# IDENTIFYING THE INTENSITY OF USING AGRICULTURAL FARMING LANDS FOR AGRICULTURE IN LITHUANIA

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**Abstract**
In the Republic of Lithuania the average land productivity score is about 41.8. However, in separate elderates it ranges from 30.5 to 55.1. As a result, it determines different intensity of using agricultural farming lands. Research object - agricultural farming lands in rural municipalities of the republic of Lithuania. Aim of the research – identify the intensity of using Lithuanian agricultural farming lands for agriculture. The following objectives were raised to reach the aim of the research: - analyse statistical data by identifying the index of unused lands; - analyse statistical data by identifying the index of extensive land use.
The research determined that the index of unused land in districts of northern Lithuania hilly uplands is 59 % higher than the average of Lithuania. In the area of Western Lithuania the index of extensive farming was identified as it is in North-East Lithuania. However, the index of unused land within the area is 32 % lower than the mean in Lithuania. It was identified that the correlation coefficient between land production score and that of unused land was 0.58 while it is 0.57 between land production score and extensive farming.
Key words: extensive farming, unused land, land use.

## Introduction

Owing to historical-geopolitical conditions agriculture in Lithuania has more economic and social significance than in neighbouring and EU states. Therefore, agricultural sector performs an important economic, social, environmental, and ethno-cultural function (Aleknavičius, 2007). In addition, it is one of priorities as far as economy is concerned (Alenkavičius, Stravinskienė, 2011). V. Sinkevičiūtė and D. Gudritienė analysed changes of land use in southern Lithuania (Sinkevičiūtė, Gudrtitienė, 2005; 2011). Having analysed the tendencies in the alternation of arable land in Lithuania, V. Sinkevičiūtė and V. Stravinskienė found out the occurring changes of farming lands, the reasons of which are the use of agricultural land not for agricultural purposes, activity of agricultural market and state of reclamation systems as well as naturally occurring alternation of agricultural farming lands and inappropriate farming (Sinkevičiūtė, Stravinskienė, 2005). A. Aleknavičius and P. Aleknavičius, having analysed the intensity of land use within the period of 2008 and 2009, discovered that the index of land use intensity on average in Lithuania constitutes 0.62 whereas in locations not favourable for farming it is 0.40. In Molėtai and Zarasai districts it is 0.17 (Aleknavičius, Aleknavičius, 2010). E. Hatna and M. Bakker analysed the abandonment of arable land in Europe. The assumption that arable land is abandoned in areas not favourable for farming was verified (Hatna, Bakker, 2011).
In the Republic of Lithuania the average land productivity score is about 41.8. However, in separate elderates it ranges from 30.5 to 55.1. As a result, it determines different intensity of using agricultural farming lands.
Research object. Agricultural farming lands in rural municipalities of the Republic of Lithuania.

Aim of the research – identify the intensity of using Lithuanian agricultural farming lands for agriculture.

The following objectives were raised to reach the aim of the research:
- analyse statistical data by identifying the index of unused lands;
- analyse statistical data by identifying the index of extensive land use.

## Methodology of research and materials

The methods of information search, systemising, analysis of cartographic material and statistical data as well as scientific and methodological literature analysis, comparative analysis, and generalization were employed to reach the aims and objectives of the paper. The main data for the research was obtained in Lithuanian Department of Statistics, National Land Service under the Ministry of Agriculture, state enterprise State Land Fund, National Paying Agency under the Ministry of Agriculture, and state enterprise Register Centre. Cartographic data was used for analytic research and data bases, constituting Land Information System.

