

A RESEARCH ON ENERGY USAGE IN AGRICULTURE

(Example of Turkey)

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Abstract— From the beginning of human history to this time, it is important that energy sources are found, operated and the energy obtained is usefully prepared for human beings. In the whole world, there is a need for energy to raise the standard of living of societies.

Agricultural production is also an important input to energy. Particularly the most important input that is affected when energy is marketed in foreign countries is energy costs.

In this study, the energy used in the agricultural sector is considered. In the study, the amount of energy and the yields used in agricultural production in Turkey were investigated. As a result of the work, it saves a lot of energy. For this, farmers need to be educated and educated.

Keywords— Agriculture; Using energy; Efficiency; Turkey

I. INTRODUCTION

Energy obtained from natural energy sources is gradually decreasing due to the excessive consumption of the increasing world population. So far in the history, mankind has made great efforts to supply, operate the energy resources and preserve the present energy for maximum use. While energy can be described as the ability to do a work, it is the source of living standards for mankind and other living things in nature. The use of energy has reached today's level and has been a factor in increasing the standard of living.

Beginning with muscle power and continuing with the use of solar energy, energy has spread over a wide area in our daily lives. Utilizing natural energy resources, numerous facilities, tools and equipment have been made, the area of consumption has expanded. Despite the arithmetic increase of the world population, the energy is increasing logarithmically. According to Reference,[1], the world population is estimated to be 9.5 billion by 2050. In particular, it is estimated that the use of energy in the agricultural sector will spread to even wider areas.

In this study, measures to be taken concerning the energy demand and energy use of agriculture sector in Turkey have been discussed. With the measures to be taken, energy will be used at an optimum level, both production increase and energy efficiency will be ensured.

I Energy Resources in Turkey

A large part of the energy consumed in the earth is supplied from fossil fuels.

The most common of these are petroleum products and coal. In addition, the use of renewable energy sources has also reached increasing levels. The most widely used renewable energy sources in Turkey are hydraulic, solar energy, wind energy and geothermal energy respectively.

Agricultural tractors are the main source of power used in agriculture. The sources of energy for tractors, combine harvesters and self-propelled agricultural machines are fossil fuels.16,04 % of the diesel fuel consumed in Turkey is used in agriculture [2]

According to Reference [3] data, Turkey's 2015 tractor, combine harvester and self-propelled agricultural machinery park are given in Table I.

Table I. TURKEY'S 2015 TRACTOR AND HARVESTER PARK [3].

Type of Vehicle Used in Agriculture	Number
Tractor	1 260 358
Harvester	15 998

In rural areas; electrical energy is widely used because its distribution, conduction and efficiency are higher than other types of energy. Especially, most of the vehicles used for internal agriculture are operated by electrical energy. Besides, it is used for lighting, heating and water supply of houses. The amount of electrical energy consumed on sectoral basis in Turkey for 2010-2014 is given in Table II.

Table II. QUANTITIES OF ELECTRICAL ENERGY CONSUMED ON SECTORAL BASIS IN TURKEY [4]

Years	Total Consumption (GWh)	Domicile (%)	Trade (%)	Official institutions (%)	Industry (%)	Lighting (%)	Agriculture sector (%)
2010	172.051	24,1	16,1	4,1	46,1	2,2	7,4
2011	186.100	23,8	16,4	3,9	47,3	2,1	6,5
2012	194.923	23,3	16,3	4,5	47,4	2,0	6,5
2013	198.045	22,7	18,9	4,1	47,1	1,9	5,3
2014	207.375	22,3	19,2	3,9	47,2	1,9	5,5

Energy consumption for modern technology applications in agriculture has increased. The use of agricultural equipment / machinery and pesticides requires consumption of fossil fuels, the most important energy source. The use of additional energy significantly reduces the energy efficiency of agricultural ecosystems when compared to natural systems. Particularly in pesticide production, energy is consumed excessively. Since agricultural systems includes natural processes, the use of energy must be analyzed in order to evaluate the energy efficiency in the management of natural resources [5].

II. ENERGY SAVING

Mankind has used all kinds of energy sources to meet its needs and increase the standards of life. In this universe with limited resources, efficient use of existing energy should be the main objective. In the globalizing world, oil prices are constantly changing as a result of rapid developments. This situation; especially for the energy - dependent foreign countries, necessitate taking a number of measures. World countries in this context remind that the fossil fuels could consume energy resources, countries with these resources could sustain the economic dependence of other countries, and the need to accelerate renewable energy sources and Research & Design work.

In recent years, countries have had to review and rearrange their energy policies. The basis of these policies is the efficient use of energy and the use of new and renewable energy sources. The basis for these policies is the efficient use of energy, and the use of new and renewable energy sources through saving. It is aimed that it will be most beneficial to use the most suitable energy shape in the fields such as industry and agriculture. Even those oil producing countries, has been one of the countries most affected by developments in the world. Even the industry has suffered significant power interruptions. In order to make the agricultural mechanics attractive, fertilizer, machinery, struggle against agricultural war, irrigation tools and supplies were provided in abundant quantities.

