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A study on the evaluation of factors affecting the development of cattle husbandry via regional development analysis methods

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Abstract: This study was conducted with an aim to investigate the applicability of Regional Development Analysis Methods on agricultural production along with the evaluation of the territorialisation/clustering of cattle husbandry in Turkey. In this regard, secondary data obtained from related agencies and institutions was used for this study. "Development Index" as a regional development analysis method was applied for the evaluation of the territorialisation. Data set compiled within this framework was evaluated via factor analysis methods and a development index was also compiled for each province along with 41 variables and 7 factors representing the cattle husbandry extracted for the study. Aftermath, development rankings of each province were determined in accordance with the territorialisation. Results of the study reveal that while cities located in west of Turkey are prominent for culture cattle husbandry, cities in Central Anatolia are prevalent for cross-bred cattle farming and domestic cattle husbandry is concentrated in the eastern cities of Turkey. While no clustering was evident for the cultivation of forage crops, Van, Hakkari, Erzurum and Sakarya were indicated as prominent cities in this regard.

Key words: Regional development analysis methods, cattle husbandry, development index

Büyükbaş hayvancılığın gelişimine etki eden faktörlerin bölgesel gelişme analiz yöntemleri ile incelenmesi

Özet: Bu çalışma Bölgesel Gelişme Analiz yöntemlerinin tarımsal üretimde kullanılabilirliğinin araştırılması ve bu çerçevede Türkiye'deki büyükbaş hayvan yetiştiriciliğinin bölgeselleşmesi/kümelenmesinin tespit edilmesi amacıyla yapılmıştır. Bu amaca yönelik olarak ilgili kurum ve kuruluşlardan temin edilen ikincil veriler kullanılmıştır. Bölgeselleşmenin belirlenmesinde bölgesel gelişme analiz yöntemlerinde kullanılan "gelişmişlik indeksi" dikkate alınmıştır. Bu çerçevede oluşturulan veri seti üzerinden faktör analizi yöntemi kullanılarak her il için bir gelişmişlik indeksi hesaplanmış ve analiz sonucunda büyükbaş hayvan yetiştiriciliğini temsil eden 41 değişken 7 faktöre indirgenmiştir. Bunun ardından ise, her bir faktöre göre illerin gelişmişlik sıralaması ve dolayısı bölgeselleşme belirlenmiştir. Elde edilen sonuçlara göre kültür ırkı sığır yetiştiriciliğinde Türkiye'nin batısındaki illerin, melez ırkı sığır yetiştiriciliği açısından Orta Anadolu'daki illerin ve yerli ırk sığır yetiştiriciliği açısından ise Türkiye'nin doğusundaki illerin yoğunlaştığı belirlenmiştir. Yem bitkileri üretiminde bölgesel yoğunlaşma belirlenememiş olup, Van, Hakkâri, Erzurum ve Sakarya öne çıkan illerdir.

Anahtar kelimeler: Bölgesel gelişme analiz yöntemleri, büyükbaş hayvancılık, gelişmişlik indeksi

Introduction

Ensuring the sustainability of human life and national economies, agricultural economy is one of the most significant sectors impacting economies. The significance of a sector in economy is highly correlated with the bond between the said sector and other sectors providing for the economy. In addition, the depth of the inter-sectoral bond has vital importance for the progress of the economy. The intensity of the inter-sectoral bond can be explained as the exchange of input and output. In this regard, agricultural sector is considered as having higher rates of input and output exchange compared to other sectors. Indeed, in several studies this fact was proved to be real and was included in the scientific publications [6,11]. This can be stated as; along with being an important industry providing an important market for other sectors agricultural sector is also considered as a significant supplier of these. This situation has a direct impact on the economic structure of the regions where agricultural sector has higher density. In addition to this if such interaction occurs in places where the agricultural potential is higher it will be also impacting the development of the area.

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Agricultural sector in general is divided into two main categories namely; animal and plant production and the density of the production are correlated with social, economic and ecologic structure. Due to the failure to conduct proper agricultural census in the last 12 years, an accurate data today is not available regarding these. However, according to the year 2006 data on Agricultural Enterprise Structure Survey published by Turkish Statistical Institute; 62,3 % of the agricultural enterprises relies on both plant and animal production where 37,2 % is solely depended on plant production and 0,5 % is only engaged in animal production [21].

Crop production pattern varies based on the ecology of the region and accordingly the animal production varies depending on the breeds of the animals, pasture, cultivation of feed crops and the market. Although it is with different methods (conventional or industrial) animal production takes place in every province of the Turkey. In this context, based on the general data on animal husbandry, Eastern Anatolia, Aegean and Marmara regions in Turkey are considered as the regions prominent for animal farming.