**Discussions and results**

Impact of land on the land use intensity was analysed when comparing mean statistical indices of municipalities, which describe the relationship between land area and production (relative production of agricultural farming lands). The following main indices were analysed:

$A_{sa}$ – statistical area of agricultural farming lands (excluding gardeners' communities and land of their members), which is provided by State enterprise Centre of Registers. Following the procedure of National land accounts, (Lietuvos..., 2002) this area was calculated on the basis of former precise land accounts until 1990 by annually alternating the areas of land farming lands, which changed due to human agricultural activity (were transferred to building, forest cultivation, water reservoirs, roads, etc.) In theory when agricultural farming lands are not transformed to other farming lands due to natural processes (overgrow with bushes and forests, turn to marshes, etc.), the same area must be used and declared;

$A_{ua}$ – the used (declared) area of agricultural farming lands, ha, provided by National Paying Agency;

$A_{un}$ – the area of unused agricultural farming lands, ha, calculated as a difference between statistical and declared agricultural farming lands: $A_{sa} – A_{ua}$;

P – average land productivity score;

$P_d$ – declared area of pastures and meadows (including perennial grasses), ha, which is provided by National Paying Agency. It is relatively accepted that it includes crops used extensively because the value of agricultural production obtained from this area is the lowest;

$I_{ul}$ – the index of unused lands, calculated according to the formula: $(A_{un} : A_{sa})x100$;

$I_{el}$ – the index of extensive land use calculated according to the formula: $(P_d : A_{ua})x100$.

The research data is provided in table 1.

**Table 1**

The impact of land productivity on the use of agricultural farming lands in Lithuanian municipalities

| Municipality | Index | | | | | | |
|---|---|---|---|---|---|---|---|
| | **P** | **$A_{sau}$** | **$A_{ua}$** | **$A_{un}$** | **$N_{žūn}$** | **$I_{ul}$** | **$I_{el}$** |
| Akmenės r. sav. | 47.4 | 45681 | 40885 | 4796 | 10.50 | 6121 | 14.97 |
| Alytaus r. sav. | 38.7 | 78398 | 60083 | 18315 | 23.36 | 31274 | 52.05 |
| Anykščių r. sav. | 37.5 | 97104 | 76142 | 20962 | 21.59 | 31018 | 40.74 |
| Birštono sav. | 39.7 | 4161 | 4145 | 16 | 0.39 | 1536 | 37.06 |
| Biržų r. sav. | 47.4 | 92566 | 84798 | 7768 | 8.39 | 23384 | 27.58 |
| Druskininkų sav. | 32.7 | 8410 | 4419 | 3992 | 47.46 | 2074 | 46.94 |
| Elektrėnų r. sav. | 36.1 | 23338 | 11410 | 11928 | 51.11 | 4729 | 41.44 |
| Ignalinos r. sav. | 36.2 | 59420 | 42913 | 16507 | 27.78 | 25687 | 59.86 |
| Jonavos r. sav. | 42.65 | 41554 | 36594 | 4960 | 11.94 | 7601 | 20.77 |
| Joniškio r. sav. | 50.5 | 80868 | 81186 | 318 | 0.39 | 5432 | 6.69 |
| Jurbarko r. sav. | 48.0 | 79747 | 63962 | 15786 | 19.79 | 24287 | 37.97 |
| Kaišiadorių r. sav. | 38.5 | 52813 | 40150 | 12663 | 23.98 | 15440 | 38.46 |
| Kalvarijos sav. | 38.3 | 30969 | 24530 | 6439 | 20.79 | 10484 | 42.74 |
| Kauno r. sav. | 48.0 | 71927 | 63066 | 8861 | 12.32 | 13053 | 20.70 |
| Kazlų Rūdos sav. | 38.4 | 16024 | 12788 | 3236 | 20.20 | 5704 | 44.60 |
| Kėdainių r. sav. | 51.65 | 113707 | 103440 | 10268 | 9.03 | 13760 | 13.30 |
| Kelmės r. sav. | 37.6 | 96561 | 83522 | 13039 | 13.50 | 42116 | 50.43 |
| Klaipėdos r. sav. | 38.8 | 68061 | 50777 | 17284 | 25.39 | 26450 | 52.09 |
| Kretingos r. sav. | 39.2 | 51060 | 49816 | 1243 | 2.43 | 18836 | 37.81 |
| Kupiškio r. sav. | 41.8 | 60191 | 52207 | 7984 | 13.26 | 18471 | 35.38 |
| Lazdijų r. sav. | 36.9 | 57259 | 41347 | 15913 | 27.79 | 21805 | 52.74 |
| Marijampolės r. sav. | 48.5 | 52188 | 48672 | 3516 | 6.74 | 12845 | 26.39 |
| Mažeikių r. sav. | 43.3 | 70220 | 63778 | 6442 | 9.17 | 19819 | 31.07 |
| Molėtų r. sav. | 34.6 | 61761 | 37202 | 24559 | 39.77 | 27553 | 74.06 |
| Pagėgių sav. | 37.6 | 37272 | 32956 | 4315 | 11.58 | 20957 | 63.59 |
| Pakruojo r. sav. | 47.5 | 92507 | 82486 | 10021 | 10.83 | 9011 | 10.92 |

