Methods of calculating the handicaps of less favoured natural conditions

Metodické přístupy ke kalkulaci omezení vlivem méně příznivých podmínek

Marie ŠTOLBOVÁ, Tomáš HLAVSA, Michaela LEKEŠOVÁ

Institute of Agricultural Economics and Information, Prague, Czech Republic

Abstract: The authors address the issue of determining the size of less favoured area payments so that such payments, in compliance with the objectives of the measure, will be the compensation for the farmers' additional costs and income forgone due to the handicap of agricultural production in the area concerned. Alternative methods for the calculation of the handicaps caused by the less favoured conditions have been verified. A new methodology of determining the basic LFA payments level is proposed for the following program period. Similarly, a method for calculating the envisaged impacts of changes in the EU Common Agricultural Policy after 2013 on the natural handicap compensation is proposed and verified.

Key words: LFA, natural handicaps payments, economic results of farming, calculation methods

Abstract: Autoři se zabývají problémem stanovení výše plateb LFA tak, aby v souladu s cíli opatření kompenzovaly dodatečné náklady a ušlé příjmy, které zemědělcům vznikají v souvislosti se znevýhodněním dotyčné oblasti z hlediska zemědělské výroby. Jsou ověřeny variantní metodické přístupy pro výpočet omezení vlivem méně příznivých podmínek. Je navržena nová metodika stanovení základní úrovně plateb LFA pro příští programové období. Navržen a ověřen je způsob provedení modelových propočtů předpokládaných dopadů změn Společné zemědělské politiky EU po roce 2013 na výši kompenzací v méně příznivých podmínkách.

Klíčová slova: LFA, kompenzační platby, ekonomické výsledky hospodaření, metody kalkulace

Unlike American farming, the European agricultural model is focused not only on the generation of profits but also on the provision of complete services of agriculture. The differences between these two concepts were compared and summarized by Fischler (2005). He stated that European farmers were also supported in mountainous areas and in less favoured areas where agricultural production was not competitive and where the extra costs were reimbursed by the natural handicap payments, because it was possible to maintain the cultural landscape.

In the Czech Republic, the emphasis is also put on the multifunctional role of agriculture and its importance for the landscape maintenance. Agriculture is an important factor of the social-economic development of the countryside according to Hrabánková and Boháčková (2009). The necessity of supporting sustainable multifunctional agriculture under the Czech natural and environmental conditions was also expressed by Majerová (2007), Doucha and Foltýn (2008), Hudečková and Lošťák (2008), Miškolci (2008) and Střeleček et al. (2008) in their works.

In the recent years, it has been discussed how the rural development measures can be better integrated into Common Agricultural Policy (CAP). Findings of the analysis of the territorial dimension of the CAP (Dax and Hovorka 2007) indicate that almost all CAP measures have remained horizontal across whole nations or regions, except in Less Favoured Areas (LFA) and areas designated for agri-environmental programmes.

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The aid scheme to farmers in Less Favoured Areas, which has been in place since 1975, has provided a mechanism for supporting the continuation of farming and thus maintaining the countryside in mountain areas, in less favoured areas other than mountains and in the areas affected by specific handicaps. In the period 1975–1999, the objectives of payments were the continuation of farming, the maintenance of a minimum population and the conservation of the countryside. After the CAP reform in 2000–2006, the main objectives were slightly shifted to the continued use of agricultural land, to maintaining a viable rural community, to maintaining the countryside and maintaining and promoting sustainable farming systems. The current EU legal regulation (EC 1698/2005) justifies the necessity of supporting farmers in less favoured areas as follows: Natural handicap payments in mountain areas and payments in other areas with handicaps should contribute, through the continued use of agricultural land, to maintaining the countryside, as well as to maintaining and promoting sustainable farming systems.

