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### A SCOPE AND REVIEW OF RENEWABLE ENERGY SOURCES IN AGRICULTURE

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**Abstract:** The present paper provides brief information about the various types of renewable energies and its importance in agriculture field. Energy is a key component to bring the development and growth for any country. As the Earth's non-renewable energy reserves decline, individuals, public bodies and industries are coming under pressure to reduce their consumption of fossil fuels by looking for advanced technological solutions that optimize the use of existing energy sources and making the use of renewable energy sources with high priority. Use of renewable energy sources is important for the current world population without compromising the ability of future generations to meet their needs. India is said to be an agricultural based country. Approximately 80% population of India is dependent on farming directly or indirectly. The agricultural industry has always been the backbone of India's sustained growth. As the population of India continues to grow, the demand for produce grows as well. Energy is a central issue in agriculture field. The aim of this study is to investigate the utility of renewable energies for organic agricultural activities. There is significant potential for organic agricultural involvement in the production and consumption of solar, wind, geothermal and biomass energy.

**Keywords:** Renewable energy, Agriculture, fossil fuels



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## **INTRODUCTION**

Given the growing population's food requirements, the world's finite supply of fossil fuels and the adverse environmental impacts of using this nonrenewable resource, the existing relationship between agriculture and energy must be dramatically altered. Among the most obvious solutions is to simply improve the energy efficiency of food production and distribution. This can be accomplished by shifting from energy-intensive industrial agricultural techniques to less intensive methods. Use of renewable energy in farming systems can mean several different things. For example, fossil fuels such as oil are non-renewable, so finding alternative ways of fertilizing the land and controlling pests that do not depend on chemicals, will normally involve the use of renewable resources. Renewable energy also includes generation of power to do a number of farm tasks [1]. To meet the basic food needs of our expanding human population, a productive, sustainable agricultural system must become a major priority. From analyses of various agricultural systems, we can understand the use of all forms of energy and learn how to preserve essential land, water, and biological resources for future generations [2]. The various renewable energies solar energy, biomass energy, wind energy and geothermal energy are hereby discussed with their application in farming sector.

## **SOLAR ENERGY**

India has the fifth largest installed renewable energy capacity with much larger investments planned, particularly in solar power. The amount of energy from the sun that reaches earth each day is enormous. All the energy stored in Earth's reserves of coal, oil, and natural gas is equal to the energy from only 20 days of sunshine [3]. In order to efficiently use this energy, solar technologies have been developed to produce electrical or thermal energy. In agriculture, photovoltaic applications can economically provide electricity where the distance is too great to justify new power lines [4].

In today's climate of growing energy needs and increasing environmental concern, alternatives to the use of non-renewable and polluting fossil fuels have to be investigated. One such alternative is solar energy. Solar energy is quite simply the energy produced directly by the sun and collected elsewhere; normally the Earth Sunlight can also generate electricity. Photovoltaic (PV) panels are often a cheaper option than new electric lines for providing power to remote locations. And because they require no fuel and have no moving parts, they are more convenient to operate and maintain than diesel or gasoline generators. Solar energy-power from the sun-is clean and unlimited. Capturing the sun's energy for light, heat, hot water, and

electricity can be a convenient way to save money. Whether drying crops, heating buildings, or powering a water pump, using the sun can make the farm more efficient.

Swetha S. and Shreeharsha G. H. [5] stated solar operated automatic seed sowing machine is to fulfill the tasks like digging, seed sowing, water pouring and fertilizing by using non-conventional energy sources. Thus solar operated automatic seed sowing machine will help the farmers of those remote areas of country where fuel is not available easily. And also they can perform their regular cultivation activity as well as saves fuel up to larger extent. Rossello [6] concluded that due to the current trends towards higher cost of fossil fuels and uncertainty regarding future cost and availability, use of solar energy in food processing will probably increase and become more economically feasible in the near future. Solar dryers have some advantages over sun drying when correctly designed. They give faster drying rates by heating the air to 10-30<sup>0</sup>C above ambient, which causes the air to move faster through the dryer, reduces its humidity and deters insects. The faster drying reduces the risk of spoilage, improves quality of the product and gives a higher throughput, so reducing the drying area that is needed. Mingle Liu et al [7] found that, the heat dryer which combined the solar energy and conventional energy can be saving energy more than 20 to 40 percent. The product is clean with particularly good color, smell and taste. Because of the hot strong penetrating power, the drying effect is good that is positive significance to improve the quality of drugs and clinical curative effect. The technology of spraying can be extended for spraying pesticides, Fungicides and Fertilizers etc. by using Solar Sprayers. R. Joshua et al [8] presented a working model of spraying on solar energy along with the technical specification and economic analysis. Varikuti Vasantha Rao [9] suggested that the initial cost of the solar based proposed system is little more as compared to conventional sprayer but the running cost of the system is very less. The developed system which utilizes solar energy can be used for spraying the fertilizer, pesticides, fungicides and painting.



