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[1]Ahmet Sami Erol, [2]Sabit Ersahin, [3]Evgeny Shein, [4]Fariz Mikailsoy, [1]Durmus Ali Ceylan, [5]Fatih Er

EXAMINATION OF CENTRAL ANATOLIA REGION IN TERMS OF SOIL STRUCTURE, PRODUCT DIVERSITY AND PRODUCTIVITY (SAMPLE OF KONYA PROVINCE - CUMRA DISTRICT)

[1]Selcuk University, Cumra Vocational School, Cumra, Konya, Turkey

[2]Cankiri Karatekin University, University, Faculty of Forestry, Cankiri, Turkey

[3]Moscow State University, Faculty of Soil Science, Moscow, Russia

[4]Igdir University, Faculty of Agriculture, Department of Soil Science and Plant Nutrition, Igdir, Turkey

[5]Selcuk University, Cumra School of Applied Science, Cumra, Konya, Turkey

E-mail: aserol@selcuk.edu.tr

Abstract. Soil fertility is among the most important parameters in agriculture. Cumra which is situated in the southern part of Konya Closed Basin, where Central Anatolia's most important agricultural production center surrounded by mountains and has a plain structure. Basin soil which has arable climatic structure and topography, has the young alluvial calcareous soil properties that has occurred over time. Cumra region is an important agricultural area in Turkey, where all kinds of crop production can be made because of climatic conditions and its irrigable. In this study by examining the soil and climatic characteristics of Cumra, its efficiency are discussed. Product diversity and sustainability in terms of economy have been evaluated.

Key words: Central Anatolia, Cumra, soil properties, climate, agricultural productivity, yields.

INTRODUCTION

Soils of Central Anatolia are actively used in agriculture due to their high heat resources, natural fertility, and the availability of water for their irrigation. However, many processes that determine the evolution and contribute to the scientifically substantiated and ecologically safe use of these soils remain poorly unknown [1]. Konya is one of the most important agricultural centers. Due to the ecological aspect of the district a wide variety of plants can be grown at an altitude of 1013. It is built on a land area can be considered flat. Agricultural shows great parallels with the geographical features. Cumra constitutes 7,8 % of the agricultural land of Konya. Around 70 % of the total area of the district presents agricultural land [2].

OBJECTS AND METHODS

Geographical Location of the Study Area

The geographical location of the study area Cumra located between 37^0-38^0 North longitude and 33^0-34^0 East latitude. East of it is surrounded by Karaman (province) and Karapinar (district), west of it is surrounded by Akoren and Bozkir, south of it is surrounded by Guneysinir and Bozkir, north of it is surrounded by city center of Konya, Meram and Karatay. Cumra area is located 1013 meters above sea level. Area is about 2,330 km^2. Plain shows a non-uniform characteristics in terms of topography. 50 % of the land is flat. 17 % of light. 14 % medium batter. And 6 % other 13 % is too steep [2].

Climate of Research Area

Cumra which is located in Konya's closed basin is an important agricultural center that crops are grown together with a wide range of different products. Cumra and its around, winters are cold and snowy. Summers are hot and dry. Fall and spring months are rainy. Summer temperatures are favorable for cultivation of many agricultural products [3]. While the average temperature increases in summer, humidity decreases.

Figure 1 – Map the of study area in Cumra Province

Table 1 – Cumra's Average (1975-2012) and 2013 Temperature Data [4]