The ssupport for less favoured areas was investigated by the European Court of Auditors in 2003 (European Court of Auditors 2003). A number of significant weaknesses in the LFA implementation were highlighted in the Court of Auditors report. The main findings of the audit were: the Commission had an insufficient evidence that the classification of LFAs was valid because the Member States used a wide range of indicators to determine whether the areas were less favoured or not, the monitoring of the LFA scheme was poor, the Commission did not have enough sound information on the impact of the measure, in particular whether the level of compensation was justified (overcompensation could occur).

Several critical points raised by the Court have been solved. An extensive and comprehensive evaluation report of the LFA measure was elaborated (IEEP 2006). The Commission and member states are currently carrying out a deep review of the existing classification of the LFA delimitation. The Joint Research Centre for DG Agriculture and Rural Development has provided a clear definition and scientific justification for 8 common bio-physical soil and climate criteria that have been identified by a group of experts as defining the natural constraints for agriculture in Europe (JRC 2008). During 2010, the application of a new delimitation scheme will be tested and after 2013, new LFAs will be delimited in the EU member states.

The research is at present also focused on the support level for farmers in the LFA. The main rationale for the continued public support has to be communicated very clearly (Dax 2005; Dax and Hovorka 2007). An analysis of LFAs across Scotland showed that the review of the eligibility criteria and a better distribution of funds between different regions and farm types could give a greater weight to delivering the socio-economic objectives (Schwarz et al. 2007).

Systems for calculating the level of the LFA payment rates vary among countries and usually represent modifications from those used prior to the Regulation EC 1257/1999 (CJC Consulting 2003). The IEEP evaluation report of the LFA (IEEP 2006) states, that the methods of setting payment rates appeared to be more arbitrary than the delimitation of LFAs. The method of the payment calculation, no matter how complicated or sophisticated it may be, in most cases includes some degree of arbitrariness. In some cases, the process of arriving at a certain payment for a certain farm appears to rely on a multitude of factors so that the transparency is lost, as in France (IEEP 2006). In some countries, a sophisticated system of payments rates is used, for example in Austria or Bavaria (CJC Consulting 2003, Hovorka 2004). On the other hand, the Czech Republic, despite many different natural conditions, uses 6 different payment rates only (Štolbová 2008). The conclusion is that a better guidance is needed on the measurement of handicaps, the use and interpretation of base-lines, and the presentation of the compensatory payment calculations to provide a more effective and transparent implementation of the LFA policy in the future (IEEP 2006).

The Regulation EC 1698/2005 revised the approaches for calculating the payment and linked them unequivocally to natural handicaps for agriculture. Payments should compensate for the farmers' additional costs and income forgone related to the handicap for agricultural production in the area concerned.

After 2013, not only the new delimitation of LFAs, but also new methods of calculating the natural handicap payments are to be introduced.

This paper asks the following questions: What economic indicators may serve as objective parameters to determine the amount of support for farming activities under less favoured conditions? How to ensure the effectiveness of such support to achieve the objective of the measure? What method determining the basic rate level should be chosen to avoid overcompensation on one hand and inadequate compensation on the other?

The authors propose a new methodology of how to determine the basic LFA payment levels for the next programming period and propose the method of how to carry out model calculations of the envisaged impacts of changes in the Common Agricultural Policy after 2013.

MATERIAL AND METHODS

The current LFA payment rates for 8 different types of LFAs were fixed just before the Czech Republic accession to the EU during the Horizontal Rural Development Plan (HRDP) preparation. There was a limited set of information about the economic results of agricultural enterprises in different natural condition in the Czech Republic. The Farm Accountancy Data Network (FADN) was being introduced and calculation methods were not yet in compliance with the EU standards. The basic levels of payments were partly calculated on the economic data of the years 1999–2001 (difference between the LFA and non-LFA farms), and partly assessed on a normative base. There was no precise information to what extent the FADN farms represented the LFA types. The Land Parcel Identification System (LPIS) had not been established yet. On the other hand, in the base years of 1999–2001, the economic results of farms were minimally influenced by subsidies.

