$$

Under the above-mentioned assumptions, the relative change in costs due to unit intensification cost change and the relative change in costs due to unit non-intensification cost change can be defined.

The relative change in costs due to unit intensification cost is given by:

$$\Delta VN/jNI = (jNI_1 - jNI_0)\, Q_1$$

The relative change in costs due to unit non-intensification cost equals:

$$\Delta VN/jNN = (jNN_1 - jNN_0)\, Q_1$$

Both the aforesaid changes are added as follows:

$$\Delta VN/jN = \Delta VN/jNN + \Delta VN/jNI$$

AGGREGATE DEMONSTRATION OF ABSOLUTE AND RELATIVE CHANGES IN COSTS AND IN THE ECONOMIC RESULTS

The said changes can be arranged into a pyramid in which the indicator of a higher grade is the criterion for the dynamics of the lower-grade indicators (Table 1).

COMPARISON OF UNIT GROWTH COSTS AND UNIT COSTS

To assess the aforesaid relationship, it is useful to realise that a unit cost in the compared period is the weighted mean of the unit differential cost and unit cost in the basic period.

It is then true that:

$$jN_1 = \frac{jN_0\, Q_0 + jdN\, \Delta Q}{Q_1 + \Delta Q} \quad \text{,where } \Delta Q = Q_1 - Q_0$$

Table 1. Dispersion pyramid of changes in the profit volume and changes in costs

Indicator	Change in profit volume	Change in costs
Total absolute change	$\Delta Z = Z_1 - Z_0$	$\Delta VN = VN_1 - VN_0$
Dispersion of the total absolute change		
Impact of changes in prices	$\Delta Z/C\ (C_1 - C_0)\ Q_1$	
Relative change due to production volume change	$\Delta Z/Q = (c_0 - jN_0)\ (Q_1 - Q_0)$	$\Delta VN/Q = jN_0\ (Q_1 - Q_0)$
Relative change due to unit cost change	$\Delta Z/jN = -(jN_1 - jN_0)\ Q_1$	$\Delta VN/jN = (jN_1 - jN_0)\ Q_1$
Dispersion of the relative change due to unit cost change		
Relative change due to unit intensification cost change	$\Delta Z/jNI = -(jNI_1 - jNI_0)\ Q_1$	$\Delta VN/jNI = (jNI_1 - jNI_0)\ Q_1$
Relative change due to unit non-intensification cost change	$\Delta Z/jNN = -(jNN_1 - jNN_0)\ Q_1$	$\Delta VN/jNN = (jNN_1 - jNN_0)\ Q_1$
Dispersion of the relative change due to unit non-intensification cost change		
Relative change due to change in the production utilisation of non-intensification costs	$\Delta Z/Q_1/Q_0 = -N_0\ (1 - Q_1/Q_0)$	$\Delta VN/Q_1/Q_0 = VNN_0\ (1 - Q_1/Q_0)$
Relative change due to non-intensification cost change	$\Delta Z/VNN = -(VNN_1 - VNN_0)$	$\Delta VN/VNN = VNN_1 - VNN_0$

Provided that the production volume grows, the following relationships between the unit diferential cost and unit cost are true.

If $jdN > JN_0$ then the unit cost grows ($jN_1 > jN_0$).
If $jdN = JN_0$ then the unit cost remains constant ($jN_1 = jN_0$).
If $jdN < JN_0$ then the unit cost falls ($jN_1 < jN_0$).

If the unit cost is replaced with the price in the above-mentioned formulae, the following relationships can be defined:

If $jdN < C$, then the economic results volume in the compared period is higher than that in the basic period.

If $jdN = C$, then the economic results volume in the compared period equals the economic results in the basic period.

If $jdN > C$, then the economic results volume in the compared period is lower than that in the basic period.

To assess the unit differential intensification cost, analogical relationships such as those between the unit differential cost and unit cost can be used.