Months	Minimum temperature ^{0}C		Average temperature ^{0}C		The highest temperature ^{0}C		Precipitations mm			
	1975-2012	2013	1975-2012	2013	1975-2012	2013	1975-2012	2010	2011	2013
January	-23,7	-13,5	0,1	2,3	18,0	15,3	37,8	43,6	52,9	13,4
February	-26,3	-6,3	1,1	5,3	21,1	19,2	28,3	33,3	40,1	26,4
March	-18,6	-6,2	5,7	7,8	28,2	24,6	31,2	12,1	44,2	14,8
April	-9,7	3,0	11,2	12,1	31,5	28,3	40,9	67,4	48,0	61,2
May	-1,2	7,2	15,7	18,5	33,8	31,7	36,0	12,4	52,5	12,8
June	3,9	9,0	20,0	21,0	37,3	34,9	19,6	47,9	39,5	13,0
July	7,1	10,6	23,0	22,5	39,9	34,4	5,4	0,0	-	4,6
August	4,8	12,5	22,3	22,5	39,2	33,9	3,1	-	1,0	0,2
September	-0,4	4,8	17,9	18,0	39,3	34,9	8,9	1,6	3,8	0,2
October	-5,0	-2,0	12,2	10,1	31,8	30,1	30,6	62,6	32,1	19,4
November	-18,2	-2,5	6,0	8,1	25,0	22,4	34,5	4,2	29,2	20,6
December	-21,8	-14,4	1,9	-2,4	22,1	15,4	42,6	106,8	24,9	17,4
Average	-9,1	0,2	11,4	12,2	30,6	27,1	318,9	391,9	368,2	204,0

The highest temperature compared to the average of many years of harvest data in July with 39,9°C. The lowest temperature has been measured in February as -26,3°C. The average temperature is 11,4°C. Average rainfall is 318,9 mm and the amount of rainfall in 2013 based on an average of many years is 204,0 mm that shows a significant amount of reduction.

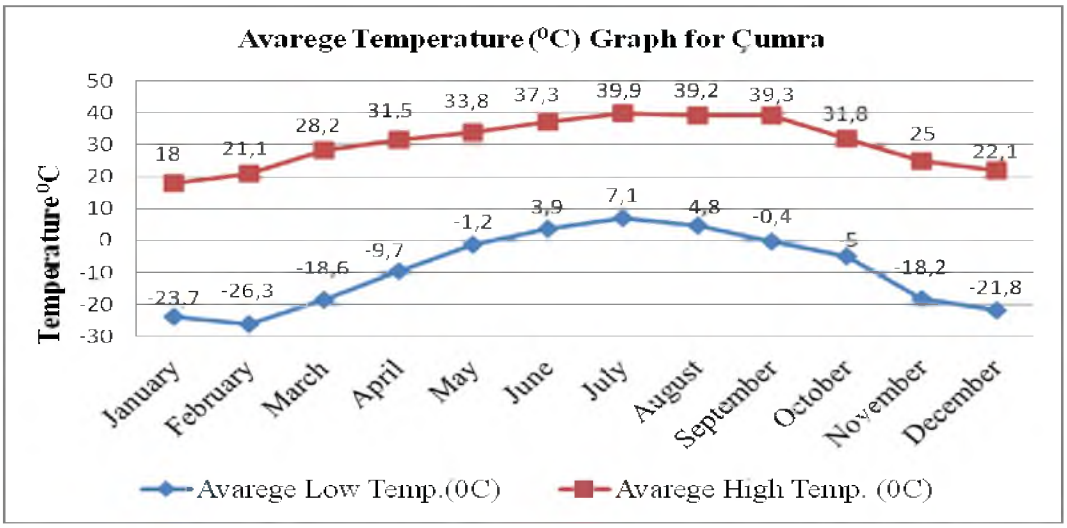

Figure 2 – Long-term (1975-2012) climatic data for Cumra. Konya. Turkey [4]