**1 table (continued)**

| Municipality | Index | | | | | | |
|---|---|---|---|---|---|---|---|
| | P | $A_{sau}$ | $A_{ua}$ | $A_{un}$ | $N_{žūn}$ | $I_{ul}$ | $I_{el}$ |
| Panevėžio r. sav. | 47.4 | 120921 | 107454 | 13467 | 11.14 | 19287 | 17.95 |
| Pasvalio r. sav. | 52.35 | 95528 | 83648 | 11880 | 12.44 | 10987 | 13.13 |
| Plungės r. sav. | 35.3 | 53156 | 47453 | 5703 | 10.73 | 30963 | 65.25 |
| Prienų r. sav. | 40.5 | 58755 | 47818 | 10937 | 18.61 | 22367 | 46.77 |
| Radviliškio r. sav. | 47.2 | 101192 | 94503 | 6690 | 6.61 | 17756 | 18.79 |
| Raseinių r. sav. | 42.1 | 98546 | 97070 | 1476 | 1.50 | 33734 | 34.75 |
| Rietavo sav. | 35.9 | 20990 | 16770 | 4220 | 20.11 | 11925 | 71.11 |
| Rokiškio r. sav. | 38.4 | 98903 | 81974 | 16929 | 17.12 | 35392 | 43.17 |
| Skuodo r. sav. | 39.9 | 62811 | 54230 | 8580 | 13.66 | 32730 | 60.35 |
| Šakių r. sav. | 48.5 | 97116 | 95291 | 1825 | 1.88 | 16139 | 16.94 |
| Šalčininkų r. sav. | 36.4 | 64087 | 49458 | 14629 | 22.83 | 13935 | 28.18 |
| Šiaulių r. sav. | 45.1 | 97124 | 85794 | 11330 | 11.67 | 16508 | 19.24 |
| Šilalės r. sav. | 34.2 | 64574 | 63644 | 930 | 1.44 | 48058 | 75.51 |
| Šilutės r. sav. | 34.9 | 81984 | 70199 | 11785 | 14.37 | 43576 | 62.07 |
| Širvintų r. sav. | 38.65 | 49143 | 35923 | 13220 | 26.90 | 16429 | 45.73 |
| Švenčionių r. sav. | 36.4 | 45916 | 30908 | 15008 | 32.69 | 9926 | 32.11 |
| Tauragės r. sav. | 37.9 | 57903 | 49907 | 7996 | 13.81 | 34440 | 69.01 |
| Telšių r. sav. | 35.8 | 72167 | 63281 | 8886 | 12.31 | 37698 | 59.57 |
| Trakų r. sav. | 33.2 | 37970 | 22005 | 15965 | 42.05 | 8612 | 39.14 |
| Ukmergės r. sav. | 39.7 | 73620 | 63294 | 10326 | 14.03 | 20902 | 33.02 |
| Utenos r. sav. | 35.1 | 60622 | 40392 | 20229 | 33.37 | 32014 | 79.26 |
| Varėnos r. sav. | 34.2 | 45737 | 34635 | 11102 | 24.27 | 9755 | 28.16 |
| Vilkaviškio r. sav. | 45.2 | 94368 | 83913 | 10455 | 11.08 | 22020 | 26.24 |
| Vilniaus r. sav. | 36.05 | 91127 | 37035 | 54092 | 59.36 | 20110 | 54.30 |
| Zarasų r. sav. | 35.5 | 48606 | 33110 | 15496 | 31.88 | 25076 | 75.73 |
| | 41.85 | 3336630 | 2782981 | 553649 | 16.59 | 1029783 | 37.00 |

