

## The Degrees of Soil Suitability in the Municipality of Bužim for the Purpose of Cultivating Potato (*Solanum tuberosum* L.)

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### Abstract

Rational use of available land is of great importance for the economic development of every society, especially when considering the fact, that the soil is a primary production resource, thereby placing an even greater importance on its protection and conservation, but also on the correct use of it. This paper focuses on the municipality of Bužim, located in the north-western part of Bosnia and Herzegovina, where we assessed and examined the soil suitability for the purposes of potato cultivation by using the FAO methodology of AEZ (agro-ecological zoning), which uses input data such as soil characteristics, climate changes, relief patterns of the investigated area, and the requirements of the agricultural crops. Within the municipality of Bužim, 13,026.27 ha of land is used for agricultural purposes. In regards to the potato cultivation, one distinguishes between two categories of soil suitability: the suitable classes (S1, S2, S3) which occupy more than 45% of the land surface, and the unsuitable class (the N class) which only occupies 1.43% of the land surface. Thus, it can be concluded that conditions necessary for potato production do exist within the municipality of Bužim in the form of land resources, and higher yields can be achieved by implementing landscaping measures and introducing new potato varieties in accordance with the latest scientific and expert achievements.

*Key words:* Municipality of Bužim, soil suitability, potato.

## Introduction

The municipality of Bužim is located in the southern part of the northern temperate climate zone and is influenced by continental air currents. Administratively and geographically, it is a part of the Una-Sana Canton, i.e. Federation of Bosnia and Herzegovina. It covers the total area of 13.026,27 ha, which makes it the smallest municipality of the Una-Sana Canton. According to 2013 Census, the population of the municipality was 20.298. In this municipality there are two repartitions of soils/land with associated classes and types, namely automorphic/terrestrial and hydromorphic soils. The total of eight types of soils have been identified: regosol, calcomelanosol, calcocambisol, terra rossa, eutric cambisol, distric cambisol, luvisol, and fluvisol, as well as six land capability classes including two related land capability subclasses. Currently, the relationship between high-quality land and lower quality categories is moving towards fewer quality categories. The purpose of this research is to assess the suitability of soil in the Municipality of Bužim for cultivating potato, taking into account all the required data and analysing them according to the agro-ecological zoning method, and to develop the soil suitability map. The research resulted in three suitable soil classes S1 (9.41) and S2 (19.95%) and S3 (14.96%) and N class of unsuitable soil with 1.43%.

## Materials and Methods

Soil/land as the subject of suitability assessment encompasses a wide array of different suitability factors required for the assessment of the intended use of space (FAO, 1976 and Vidaček et al. (n.d.)). The applied model of agro-ecological zoning is the methodology used for assessing the suitability of soil for agricultural production. The AEZ system is used in order to determine specific limitations for crop cultivation in a certain climate, soil and terrain conditions. A detailed description of the AEZ method used in this research can be found in FAO Guidelines on Agro-Ecological Zoning (FAO Soils Bulletin 73, Rome, 1996). The soil map at the 1:25000 scale of the Municipality of Bužim was used as the basis for the development of this research. The data on boundaries of agro-zones was obtained from the Federal Agro-Pedological Institute, and the data on climate were obtained from the Federal Hydro-Meteorological Institute. Reconciliation of specific requirements of crops, defined by LUT, with the parameters of soil texture, reaction, contents of organic carbon, and soil depth renders the degrees of soil suitability for cultivation of certain crops. The interaction of these parameters results in the final form for land utilization planning.