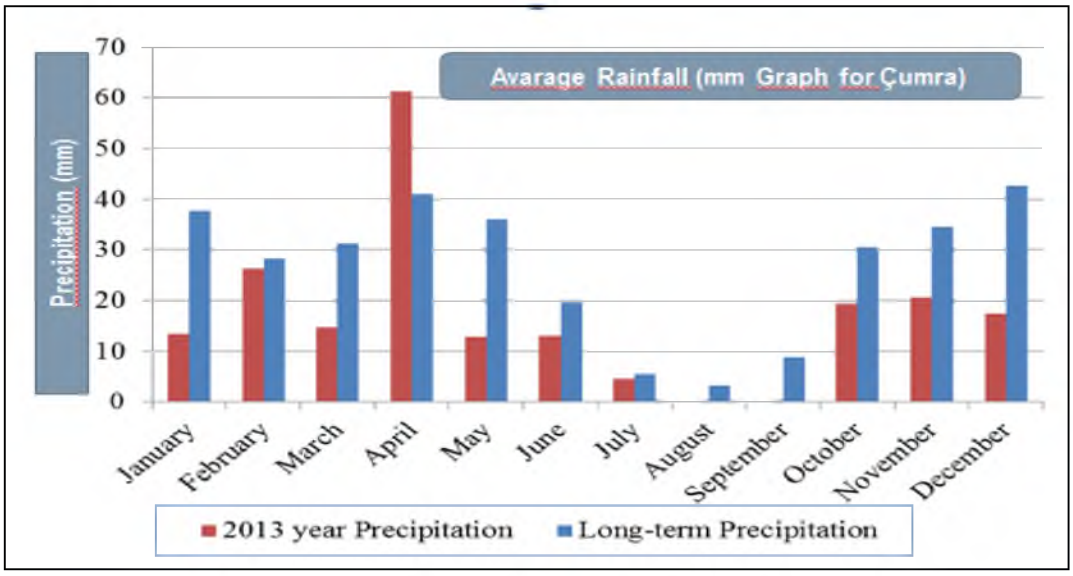

Figure 3 – Rainfall amount average of the years between (1975-2012) and in 2013 [4]

RESULTS AND DISCUSSION

Soil Properties and Water Resources of the Research Area

As the geological elements both Mesozoic and Tertiary formations layer of Quaternary, and Neogene layer and Quaternary alluvium which located on them cover large space. This region is influenced by the Hercynian orogeny and gained the basic shape with Alpine orogeny. During the Neogene period Cumra and its area spent sedimentation. Neogene layers and the alluvials on them are thick on grassy plain; but in mountainous areas they are thin. Cumra and its surrounding area shows a depressed area (subsidence) character. During Neogene period filled with silt from the Taurus Mountains and its surrounding plains along the base is located between 1000-1100 m contour line. At also Cumra Plain which has the same characterictics with Konya Plain covers with the lake whose average depth of 15-20 meters and under the humid and fluvial climate influence during Pleistosen period, was found the remains of the lake [5].

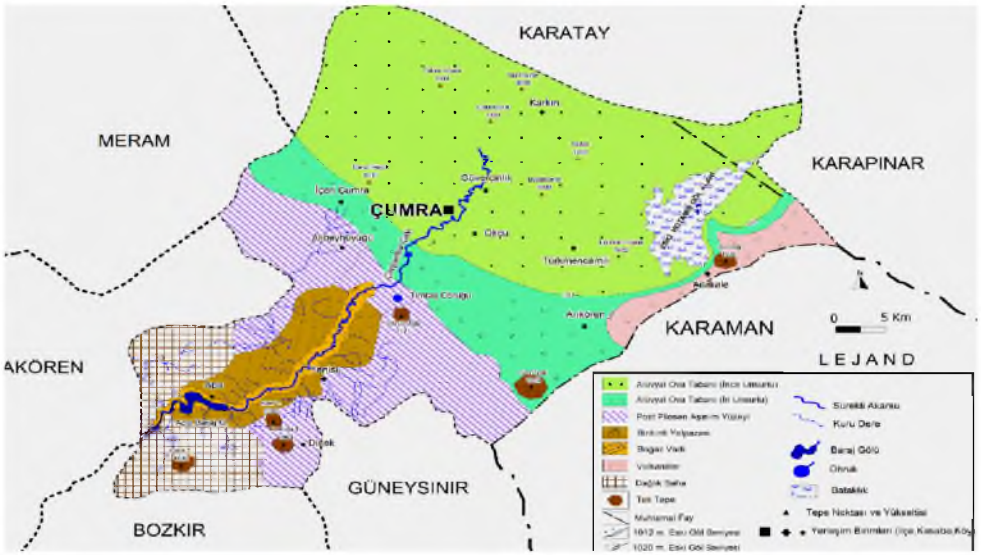

Figure 4 – Cumra area and its main morphological units [6]

Lands of research consists of alluvial soil. They are lime-rich soils which is moved from the surrounding mountains and hills from the fourth time accumulated in the old lake bed. According to the new genetic classification system they are AC horizon soil as vertisol. The upper horizon of the partially decomposed organic waste is seen mixed with mineral. At C horizons (at bottom) is seen the main material which is dissociated and moved from the environment [6].