The research determined that the index of unused land in districts of northern Lithuania (Zarasai, Ignalina, Utena, Molėtai districts) hilly uplands is 59 % higher than the average of Lithuania while the index of extensive farming is twice as big as the mean, i.t. 72.2 %.

The visualization of the table using ArcGis software shows the extent of unused agricultural farming lands in detail (fig. 1, 2).

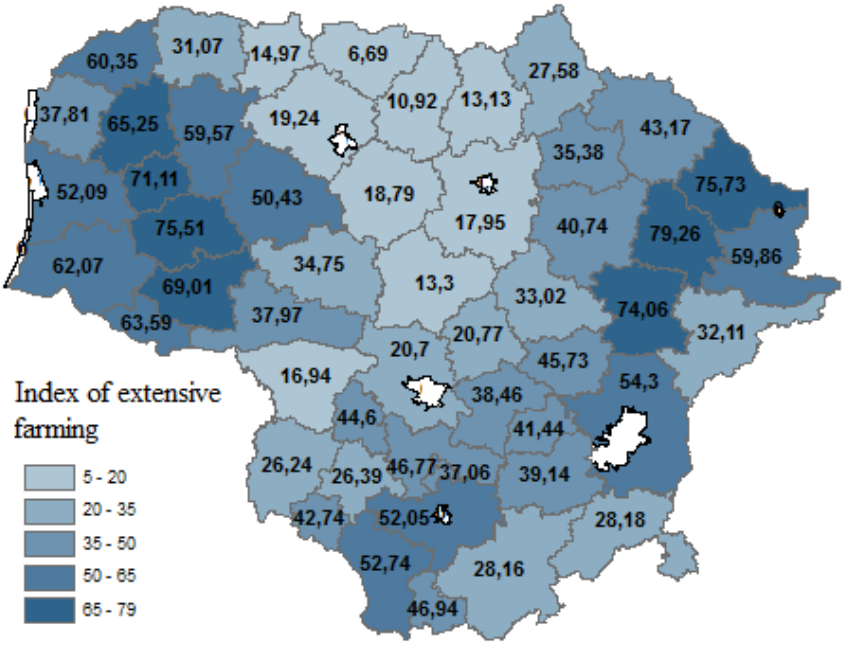


**Fig. 1.** The index of extensive farming.

In the area of Western Lithuania highlands and plateaus (Šilalė, Telšiai, Plungė districts and Rietavas municipality) the same tendency of extensive farming was identified as it is in North-East Lithuania (the index of extensive farming is 67.9). However, the index of unused land within the area is 32 % lower than the mean in Lithuania.