Tab. 1. Soil/land suitability classes (Biancalani et al., 2004)

Classification	Suitability class	% suitability
S1	Highly suitable	> 80
S2	Suitable	60-80
S3	Moderately suitable	40-60
S4	Limitedly suitable	20-40
N	Unsuitable	< 20

Tab. 2. The Degree of suitability of specific parameters for potato cultivation (Source: Biancalani et al., 2004)

Parameters	S1	S2	S3	N
pH in KCl	5.5-7.5	5.0-5.5	4.5-5.0 7,5-8,0	<4.5>8.0
Depth (cm)	>90	30-90	20-30	<20
Texture	PI, I, PrI, PGI, PrGI, PrG, Pr	GI, PI, PG	G, P	-
Total C	>20	20-10	<10	-

## Results and Discussion

### Soil types

There are two soil orders in the Municipality of Bužim: automorphic/terrestrial and hydromorphic soils. Situated out of reach of the flooding or underground waters and characterized by water percolation through solum, automorphic soils are the dominant ones (Ičanović M., 2016). Due to denser net, the quality of data presented, and the comprehensiveness of the research probes and profiles, eight soil types were observed in the research area and the soil map was developed at the scale of 1:25 000. (Fig. 1.).

In regards to the potato cultivation within the municipality, one distinguishes between two main categories of soil suitability: the suitable S class occupying more than 45% of the land surface, and the unsuitable N class occupying mere 1.43% of the land surface. The suitable S class is furthermore divided into the S1 class occupying 9.41%, the S2 class occupying 19.95%, and the S3 class occupying 14.96% of the total area.

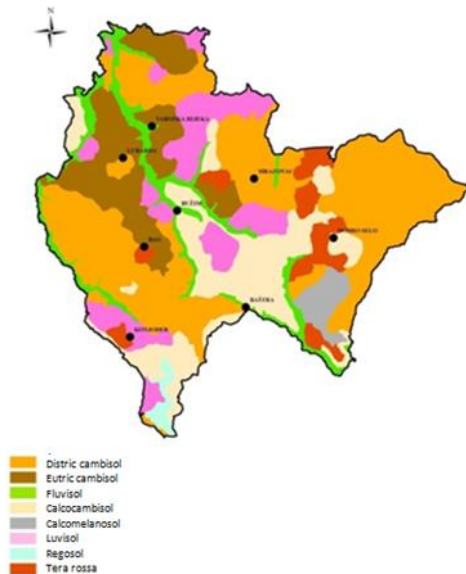


Fig. 1. Soil Map of Bužim Municipality (Ičanović, 2016.)

## S1 class

The areas within the local community Konjodor, located beneath the Konjodor hill, at the entrance from the direction of Cazin and towards the Trepčića hill, are all classified as S1 class of benefits in regards to potato cultivation (Fig. 2.)

Furthermore, within the area of this local community, namely in the village of Elkasova Rijeka, we also found the S1 class of benefits on the curbed soil plateau, and likewise in the local community of Bag, where alluvial sloping plains located around riverbeds are marked with the S1 class of benefits. The total land area covering the villages Bag and Lubarda, and all the way through to the Varoška Rijeka village, is also marked with the S1 class of benefits. This class of benefits is represented within the village of Varoška Rijeka at the lowest altitudes upstream and towards the Varoška Rijeka, and these land areas are marked as Fluvisol soils on the pedological map.

The S1 class of benefits has also been observed within the wider area of the municipality, namely the villages Zaradostovo, Mrazovac, Mrazovo, and Dobro Selo, and at the exit from the Bužim municipality towards Bosanska.

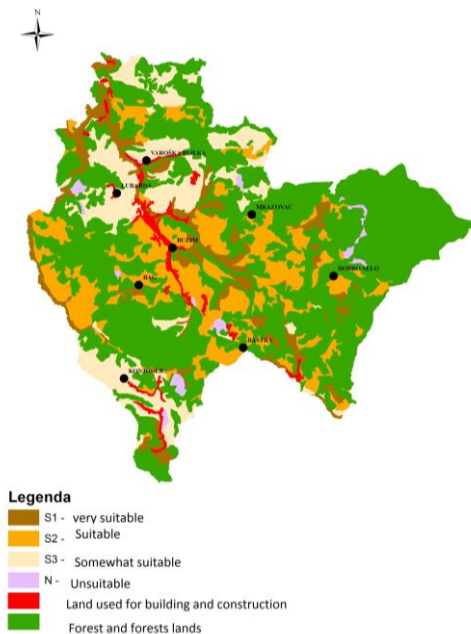


Fig. 2. Representation of the soil suitability for the purpose of potato cultivation within the municipality of Bužim

## S2 class

The largest land areas within the Bužim municipality are classified as S2 class of benefits for the purpose of potato cultivation, and predominantly located in the eastern and southern parts of the municipality, namely in the villages Elkasova Rijeka, Bag, and Varoška Rijeka. (Fig. 2.)

