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Rural Development and Biosystems Engineering in Turkey

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Abstract: Early on Republic of Turkey while 75 % population of the country was living in villages, now there is a consistent immigration from rural areas to urban. Although our country is a candidate to European Union, living conditions in rural areas doesn't attain to a desirable level, thus some of the urban become like mega villages as a result of this migration. By the year 2009, farmer's population ratio decreased to 25 % and rural population ratio is 35 % of the whole population. However, in developed countries, the difference between the population of rural and urban is very low. With Agricultural and Rural Development Supporting Organizations, which were built firstly in 20 cities and planned to built in 20 more cities between the years 2011-2013, it is aimed to raise the development level of agricultural sector and weal level of rural population, and to counteract the immigration from rural to urban and also to ensure Turkey's accordance to European Union in order to form villages like urban in rural areas and to support rural development. For this purpose, in the view of engineering, realizing the application of basic principles of engineering; as mechanical, energy, construction (civil), hydrology, environment, electrical-electronics and information technologies that stand first on the list; to all sorts of rural planning activities and production areas is to be on the objectives of Biosystems Engineering. In this paper, rural development investment made in Turkey as a part of European Union in recent years and in this context place and the development of Biosystems Engineering in Turkey was investigated.
Key words: Biosystems engineering, rural development, engineering education, engineering formation

INTRODUCTION

Today, the world's population to reach 7 billion and the depletion of natural resources leads the human beings to understand the importance of efficient use of limited resources. This situation required human beings to better understand the fine line between rural and urban. The relationship between rural and urban, left humanity face to face with the problem of development. At this point "general development" brought "village development" with a more general explanation "rural development" to agenda (Gürlük, 2001).

The studies to develop rural settlements and to improve the living conditions of rural population go back to the years of the establishment of the Republic. Striking point on the rural development projects implemented to date is that there is not given enough places to diversifying and improving non-agricultural economic facilities on rural development projects despite the labor force allocated to agriculture.

There is still a large mass of population living in rural areas where scientific and technological developments do not give enough service in Turkey aspiring to enter the integration process of the European Union and the World. While the ratio of farmer/villager as a percentage of active population is fewer than 2% in USA and 5% in European Union it is nearly 30% in our country. According to the DIE (State Statistic Institute) data, excluding the three large cities, this ratio is observed to be 45% and in most cities in Anatolia it is observed to be 50%. Compared with the urban life, engineering services do not go enough to such a large community. Industrial

revolution has been lived since the 1850's has not been lived in our country and hidden/open unemployed living in urban can not be transferred to industry. It is seen that we are too late in the transition to information society in the light of emerging information technologies after the 1980s. In this context, it is thought that development should start from rural. In this point Biosystems engineering will fill an important gap, will be the basic dynamic of rural development.

As in all areas of production, in food production based on vegetable and animal products there is an obligation to act within the framework of the basic principles of engineering and business administration. In addition, to train adequately equipped high school graduated Biosystems engineers that can carry out rural development projects and have integrated the principles of the science of biology for agriculture-based industries with engineering profession is an extremely important issue for our country.

RURAL DEVELOPMENT ACTIVITIES IN TURKEY

National Rural Development Strategy Paper has been prepared in 2003 to create a comprehensive policy framework for rural development activities in Turkey, to constitute the basis of "National Rural Development Plan" predicted for preperation and implemantation, provide perspective to stakeholder on the preperation and implementation of rural development programs and projects financed by national and international sources.

In this strategy paper **rural development**; based on sustainable natural resource use in rural areas, is considered as the whole facilities that on the one hand turning to the purpose of reducing disparities by increasing the income level of rural and life quality, on the other hand providing improvement and protection of environmental and cultural values and facilities that planned by multisectoral approach by taking into account the locally diversed social, cultural and economical properties, needs, potentials and dynamics (Anonymous, 2003).