Cumra agricultural land; bedrock. precipitation. temperature. influenced by conditions such as vegetation and rainfall have led to the emergence of a variety of soil types. In terms of structure of clay loam soil, Cumra soil has a suitable structure for cultivating many agricultural products. They are rich in minerals, young,deep and efficient. However they have problems such as lime, alkalinity (pH=7,5-8,5), drainage and wind erosion. Because of its lime it has toxic effects on plants [2].

While top and bottom soil of all irrigated agricultural areas have a heavy structure, loamy and sandy soil are seen on a small amount. Soil depth is very high. Clay varies between 5 and 75 m depth. While the soil color is light brown sometimes soil color is seen yellowish and whitish tones due to excess lime. Due to most of plain soils remain effect of ground water along the profile from the surface yellowish stains and rust stains resulting from gray iron deficiency may occur. Soil structure is usually 0-30 cm depth in the upper processing angular blocks or granular solid in the down part. And water holding capacity of soil saturation values are quite high. 180-300 cm were attained in the relative barrier layer [6].

According to [7] Er and Erol's study, 100 soil sample which are picked from100 different areas were analyzed separately and identified the characteristics of Cumra agricultural land. According to the analysis of soil structure; 76 % of it is clay loam. 13 % of it is loamy and 11 % of it is clayish. 91,6's % of soil is salty; 2,8 % of soil is lightly salted; 1,4 % of soil is medium salty, 4,8 % of it is too salty and 8 % of it is limy 31 % of sand is medium lime; 31 % of sand is too limy and 30 % of sand is identified as too much limy. When analyzed in terms of the organic substance content 59 % of it contains small amount; 20 % of it contains precious little and 21 % of it contains moderately organic substance. In terms of pH values 98,6 % of it shows slightly alkaline character and 1,4% of it shows neutral characters [7].

Table 2 – Nutrient Distribution of Cumra's Agricultural Soil (%) [7]

Nutrient element	Deficient (%)	Excess (%)
Phosphorus	60	14
Potassium	7	48
Magnesium	12	32
Iron	77	6
Zinc	52	33

Agricultural land of Cumra is not sufficient in terms of macro nutrients nitrogen and phosphorus but it has been brought to a sufficient level with the addition of organic matter and fertilizer. Even if micro elements are in soil decently, they are not plant-available for plants due to the chalky soil [2].

Very few villages in the mountainous terrain of the town is built on the plains. In Apa and Dinek villages forested areas are available. The north, south and east of the district are covered with fertile agricultural areas. The only stream of the district called Carsamba is used for irrigation purposes. This stream is connected a water channel from Beysehir to Cumra. This channel is Turkey's first irrigation channel. And then Apa barrage was built on it. The excess water of Carsamba is drained to Salt Lake with another channel. In addition, Irrigation water are provided from the private wells which are opened and builded with the facility and help of DSI (State Hydraulic Works), Irrigation cooperatives and farmers. Thanks to new wells the amount of irrigated land expands and consequently the wealth and productivity of product increases [8].

Carsamba is the largest and most important rivulet in Cumra. Its source is elevation of Bozkir. Combining with Beysehir Lake's outlet it creates Cumra Plain's irrigation network. Because Cumra Plain located in Konya closed basin there is no outlet port [2].

Field Presence of Research Area

Approximately 60 % of agricultural land can be irrigated in Cumra. Irrigation is done using surface and groundwater resources. The high possibility of irrigation let intensive agricultural practices in the region. At Table 3. the use of the area of the Cumra distribution are given. Also examining the chart can be seen as there is almost no inefficient agricultural areas. Intensive agriculture is done at all agricultural area of Cumra.