The unit intensification cost in the compared period is the weighted mean of the unit intensification cost in the basic period and the unit differential intensification cost.

$$jNI_1 = \frac{jNI_0\ Q_0 + jdNI\left(Q_1 - Q_0\right)}{Q_0 + Q_1 - Q_0}$$

Provided that the production volume grows, the following relationships apply:

If $jdNI > jNI_0$, then the unit intensification cost in the compared period is higher than the unit intensification cost in the basic period.

If $jdNI = jNI_0$, then the unit intensification cost in the compared period equals the unit intensification cost in the basic period.

If $jdNI < jNI_0$, then the unit intensification cost in the compared period is lower than that in the basic period.

To compare the impact of the effectiveness of intensification and non-intensification costs in more detail, it is useful to clarify the relationships between both unit differential costs.

From the definition of these costs arises:

$$jdN = jdNI + jdNN$$

where $jdNN$ – unit differential non-intensification cost

$$\frac{VN_1 - VN_0}{Q_1 - Q_0} = \frac{VNI_1 - VNI_0}{Q_1 - Q_0} + \frac{VNN_1 - VNN_0}{Q_1 - Q_0}$$

If $jdNI < jdN$, then the non-intensification cost growth is positive and the unit differential non-intensification cost is also positive.

If $jdNI = jdN$, then the non-intensification cost growth is zero and the unit differential non-intensification cost is also zero.

If $jdNI > jdN$, then the non-intensification cost change is negative (non-intensification cost decrease) and the unit differential non-intensification cost is also negative.

Thus, by comparing the unit differential intensification cost and unit differential cost, the non-intensification cost dynamics can be judged.

CLASSIFICATION OF INTENSIFICATION COST DEGREES OF EFFECTIVENESS

Based on the interdependence between the production volume and intensification/non-intensification cost dynamics, different numbers of degrees of effectiveness can be determined for profitable and unprofitable productions.

The characteristics of each degree of the effectiveness of intensification costs can be divided into three categories:

1. The expression of relationships between simple indicators can be used to reliably and easily identify the respective degree of effectiveness. To do so, the relationship between index and growths in the production volume and intensification costs (or the relationship between the development of the unit differential cost and unit intensification cost, or the unit cost and the price) is used.
2. The description of the impact of the individual degrees of effectiveness of intensification costs on the development of the resulting indicators and the increase in the value of the economic consequences thereof. Therefore, the impact of intensification cost degrees of effectiveness on production, development of the profitability rate and volume, and the profit volume will be evaluated.
3. Overall economic assessment of the individual degrees of effectiveness of costs.

A general prerequisite for the definition of intensification cost degrees of effectiveness will be the fact that the price of an in-kind production unit is constant and is at the same level as in the basic period (C_0). From the aforesaid, it arises that the impact of a change in prices on the economic result volume is evaluated independently from the degrees of effectiveness of the costs.

For the classification of the degrees of effectiveness itself, the categorisation according to the following three points of view is significant:

a) Direct effectiveness of intensification costs. This viewpoint divides the effectiveness into three groups: growing, constant, and falling.
b) Production volume dynamics. The production volume grows, remains constant, and falls.
c) Profitability of production. In the basic period, production is profitable, profitability is zero, and production is unprofitable.

It can be assumed that, based on this systemisation, the explanation is the merit of the subject in question and a careful reader will acquire a very detailed insight.

DEGREE OF GROWING EFFECTIVENESS OF INTENSIFICATION COSTS

This effectiveness degree is based on the relationship $jdN_1 < jNI_0$. As a result, the unit intensification cost is decreasing and the relative saving of costs due to the unit intensification cost positively affects the economic result dynamics.