On the other hand such indicators do not allow the acquisition of the sufficient data for the identification of sectoral development rate and its rank within the country. Apart from different analysis methods used for obtaining sufficient information, assessments can be also carried out through Regional Development Analysis along with these. Determination of development index is considered as the most prominent and significant analysis method in this regard. Development Index is calculated by combining various cause related indicators. Said index can be especially used for regional development analysis at a national, regional, provincial or district level. These calculations are made not only for scientific reasons but they are also used by public institutions for making policies aiming to reduce development disparities. In these analyses, social, economic, technical, ecological etc. variables are used for the calculation of purposive development indices. However for the calculation of sectoral development index, sector related variables generally with economic and technical characteristics are used [15].

In this study, development index values in terms of cattle husbandry related to 81 provinces of Turkey was calculated. Development index data obtained as a result of the calculations is considered to be contributing to the regional planning, determination of sectoral potential of husbandry at provincial level, guiding the policies developed for husbandry sector, developing strategies for the suppliers working in the sector and offering support for other sectors that are processing animal products depending on the province and other stakeholders to develop strategies in accordance with their own goals.

Materials and Methods

In accordance with the analysis method used in this study, spatial statistical data was obtained from secondary sources. In this regard statistical data provided in this study was compiled by Turkish Statistical Institute and Ministry of Development.

Methods used for regional development studies were used as the analysis method of this study. In order to determine the correct policy for national and regional development and to develop appropriate implementation mechanisms for the region, it is necessary to figure out the socio economic status, spatial organization, their interactions with other regions and how the stakeholders outside of the region perceive it. Although various methods for analysis are used in this regard, it is evident that the socio-economic analysis methods stand out as the most important ones. Socio-economic analyses conventionally include statistical data, indices, coefficients and economic models that are commonly used for regional planning. Socio-economic analysis is considered as an efficient tool for understanding the economic and social structure of a region. In addition to quantitative analysis based on statistical data, analysis may also include field research conducted on a certain area or subject and qualitative methods of analysis [15].

Spatial statistics are considered as the basic building blocks for quantitative socio-economic analysis. Spatial statistics associates observations that correspond to a variable on any subject in accordance with its geographic location. Data on gross domestic product at provincial level constitutes a good example for that. In this regard, statis-

tics often used for regional planning are considered as spatial statistics produced at regional, provincial or district level. Spatial statistics allows making comparisons among regions or provinces within each other and helps the identification of socio economic structure and dynamics within the region. Generally performed along with univariate or multivariate analysis methods, regional development analysis is a commonly used analysis method and the analysis is conducted based on a single coefficient obtained from multiple data and are related to such; concentration coefficient, decentralization coefficient, geographic concentration coefficient and Gini coefficient. Also, where it is required to use a comprehensive application package it is helpful to aggregate analysis methods in two groups. The first group include multivariate analysis methods such as principal components and cluster analysis and the second group includes methods such as graphical analysis based on spatial and economic relations and Continuous Intramax Analysis based on gravity and spatial interaction modeling [15].

Principal Component Analysis included in the first group of comprehensive analysis methods is a multivariate analysis especially preferred for index studies. The method is applied for two objectives in general. One of them is to reduce the data size. The original data set consisting p indicators is reduced to a k variables with a minimum data loss via analysis [13]. This enables the easy implementation of cluster analysis and other methods.

The second objective of this method is to reveal and interpret relationships that were not previously suspected [13]. In this regard, a good example for that are the reports published on Socio-economic Development Levels by State Planning Organization. In said studies, socio-economic development factor which was used for revealing the socio-economic structure of spatial units was also considered as the general causal factor that has the impact on all variables contributing to the change of each and the development level of spatial units is determined this context [8].

In this study, methods mentioned are used for the determination of the development levels of provinces in terms of cattle husbandry. Known as the multivariate statistical analysis, factor analysis is commonly used for the reduction of multiple variables [14,17]. Enabling the interpretation by reducing the set of variables, factor analysis is a common and efficient method used for the studies where several variants are observed. This method combines high correlated variables and represents these with a unique variable. It is desired to observe no associations between factors derived via this analysis. KMO test is used for the confirmation. This analysis can be applied to several scientific areas as a result of flexibility of application on data sets with different properties [1,2,5,10,18,20].

Mathematical model of the factor analysis is as follows [19].

$$X1= b11\ f1 + b12\ f2 + \ldots\ldots\ldots + b1k\ fk + u1$$

$$X2= b21\ f1 + b22\ f2 + \ldots\ldots\ldots + b2k\ fk + u2$$

$$XP= bp1\ f1 + bp2\ f2 + \ldots\ldots\ldots + bpk\ fk + up$$

Here;

fk= general factors (significance or factor weight of p variable in k factor)

bpk= factor weight (the degree of correlation between p variable and k factor)

UP= Unique factor (the source of change associated with each unexplainable unique variable)

Results and assessments obtained via analysis conducted in this regard are as follow.