The first element is the education of a man, as it is in every area. The knowledge, skill, and experience of the person using the energy is extremely important. Teaching farmers the most suitable, cheap and useful energy saving methods for tillage, sowing, harvesting, threshing, transportation, marketing and operation comes at the forefront of the measures to be taken [6]. The scattering of agricultural land and the small size of the parcels significantly increases fuel consumption, as it increases farm traffic.

III. CONCLUSION AND DISCUSSION

Manufacturers and governments should design and develop agricultural equipment appropriate to the power of the different tractors by hand. Farmers should be trained about tractor and equipment combinations. It is possible to achieve more work success with less fuel consumption by taking advantage of all the power of the agricultural tractor, its transmission systems and its capabilities.

The use of front and rear propelling tractors should be encouraged. While the fuel consumption of these tractors is 15% higher than that of the standard tractors, a 30% bollard pull can be achieved [6].

The use of the power take-off from the tractor should be increased. Benefits can be provided in fuel economy as the usage rate is increased.

Methods of sowing to stubble should be developed. Plant species should be selected according to the type of crop, soil structure and amount of precipitation. Minimal tillage will also reduce product cost by saving energy.

Suitable plows should be designed to reduce soil resistance by selecting. The total weight of the pulp must be reduced, and the ears and front part must be covered with special materials. Sharpening the front part and reduce the body and total work width will make saving.

The harvesting speed and other adjustment patterns at the harvest of cereals should be checked continuously. Fuel consumption and grain losses can be reduced. Cutting the crop high from the ground at

harvest can save fuel by 15-20%. This situation is not possible in these regions where handle and straw are of high commercial value.

Farmer wants to generate energy from the products he produces with his own means. In particular, plant residues are energy resources that can be found near renewable energy sources such as wood, peat, peat, sun, wind and biogas. These are the indispensable resources of the farmer.

Many examples can be given as agricultural activities are widespread and varied. It should not be forgotten that a 2.5% increase in energy consumption is required to achieve a 1% increase in agricultural products. Agricultural techniques and methods that can provide high production with less energy in agricultural production can be developed.

Drying facilities for houses and greenhouses are commonly used to heat barns and poultry in areas with high solar intensity. Biogas can also be an important source of energy to support of agriculture in areas where livestock farming is being carried out.

Continuous wind areas can provide electrical energy from wind power.

The need for energy for transportation is required for the marketing of the products that are produced, as well as for the transport of materials such as fertilizers and pesticides. For this purpose, the development of transportation techniques and services is obligatory.

Running a large powerful tractor with a small work machine reduces energy efficiency while increasing fuel consumption on the other hand. The working way and methods are also very important.

Despite the increase in energy consumption areas in agricultural production activities, the increase in agricultural production against consumption of electricity is limited. More energy is needed for higher production, but the relation between production and energy consumption is based on certain limits.

While achieving high efficiency from the unit area, energy consumption can be reduced with less water use and production technologies, such as drug and fertilizer, use. In this context, energy should be allocated primarily to agricultural and industrial areas, rather than directly to non-contributing areas.

The structural characteristics of buildings in rural agricultural areas should be improved. Heat transmission coefficients of windows, roof, floor and walls should be reduced. With using double glazed-windows, the buildings can be ventilated by ventilator systems.

Heating costs are the most important factor affecting the profitability of greenhouses. In recent years, both in our country and in other countries, it has become increasingly common to use renewable energy sources to heat greenhouses because of their being cheap and environmentally friendly.

The development of greenhouse based on geothermal resources in our country will make important contributions to greenhouse, especially in Aegean Region and all other regions. Today, with the developing technology, solving the problems related to both the projecting of the greenhouse heating systems and the operation of the system, can play an important role in the dissemination of these heating systems [7]. Strategies for the formation of sustainable geothermal greenhouses should be identified [8].

The heat energy taken from the milk during the cooling system is usually released into the atmosphere this loss can be utilized. The milk, which is at 36-37 °C temperature, comes to the cooling tank by piping system. In order to take advantage of the heat energy, to be taken from the cooling milk and thrown out, a second pipe is passed around the tube carrying the milk and the outer surface is insulated against heat loss. As the milk, transferred to the cooling tank, passes through the pipe, some of the heat inside is given to the cold water circulating in the pipe around the milk. Then, hot water can be obtained at 40-70 ° C by passing through the condenser. This hot water can be used in stables, at homes or for the needs of working people.

As a result, we can say that countries and especially Turkey have some problems in energy supply with the reason that their energy sources are limited. For the development of living standards; energy should be used efficiently, energy consuming vehicles should be replaced by more economical means, rational use of natural wealth is necessary.

It should not be forgotten that there may be various alternatives that can reduce energy use without decreasing efficiency or increasing labor intensity.

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