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Saving Energy and Resources in Agriculture. Architect's View

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ABSTRACT: Today there are different forms of ownership and management in agriculture. First of all, this is individual form: a house with a land plot, household farm designed practically exclusively for own individual consumption. Second type — family production, private farm, when agricultural products are produced for sale. And third form — collective enterprise. When we are talking about design of large agricultural facilities, such as poultry farms or greenhouse complex, the issues of energy and resources conservation become determinative.

KEY WORDS: energy conservation, energy-bio complex, utilization of organic waste, renewable energy sources

I.INTRODUCTION

Today in agriculture, one can distinguish different forms of ownership and management. Firstly, this is an individual form: a house with a plot, a subsidiary farm, designed almost exclusively for their own individual consumption. The second type is family production, farming, when agricultural products are sold. And the third form is a collective enterprise. When it comes to designing large agricultural facilities, such as a poultry farm or a greenhouse complex, energy and resource conservation issues become crucial.

The development of agricultural enterprises in the context of constant growth in energy costs and the need to increase the competitiveness of products involves the search and implementation of energy-saving measures and alternative energy sources. The potential for energy savings varies depending on the type and size of the economy. In the field of improving energy efficiency, the most promising are large agricultural enterprises based on the concept of an “energy and biological complex”: raw materials are grown, processed into a final product, and production waste becomes a source of energy.

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Today in agriculture, one can distinguish different forms of ownership and management. Firstly, this is an individual form: an individual house with a plot, a subsidiary farm, any individual production, designed almost exclusively for own consumption. The second type is family production, farming: the family produces agricultural products not only for their own consumption, but also for sale. And the third form is a collective enterprise. Previously, these were collective farms, state farms, and now joint-stock companies or even associations of these enterprises: groups of companies, agricultural holdings. Mostly agricultural holdings are located in places of mass production of agricultural products - these are the Stavropol Territory, Krasnodar Territory, etc.

Based on these three forms of management, from the point of view of energy and resource conservation, three types of agricultural objects should be considered:

• individual estate with a plot of about 6 to 20 or more hundred parts;

• farming, where the area used is much larger: an average of about 10-12 hectares;

• large joint-stock enterprises of the agricultural industry. There are very large land areas used, the enterprises themselves are very energy intensive and, of course, the potential for energy and resource conservation is huge. Therefore, the issue of economy is gaining state scale.

Individual estate

What is usually the owner of the estate with the farm? First of all, he is trying to make sure that the economy was attended by different industries and types of production of products. The main activity is usually plant growing, that is, any planting (depending on climatic conditions, type of soil, etc.). Animal husbandry or poultry farming are present as directions related to crop production. That is, some agricultural products are grown, such as beets or potatoes, and part of this production goes to livestock feed.

Crop waste can be effectively processed into biogas. There are special devices for anaerobic fermentation of organic waste - digesters. The green mass is loaded into them, and there at a temperature of 35 ° C it begins to burn. As a result, two useful products are obtained: biogas, which is an energy resource, and the remains of rotting products that go to fertilizers.

Of course, it is possible to save energy even with a competent choice of house architecture, wall insulation, energy-saving double-glazed windows, etc. - all these solutions of individual residential buildings are well known and have been tested in practice many times.

The collection of water for irrigation of the adjacent territory is also relevant.As for renewable energy sources, now these devices are very much interested and architects are trying to use them in their projects. At the same time, solar collectors and photovoltaic panels greatly affect the architecture of the building. The most affordable is just to hang the panels on the roofs or walls. But this is not a very suitable way. But to make the elements of solar installations organically fit into the structure of the building, supplying it with energy, is a difficult creative task.