At present, more precise information is available. First, the authors have applied the formula for the HRDP basic payment rate calculation on the economic results of farms in the years after the Czech accession to the EU. Then the formula was made more accurate and the calculation method was adjusted to the changed situation in agriculture.

The Farm Accountancy Data Network CR was used as the basic database for the determination of the economic results of farms under various natural conditions. Data for four years after the accession of the Czech Republic to the EU were available, i.e. the results for the years 2004–2007.

The FADN farms were classified according to the individual LFA types and areas outside LFA in accordance with the share of their utilized agricultural area (UAA) in the individual types of LFA on the basis of the Land Parcel Identification System and the farmer's block included in the LFA. The FADN farms were classified as representative for the mountain areas if more than 50% of the utilized agricultural area was located in mountain land blocks. The FADN farms were classified as the LFA other than a mountain LFA in the case where more than 50% of the UAA was located in land blocks designated as "Other" LFA or areas with specific handicaps. Areas outside LFA are represented by the FADN farms with more than 95% of the UAA in land blocks not included in the LFA. The FADN farms that failed to fulfill these given conditions were excluded from further analyses as irrelevant to the representation of the examined groups.

Gross farm income (GFI) was used as the key indicator for the assessment of the differences in economic results of farms. GFI is defined as the difference between the Total Output (including Balance of Current Subsidies and Taxes) and Intermediate Consumption. Regional differences in the costs of Asset Depreciation, Wages and Rents were also taken into consideration. The total volumes as well as the individual items of Current Subsidies, including in particular the LFA payments were used for the calculation formula. The indicators (all items according to the EU FADN standard results) for the representatives of the LFA and non-LFA were calculated per 1 hectare of the UAA, as an average for 2004–2007.

The impacts of various methodologies on the calculation result of differences in economic performance were evaluated on the background of various classifications of the FADN farms:

(1) *Classification: All farms*

All farms cultivating agricultural land were taken into consideration. The resulting calculations of handicaps were influenced by the different structure of the groups of representatives in the individual LFA types from the viewpoint of the type of farming undertaken. Farms growing wine grapes, vegetables, flowers and ornamentals, fruit and other farms with production in good soil and climatic conditions constituted the group of farms outside the LFA. This group represented a benchmark of the income level. The difference between the benchmark and the income level of the LFA farms was the basis for compensation for worse production conditions in the LFA. The same procedure was used for the next classification of farms. We concentrated on two main farm types using the FADN typology of agricultural holdings.

(2) *Classification: Dairy cows – milk production*

This group includes only farms producing milk and breeding dairy cows. In terms of the FADN classification, they are: Specialist milk production , Specialist milk production with cattle-rearing, Cattle – dairying with rearing and fattening, Cattle – rearing and fattening with dairying, Mixed livestock, mainly dairying and Dairying combined with field crops.

(3) *Classification: Crop production*

Farms producing mainly crops. This group includes the following production: Specialist cereals (other than rice), oilseeds and protein crops, Specialist root crops, Cereals and root crops combined, Various field crops, Mixed cropping, mainly field crops, Field crops combined with dairying. It must be noted that only a small number of farms included in this group come from the mountainous areas (22–37 farms in the individual years) and therefore the results for mountainous areas are only approximate.

In addition to the above-mentioned groups of farms, the LFA farms breeding suckle cows were compared

with the LFA farms producing mainly plants to estimate the amounts of payments necessary to achieve the desirable extensification of the LFA agriculture. Only farms with more than 50% UAA in the LFA land blocks were included into this analysis.

At first, the algorithm used for the Horizontal Rural Development Plan of the Czech Republic (HRDP 2004–2006) was critically assessed. The basic criterion of the assessment of this method was the compliance of the LFA payments with the other Common Agricultural Policy (CAP) payments referring to the double financing of handicaps. An analysis of the impact of the LFA payments on the economic results of farms in the years 2004–2006 was also used (Štolbová and Hlavsa 2008). This analysis indicated that in some cases, due to the current LFA payments rates, overcompensation could occur.