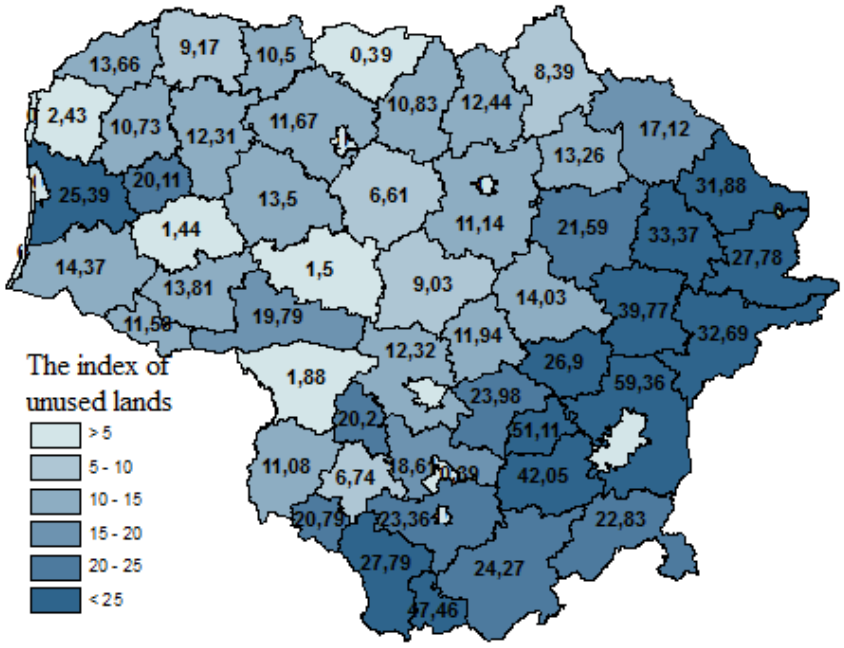


**Fig. 2.** The index of unused land.

In South-East Lithuanian sandflats the index of extensive farming is 9 % higher than the average whereas the one of unused land is twice as high.
Regression analysis of land production and extensive farming index as well as score of unused land was conducted on the basis of the data (fig. 3).

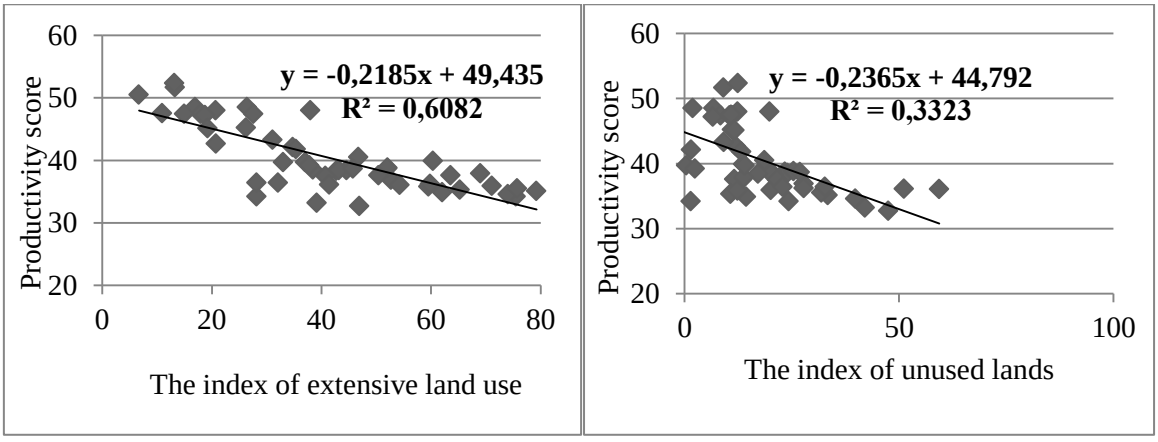


**Fig. 3.** Regression analysis of land production impact on land use in Lithuanian municipalities.

It was found out that land productivity having reduced in 5 points, the area of unused agricultural farmin lands increases by 1.1 % if calculated of all statistical agricultural farmin lands. Land productivity having decreased in 5 points, the area of meadows, pastures and perennial grass crop increases by 1.2 %, calculating of all declared agricultural farmin lands.
It was identified that the correlation coefficient between land production score and that of unused land was 0.58 while it is 0.57 between land production score and extensive farming.

**Conclusions and proposals**

1. The research determined that the index of unused land in districts of northern Lithuania hilly uplands is 59 % higher than the average of Lithuania
2. In the area of Western Lithuania the index of extensive farming was identified as it is in North-East Lithuania. However, the index of unused land within the area is 32 % lower than the mean in Lithuania.
3. It was identified that the correlation coefficient between land production score and that of unused land was 0.58 while it is 0.57 between land production score and extensive farming.

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