Desertification problem is a problem of global significance. It has serious implications for the international environmental safety, efforts in poverty eradication, establishment of socio-economic stability and sustainable development.

Problems faced by poor people in dry lands are multifaceted: loss of income, food insecurity, health deterioration, lack of security systems, land rights and rights for access to natural resources, as well as the lack of access to markets. Limited opportunities in relation to livelihood often force people to migrate in search of a better life to areas not affected by desertification.

Approximately 2.6 billion people live in and depend on dry land ecosystems. Arid regions occupy 41 percent of the Earth’s surface. These areas are inhabited by approximately one third of the world population. Kazakhstan can serve as an example of one of such countries.

Kazakhstan is the 9th largest country in the area. Over a quarter of our territory is occupied by steppes (26%), half-deserts (44%) and semi-deserts (14%), the remaining quarter includes mountains, seas, lakes, rivers and forests (16%). These arid regions of our country characterized by steppes, deserts and semi-deserts are full of small villages and settlements inhabited by people who cannot afford to engage in farming and agriculture because of the need to bring water resources from the outside. But this process is difficult, time consuming and expensive. Apart from the delivery of water being quite expensive these days, transportation as well brings fairly high expenses together with energy and thermal energy consumption; so a lot of money and plenty of water are needed. But we believe that our engineering idea is able to solve these problems.

Absorption is the process of absorption of one substance by another. So, if any substance is able to absorb water, it can be transported to arid regions.

Potassium polyacrylate, falling into the water can absorb over 500 times more liquid than it weighs itself. In the middle of a drought it is enough to add potassium polyacrylate into the soil and the plants themselves will take as much water as they need. However, its swells. Shelf life of water inside the potassium polyacrylate is one year. However, this does not mean that new portions cannot be used after 12 months. In contrast, over the next 2-10 years potassium polyacrylate moisture will garner as precipitation and return to the ground during a drought. By outward signs potassium polyacrylate itself is similar to the detergent, sugar or salt. In addition, the hydrogel is an environmentally friendly product with no adverse effects on the soil and the environment. Therefore, it can be used not only for the transportation of water in arid regions, but also for watering plants. Gradual polyacrylate potassium decaying will provide the plants with the accumulated water supplying moisture. But after the rain appears the sun evaporates the moisture, the earth then cracks and excessive moisture goes into the deeper layers that are inaccessible for the major crops. Scientists estimate that plants use only 10% of moisture, 20% go into the groundwater, and 70% evaporate. The next rain brings moisture that does not have time to soak through the cracks and streams out, thereby the soil surface is «hammered» and the rain turns it into an airtight crust. [1]

One way out of trouble is hydroabsorbents. Super-absorbent is 1 kg of soil which accumulates up to 400 liters water. Absorbent crystals are specifically designed for the use in agriculture, from greenhouses and indoor plants to crops, tobacco, flowers, vines, lawns, trees, shrubs and ornamental plantings. Hydroabsorbent contains crystals that absorb and retain unique volume of moisture - hundreds of times more than the absorbent’s own weight. During the drought they give dosed moisture to plants.

The following sizes of crystals of
potassium polyacrylate are used in different situations: fine granules for light loose soil and for enveloping pastes; large granules for heavy soils and black earth; powdered is used to treat roots; a combination of different granules is intended for general use.

While drying, absorbent goes back to its original form—the crystal and becomes ready for a new cycle in the subsequent moistening.

This rare ability to cyclically absorb and release moisture during several years, using a single introduction, is not inherent in all absorbents, so the most reasonable option during the agricultural activities is using the potassium polyacrylate hydrogel.

In areas of the globe dominated by a sharp continental climate it is important to ensure that during drought plants are watered. We believe that using the potassium polyacrylate hydrogel even in the small landscapes of school districts with the lowest cost can lead to massive use of hydrogel in agriculture and subsequently—can take the economy of our country to the new level. Also, the use of potassium polyacrylate is very advantageous from the economic point of view: it helps to save (i.e., getting free from nature itself) 50-80% of water depending on the climate and soil conditions. [2]

We use potassium polyacrylate hydrogel for landscaping a small area in an arid region. In Kazakhstan, namely in the Akmol region, 15 kilometers from the town there is a small village of Kokshetau. Aidarly where people live experiencing an acute shortage of water. Every week a tractor with water comes to the villagers and provides them and the local school with the supply of water for one week. The inhabitants of this village desire to plant trees in their lands, so they could begin to engage in farming, agriculture and animal husbandry. But the problem is that in such arid regions of our country as steppes, deserts and semi-deserts, the water must be delivered from outside. But this process is difficult, time consuming and expensive. Apart from the delivery of water being quite expensive these days, transportation as well brings fairly high expenses together with energy and thermal energy consumption; so a lot of money and plenty of water are needed. In addition to the tractor, bringing water required large amounts of thermal energy. Pumps, pumping water from the springs, spend about 105.8 MJ of energy to fill 42 barrels. And also 90 m3 of water are spent. For this reason, we want to offer potassium polyacrylate, which repeatedly saves electric and thermal energy, money and water expenses. Besides potassium polyacrylate is an environmentally friendly product with no adverse effects on the soil and the environment. Therefore, it can be used not only for transportation of water to arid regions, but also for watering plants. Gradually decaying polyacrylate potassium will provide plants with the accumulated water supplying the moisture. Aidarly is just one example of these villages, and in the world there are thousands and even millions of these inhabited by people affected by dry climate. We believe that starting to plant trees and gardens even in small areas in arid regions can lead to massive use of potassium polyacrylate, which would later bring not only our country to a new level, but also many other countries having ave problems of desertification. After all, there are so many people out there! We could help them stop suffering from the lack of water and food, as well as unemployment. In addition, the hydrogel application range is very wide. It can be used not only in agriculture, but also in greenhouses for growing indoor plants, in clothing, medicine and for growing lawns. [3]

In many cities of our country one can see bare, empty lands, and in fact this is a big problem from the environmental standpoint. Because of such strong gusts of wind in our country one can meet great flows of gust rising in the air. But these cities are inhabited by children, adults and older people who breathe this polluted air, and this in turn causes many diseases, such as asthma. Of course, buying a grass lawn is relatively expensive, and besides, leads to the big money, power and thermal expenses, requiring large amounts of water as well. Because to remain fresh and green the grass needs to be watered on a daily basis. But if you use potassium polyacrylate for growing turf grass, the frequency of irrigation will be reduced by several times as the need for watering the turf on a daily basis disappears, and it is enough to water it 2-3 times a month. Since potassium polyacrylate is gradually decaying, it will provide plants with the accumulated water, supplying the moisture they need.

In future, it will be necessary to launch the production of potassium polyacrylate using raw materials of the Republic of Kazakhstan, as one of the main resources of our country is its natural richness. Even scientists estimate that Kazakhstan is ranked sixth in the world—among the leading countries in relation to mineral resources deposits, which means that on the territory of Kazakhstan one can find all the resources required for the synthesis of the hydrogel. Industrial production of potassium polyacrylate requires simple organization as well.

In conclusion, we would like to say that potassium polyacrylate, as we believe, would help to solve many problems arising in the most of the countries around the world. Not only it can to bring the economy and the ecological condition to the new level, but it can also help the ordinary people—the people suffering every day because of the conditions they are forced to live in. But we believe that our idea will help to make life easier for many people who will subsequently accumulate their savings and bring the countries they live in to the new level.

References:


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