**Fig. 1. Solar Operated Spraying**

## BIOMASS ENERGY

Biomass is defined as any organic material from plants or animals. Biomass can be produced by farming, land management and forestry sectors and used for renewable energy generation. Biomass energy is an important source of energy in most Asian countries. Substantial amounts of fuel-wood, charcoal and other biomass energy such as agricultural residues, dung and leaves are used by households and industries [10]. Biomass gasification offers the most attractive alternative energy system for agricultural purposes. Most preferred fuels for gasification have been charcoal and wood. However biomass residues are the most appropriate fuels for on-farm systems and offer the greatest challenge to researchers and gasification system manufacturers [11].



**Fig. 2. Biomass: Wood fuel**

Peter McKendry [12] founded biomass is an accepted form of renewable energy and is seen as a means of helping to reduce global warming, by displacing the use of fossil fuels: up to 10% of the UK's electricity needs is targeted to be generated from renewable forms of energy by 2010. All biomass can be burned in thermo-chemical conversion plant i.e. combustion, to produce steam for use in a turbo-generator to produce electricity: some biomass species are better suited for biochemical conversion processes to produce gaseous or liquid fuels. The best commercially available technologies for conversion of biomass into renewable forms of energy at the farm scale fall into three main classes: Direct combustion, anaerobic digestion, and small-scale gasification [13]. The Rutgers Cooperative Extension publication "Crop Residues as a Potential Bio-energy Resource" provides detailed information about using cover crops and field residues for bio-energy while maintaining soil health [14].

## WIND ENERGY

Wind technologies as another type of renewable energy can provide mechanical and electrical Energy. Wind power is the fastest growing energy source in the world, with annual average growth of 32 percent between 1998 and 2002. Wind energy can be used in agriculture field for power generation, wind generators, windmills, water pumps etc. Farms have long used wind power to pump water and generate electricity. Farmers are in a unique position to benefit from the growth in the wind industry. To tap this market, farmers can lease land to wind developers, use the wind to generate power for their farms, or become wind power producers themselves.



**Fig. 3. Wind Turbine**

Small wind systems can serve organic agriculture in traditional ways, such as using mechanical energy to pump water or grind grain. As costs decrease, small systems used to generate electricity may also become economically efficient by avoiding the expense of installing transmission wires, especially in more remote applications [15]. Use of wind energy can provide an important economic boost to farmers. With technological improvement (e.g., hybrid energy systems), the economic efficiency of wind energy continues to increase. Agricultural producers are likely to increase their use of wind power to reduce energy costs and become more energy self-sufficient [16].

## GEOTHERMAL ENERGY

Geothermal is energy available as heat emitted from within the earth, usually in the form of hot water or steam. Geothermal technologies produce electrical or thermal energy. Fifteen countries report the use of geothermal energy for drying various grains, vegetables and fruit crops. The heat from geothermal energy can also be utilized directly. Geothermal fluids can be used for such purposes as heating buildings, growing plants in greenhouses, dehydrating onions and garlic, heating water for fish farming, and pasteurizing milk.

Direct-use of geothermal energy is one of the oldest, most versatile and a common form of utilization of geothermal energy in agriculture. Recently geothermal energy is utilizing in organic agriculture. There are three types of geothermal power plants are operating today: dry steam plants, flash steam plants, and binary-cycle plants. High-temperature geothermal resources (greater than 149°C) are used for power generation in organic agriculture. Utilization of geothermal energy in general can be divided into two types, namely utilization (indirect use) and use (direct use). Utilization of the indirect use of geothermal energy for power generation, while the direct use of the direct use of heat contained in the geothermal fluid to various fields such as conventional and organic agriculture / agro-industry, fisheries, etc [17].

## CONCLUSION

A growing demand of energy is one of the major threads in every sector. It is the great challenge for social scientist, engineers and entrepreneurs to find the solutions because finite supply of fossil fuels. According to findings applications of renewable energy sources is the only alternate solution for conventional energy demand. Now-a-days the concept and technology employing of renewable energy becomes very popular in agriculture field for the development activities. These renewable resources have a huge potential for the agriculture industry. There is a need to create awareness about use of renewable energy systems for farming sector. Therefore, applications of renewable energy sources have a great scope in agriculture field in order to face the future energy crises and to meet the requirement of growing world population.

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