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Poland, Factor 3: Biofuels

Biofuels in Poland

Poland, or officially the Republic of Poland, is a country in Central Europe between the Baltic Sea to the north and two mountain ranges to the south, the Sudetes and Carpathian Mountains. Its neighboring countries include Germany to the west, Czech Republic and Slovakia to the south, and Ukraine and Belarus to the east. Poland has an area of 312,679 square kilometers (120,726 sq. mi) and a population of over 38.5 million people. Many of those residents rely on farming, as Poland has more than two million private farms. Poland is one of the leading producers of triticale, barley, oats, sugar beets, flax, and fruits. Poland is the fourth largest supplier of pork in the European Union, after Germany, Spain, and France. Many of the small farms are struggling and the poverty rate in rural areas is high (The World Factbook: POLAND, 2017). As a member of the European Union, Poland must increase the percentage of renewable energy sources significantly in the coming years. One promising eco-friendly source of energy and fuel is biofuels and biogases. These fuels are produced directly from living matter, such as plant or animal waste/byproducts. The most common type of biofuel is ethanol, which is produced by a process called gasification. This system uses high temperatures and low oxygen to convert biomass into synthesis gas, a mixture of hydrogen and carbon monoxide. This “syngas” is then converted into ethanol chemically (Biofuels Basics, 2017).

The typical farming family of Poland represents many of the rural people. The country of Poland itself is over one-third rural, or living away from large cities, in countryside farms or towns. Over 17% of the population works in agriculture specifically (Better Life Initiative Country note Poland, 2015). The average family in rural Poland has 2.84 people, often surviving with incomes below the living wage levels (5 Family Facts, 2017). The low-income families of Poland often have poor housing conditions, and the life expectancy is only 77.1 years (Better Life Initiative Country note Poland, 2015). Though housing conditions are certainly significant, it is only one of many problems. Other problems include the wellbeing of children and female employment. Child poverty in Poland is high, and the general wellbeing of young children and teens across Poland is suffering significantly. The disposable income of households, due to poor parental employment and low job security, contribute to many issues among children, including but not limited to: lack of basic facilities, high infant mortality, high obesity, high adolescent suicide rate, high teenage birth rate, low problem solving skills, low life satisfaction, and a lack of belonging in society (Better Life Initiative Country note Poland, 2015). Low social spending, at only 116,200 PLN, or 29,050 USD, (5 Family Facts, 2017) could be a cause for many of these family issues. Other major issues with the low-income society in Poland are problems specifically related to gender. Women in Poland have only an education rate of 52.8% and fertility rates are low, at only 1.4 average children per woman (5 Family Facts, 2017). The employed people in Poland report having less time off and low job security (Better Life Initiative Country note Poland, 2015). Health care is provided by the state governments for all residents, but often long waits result in citizens choosing to pay for private health care. Governmental health care comes from 8.1% of salaries and has very inclusive coverage (Healthcare in Poland, 2017). Educational attainment in Poland is high, with 90.1% of working age people with an upper secondary education, but many youth report that they lack problem solving skills (Better Life Initiative Country note Poland, 2015)

The farms in Poland are mostly traditional, which poses many advantages and disadvantages. These traditional farms are small, at less than 8 hectares, or 20 acres, on average (FAOSTAT, 2017), and 1.4 million farms under 5 hectares, or 12 acres, have low levels of output. Overall, 63% of the agricultural holdings are in the form of small farms (Farming in Poland, 2017). The traditional farms have diversified

their output to suit the growing need and the many challenges that they face. The main crops that are grown in Poland are grains, and the highest yields come from rye, wheat, barley, and oats. Other major crops are potatoes, sugar beets, fodder crops, flax, hops, tobacco, and fruits. Farms all over Poland not only grow plants, but also raise animals such as dairy cows, beef cattle, pigs, and poultry. The diet of rural Poland relies 43% on cereals, roots, and tubers to supply the daily energy need, with 49-53 g/capita/day of animal protein since the 1980's. Ninety-eight percent of the population has access to clean water (Farming in Poland, 2017). Traditional farms often strive to be self-sufficient, but the amount of product available for sale after their personal use is extremely small. A prime example for a small, rural farm is the farm of the Masters. Szczepan Master runs a small farm consisting of just him and his wife, and produces high quality products. He keeps livestock in a room in his house, on a straw-floored "Barn", which you can enter through the kitchen door. He kills his own pigs, they milk their cows by hand, and they reject genetically modified seeds. His crops are plowed and rotated, and no sprays are applied. They are dependent upon frosts to kill insect pests (Rosenthal, 2008). Many people live like this and experience high levels of poverty among farmers, and the low levels of average disposable household income per capita. 8.1% of children live in a household with at least one long term unemployed parent, which can lead to a poor upbringing (Better Life Initiative Country note Poland, 2015). The field of agriculture employs almost one third of the total Polish working class, but contributes less than 4% of the GDP (Farming in Poland, 2017).