Various scenarios for the determination of the economic disadvantage of farms due to natural conditions were proposed. The results of calculations according to the proposed individual scenarios were compared with the HRDP calculation methodology.

RESULTS AND DISCUSSION

For the HRDP, the following methodology of calculating the basic LFA payment rates was used as expressed by the formula:

$$R = D - S \quad (1)$$

Where:
R = base rate of LFA payment per ha
D = difference of GFI without current subsidies of LFA farms and non- LFA farms
S = reduction of external factors of LFA farms in com parison with non -LFA farms

$$D = \left[\frac{\sum_{i \in nonLFA}^{n} (GFI_i - CS_i)}{\sum_{i \in nonLFA}^{n} UAA_i} \right] - \left[\frac{\sum_{i \in LFA}^{n} (GFI_i - CS_i)}{\sum_{i \in LFA}^{n} UAA_i} \right] \quad (2)$$

Where:
GFI = Gross farm income
CS = Current subsidies
$\{nonLFA\}$ = non-LFA representatives
$\{LFA\}$ = LFA representatives
UAA = utilized agricultural area
i = individual representative (farm)

$$S = \left[\frac{\sum_{i \in nonLFA}^{n} (Dep_i + W_i + R_i)}{\sum_{i \in nonLFA}^{n} UAA_i} \right] - \left[\frac{\sum_{i \in LFA}^{n} (Dep_i + W_i + R_i)}{\sum_{i \in LFA}^{n} UAA_i} \right] \quad (3)$$

Where:
Dep = Depreciation
W = Wages
R = Rent

The methodology is based on the differences in the Gross Farm Income between the LFA farms and farms outside the LFA after the deduction of Current Subsidies. The difference is adjusted for savings in wage costs, rent and depreciation per 1 UAA hectare in groups of LFA farms in comparison with the farms outside LFA. Such savings are the results of the extensive production in LFA with lower needs for labour, machinery and equipment as well as the lower price of agricultural land expressed as the rent. Calculations according to the 2004–2006 HRDP methodology on the basis of the FADN average 2004–2007 results were designated as M1.

The specification of the GFI was proposed in the first stage of the calculation process. It is based on the fact that in the group of family farms, the remuneration for family members is not reflected in the accounts under the wage cost item, but it increases the family farm income. In family farms, the Gross Farm Income is decreased by the "remuneration" of the unpaid Annual Work Units (AWU). The share of the unpaid AWU may be different in different regions. The proportion of the own land can also influence the differences calculated by the above-mentioned method as this can influence the average rent paid per 1 hectare of agricultural land. Therefore, it was proposed to adjust the Gross Farm Income, as the basis for the calculation, by the following formula:

$$adjGFI = GFI + oAWU + oL \quad (4)$$

Where:
$adjGFI$ = adjusted GFI per ha UAA
$oAWU$ = labour costs on own AWU assessment per 1 ha UAA
oL = own land cost assessment per 1ha UAA

$$oAWU = \left(\frac{wages\ volume(CZK)}{paid\ AWU} \times non\text{-}paid\ AWU \right) \Big/ ha\ UAA \quad (5)$$

$$oL = \left(\frac{rent\ volume(CZK)}{rented\ land(ha)} \times own\ land(ha) \right) \Big/ ha\ UAA \quad (6)$$

Calculations according to such an adjusted methodology on the basis of the FADN average 2004–2007 were designated as M2.

The authors consider the fact that the territorially differentiated effects of the current subsidies were not reflected as a fundamental weakness of the methodology used for the HRDP. The sustainable use of

agricultural land is also supported by direct payments within the framework of the Common Agricultural Policy. Jones (2008) emphasizes that the LFA payments should be set up to be in compliance with the other CAP measures. He also points out that the payments might be overlapped by the support directed to the LFA areas from the direct payment modulations (Council of the European Union 2009). Analyses carried out as a part of the assessment of the possible impacts of the direct payment modulation in the case of Czech agriculture (Medonos et al. 2009) draw attention to the regionally differentiated impact.