## S3 class

The S3 class of benefits has resulted in two significant nursery gardens within the borders of Bužim municipality (Fig. 2.). One is located in Konjodor, situated between villages of Elkasova Rijeka, and another, significantly larger nursery garden is located in the western part of the municipality encompassing the villages Lubarda and Varoška Rijeka, located on the left side of the regional road towards the city of Velika Kladuša. And likewise, the S3 class of benefits has been observed on the right side of the road, namely in the villages Zaradostovo and Bužim, as well as the towns Bag and Dobro selo.

## N class

N class of benefits occupies mere 1.43% of the municipality's land area, and can be found in villages Klis and Durakovići, the town of Sip located in the local community Dobro selo, and a small part of Lubarda village towards the village Pašin Brod.

Also, one part of the Municipality consists of built land of 1.77%, as well as forest and forest land with a total area of 52.53%.

## Conclusion

Within the Municipality of Bužim there are eight soil types: regosol, calcic melanosol, calcic cambisol, eutric cambisol, distric cambisol, red soil, luvisol, and fluvisol. In terms of the overall soil suitability, three soil classes were observed for potato cultivation: S1, S2, S3 and N class-unfavourable soil.

The S1 class of benefits occupies land areas of lower altitudes, most often brown and Fluvisol soils have been found within the border district, which are not prone to floating or retaining surface waters, and can be recognized by their somewhat lower soil reactions. Of all classes of benefits, this class occupies the least surface area with only 9.41% of the total area of the municipality.

The S2 class of benefits occupies the largest part of the land area within the Bužim municipality totalling at 19.95%, predominantly in the eastern and southern parts of the municipality. Those areas are characterized with a higher terrain inclination and lower soil reaction in contrast to the S1 class, and as presented on the map, located on the marginal edges of Bužim municipality which borders with the cities of Cazin and Velika Kladuša.

The S3 class of benefits is to be found around the local community Konjodor, at the entrance to the Bužim municipality from the direction of the city of Cazin, and the larger one of the two nursery gardens is somewhat smaller at the exit of the municipality towards Velika Kladuša.

Since potato is a fairly tolerant culture and possesses a wide spectrum of cultivation possibilities, so does the land area marked as N soil class occupy mere 1.43% of the municipality's total land area.

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# Процјена погодности земљишта општине Бужим за узгој кромпира (*Solanum tuberosum* L.)

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## Сажетак

Рационално кориштење расположивог земљишта од велике је важности за развој привреде сваког друштва, посебно ако се узме у обзир чињеница да је тло основни ресурс за сваку производњу, што даје још већи значај заштити и очувању, али и правилном кориштењу истог. У овом раду истраживано је подручје општине Бужим, која се налази на сјеверозападу Босне и Херцеговине, у којој смо помоћу FAO методологије АЕЗ (агро-еколошко зонирање) извршили процјену погодности земљишта за узгој кромпира. Наведена методологија као улазне податке користи карактеристике тла, климе и рељефа истраживаног подручја, те захтјеве пољопривредних култура. Укупна површинама пољопривредног земљишта општине Бужим износи 13.026,27 ha. У односу на укупну погодност земљишта за узгој кромпира на подручју општине издвојене су четири класе погодности: S1, S2, S3 и N класа непогодног земљишта, од чега преко 45% површине земљишта се односи на прве три класе погодности, док N класа непогодног заузима свега 1,43% површине. На основу изложеног може се закључити да на подручју општине Бужим постоје услови, у виду земљишних ресурса, за производњу кромпира, а уз провођење мјера уређења тла и увођење новог сортимента у складу с најновијим научним и стручним достигнућима могу се постићи већи приноси.

*Кључне ријечи:* агро-еколошко зонирање, кромпир, општина Бужим, погодност тла.

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*Received:* May 6, 2019  
*Accepted:* February 19, 2020