Results

Large ruminant existence and the status of animal production status in Turkey: Husbandry sector in Turkey is generally known for having a problematic nature and in general have been sustained through public interventions for many years. Following the adoption of free market economy and privatization policies after 1983, producers and industrialists had to face with the distress directly and as the sector was lacking regulatory market measures the whole structure was dominated by brokers and industrialists. During this period the liberization of the market and the implementation of import-based programs in general raised major question marks regarding the sustainability of the sector. For example, zero-interest loans sourced by World Bank and mediated through Resource Utilization Support Fund for Hay-Gel, Türk-ANAFİ and GTZ Cattle Breeding Projects are basically import based practices. Ac-

cording to the data provided by Ministry of Food Agriculture and Livestock (MoFAL) between years 1987 and 1996 approximately 300k-head breeding animal was imported along with a significant amount of slaughtering animals and stocks. After this period policies and projects were implemented with an aim to improve the sector and despite all efforts an entire pile of problems aroused as a result of meat and milk supply. As a matter of fact, problems revolving around red meat production had evolved into a major crisis resulted from milk production increased up to approximately 15 M tons and this embarked a quest on the ways of removing this excess of milk supply from the market. On the other hand, as a result of policy measure implementations adopted in recent years and generally accompanied with support tools evolved issues to a relatively positive status.

In addition, Turkey is considered having a favourable potential for animal production. According to year 2013 TURKSTAT data total bovine existence in Turkey is 14.415.257 head and 97 % of these are cattle [22]. In the previous years, bovine assets in Turkey largely consisted of low yield domestic breeds. However, in the last 15-20 years period significant changes has been observed on distribution of breeds (Figure1).

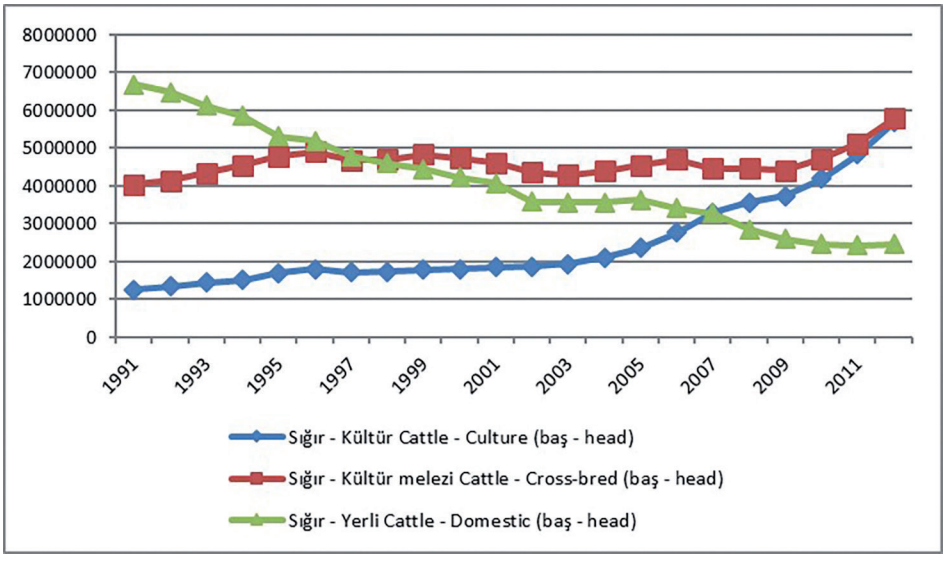

Figure 1. Change of cattle assets in Turkey / Türkiye sığır varlıklarındaki değişim (1991-2012) (head/baş) [22]

In year 1991 in Turkey, while 56 % of total cattle assets in Turkey were made of domestic cattle existence, 10 % consisted of cultured cattle breeds. As a result of the efforts made on breeding and dissemination of breeds with high yield characteristics in recent years, 41% of total cattle existence consisted of culture breeds, 34% was crossbreds and 14% was made of domestic breeds at the end of the year 2012 [22]. Increasing the support budget on husbandry along with the importation of breeding animals in serious amounts contributed to the issue largely in this regard.

The change on the assets of animal breeds is naturally reflected in the amount of animal production. In the said period of time, the amount of animal production increased along with the meat and milk yield per animal. In addition to this, as the intensive production systems became widespread, private sector gradually became more attracted to the sector and started investing on it. In this framework, while the carcass weight was 143 kg/per head in year 1991, this amount was recognized as 286 kg/per head in 2012. Also increase was observed in both the average amount (milk yield) and as of milk yield of races. For cultured breeds average annual milk yield was noted as 2940 kg/per head in 1991 where this number was 3869 kg/per head in year 2012. This increase was observed in almost similar ratios for crossbred and domestic breeds [22]. Data on meat production derived from ruminants in Turkey can be found on Table 1 and data related to milk yield is shown in Table 2.

Table 1. Number of slaughtered cattle and meat production / Kesilen büyükbaş hayvan sayısı ve et üretimi [22]

Year	Cattle		
	Number of slaughtered animals (head)	Amount of meat production (tons)	Yield (kg/per head)
1991	2.162.860	309.563	143
1995	1.820.770	292.447	161
2000	2.101.583	354.636	169
2005	1.630.471	321.681	197
2010	2.602.246	618.584	238
2011	2.571.765	644.906	251
2012	2.791.034	799.344	286

Another reason for the increase in both yield per head and total number is the steadily increasing budget and the support tools achieving a significant level starting from 2002. While a significant amount of the support tools was allocated for the plant production, in 1999 the amount allocated for livestock was 0,5 % which has been increased up to 30 % today. Within this period, the amount of support allocated for the sector has been increased gradually year by year and various tools has been implemented to ensure the viability of the sector.