Parallel to the long-term development perspective of Turkey, **the main aim in rural development**; is to render the working and living conditions of rural communities areas improved and sustainable in accordance with the urban with respect to the assessment of local potential and resources, protection of natural and cultural assets (Anonymous, 2003)

As the cultural, social, demographic, economic, environmental, and spatial diversities contained in the rural areas gaining new meanings over time with changing circumstances, makes it difficult to determine a precise definition or **rural area**. Residential areas with a population of less than 20 thousand rural area has been recognized as rural areas, in order to ensure compliance with development plans in our country. In another rural area definition that improved by OECD and used by EU, according to the administrative boundaries areas with population density less than 150 per km^2 is considered to be rural area (Anonymous, 2006)

In Turkey, population statistics, compiled from the general population censuses. As these counts are taking the village-city definition instead of the rural-urban definition, population statistics are published separately as village and city. Therefore, in this section, using the term "village population"instead of "rural population" does not cover the centers of the district with population. Thus, the rural population can be calculated with the addition of the the total population of the district centers with a population of less than 20 thousand to village population. Rural-urban migration process gained acceleration since 1950s in our country is still continuing. Of as the rural population was 75% and of urban population was 25% in 1927, this situation has reversed in 2007 as the village population is 25% and urban population is 75%.

STRATEGIC OBJECTIVES AND PRIORITIES IN RURAL DEVELOPMENT

Objectives and priorities form the basis of rural development activities (Anonymous, 2006)

Strategic Objective 1: Developing Economy and Increasing Job Opportunities

Priority 1.1: Attaining a competitive structure for agriculture and food sectors, Increasing manufacturers association and knowledge level, Efficient Use of Water and Soil Resources, Increasing Competitiveness Agriculture and the Food Industry Enterprises, Food Quality, Consumer Protection and Empowerment of the control systems for food health

Priority 1.2: Diversification of the Rural Economy

Strategic Objective 2: *Developing Human Resources, Organization Level and Local Development Capacity*

Priority 2.1: Strengthening the Education and Health Services
Priority 2.2: Combating Poverty and Improving Employability of Disadvantaged Groups
Priority 2.3: Strengthening Local Development Capacity

Strategic Objective 3: Improving Rural Physical Infrastructure Services and Life Quality
Priority 3.1: Improvement of Rural Infrastructure
Priority 3.2: Development and the Protection of Rural Housing

Strategic Objective 4: Protection and Development of the Rural Environment
Priority 4.1: Development of Environment-Friendly Agricultural Practices
Priority 4.2: Protection of Forest Ecosystems and Providing Sustainable Utilization of Forest Resources
Priority 4.3: Management and Development of Protected Areas

These strategic objectives and priorities are prepared as required by Turkey's rural development plan, "National Rural Development Strategy " adopted by the decision of the High Planning Council (HPC) dated 25.01.2006 and 2006 / 1 number.

The number of qualified operational programs on rural development is growing in our country. Grant programs and the integrated nature of development and/or rural development project in the form of these applications developed are resources allocated on behalf of the major policy tool for rural development. As indicated below, currently being carried out in terms of the basic nature of rural development activities are important to have shed light on future applications. Rural Development Plan; including IPARD Program, has the characteristics of the reference document for the activities of all rural development which was practiced or will be practised (rural development projects, financial support programs, and so on.)

RURAL DEVELOPMENT PROGRAMS

IPARD Program (Instrument For Pre-Accession Assistance For Rural Development)

EU, formed Pre-Accession Assistance Tool (IPA) to provide support for candidate and potential candidate countries' preparations for the participation of Union, Turkey, as a candidate country, can benefit from all the IPA components. IPA assistance consists of the following components;

1) Transition Assistance and Institution Building
2) Cross-Border Cooperation
3) Regional Development
4) Human Resources Development
5) Rural Development

As the fifth component of the IPA, Rural Development Component (IPARD); is a component that aims to increase the development of institutional capacity of candidate countries in this direction in the period before the accession and to increase the structural compliance for application and management of the EU Common Agricultural Policy, the rural development policy and other related policies. For this purpose, the modernization of the agricultural sector and rural areas to serve the sustainable development of the candidate countries, financial assistance is provided under IPARD.