Poland, like many other countries, is facing a fight between the new and old. Many small rural farms are having to make difficult decisions to survive. One of the numerous challenges that small farming families are facing is the lack of interest in farming. The younger generation tends to drift toward the more modern employments, and that is causing a huge barrier for many small farms. As the young people move to cities, the farms are left lacking skill, manpower, and employment (Farming in Poland, 2017). Another challenge for traditional farmers is the fact that Poland joined the European Union. Farmers have been victim to new sanitary laws and mandates to encourage efficiency and competition that favors newer, mechanical farming styles. An example of an EU treaty is the European Convention for the protection of animals kept for farming purposes (ETS No. 87). This treaty states that "A cattle crush, race or other adequate facilities with quick-release devices should be provided for the proper handling of animals under examination, treatment or test." (Standing Committee, 1988). These laws legally require conditions that cannot be met by standalone farms that are owned by a large population of Poland. Another section of Treaty ETS No. 87 states "Automatic computerized feeding systems should be designed so as to provide at least as much information to the stockman as would be available under manual feeding systems, and in particular whether or not an individual animal has consumed all its feed." Although this benefits many, and is a step toward more efficient and better systems, the small traditional farms overall are suffering (Rosenthal, 2008). Many of the styles that many small families use are now considered unsafe or unsanitary, such as the mandate stating "Those parts of the accommodation with which the animals come into contact should be thoroughly cleansed, and where appropriate, disinfected, every time the accommodation has been emptied and before new animals are brought in. While the accommodation is occupied by the animals, the interior surfaces and all equipment therein shall be kept satisfactorily clean.", as well as "For thorough inspection of the animals, special attention shall be paid to bodily condition, movements and posture, rumination, condition of hair, skin, eyes, ears, tail, legs and feet. Healthy animals have sounds, activity, movements and posture appropriate to their age, sex, breed or physiological condition. These include: clear bright eyes, good posture, clean and shiny coat, sound feet and legs, normal feeding, ruminating, drinking, sucking or suckling behavior,

normal getting up, lying down, and resting behavior and otherwise normal movements and behavior.” (Standing Committee, 1988). Another barrier against productivity is the soil quality in many parts. The large number of farms that make up most of the land and population are struggling with efficiency so much that they now require assistance from the government, rather than providing a stable source of income/food for local residences (FAOSTAT, 2017). The small farms of Poland are no longer encouraged to use former, traditional techniques and struggle for a source of income and nutrition. One solution, although controversial, is the use of genetically modified organisms, which are banned in Poland. This further reduces opportunities for small farmers as they have to compete against large commercial companies (Rosenthal, 2008). Poland has a diverse agricultural production system due to its complex history and its association with other countries. This causes an even larger need for a consistent renewable energy source. The former Austrian region has many farms that are unable to sustain their owners. This is mainly due to the low soil quality and weather patterns that differ from the rest of the country. While the former Prussian region, originally from the Kingdom of Prussia, has a high level of agricultural productivity. The former Russian region has low productivities and rural overpopulation and the former Prussian region within Germany has large scale farms.

Biofuel has been used worldwide as a renewable source of energy and biogas. Like many other countries, Poland is using biofuels to create the energy needed for its population in a sustainable manner. It has become an increasingly relevant and necessary part of life in Poland, increasing by 137.29 million m³ between 2011 and 2014. A total of 173.932 million m³ of biogas was produced in 2014, which was used to solve needs for heat and fuel (Piwowar et al., 2016). Although it is growing, the production of biofuels and biogases could be greatly improved, up to a maximum of 1.7 billion m³ of biogas per year. Organizational barriers, economic barriers, and lack of information provided to potential producers, limit the ability to achieve this potential (Piwowar et al., 2016). Through increased farmer access to processing plants, technical knowledge sharing, and economic incentives, the biofuel production could be enhanced. Many small farms or local companies could use biofuel to boost their production and profitability, and to become relevant in the ever-growing technical world. One of the largest problems that small farm owners and traditional rural families have is access to facilities that could provide the necessary processing for creating renewable sources from animal and plant waste. Organic waste, sewage, and plant waste can all be used to create biogases, but animal based sources, both liquid and solid, must be combined with plant matter to become useful. Without plant sources, the carbon necessary for biofuel is not there, and the amount produced would be drastically smaller. Over 60 million m³ of biogas can come from these non-plant biomass sources, which would provide a useful and environmentally safe way to produce energy and fuel for those who have access to the necessary technology (Muradin and Foltynowicz, 2014).