Table 3 – Field Distribution of Cumra [2]

Usage	Quantity(ha)	%
Agricultural land	148,440	74,34
Grassland Area	39,558	19,81
Forest Area	3,750	1,88
Dam lake Area	2,220	1,11
The Swamp Area	1,008	0,50
Inefficient Area (slope)	1,430	0,72
Residential property Area	3,282	1,64
TOTAL	199,688	100,00

Research in the area of the pattern of crop production

Production of agricultural land in Cumra where is selected as the study area of the crop growing areas, production quantities, the yield condition are shown in table 4.

Table 4 – Cultivation Area of Agricultural Crops, Production and Yield Condition in 2013 in Cumra [2]

Products	Planted Area (da)	Manufacturing (ton)	Yields (kg/da)
Wheat	435,000	213,000	490
Barley	130,500	48,860	374
Sugar beets	180,940	1,350,000	7461
Sun flowers	134,000	49,100	366
Corn	118,000	252,000	2136
Peas	21,500	3,325	155
Alfalfa	15,000	90,000	6000
Dry beans	60,000	21,600	360
Rye	250	113	452
Potato	15,000	60,000	4000
Oat	300	65	217
Sainfoin	60	66	1100
Vetch	15,000	30,000	2000
Lentil	1,200	112	93333
Safflower	100	7	70

Table 5 – Cultivation Area of vegetables grown in Cumra, its Production and Yield Condition [2]

Products	Planted Area (da)	Manufacturing (ton)	Yields (kg/da)
Tomato	2550	11475	9007
Pumpkin Seeds	6000	840	140
Green Bean	500	550	1100
Melon	5000	25000	5000
Watermelon	2500	10000	4000
Carrot	17000	144500	8500

Table 6 – 2014 Distribution of Field and Production of All Orchards in Cumra [2]

Products	Area of Orchard (da)	Manufacturing (ton)	%
Apple	6085	4728	57 %
Grape	2000	773	19 %
Walnut	1065	15	10 %
Cherry	800	670	7 %
Pear	310	274	3 %
Almond	125	80	1 %
Peach	140	161	1 %
Plum	90	138	1 %
Apricot	100	126	1 %
Quince	41	16	0 %
Total	10756	6981	100

According to the 2013 Cumra's Farmers registration system the largest production area belongs to wheat. As shown in Table 4. total cultivated area of wheat stood at 435,000 decares. The total cultivated area of barley, rye, oat is 131 050 decares. Other major products of Cumra: Sugar beets 80,940 acres, Dry beans 60,000 acres, Peas 21,500 acres, Potatoes 15,000 acres, Forage (alfalfa. sainfoin. vetch) 30 060 acres, Corn 118 000 acres, Sun flowers 134,000 acres.

At table 6 production quantities of fruit available in bulk at Cumra and and its field are given. Accordingly, maximal apple cultivation (in 6085) done in the field and 6,085 tons of product are obtained. In addition, the district has vineyards about 2000 square meters.

CONCLUSION

Cumra is capable of being the center of agriculture. Since Republic Period, Cumra showed continuous improvement in agriculture, and sustained the feature of being a brand (Cumra melon. As Cumra tomatoes) 33 % of the Konya's carrot production belongs to Cumra- Kasinhani. 40 % of the cultivated carrot is exported [2]. When examining the diversity of products and production capacity of Cumra has a great importance as agricultural production. Agriculture is the most important source of livelihood in this region. The most important factor of this situation is the agricultural productivity of the soil and the suitability of climatic factors. In addition; the reason of high crop productivity in the region is presence of irrigation canal and irrigable farm land.