Actual support budget expenditures for year 2013 were realized as approximately TRY 8.9 bn total and for year 2014, TRY 9.7 bn budget with approximately 8 % increase of agricultural subsidies was estimated [16]. A large amount of the budget allocated for the livestock support was spent on large ruminant breeding; however the amount allocated for the small ruminant breeding and poultry was in really insignificant rates. Budget allocated for agricultural and livestock support is shown in Table 3.

Development index analysis results: Factor analysis method is used for the development index calculations in this study and KMO test is performed to examine the goodness-of-fit. Interpretability of factor scores and determination of reliability is highly dependent on the high correlation of reduced variables. High association between the sub groups of variables forming the reduced variable indicates that the result of the factor analysis is usable. KMO measure varies from 0 to 1. A value near one is desired as a result of the KMO test. Accordingly, KMO was calculated as 0,76 for this study which means the results of the analysis are sufficient in terms of interpretability and usability. Hence, as referred in other scientific publications a result identified greater than 0.60 is considered as having adequate reliability [4]. The results of the KMO test performed are shown in Table 4. Also, the results obtained through analysis on distribution of total variance and eigenvalues of components is shown in Table 5.

Table 2. Number of cattle milked and the amount of milk produced / Sağılan büyükbaş hayvan sayısı ve süt üretimi [22]

Year	Cattle - Culture			Cattle - Cross bred			Cattle - Domestic		
	Number of animals milked (head)	Milk (tons)	Yield (kg/head)	Number of animals milked (head)	Milk (tons)	Yield (kg/head)	Number of animals milked (head)	Milk (tons)	Yield (kg/head)
1991	650.739	913.438	2.940	2.087.014	4.188.398	2.007	3.381.244	2.514.576	744
1995	870.248	258. 711	2.967	2.392.621	4.751.023	1.986	2.622.717	1.942.578	741
2000	904.849	263. 113	2.917	2.335.119	4.591.861	1.966	2.039.601	1.501.067	736
2005	925.618	359. 017	3.885	1.717.309	4.646.857	2.706	1.355.170	1.783.328	1.316
2010	1.626.412	630. 065	3.879	1.787.012	4.861.835	2.721	948.417	1.247.644	1.316
2011	1.868.274	723. 644	3.875	1.962.713	5.341.224	2.721	930.155	1.221.560	1.313
2012	2.211.242	855. 402	3.869	2.263.400	6.166.762	2.725	956.758	1.256.673	1.313

Table 3. Agricultural support and livestock budget allocation, distributed by years / Yıllar itibarıyla tarımsal desteklemelere ve hayvancılığa ayrılan ödenekler

Year	Livestock payments (million TRY)	Total support payments (million TRY)	Share of the livestock in total (%)
1999	1	221	0,5
2000	11	326	3,4
2001	49	532	9,2
2002	75	2.276	3,3
2003	126	3.015	4,2
2004	209	3.084	6,8
2005	345	3.736	9,2
2006	660	4.793	13,8
2007	741	5.643	13,1
2008	1.095	5.839	18,8
2009	908	4.674	19,4
2010	1.158	5.684	20,4
2011	1.728	6.951	24,9
2012	2.216	7.553	29,3
2013 (*)	2.900	8.920	32,5
2014 (**)	2.793	9.670	28,9

(*) Realization Forecast (**) Programme [16]

Table 4. KMO test results / KMO test sonuçları

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0,760
Bartlett's Test of Sphericity	Approx. Chi-Square	10355,756
	df	820
	Sig.	0,000

In this regard, the first factor accounts for 46,327 % of the total variance. Also the share of the second factor is accounted as 15,007 %. Furthermore the values of the other factors decrease gradually. Factors with a significant portion of the total variance, represents the variables accounted for in the model better. There may be several reduced factors produced via factor analysis and not all of them may possess usable or interpretable characteristics. As a result, for a better representation of the variables accounted for, factors with appropriate characteristics should be retained. There are a couple of approaches for choosing the factors. While one of them is Eigenvalues method the other one is known as scree plot. For eigenvalues method, eigenvalue-greater-than-one rule applies [8]. In accordance with this criterion the number of factors with an eigenvalue greater than 1 is accounted as 7. A scree plot of eigenvalues is shown in Figure 2.