IPARD program is implemented in two periods, in the first application period 20 city and in the second application period 22 City, totally 42 City,were included in the program. Established by Law No. 5648 of Agriculture and Rural Development Support Agency (TKDK) Program implemented by the Executive Authority, the Ministry of Agriculture and Rural Affairs (MARA) is determined as the Strategy Development Board. According to the finalized figures, the program having 660.80 million euros financial resources during 2007-2012, considered with beneficiary contribution has a financial size of approximately 1.3 billion euros worth (Anonymous, 2006).

Financial Assistance (Grant) Programs

IPARD program is implemented in each city. In this context, the basic objectives of IPARD accessible national-scale programs need to be developed in order to be able to substitute other provinces IPARD Program. For this purpose, in 2006 by MARA Agricultural Reform Implementation Project (ARIP) introduced under the pilot provinces and then expanded the scope to include the province of 81 "Rural Development Investment Promotion Programme" observed to win an important function. On the other hand, "agriculture and rural development" grant programs applied / will be applied by the established development agencies (KA) has gained an important function. The case of ensuring

coherence between applications, the effectiveness of the EU preparatory work carried out in the field of agriculture and rural development will increase. Thematic areas for EU rural development policies; the modernization of agricultural enterprises, food safety, processing of agricultural products, dissemination of environmentally friendly agricultural production, rural environmental protection, vocational training, the development of non-agricultural economic activities, rural infrastructure and local development.

Integrated Rural Development Projects

Integrated rural development projects being implemented in our country since the 1970s, is one of the application tools used by the source for rural development. However, due to the execution of these projects financed by external resources, the method for the design and implementation of the projects is changing du to the organizations providing financial support and this situation negatively affects the formation of central and local level institutional capacity.

THE ROLE OF BIOSYSTEMS ENGINEERING IN RURAL DEVELOPMENT

In order to ensure rural development,the supports provided on the EU and the external support grant programs' measures and priority areas mentioned above are almost all of the the issues concerning the branches of engineering.

On the preparing, monitoring, evaluating and finalizing the projects under IPARD program, it is benefitted from the maximum degree of the engineering disciplines as mechanical, civil, electrical, computer, agriculture, and geology and from engineers, architects, and urban regional planners. Because, rural subsidies in this context, are not only in terms of agricultural products, aim an integrated development in a wide range of technological developments from agriculture to industry, environment, tourism, communications. The scope of projects prepared in this framework is large and those who want to prepare and present project, must obtain support from mentioned engineering branches. Otherwise, the probability of acceptance of the project prepared will be reduced because of the fact that the project can not be detailed. As an example, mechanical engineers are involved in determinig the power supply operated, in the preparation and operation of heating and cooling projects. Construction engineers are involved in projects like the construction of rural buildings such as buildings, irrigation canals, ponds, etc. and the construction of village roads. Agricultural engineers are involved in making other agricultural projects such as transition pressurized irrigation systems, high-tech systems that require determination of agricultural machinery and projecting animal shelters in accordance with the design technique. Planning the rural settlements in a modern way is the task of urban regional planners. Also, waste assessment and environmental protection projects in rural areas are done by environmental engineers. During the application and implementation phase, necessary checks of the projects are carried out by expert engineers on the institutions.

Biosystems Engineering Department will make the application of the basic principles of engineering such as machinery, energy, construction, hydrology, electrical and information technologies that stand first in the list to all rural planning, operations and production areas. Biosystems engineering aims to gather under one roof of engineering services in rural. Department, will integrate industrial technology and agricultural technology and will act as a bridge between the two.