Farms

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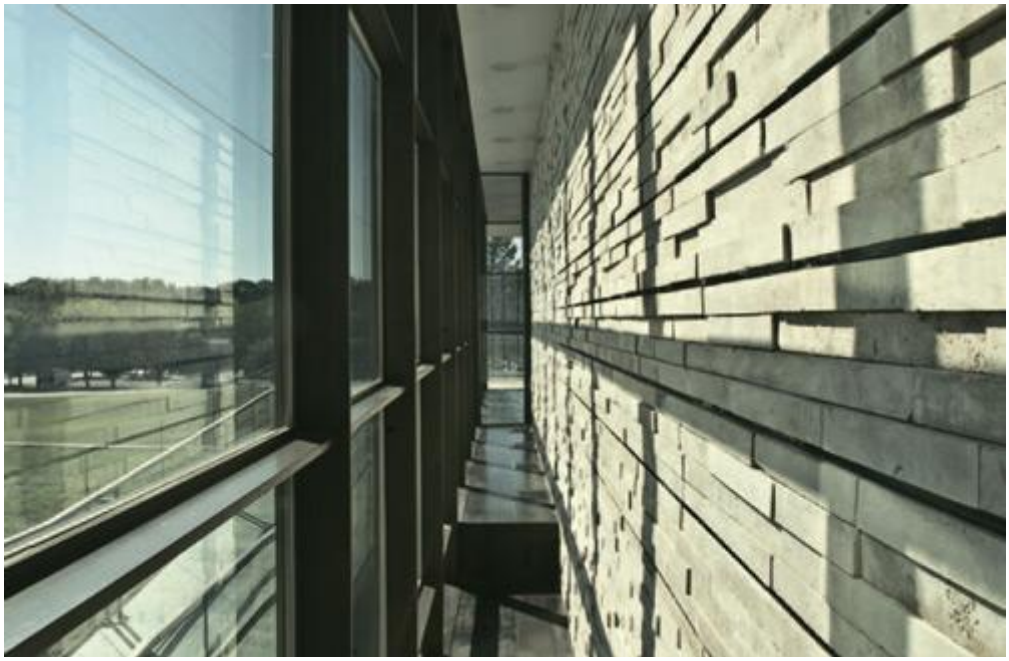
The main activities of farms are crop production, animal husbandry (including poultry farming). It is good when fish farming is implemented - this is the third element of a multidisciplinary individual economy. Fish needs to be fed, and the silty sediments formed in the ponds are collected and transported to the fields as valuable fertilizer. It can be argued that the creation of such a diversified economy, in principle, contributes to energy saving: building several types of activities in one production chain with interchangeable and complementary energy and water consumption.

Agro-industrial complexes

Of course, when it comes to designing large agricultural facilities, such as a poultry farm or a greenhouse complex, energy and resource conservation issues are crucial. For example, when choosing the orientation of a greenhouse or greenhouse, it is possible to protect the north side of the structure from cold and wind. The north wall can be either glass or non-glass, with increased thermal protection (there are many such examples abroad). Such a well-known construction as the Trombe-Michel wall finds its application.



To effectively use the available space, multi-tiered, multi-link Dutch greenhouses are being made. Seedlings for these greenhouses can be grown separately in high-altitude greenhouses. When using high-altitude greenhouses, the economy of the territory is very large. High-altitude greenhouses are a glass pillar with gears in the upper and lower parts of which. They set in motion a ring chain to which pallets with seedlings are suspended. At the bottom is a reservoir of water with fertilizers. During rotation of the wheel, the pallets are alternately dipped in a nutrient solution, thus moistening the soil.

The greatest effect of energy and resource saving can be achieved in full-cycle agro-industrial enterprises, where raw materials are first grown and then processed into the final product. We call this concept the energy-biological complex - EBC. The EBC scheme includes crop production, animal husbandry and poultry farming. There is also fish farming and a waste recycling complex. In this scheme, plant-growing provides a product for sale and feed for livestock. Livestock also provides a product for sale, but livestock waste (manure) is returned to the crop sector as fertilizer. Organic waste from plant growing and animal husbandry, which is impossible or impractical to directly use as fertilizer, is digested in digesters; the result is biogas and organic residues that can already be used for fertilizer.

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If there are any open spaces, they can be used with great success. Projects for the Kursk NPP were implemented. Huge cooling ponds are located near the nuclear power plant. Water cools the nuclear reactors, and then is discharged into cooling ponds at a temperature of about 50 ° C. In the pond, the water cools and then goes back to the nuclear power plant. A greenhouse was built that uses this warm water both for watering plants and for heating greenhouses (both through heating pipes and by flowing around the glass walls of greenhouses). This example clearly shows how the secondary heat of nuclear plants, thermal power plants, chemical plants, etc. can be used for growing agricultural products.

At the Kursk NPP, this warm water is used to grow fish. Workshops with huge round tanks for growing fry of carp and silver carp were built. There are, of course, certain psychological fears - "fish from the nuclear power plant." However, in this case, this product is absolutely safe and environmentally friendly. At the same time, the time for growing fish in warm water is reduced by about half.

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