Table 5. Distribution of total variance and eigenvalues / Toplam varyansın dağılımı ve özdeğerler

Component	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of Variance	% Cumulative	Total	% of Variance	% Cumulative	Total	% of Variance	% Cumulative
1	18.994	46.327	46.327	18.994	46.327	46.327	9.638	23.507	23.507
2	6.153	15.007	61.333	6.153	15.007	61.333	7.037	17.163	40.670
3	3.139	7.656	68.989	3.139	7.656	68.989	6.038	14.726	55.396
4	2.191	5.345	74.334	2.191	5.345	74.334	4.743	11.568	66.964
5	1.882	4.591	78.925	1.882	4.591	78.925	3.336	8.136	75.101
6	1.327	3.237	82.163	1.327	3.237	82.163	2.554	6.228	81.329
7	1.065	2.597	84.760	1.065	2.597	84.760	1.407	3.431	84.760
8	.959	2.340	87.100						
9	.805	1.963	89.063						
….	….	….	….						
38	0.000010	0.000024	100.000						
39	0.000008	0.000021	100.000						
40	0.000003	0.000008	100.000						
41	0.000003	0.000006	100.000						

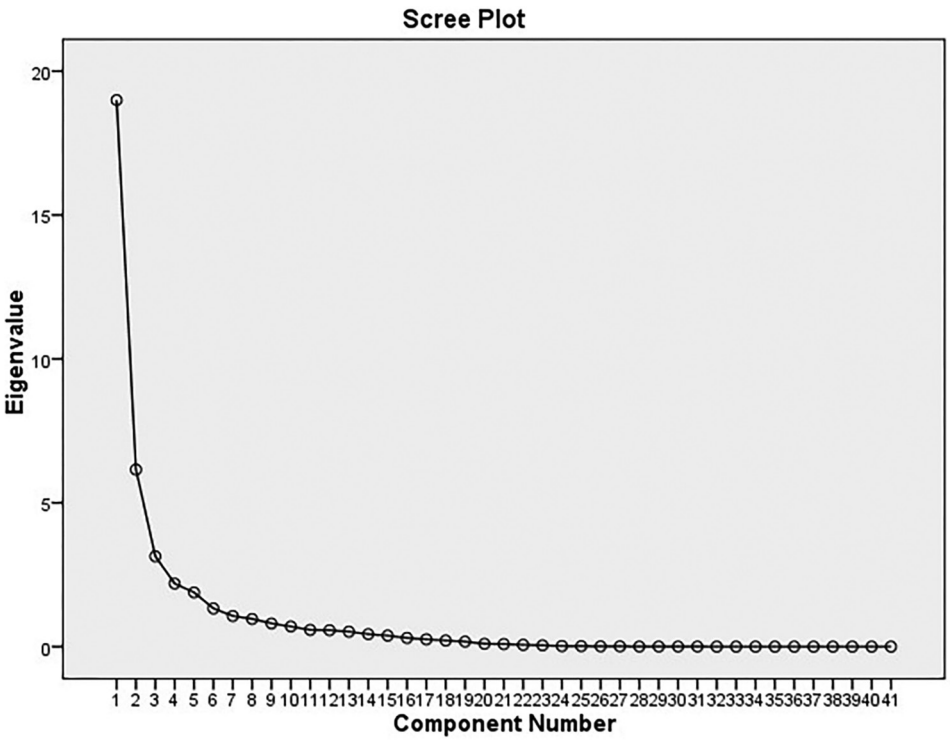

Figure 2. Scree plot of eigenvalues / Özdeğerlere ait yamaç grafiği

Scree plot method provides a graph of the eigenvalue distribution. Changes illustrated in the given slope of the scree plot are inspected for the determination of factors. Determinations of the factors based on the change in slope, is highly dependent on the knowledge of the researcher. The change in the slope of the scree plot related to eigenvalues of the factors derived for this study can be seen on 5th, 6th and 7th factors. However, factors with eigenvalues greater than one are used within the scope of this study. Seven factors derived here account for 84.76 of total factors. For social sciences, the share of the variance of derived factors should at least account for 60 percent of total cumulative variance in order to be considered satisfactory [12].

Factors obtained via factor analysis method should be labelled. For this purpose, factor weights related to factor loadings of variables should be considered and labelled accordingly. Seven factors are identified for this study. However, because of the lack of correlation between "village population ratio and manure spreading machine" the number of factors were reduced to six. Labels of factors identified in this regard are as follows:

1. Meat and Leather Production

2. Cultured Cattle Husbandry and Milk Production

3. Domestic Cattle Husbandry

4. Crossbred Cattle Husbandry

5. Forage Crop Area

6. Production and Mechanization of Forage Crops

Factor scores are considered as another output of factor analysis. Factor scores can be also useful when using factors obtained via factor analysis for other analysis methods (such as regression analysis). Factors scores represent the significance of each observation within the factor itself. In this respect, factor analysis is considered as one of the most commonly used procedures for exploring data related to national, regional etc. development indices. In this study factor scores are used for ranking the development levels of provinces in terms of cattle husbandry. Results are shown in Table 6.