The potential for biofuel is great in Poland, among the greatest in Europe, but the availability must be improved, and the education and infrastructure of local/rural farms and families must be taken care of to see significant improvement. Improvement is, however, almost a guarantee, as the European Union requires nearly a doubling in the production of renewable energy by 2020 (Jeziarska-Thole et al., 2016). Across Poland, there is about 1 million hectares of land available for biofuels. These areas are unusable for farming, but certain biofuel plants, such as maize, Giant Miscanthus, Amur Silver grass, and sweet sorghum could thrive (Jankowski et al., 2016). The European Bio economy in 2030 strategy promotes the production of these plants, which provides opportunities for many families to greatly improve their way of life (Arodudu et al. 2017). Systems such as the European Bio economy in 2030 could be useful to not only large biofuel and biogas companies, but also would greatly benefit the local communities and families. Smaller communities or cooperatives could be encouraged to invest in equipment, with the help of the national government, to produce biogas and biofuel, and the individual farmers and/or families

could supply the raw resources. The local, national and EU governments can help by encouraging local cooperatives to help farmers learn about biofuel production and processing. Government support may be available to support the construction of biofuel refineries in rural locations in Poland so that it is economical for the farmers can deliver their biomass to the processing plants. Groups of farmers could collaborate to establish the necessary equipment and infrastructure through community support, thus not only strengthening the economy but also the community through these cooperatives (LEI Wageningen UD, n.d.). Cooperatives in remote areas are often important employers. In many cases the activities of these cooperatives go hand in hand with support of community objectives such as the development of local income and environmental protection (LEI Wageningen UD, n.d.). Not only would this solution solve the problem of poverty and poor living conditions, but the communities would have a more stable and trustworthy income. Participation in conferences, such as the International Conference on Renewable Resources and Biorefineries to be held in Wroclaw, Poland June 7-9 2017, will help educate participants on the potential of biofuel use in Poland (International Conferences on Renewable Resources and Biorefineries, 2017).

Crops can be used to produce both biogas, which replaces natural gas, and bioenergy, which can be used for electricity and heat. In other countries across Europe, such as Germany, as much as 45% of biogas comes from biomass. This is mainly supplied as corn silage. Research has shown that Giant Miscanthus is a highly productive biomass producer under Polish growing conditions. In addition, its productivity will increase with warmer temperatures. Although warmer temperatures resulting from climate change are a threat to many places, these conditions could benefit Giant Miscanthus producers in Poland. Small farmers could grow Giant Miscanthus and sell it not for nutritional purposes, but for biomass, if processing plants were made available to them (Arodudu et al., 2017). At this time, biogas production is more expensive than fossil fuel based energy production in Poland. However, European regulations require the expansion of this segment of the energy industry in the future. Biofuel and biogas production will be enhanced by having increased access to cheap raw materials, including animal processing byproducts, plant processing byproducts, and plant biomass. Algal biofuels are also a possibility, but are less relevant for many reasons. Although they use much less total land than other biofuel producing plants, algal biofuels require many more technological advance. Putting products such as algal biofuels into circulation would be much more work and investment than simple plant and animal biomass (Budzianowski, 2016)

Although it is not the only option, biofuels, and biogases such as biodiesel, ethanol, or methanol are certainly hopeful alternatives to improve the lives of small farmers and homeowners in the future (Biofuels Basics, 2017). These options provide a source of income to the community and the family owners. With an investment, biofuels can help farmers be more productive with respect to land use, provide eco-friendly solutions, and also lower the poverty level/increase the style of life, all of which are certainly necessary. Being a country with rich and extensive history, the tradition of farming has become strong in many parts of its rural countryside. Unfortunately, this also means a rough way of life that often fails to meet the standards set by the modern world. Local farmers who still hand milk their cows, grow their own food, and slaughter their own livestock create a traditional lifestyle which, although being what the Polish have done for much of its history, is not consistent with the technology of the modern world.

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