BIOSYSTEMS ENGINEERING EDUCATION

While new alternatives and applications such as changing technologies, distance education, joint training programs, exchange of students and teaching staff are emerging, electronic communication facilities in education has been used widely. In addition, in the world, especially in agriculture, beside the traditional agricultural topics, new departments as Biosystems Engineering, Agricultural and Biosystems Engineering, Biological Systems Engineering and so on which are including topics such as bio-technology, precision farming and nanotechnology are established. Before describing Biosystems engineering not to be confused with the Biological Engineering, there is great benefit in understanding these two concepts clearly.

Biological Engineering: The main topics of this engineering branch combining engineering and quantitative biology are food systems, life sciences, human health and the environment (Cornell University). Biological engineering is an engineering field applied nature and information rationally or bring benefits mainly dealt with biology or biological

systems to humanity. Some of the issues it contains are biological materials, biomechanics, modeling biological systems, bio-instrumentation and video image analysis, implant design, food and fiber processing plant, the design of sustainable systems, mass transfer in biological environment (Fridley et al., 1993; Uçar ve Yumak, 2003a).

Biosystems Engineering: In English it is named as "Biological Systems Engineering" or the first two words are abbreviated and the term "Biosystems Engineering" is obtained. Systems Engineering branch, called in English, is expressed in the form of singular System Engineering because of the ease of spelling and pronunciation in Turkish. The attachement Bio contained in Biosystems Engineering term refers biological systems and, biological systems refer to a set of components that interact with livins with machine, structure and the technologies used. Some of the issues it contains are automation and emerging technologies, power and construction equipment, precision agriculture, soil and water, post-harvest technologies, information technology and human interaction, structures and environment, animal production technologies, rural development In this context in the next 10 years, American Krutz and Schueller (2000) reported that Biosystems engineers will work and do research on the subjects such as biosensors, biomaterials, biomedical, additives, magnetic and fluorescent materials.

Biosystems Engineering in the World

The first attempt at the international level within the scope of the restructuring at the International Agricultural Engineering Congress in the city of Liege in Belgium in 1930, is International Commission of Agricultural Engineering (CIGR) 's establishment with a study based on elections (Anonymous, 2002). CIGR, is a non-profit structure without formal qualifications and a network system that connects the related units of regional and national associations of agricultural engineers, individual, private and public organizations in the world.

Parallel to the specified purposes,the most concrete development of restructuring is harmonization alignment project facing the comparison of agricultural engineering education and training programs in European Community member 12 countries universities' launched jointly by CIGR, the Italian Association of Agricultural Engineers (AIGR) and the University of Milan at the end of 1989. In these 12 countries that will become a single market in In 1993, it was intended to ensure academic conformity on agriculture and agricultural engineering and thus the free movement of students and academics. In fact, every country has to update the academic structure according to the terms of the developing world in order to provide expected developments in agricultural industry sector and meet the needs of market. For example, Japan and the United States are in the thought of changing the name of the Faculties of Agriculture expanding as Nature and Earth Resources, Biosources / Biosystems Engineering. Therefore, such a project naturally met with great interest by other countries in the world and also opened to other countries interested in and participation has been provided.

Biosystems engineering departments are established as connected to the Engineering and Agriculture faculties of universities. There are 49 Biosystems Engineering Department accredited by the world's leading engineering accreditation body ABET.

Some universities offering education of Biosystems Engineering in the United States are: University of Manitoba, University of Auburn, Clemson University, Oklahoma University, Michigan University, the University of Arizona, Washington State University, the University of Wisconsin, and the University of Tennessee. At all of these universities Biosystems Engineering Department is opened within the Faculty of Engineering and Architecture.