Table 6. Assigning factor labels / Faktör adlarının belirlenmesi

Indicators		Component						
		1	2	3	4	5	6	7
1	Leather production value	.934	.176	.110	.053	-.064	.058	.119
2	Total meat production value	.908	.320	.031	.142	-.027	.125	.112
3	Total value of meat marketed	.907	.321	.031	.143	-.026	.127	.112
4	Total meat production amount	.906	.267	.067	.164	-.043	.217	.079
5	Leather production amount	.879	.159	.160	-.008	-.119	-.029	.085
6	Cow meat production value	.863	.352	.013	.191	.002	.188	.091
7	Cow meat production amount	.851	.297	.042	.216	-.010	.284	.058
8	Total value of marketed animal product	.724	.446	.096	.284	.067	-.037	.084
9	Total value of animal production	.707	.472	.143	.314	.065	-.019	.070
10	Culture cattle value	.416	.870	-.063	.131	-.009	.139	.016
11	Marketed culture cattle value	.417	.869	-.063	.131	-.009	.140	.015
12	The number of culture cattle	.403	.861	-.044	.173	-.008	.170	-.011
13	Silage production	.516	.678	-.076	.069	.126	-.178	.045
14	Cow milk production amount	.334	.629	.479	.465	.038	.100	-.005
15	Total milk production amount	.351	.610	.516	.441	.058	.131	.006
16	Cow milk production value	.323	.597	.513	.455	.023	.072	-.013
17	Baler	.367	.588	-.002	.045	.085	-.135	.398
18	Total value of marketed milk	.344	.577	.541	.423	.036	.118	-.007
19	Total milk value	.349	.574	.542	.420	.034	.114	-.007
20	Domestic cattle count	-.034	-.067	.961	.081	.126	.060	-.021
21	Value of marketed domestic cattle	.016	-.062	.960	.101	.100	.057	-.036
22	Domestic cattle value	.018	-.062	.960	.103	.100	.059	-.033
23	Total market value of livestock	.450	.505	.560	.337	.107	.166	.029
24	Total livestock value	.445	.473	.493	.329	.097	.114	.032
25	Threshing machine	.081	.009	.232	.720	-.046	.383	-.055
26	Crossbred cattle count	.317	.246	.422	.717	.092	.025	-.004
27	Mechanical reaper	-.035	.133	-.068	.713	-.049	.300	-.081
28	Value of domestic cattle	.441	.337	.298	.684	.047	.018	.024
29	Marketed value of crossbred cattle	.442	.337	.299	.684	.046	.018	.022
30	Share of forage cultivated land in total land area	-.101	-.085	.038	-.120	.892	-.033	-.174
31	Share of forage cultivated land in total cultivated land	-.074	-.082	-.031	-.155	.848	-.110	-.274
32	Forage area harvested	.050	.226	.466	.324	.695	.091	.278
33	Forage crops cultivated land	.048	.226	.470	.323	.693	.090	.275
34	Fodder production	-.114	.195	.482	.095	.645	.213	.326
35	Binder	.210	.129	.126	.401	.401	-.286	.381
36	Straw pick up machine	.164	.103	.072	.148	-.052	.764	.018
37	Hay grass production	.153	.071	.369	.172	.177	.695	.121
38	Silage conveyor and unloader	.339	.128	-.046	.344	-.046	.695	-.158
39	Soilage production	.377	.332	-.135	.144	.277	-.381	.055
40	Village population rate	-.337	.070	.110	.132	.178	-.077	-.675
41	Manure spreading machine	.381	.329	.025	-.121	-.005	-.171	.384

Development ranking studies based on the calculation of development indices are generally carried out through factor scores of the first factor generated [3,7]. However, development rankings of the provinces studied here are determined based on the extracted seven factors. Cattle husbandry within itself is also divided into groups of subjects such as; culture, crossbred or domestic bred cattle husbandry and feed production. All these characteristics may not be possibly seen in a single region of Turkey alone. Hence, Turkey consists of different geographic and ecologic characteristics. Diversity of geographical structures directly impacts ecological characteristics and the changes of ecological structure determine the pattern of agricultural production and systems. This also applies to cattle husbandry. As it can be also seen on the results of development index, prevalent animal existence varies depending on the region. As a consequence, development rankings of provinces are determined in terms of the status each factor.

The first factor accounts for 46,327 percent of total variance. Thus, it can be considered as the common cattle husbandry development index as the percentage of the variance explained by this factor reflects the influence of all kinds of variables that has been used in this study. Considering its factor loadings, first factor was labelled as "meat and leather production". In accordance with the ranking computed based on this factor, Konya ranks first with a factor score of 3,82 and ranking of other provinces are as follows; İzmir (3,28), Bursa (3,25), İstanbul (2,31), Balıkesir (2,03), Gaziantep (1,86), Diyarbakır (1,79), Amasya (1,75), Manisa (1,31) and Ankara (1,30). Bursa provides 18 percent of the cattle meat production of Turkey while İzmir has a share of 6 percent and Konya provides 8,87 percent. In terms of meat and leather production factor, Ardahan (-0,02), Tekirdağ (0,01) and Zonguldak (-0,01) are the lowest ranked provinces.