The degree of growing effectiveness of intensification costs has nine alternatives for production growth and profitable production in the basic period with the following evaluation:

Alternative 1: $jdN < jdNI < jNI_0 < jN_0 < C_0$

Consequences:

1. $jdNI < jNI_0$ => jNI is decreasing, relative saving of costs due to jNI occurs ($\Delta VN/jNI < 0$).
2. $jdN - jdNI < jN_0 - jNI_0$ => jNN is decreasing, relative saving of costs due to jNN occurs ($\Delta VN/jNN < 0$).
3. $jdN < jN_0$ => jN is decreasing, relative saving of costs due to jN occurs ($\Delta VN/jN < 0$).
4. $jdN < jdNI$ => non-intensification costs are decreasing
5. $jN_0 < C_0$ => profit growth due to production expansion occurs ($\Delta Z/Q > 0$).

The relative saving of costs is a sum of the relative savings of intensification costs and relative savings of non-intensification costs. With the production volume growing, profit increases progressively. Profit growth is composed of the relative savings of intensification and non-intensification costs and profit due to production expansion.

Alternative 2: $jdN = jdNI < jNI_0 < jN_0 < C_0$

Consequences:

1. $jdNI < jNI_0$ => jNI is decreasing, relative saving of costs due to jNI occurs ($\Delta VN/jNI < 0$).
2. $jdN - jdNI < jN_0 - jNI_0$ => jNN is decreasing, relative saving of costs due to jNN occurs ($\Delta VN/jNN < 0$).
3. $jdN < jN_0$ => jN is decreasing, relative saving of costs due to jN occurs ($\Delta VN/jN < 0$).
4. $jN_0 < C_0$ => profit growth due to production expansion occurs ($\Delta Z/Q > 0$).
5. $jdN = jdNI$ => the intensification cost difference equals the cost difference, thus, the non-intensification costs remain constant.

The relative saving of unit non-intensification cost is composed of the production utilisation thereof.

The relative saving of costs is an aggregate of the relative saving of intensification costs and the relative saving of non-intensification costs. With production volume growing, profit increases progressively. Profit growth is composed of the relative savings of intensification and non-intensification costs and profit due to production expansion.

Alternative 3: $jdNI < jdN < jNI_0 < jN_0 < C_0$

Alternative 4: $jdNI < jdN = jNI_0 < jN_0 < C_0$

Alternative 5: $jdNI < jNI_0 < jdN < jN_0 < C_0$

Consequences:

1. $jdNI < jNI_0$ => jNI is decreasing, relative saving of costs due to jNI occurs ($\Delta VN/jNI < 0$).
2. If $jdN - jdNI < jN_0 - jNI_0$ => jNN is decreasing, relative saving of costs due to jNN occurs ($\Delta VN/jNN < 0$). If $jdN - jdNI = jN_0 - jNI_0$ => jNN is constant, zero relative change in costs due to jNN occurs ($\Delta VN/jNN = 0$). The relative saving of costs is composed only of the relative saving of intensification costs.
   If $jdN - jdNI > jN_0 - jNI_0$ => jNN is growing, relative excess of costs due to jNN occurs ($\Delta VN/jNN > 0$).

The relative saving of costs is lower than the relative saving of the intensification costs by the relative excess of non-intensification costs.

3. $jdN < jN_0$ => jN is decreasing, relative saving of costs due to jN occurs ($\Delta VN/jN < 0$).
4. $jdNI < jdN$ => non-intensification costs are growing.
5. $jN_0 < C_0$ => profit growth due to production expansion occurs ($\Delta Z/Q > 0$).

The relative saving of costs is given by the aggregate of the relative saving of intensification costs and relative change of non-intensification costs. With the production volume growing, profit increases progressively. Profit growth is composed of the relative saving of costs and profit due to production expansion.

Alternative 6: $jdNI < jNI_0 < jdN = jN_0 < C_0$

Consequences:

1. $jdNI < jNI_0$ => jNI is decreasing, relative saving of costs due to jNI occurs ($\Delta VN/jNI < 0$).
2. $jdN - jdNI > jN_0 - jNI_0$ => jNN is growing, relative excess of costs due to jNN occurs ($\Delta VN/jNN > 0$).

The non-intensification cost growth drains the saving of intensification costs due to a higher production utilisation thereof as well as the relative saving of intensification costs.