The ongoing process with regard to the restructuring of the Faculties of Agricultural Engineering pioneered the existing studies towards the restructuring of these faculties to cover all the branches of higher education in Europe / EU. In this regard the first binding criteria in Europe took part in the Bologna Declaration (Anonymous, 2002a). Ireland has pioneered in Biosystems engineering education in the EU countries. Biosystems Engineering bachelor's degree education is carried out in the University College Dublin connected to the country's National University of Ireland. "Biosystems engineer" title is given since September 2004. Some universities started education in Biosystems Engineering are; University of Zagreb, University of Helsinki, Godollo University, the University of Hohenheim, Wageningen Agr.University, Poznom Agricultural University,

Agricultural University of Warsow, Swidish University, the University of Moribor, Sweden Agricultural Sci, Univ., Swiss Federal Inst. of Tech. Zurich, University of Aber, University of Wales and such as universities (Eriş, 2004; Ucar et al., 2003b).

In Japan Kobe University, Tokyo University of Agriculture and Technology are carried out postgraduate education in the field of Bio-Applications and Systems Engineering. Biosystems Engineering Department is also established in Yamagata University (Ülger, 2006).

Biosystems Engineering in Turkey

Biosystems Engineering is still a too new area for Turkey. Expanded in line with scientific and technological developments in the world the term "Biosystems Engineering" as a new chapter and a profession have been pronounced and have been on the agenda the first time in Turkey in 2002 in Van University Senato and at the University of Uludag at First and Second Agricultural Mechanization Training Workshops in 2003 and 2007.

Parallel to the developments in the world, fistly Board of Agricultural Mechanization in 2004 in Bursa in 2 Training Workshop, it is decided that as similar agriculture and engineering training was done under different names in U.S. and EU countries, "Biosystems Engineering" is the best of them, and it includes the topics of the Departments of Agricultural Machinery and Farm Structures and Irrigation, and therefore it will take place in each of two sections and it is decided to open "Biosystems Engineering"program that can be accredited at the international level.

Then, in Agricultural Structures and Irrigation Department Heads meeting in Ankara in 2007, within the framework of the restructuring of the Faculties of Agriculture in our country, have taken the decision of opening "Biosystems Engineering" Graduate Program with Agricultural Structures and Irrigation Department in conjunction with the Department of Agricultural Machinery.

Uludag University in particular, Kahramanmaraş Sütçü İmam and Tokat Gaziosmanpaşa universities established "Biosystems Engineering" as a part of Faculty of Agriculture, under the Departments of "Land and Water Resources", "Agricultural Energy Systems", "Agricultural Machinery Systems" and "Agricultural Structures" and they have begun to take students. Then, in Namik Kemal (Tekirdag), Yüzüncü Yıl (Van) and Mustafa Kemal (Hatay) Universitie's Biosystems Engineering Department was established within the Faculties of Agriculture with the same departments. They are organized as Biosystems Engineering Department in 2010.

However, the first in Turkey, Biosystems Engineering was opened to contain other branches of the Departments of Biosystems Engineering within the Faculty of Engineering and Architecture of Bozok University (Yozgat) in 2009.

RESULTS and RECOMMENDATIONS

Biosystems Engineering is a department that include mainly application of engineering principles physics-based (mechanical, civil, electrical and electronics, etc.) to rural and biological systems. Because of the population density live in rural areas in our country; it is aimed to make real the rural development through engineering activities and to build up villages, no different city in terms of comfort. In this respect, the idea of Biosystems Engineering is a very big project so that, it is seen as aunique and long-term way to minimize inter-regional differences in terms of development and inequality in income distribution and prevent the hidden unemployment in the villages.

Departments that will be established within the body of Biosystems Engineering must be united doubly, also in addition to these Electricity and Information Technology, Food and Bioprocess Engineering and Rural Environment and Ecological Systems departments must be established.

The Biosystems Engineering Education only must be in Faculty of Engineering. Because, existing situation of Biosystems in the faculty of agriculture haven't included any change in terms of given training and developing technology. Only, it is meaning that anew department established by removing two different department instead of them.

Besides, The Department of Biosystems Engineering that is a rural-based engineering mustn't be established within the body of Faculty of Engineering in the Universities haven't Faculty of Agriculture.

Biosystems Engineering will be anew field of profession which provide different employment possibilities for teenager who want to study in university by means of large field of study.

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