The second factor accounts for 15,007 percent of the total variance explained. Variables with greater factor loadings on this factor are generally related to culture cattle husbandry and milk production. As a result, this factor was labelled as "Cultured Cattle Husbandry and Milk Production". In accordance with this factor, while Balıkesir (3,45) has the first place in development ranking, the status of other cities are as follows: Aydın (3,15), İzmir (3,04), Çanakkale (2,41), Tekirdağ (2,15), Burdur (1,85), Edirne (1,84), Kırklareli (1,82), Gaziantep (1,79) and Amasya (-1,65). As a matter of the fact, culture-breed animal husbandry and milk production are more prevalent in these cities compared to others. Furthermore, as Balıkesir provides 3,56 percent of cow milk production in Turkey and it also has 6,80 percent of culture-breed animals. In terms of this factor Malatya (0,08), Kars (-0,06) and Muğla (0,04) are the lowest ranked cities of the development ranking

The third factor accounts for 7,656 percent of the total factor explained. As variables related to domestic cattle have greater loadings in this factor, this factor was labelled as **"**domestic cattle husbandry". In accordance with this factor while Erzurum (4,65) has the first place in development ranking, the status of other cities are as follows; Kars (3,24), Diyarbakır (2,96), Ağrı (2,90), Muş (2,51), Van (1,25), Karaman (-1,19), Sakarya (-1,15), Burdur (-1,05) and Yalova (-1,01). Erzurum has 9,21 percent of domestic cattle assets of Turkey while Kars provides 7,02 percent, Ağrı 6,52 percent and Diyarbakır 5,09 percent of the assets mentioned.

The fourth factor explains 5,345 percent of the total variance. Considering its factor loadings, this factor was labelled as **"**cross-bred cattle husbandry**".** In accordance with this factor, while Sivas (3,73) has the first place in the development ranking other cities are as follows: Samsun (3,21) Kastamonu (2,18), Konya (1,72), Tokat (1,70), Çorum (1,59), Afyon (1,54), Kütahya (1,53), Kayseri (1,50) and Antalya (1,44). Sivas has 3,93 percent of cattle existence while Sivas holds 3,10 of it. In terms of this factor Kocaeli and Erzurum are the lowest ranked cities of the development ranking.

The fifth factor explains 4,591 percent of total variance. As variables with greater factor loadings on this factor are mostly related to forage areas this factor was labeled as "forage areas". In accordance with this factor, while Van (4,02) has the first place in the development ranking other cities are as follows: Hakkari (3,08), Sakarya (2,58), Erzurum (2,26), Bayburt (2,05), Gümüşhane (1,93), Diyarbakır (-1,69), Bingöl (1,44), Yalova (1,19) and Artvin (1,13). "Share of Forage Cultivated Land in Total Land Area" and "Share of Forage Cultivated

Land in Total Cultivated Land" are the variables that have the greatest factor loadings on forage area factor. These two variables were proportionally formed. As a result in terms of cattle husbandry carried out in forage area, undeveloped provinces such as Van and Hakkari are among the top ranking cities.

The sixth factor explains 3,2372 percent of the total variance. This factor was labelled as production and mechanization of forage crops. In accordance with this factor while Konya (4,68) has the first place in development ranking other cities are as follows: Eskişehir (3,19), Aksaray (2,55), Erzurum (2,45), Afyon (2,28), Samsun (1,94), Sakarya (-1,82), Balıkesir (-1,43), İzmir (-1,41), and Yozgat (1,35). In accordance with this factor Bilecik and Kilis are among the lowest ranking places of development ranking.

The seventh factor explains 2,597 percent of the total variance. This factor consists of "Village Population Rate and Manure Spreading Machine" variables. As these two do not suggest a comprehensive factor the development index ranking related to these wasn't interpreted.

Development rankings of provinces obtained via factor analysis in this study are shown in Table 7.

Table 7. Development rankings of provinces in terms of cattle assets / Büyükbaş hayvan varlığına göre illerin gelişmişlik sıralaması