ACKNOWLEDGEMENT

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ТҮЙІН

[1]Ахмет Сами Эрол, [2]Сабит Ersahin, [3]Евгений Шеин, [4]Фариз Микалсой, [1]Дурмус Али Сейлан, [5]Фатих Эр

ОРТАЛЫҚ АНАТОЛИЯ ӨҢІРІНІҢ ТОПЫРАҚ ҚҰРЫЛЫМЫН, ӨНІМНІҢ ЖӘНЕ ӨНІМДІЛІКТІҢ ӘРТҮРЛІЛІГІН ЗЕРТТЕУ (КОНЬЯ АЙМАҒЫ - ЧУМРА АУДАНЫ МЫСАЛЫНДА)

[1]Университет Сельжук, Чумра кәсіби техникалық мектебі, Чумра, Конья, Түркия

[2]Университет Чанкыры Каратекин, Университет, орман шаруашылығы факультеті, Чанкыры, Түркия

[3]Москва мемлекеттік университеті, топырақтану факультеті, Москва, Ресей

[4] Университет Игдыр, ауыл шаруашылығы факультеті, топырақтану және өсімдік қоректену департаменті, Игдыр, Турции

[5]Университет Сельжук, Чумра қолданбалы ғылымдар мектебі, Чумра, Конья, Турция, e-mail: aserol@selcuk.edu.tr

Топырақ құнарлылығы ауыл шаруашылығындағы ең маңызды көрсеткіштердің бірі болып табылады. Чумра таулармен қоршалған және жазық құрылымды Конья Жабық алабының оңтүстік бөлігінде, Орталық Анатолияның ауыл шаруашылығы өндірісінің ең маңызды орталығында орналасқан. Алап топырағы климаттық құрылымға және егістік рельефіне және ұзақ уақыт бойы қалыптасқан жас аллювиалды эктасты қасиеттерге ие. Чумра климаттық және суармалы жағдайына байланысты өсімдік шаруашылығы өнімдерінің барлық түрлері өсірілетін Түркиядағы маңызды ауыл шаруашылығы ауданы болып табылады. Бұл зерттеуде Чумра аймағының топырақ және климаттық сипаттамасы, сонымен қатар олардың тиімділігі талқыланып зерттелді. Өндіріс әртүрлілігі мен экономикалық тұрғыдан тұрақтылығына бағалау жүргізілді.

Түйінді сөздер: Орталық Анатолия, Чумра, топырақ қасиеттері, климат, ауыл шаруашылығының өнімділігі, өнімділік.

РЕЗЮМЕ

[1]Ахмет Сами Эрол, [2]Сабит Ersahin, [3]Евгений Шеин, [4]Фариз Микалсой, [1]Дурмус Али Сейлан, [5]Фатих Эр

ОБСЛЕДОВАНИЕ СТРУКТУРЫ ПОЧВЫ, РАЗНООБРАЗИЯ ПРОДУКЦИИ И ПРОДУКТИВНОСТИ В РЕГИОНЕ ЦЕНТРАЛЬНОЙ АНАТОЛИИ (НА ПРИМЕРЕ ПРОВИНЦИИ КОНЬЯ - РАЙОН ЧУМРЫ)

[1]Университет Сельжук, профтех школа Чумры, Чумра, Конья, Турция

[2]Университет Чанкыры Каратекин, Университет, факультет лесного хозяйства, Чанкыры, Турция

[3]Московский государственный университет, факультет почвоведения, Москва, Россия

[4]Университет Игдыр, факультет сельского хозяйства, Департамент почвоведения и питания растений, Игдыр, Турция

[5]Университет Сельжук, Чумринская школа прикладных наук, Чумра, Конья, Турция, e-mail: aserol@selcuk.edu.tr

Плодородие почвы является одним из самых важных параметров в сельском хозяйстве. Чумра находится в южной части Закрытого бассейна Коньи, в важнейшем центре сельскохозяйственного производства в Центральной Анатолии, окруженном горами и имеет равнинную структуру. Почва бассейна, имеет климатическую структуру и рельеф пашни, и обладает молодыми аллювиальными известковыми свойствами, которые образовались в течение долгого времени. Регион Чумра является важнейшим сельскохозяй-

ственным районом в Турции, где все виды продукции растениеводства могут возделываться благодаря климатическим условиям и орошению. В данном исследовании изучены и обсуждены почвенные и климатические характеристики региона Чумры, а также их эффективность. Проведена оценка разнообразия производства и устойчивости с экономической точки зрения.

Ключевые слова: Центральная Анатолия, Чумра, свойства почвы, климат, продуктивность сельского хозяйства, урожайность.