As the applicant must carry out farming in compliance with the good agricultural and environmental conditions (GAEC), such payments also contribute to the maintenance of the environmentally friendly systems. Payments to the LFA should be focused on such areas where, despite direct payments, a larger risk of marginalization and land abandonment is threatening. Dax (2006) draws attention to this objective of the LFA payments. The scope of the LFA payments should also be quite distinct from that of agri-environment payments which cover the income foregone and costs incurred due to the specific environmental commitments going beyond the mandatory baseline of the GAEC. The LFA payments should only compensate for the natural disadvantage by covering the additional costs and income foregone related to it.

Therefore, it is not proposed that all current subsidies be subtracted from the Gross Farm Income as it was done according to the 2004–2006 HRDP methodology, but to subtract only the LFA payments. At the time of the HRDP preparation (i.e. prior to the EU accession), all subsidies going into the agricultural sector, both current and investment, amounted to only CZK 3.6 billion in 2000 and CZK 3.7 billion in 2001. Subsidies that could have had a territorially differentiated impact or that would have covered the increased costs, or the reduced earnings, and distort the value of the Gross Farm Income as the basis for the calculation of the compensation, were minimal. Such subsidies included, for example, subsidies for the calcification of arable land (CZK 16 million in 2001) or the support for the conversion of arable land into grassland (CZK 39 million in 2000). The influence of such subsidies on the differences in the Gross Farm Income was negligible and it was ignored.

Currently, all subsidies for agriculture amounted to more than CZK 34 billion in 2007. Business activities in agriculture and the competitiveness of farms are, to a significant extent, influenced by the subsidies from the European or national programs. The differences in the influences of such subsidies on the economic performance of farms with various natural conditions cannot be neglected. For the calculation of the GFI difference, the following formula was used:

$$D = \left[\frac{\sum_{i \in nonLFA}^{n} (GFI_i - P_i)}{\sum_{i \in nonLFA}^{n} UAA_i} \right] - \left[\frac{\sum_{i \in LFA}^{n} (GFI_i - P_i)}{\sum_{i \in LFA}^{n} UAA_i} \right] \quad (7)$$

where:
GFI = Gross farm income
P = LFA payments
$\{nonLFA\}$ = non LFA representatives
$\{LFA\}$ = LFA representatives
UAA = utilized agricultural area
i = individual representative (farm)

Two methodological approaches were employed. In the first case, the differences were calculated taking into account the average Current Subsidies (according to the EU FADN standard results) for the years monitored. Calculations based on the FADN using the average results for the period 2004–2007 taking into account current subsidies, except for the LFA payments, were designated as M3.

In the second case, the modelling of the impact of changes in the individual current subsidies on the differences of economic results in various natural conditions was verified. The adjusted difference in the GFI according to formula 4 was calculated on the average results from 2004–2007. The Current Subsidies per 1 hectare of agricultural land relating to 2007 were then taken into consideration. The impact of changes in the selected direct payments between 2007 and 2008 was projected per 1 ha of the UAA. Differences in the 2008 subsidies and the 2007 subsidies in Czech agriculture were modelled. There have been changes in the value of the SAPS since 2008, and the base of Top-Up per hectares of arable land was converted into that per hectares of agricultural land, the changes of the Top-Up for ruminants, the implementation of the Top-Up payments for suckle cows and the Top-Up for sheep and goats. The calculation of the Other Subsidies per 1 hectare of agricultural land remained at the 2007 level.