3. $jdN = jN_0$ => jN is constant, zero relative change in costs due to jN occurs ($\Delta VN/jN = 0$).
4. $jDNI < jdN$ => non-intensification costs are growing
5. $jN_0 < C_0$ => profit growth due to production expansion occurs ($\Delta Z/Q > 0$).

The non-intensification cost growth fully drains the relative saving of intensification costs and relative saving of non-intensification costs due to a higher production utilisation thereof. With the production volume growing, profit increases proportionally. Profit growth is composed of the profit due to production expansion.

Alternative 7: $\mathrm{jdNI} < \mathrm{jNI}_0 < \mathrm{jN}_0 < \mathrm{jdN} < \mathrm{C}_0$

Consequences:

1. $jdNI < jNI_0$ => jNI is decreasing, relative saving of costs due to jNI occurs ($\Delta VN/jNI < 0$).
2. $jdN - jdNI > jN_0 - jNI_0$ => jNN is growing, relative excess of costs due to jNN occurs ($\Delta VN/jNN > 0$).
3. $jdN > jN_0$ => jN is growing, relative excess of costs due to jN occurs ($\Delta VN/jN > 0$).
4. $jN_0 < C_0$ => profit growth due to production expansion occurs ($\Delta Z/Q > 0$).

This growth is fully drained by the falling effectiveness of the non-intensification costs.

The non-intensification cost growth fully drains the relative saving of intensification costs, relative saving of non-intensification costs due to the higher production utilisation thereof, and the part of profit due to production expansion. Profit volume increases degressively. Profit growth is composed of the part of profit due to production expansion.

Alternative 8: $jdNI < jNI_0 < jN_0 < jdN = C_0$

Consequences:

1. $jdNI < jNI_0$ => jNI is decreasing, relative saving of costs due to jNI occurs ($\Delta VN/jNI < 0$).
2. $jdN - jdNI > jN_0 - jNI_0$ => jNN is growing, relative excess of costs due to jNN occurs ($\Delta VN/jNN > 0$).
3. $jdN > jN_0$ => jN is growing, relative excess of costs due to jN occurs ($\Delta VN/jN > 0$).
4. $jN_0 < C_0$ => profit growth due to production expansion occurs ($\Delta Z/Q > 0$).

The growth is fully drained by the falling effectiveness of non-intensification costs.

The non-intensification cost growth fully drains the relative saving of intensification costs, relative saving of non-intensification costs due to a higher production utilisation thereof, and profit due to production expansion. With the production volume growing, the profit volume remains constant.

Alternative 9: $jdNI < jNI_0 < jN_0 < c_0 < jdN$

Consequences:

1. $jdNI < jNI_0$ => jNI is decreasing, relative saving of costs due to jNI occurs ($\Delta VN/jNI < 0$).
2. $jdN - jdNI > jN_0 - jNI_0$ => jNN is growing, relative excess of costs due to jNN occurs ($\Delta VN/jNN > 0$). 3. $jdN > jN_0$ => jN is growing, relative excess of costs due to jN occurs ($\Delta VN/jN > 0$).
4. $jN_0 < C_0$ => profit growth due to production expansion occurs ($\Delta Z/Q > 0$).

The growth is fully drained by the falling effectiveness of non-intensification costs.

5. $C_0 < jdN$ => relative excess of costs is so high that it also reduces the profit volume in the basic period.

The non-intensification cost growth fully drains the relative savings of intensification costs, savings of non-intensification costs due to the higher production utilisation thereof, the profit growth due to production expansion, and, moreover, it causes a profit decrease. With the production volume growing, the profit volume is falling.

The degree of growing effectiveness of intensification costs may, with production volume expansion, lead to the most dynamic growth of profit volume. On the other hand, in the event of an unfavourable relationship of non-intensification costs, growing production volume can result in a decrease in profit volume.