Item no	Factor 1 Meat and leather production		Factor 2 Culture breed cattle husbandry		Factor 3 Domestic cattle husbandry		Factor 4 Cross-bred cattle husbandry		Factor 5 Forage area		Factor 6 Production and mechanization of forage crops	
	Province	Score	Province	Score	Province	Score	Province	Score	Province	Score	Province	Score
1	Konya	3.82	Balıkesir	3.45	Erzurum	4.65	Sivas	3.73	Van	4.02	Konya	4.68
2	İzmir	3.28	Aydın	3.15	Kars	3.24	Samsun	3.21	Hakkâri	3.08	Eskişehir	3.19
3	Bursa	3.25	İzmir	3.04	Diyarbakır	2.96	Kastamonu	2.18	Sakarya	2.52	Aksaray	2.55
4	İstanbul	2.31	Çanakkale	2.41	Ağrı	2.90	Konya	1.72	Erzurum	2.26	Erzurum	2.45
5	Balıkesir	2.03	Tekirdağ	2.15	Muş	2.51	Tokat	1.70	Bayburt	2.05	Afyon	2.28
6	Gaziantep	1.86	Burdur	1.85	Van	1.25	Çorum	1.59	Gümüşhane	1.93	Samsun	-1.94
7	Diyarbakır	1.79	Edirne	1.84	Karaman	-1.19	Afyon	1.54	Diyarbakır	-1.69	Sakarya	-1.82
8	Amasya	1.75	Kırklareli	1.82	Sakarya	-1.15	Kütahya	1.53	Bingöl	1.44	Balıkesir	-1.43
9	Manisa	1.31	Gaziantep	-1.79	Burdur	-1.05	Kayseri	1.50	Yalova	1.19	İzmir	-1.41
10	Ankara	1.30	Amasya	-1.65	Yalova	-1.01	Antalya	1.44	Artvin	1.13	Yozgat	1.35
…	…	…	…	…	…	…	…	…	…	…	…	…
76	Yalova	0.10	Van	-0.15	Malatya	0.03	Erzincan	0.08	Muğla	0.14	Kırşehir	0.03
77	Bilecik	-0.04	Adana	-0.14	Kayseri	0.03	Elazığ	-0.06	Afyon	-0.13	Bingöl	0.02
78	K.Maraş	0.03	K.Maraş	-0.13	Mardin	0.03	Balıkesir	0.05	Konya	-0.11	Yalova	-0.02
79	Ardahan	-0.02	Malatya	0.08	Bitlis	-0.02	Ordu	0.04	Kütahya	0.08	Kastamonu	-0.02
80	Tekirdağ	0.01	Kars	-0.06	Konya	0.00	Kocaeli	0.03	Sivas	0.05	Kilis	0.01
81	Zonguldak	-0.01	Muğla	0.04	İzmir	0.00	Erzurum	0.01	Karabük	-0.05	Bilecik	-0.01

Discussion and Conclusion

Different variables can be used for the calculation of the country and region development indices. In case of a change of the variables used for the development index, ranking may also change accordingly. However when analysed, studies conducted reveal that the variables used reflects similar characteristics and index values and scores obtained via analysis display similarities. As a result development indices calculated can be considered practical.

Different from other research, in this study development levels of provinces are tried to be determined by also taking sectors into account. This study primarily focuses on the applicability of regional analysis methods to the sector and also was carried out in order to identify the provinces that the cattle husbandry sector has been clustered around.

Development rankings made in accordance with socio-economic development indices reveal that cities with thriving economies and dense populations such as İstanbul, İzmir and Ankara ranks among the top of the list. However when it comes to development rankings compiled on a sectoral basis, provinces where the target sector is concentrated is expected to be prominent. Studies conducted on a sectoral basis, represent the overall status of provinces in terms of the sector in question. Thus in this study, cattle husbandry was considered as the target sector and 42 variables related to this has been used to determine the development level of the provinces.

As the results obtained indicate that the regional development analyses can be benefitted for sectoral analyses, these can be additionally convenient for developing national or regional policies and are substantial for guiding private sector and NGOs that are in the business as well. Thus when evaluated in terms of the first factor, Konya was identified as the most developed province. Having high agricultural potential, Konya is a province with a rich agricultural production pattern as a result of various geographic areas surrounding it. Results of this study indicate that Konya is a prominent city for cattle husbandry. Along with being the top ranking city for meat and leather production, Konya in general is the fourth ranking province in terms of cross-bred beef cattle husbandry and again ranks at the top for the production and mechanization of forage crops. This result indicates that Konya is a well-developed city in terms of meat and leather production and different from the rest of the cities in Turkey it is in business for commercial reasons and has the relevant infrastructure for marketing. Furthermore, in this context it is possible to interpret the result of the study as the sector related to product processing in the province should be developed and supported along with ensuring the specialized production for meat and leather and branding activities which are fundamental.

Another point observed in this study is, a regional clustering is evident regarding the cattle husbandry based on breeds. It was determined in the study that while culture breed cattle husbandry is prevalent in the east of Turkey, cross-bred cattle farming is common in Central Anatolia. Such result can be considered as a significant finding that will give a new direction to national policies in this regard. Furthermore, income disparity can be observed related to the farming of mentioned breeds. Along with causing income disparities at a regional level, such differences in income distribution also affect the development level of regions. Having dense inter-sectoral relations, livestock sector has a multiplier effect in terms of eliminating income disparities and ensuring regional development. When developing policies at a regional level in this regard, development level of provinces should be considered. Thus, provinces like Van and Hakkari with low socioeconomic development levels (Van ranks 69 and Hakkari ranks 78) ranks among the top cities for forage crop cultivation areas [9]. Such result means that proportional share of forage cultivation areas are greater in these two cities. In accordance with the developments in livestock sector, the demand on the production of forage crops has increased. In such cities with lower social economic levels, establishing an infrastructure related to the marketing of cultivation of forage crop will result in an increase of income and also will cause a decrease in regional income disparities as well.

As a result, within the framework of this study it can be indicated that regional analysis methods can be applicable to the sector and substantive analysis can be conducted and it is also possible to conduct similar studies for all sub sectors of the agriculture with an aim to provide an agriculture profile of the country and it is also evident in this study that cattle husbandry observed as the research topic of the study has developed due to the intensive production.

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