The adjusted Gross Farm Income calculated by the formula 4 was further modified as follows:

$$adjGFI^m = adjGFI + \Delta SAPS + \Delta Ru + \Delta L + \Delta SC + \Delta S \quad (8)$$

Where:
$adjGFI^m$ = modified GFI based on the simulation of subsidies changes per 1 ha UAA
$\Delta SAPS$ = changes of SAPS in comparison with basic year per 1 ha UAA
ΔRu = changes of Top-Up on ruminants in comparison with basic year per 1 ha UAA

ΔL = changes of Top-Up on land in comparison with basic year per ha UAA
ΔSC = changes of Top-Up on suckler cow breeding in comparison with basic year per 1 ha UAA
ΔS = changes of Top-Up on sheep and goats in comparison with basic year per 1 ha UAA

Calculations based upon the FADN with the average of 2004–2007 with the model expression of the changes in the current subsidies from 2008 were designated as M3+.

Figures 1–4 show the results according to the different methodological procedures determining the economic handicaps caused by the less favoured natural conditions.

Figure 1 shows the calculations of the differences based on all FADN farm types. The LFA payments determined by using this classification would compensate for the economic results of the LFA farms so that they could achieve the same income level per 1 hectare of UAA as the non-LFA farms enjoying the best natural conditions. Individual methodological procedures provide rather different results. It is apparent that the most recent changes in the Czech current subsidies (other than LFA payments) contributed to the LFA handicap compensation (see M3 and M3+).

Figure 2 shows similar calculations in respect of the FADN farms focused mainly on crop production. The calculated handicap is based on the comparison of similar farms in the terms of the FADN typology. The differences between the LFA farms and the farms outside LFA are lower than in the previous case. It should be noted that these are only informative results, since in particular in the mountain areas, the representation of this type of farming is small.

Figure 3 compares only the FADN farms focused on milk production and dairy cows breeding. The

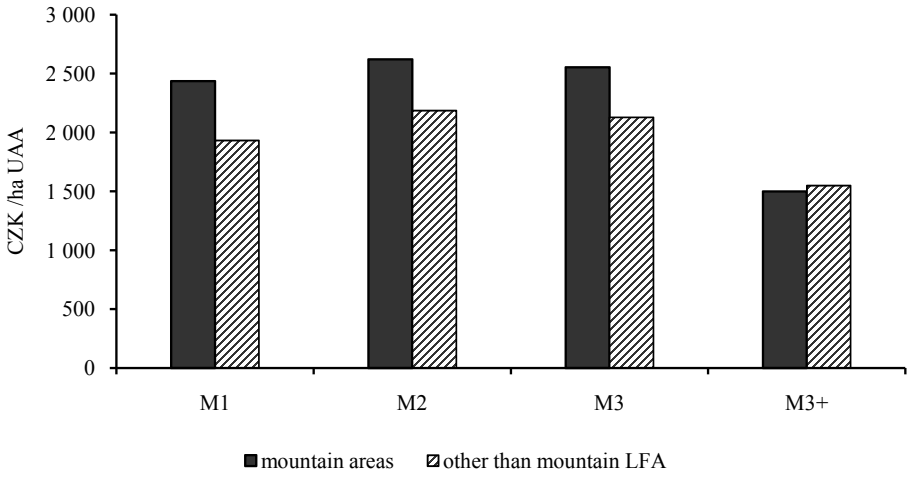

Figure 1. Natural handicap impact on GFI in respect to non-LFA – all FADN enterprises