Degree of growing effectiveness of the costs of production with zero profitability in the basic period

Zero profitability in the basic period is based on the relationship $JN_0 = C$. In such a case, the effect of production expansion is zero. Of the alternatives we have assessed, alternatives 1–5 will result in progressive growth of profit, which is linked to the higher effectiveness of costs. Regarding alternative 6, the profit volume remains zero with the production volume growing. Alternatives 7–9 lead to decreased loss with production volume growing.

Degree of growing effectiveness of the costs for unprofitable production in the basic period

Unprofitable production in the basic period is based on the relationship $jN_0 > C$. In such an event, the effect of production expansion is not an increased profit but a loss. Then, the loss will grow with production volume expansion in alternatives 6–9. As it is true that $C_0 < jN_0$, jdN will have to be compared with C_0 in alternatives 1–5. If $jdN < C_0$, the loss volume with production volume growing will fall. If $jdN = C_0$, the loss volume will remain at the basic period level, and if $jdN > C_0$, loss will grow with production expansion.

DEGREE OF CONSTANT EFFECTIVENESS OF INTENSIFICATION COSTS

This degree of effectiveness is based on the relationship $jdNI = jNI_0$, from which it arises that the unit intensification cost remains constant and the relative change in costs is given by the non-intensification cost effectiveness.

The degree of constant effectiveness of the intensification costs has seven alternatives for production growth in the case of profitable production with the following evaluation:

Alternative 1: $jdN < jdNI = jNI_0 < jN_0 < C_0$

Alternative 2: $jdN = jdNI = jNI_0 < jN_0 < C$

Alternative 3: $jdNI = jNI_0 < jdN < C_0$

Consequences:
1. $jdNI = jNI_0$ => jNI is constant, zero relative change in costs due to jNI occurs ($\Delta VN/jNI = 0$).
2. $jdN - jdNI < jN_0 - jNI_0$ => jNN is decreasing, relative saving of costs due to jNN occurs ($\Delta VN/jNN < 0$).
3. $jdN < jN_0$ => jN is decreasing, relative saving of costs due to jN occurs ($\Delta VN/jN < 0$).
4. $jN_0 < C_0$ => profit growth due to production expansion occurs ($\Delta Z/Q > 0$).

The relative saving of costs equals the relative saving of non-intensification costs. With production volume growing, profit increases progressively. The profit growth is a result of the relative saving of costs and profit growth due to production expansion.

Alternative 4: $jdNI = jNI_0 < jdN = jN_0 < C_0$

Consequences:
1. $jdNI = jNI_0$ => jNI is constant, zero relative change in costs due to jNI occurs ($\Delta VN/jNI = 0$).
2. $jdN - jdNI = jN_0 - jNI_0$ => jNN is constant, zero relative change in costs due to jNN occurs ($\Delta VN/jNN = 0$).
3. $jdN = jN_0$ => jN is constant, zero relative change in costs due to jN occurs ($\Delta VN/jN = 0$).
4. $jN_0 < C_0$ => profit growth due to production expansion occurs ($\Delta Z/Q > 0$).

With the production volume growing, the profit volume increases proportionally. Profit growth is given by the profit growth due to production expansion.

Alternative 5: $jdNI = jNI_0 < jN_0 < jdN < C_0$

Consequences:
1. $jdNI = jNI_0$ => jNI is constant, zero relative change in costs due to jNI occurs ($\Delta VN/jNI = 0$).
2. $jdN - jdNI > jN_0 - jNI_0$ => jNN is growing, relative excess of costs due to jNN occurs ($\Delta VN/jNN > 0$).
3. $jdN > jN_0$ => jN is growing, relative excess of costs due to jN occurs ($\Delta VN/jN > 0$).
4. $jN_0 < C_0$ => profit growth due to production expansion occurs ($\Delta Z/Q > 0$).
   A part of the growth is drained by the falling effectiveness of non-intensification costs.

The relative excess of costs equals the relative excess of non-intensification costs. With production volume growing, profit increases degressively. Profit growth is composed of the part of profit growth due to production expansion.