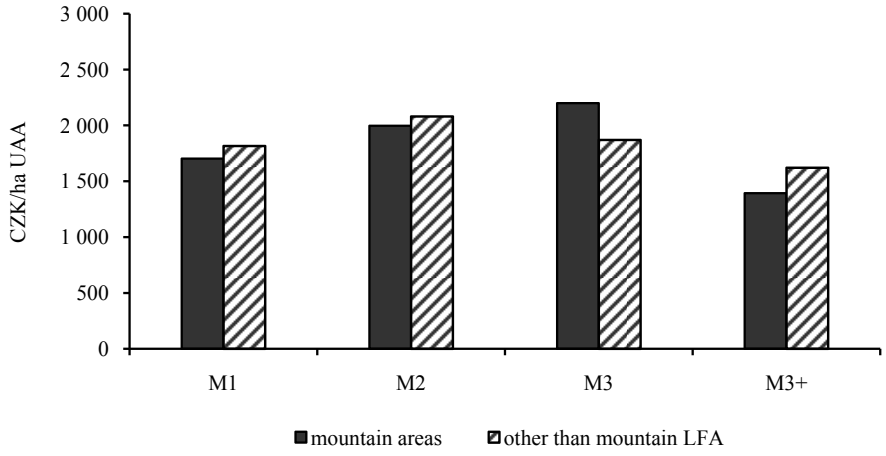

Figure 2. Natural handicap impact on GFI in respect to non-LFA – crop production

M3 methodological procedure reflecting different influences of the subsidies result from the larger handicaps of farms specializing in milk and milk cows in the LFA compared to the M1 and M2 methodologies. On the other hand, when modelling the most recent changes in current subsidies using the M3+ methodology, the size of the calculated handicaps is reduced. This indicates the effect of the influence of current subsidies (other than the LFA payments) on the improvement of economic results in less favoured conditions. The results according to the M3+ methodology also indicate that the information stated by Chatellier and Guyomard (2008) in their work relating to the conditions in France can also be related to the Czech Republic. In their opinion, milk cow breeding is jeopardized in particular in the "Other" LFA. In mountain areas, farms may draw on other subsidies from the pillar II of the CAP to a larger extent. Such a trend can also be seen in the results of calculations using other classifications of the FADN farms (see also Figures 1 and 2).

The size of the handicap of the extensive type of farming in the LFA (focused on suckle cows) was also calculated. In this case, the economic results of the LFA farms focused on crop production was used as a benchmark of the income level. These results are shown in Figure 4. It can be stated that the most recent changes in the Czech support policy have affected mainly pastures and extensive breeding. The calculation of handicaps on the base of M1 or M2 method would not reflect the economic reality well.

CONCLUSIONS

The particular LFA payments rates are influenced by the priorities of the individual countries, their

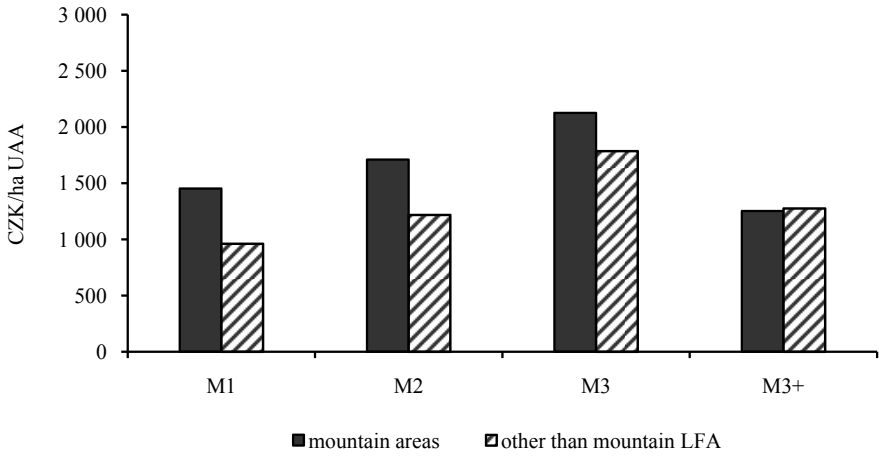

Figure 3. Natural handicaps impact on the GFI in respect to non-LFA – milk and dairy cows