Alternative 6: $jdNI = jNI_0 < jN_0 < jdN = C_0$

Consequences:
1. $jdNI = jNI_0$ => jNI is constant, zero relative change in costs due to jNI occurs ($\Delta VN/jNI = 0$).
2. $jdN - jdNI > jN_0 - jNI_0$ => jNN is growing, relative excess of costs due to jNN occurs ($\Delta VN/jNN > 0$).
3. $jdN > jN_0$ => jN is growing, relative excess of costs due to jN occurs ($\Delta VN/jN > 0$).
4. $jN_0 < C_0$ => profit growth due to production expansion occurs ($\Delta Z/Q > 0$).
   The growth is fully drained by the falling effectiveness of non-intensification costs.

The relative excess of costs equals the relative excess of non-intensification costs. With production volume growing, profit volume remains constant.

Alternative 7: $jdNI = jNI_0 < jN_0 < C_0 < jdN$

Consequences:
1. $jdNI = jNI_0$ => jNI is constant, zero relative change in costs due to jNI occurs ($\Delta VN/jNI = 0$).
2. $jdN - jdNI > jN_0 - jNI_0$ => jNN is growing, relative excess of costs due to jNN occurs ($\Delta VN/jNN > 0$).
3. $jdN > jN_0$ => jN is growing, relative excess of costs due to jN occurs ($\Delta VN/jN > 0$).
4. $jN_0 < C_0$ => profit growth due to production expansion occurs ($\Delta Z/Q > 0$).
   The growth is fully drained by the falling effectiveness of non-intensification costs.

The relative excess of costs equals the relative excess of non-intensification costs. With production volume growing, profit volume decreases. The profit growth due to production expansion is not able to cover the relative excess of costs.

The degree of constant effectiveness of costs can be connected with the progressive growth of profit as well as with the growing loss. Everything depends on the relationship between the non-intensification cost growth and the production utilisation thereof and the profit due to production expansion.

Degree of constant effectiveness of the costs of production with zero profitability in the basic period

Zero profitability in the basic period is expressed through the relationship $jN_0 = C$. In such a case, the effect of production expansion is eliminated and profit dynamics basically depend on non-intensification cost effectiveness. Of the alternatives we have assessed, the first three are linked to progressive profit growth. The profit growth is only based on saving of non-intensification costs. Alternative 4 brings about zero profitability even if production is expanded. In the remaining alternatives (5, 6, and 7), production expansion is connected with a loss equalling the relative excess of non-intensification costs.

Degree of constant effectiveness of costs for unprofitable production in the basic period

Unprofitable production in the basic period is expressed through the relationship $jN_0 > C$. In such a case, the company does not generate profit based on production expansion but, on the contrary, a loss based on production expansion. In alternatives 1, 2, and 3, the relationship between jdN and C_0 must be compared in order to assess the dynamics of loss.

If $jdN < C_0$, the relative savings of non-intensification costs are significant enough to eliminate the loss due to production expansion; the volume of loss decreases with growing production volume.

If $jdN = C$, then the relative saving of non-intensification costs eliminates the loss due to production expansion and the volume of loss remains at the basic period level.

If $jdN > C$, then the loss due to production expansion is higher than the relative saving of non-intensification costs and the total volume of loss increases with production expansion.

CONCLUSION

The evaluation of intensification costs effectiveness is given relatively very little attention in the economic theory. Usually, only the direct effectiveness of intensification costs resulting in a change in unit intensification costs is evaluated. The goal of this article was to review the complete effectiveness of intensification costs, i.e. both direct and indirect. Clearly defined relationships between the individual indicators and between the dynamics thereof made it possible, through combinatory analysis, to determine a final number of alternatives for the individual degrees of cost effectiveness. The evaluation has two levels. Within the individual alternatives, the tendencies of the development of individual indicators are assessed and, simultaneously, a procedure for the expression of relative and absolute changes in the economic results and costs is proposed. A simple, final number of indicators allows for the successful application of this methodology in the business practises of companies.

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