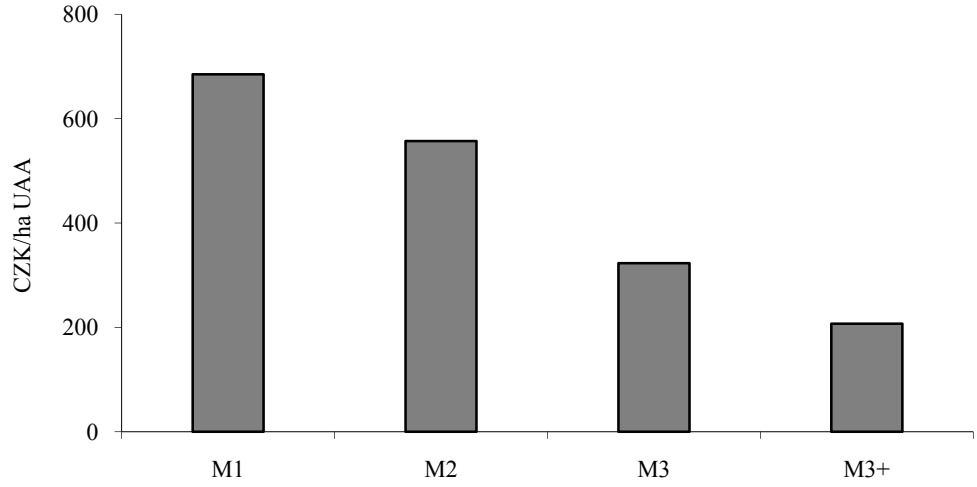

Figure 4. Handicap of extensive production against plant production in the LFA

history, the overall economic situation of the country or the allocative strategy adopted.

Determining the scale of economic handicaps by looking at the increased costs and the reduced income due the unfavourable natural conditions serves as a basis.

To express the difference in the economic results of farms in LFA and outside LFA, we propose using as the economic indicator the Gross Farm Income per hectare of agricultural land adjusted by the remuneration of the unpaid AWU and the evaluation of the owned land. Such a value of the Gross Farm Income would be the average of the period from 2004 up to the most recent year. A long time series of data would eliminate the influences of the weather or price changes on the differences in economic results under the different soil and climatic conditions. The list of the representative items for individual years would have to be statistically treated and the extreme values would have to be excluded.

The results of the calculations carried out using various methods for the identical data file show that the regionally different impact of current subsidies cannot be neglected. The methodology designated here as M3, i.e. the expression of the difference in the economic results, including the impact of current subsidies (except for the LFA payments) on the amount of the adjusted Gross Farm Income, would have to be used for calculating the payments necessary for compensating the differences in the economic results due to farming in less favoured natural conditions.

We propose using the up-to-date model expression, i.e. the M3+ methodology, to determine the level of current subsidies per 1 hectare of agricultural land. The policy of subsidies has significantly changed during the years monitored, in particular concerning direct payments. The authors arrived at the conclusion that using the average subsidies per 1 hectare for agricultural land including all periods since 2004 (i.e. since the accession of the Czech Republic to the EU) distorted the calculations.

The method M3+ might be suitable for calculating the basic LFA payments after 2013. This method will enable the influence of the proposed changes in the system of the CAP support on the economic performance of farms in different soil and climatic conditions to be modelled and the adequate basic amounts of LFA payments to be derived.

To achieve a better targeting of **the LFA payments,** it will be important to take into account other factors, such as **the types of farming, the farm size, the risk of** erosion of agricultural land and other factors, and to differentiate the payments rates accordingly. An *ex ante* analysis of the expected impact of the proposed payment rates should be carried out not only in relation to **the in come per hectare of the UAA, but also** converted to **the annual work unit.**

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Contact address:

Marie Štolbová, Tomáš Hlavsa, Michaela Lekešová, Institute of Agricultural Economics and Information, Mánesova 75, 120 00 Praha 2, Czech Republic
e-mail: stolbova.marie@uzei.cz, hlavsa.tomas@uzei.cz, lekesova.michaela@uzei.cz