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Intensification of melioration through decreasing  
maintenance load on irrigation canals

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# Introduction

- Irrigation canals are the main transporting element of irrigation water throughout the irrigation system. Each branching of the canals is tied to a specific place of irrigation; therefore, when one of the branches fails, a certain irrigated area will not be moistened fully or will not receive irrigation at all. Accordingly, maintaining canals and keeping them up and running is a top priority. The aim of our study is to determine rational options for intensification of melioration by reducing the maintenance load on irrigation canals.

# Methods

- During this study, we have used the method of empirical cognition, which served as a synthesis for theoretical analysis of literature using deductive method. The theoretical method included reference, abstracting and quoting general and special scientific works in the field. In the work we have used mathematical and statistical methods to obtain and establish quantitative dependencies between the studied phenomena. The mathematical method included data registration. The statistical method included the determination of the averages of the indicators obtained, comparing and receiving quantitative or qualitative dependence of the process under study.

# Results

- As we know, irrigation network canals are constantly in need of maintenance, to ensure stable transportation ability and deliver the necessary volumes of irrigation water. Without a proper amount of constant and seasonal maintenance operations, a canal can fail and thus not be able to supply pre-planned volume of crops from irrigated areas [1–4]. We will consider what operations are necessary for stable functioning of an irrigation canal (see figure 1).

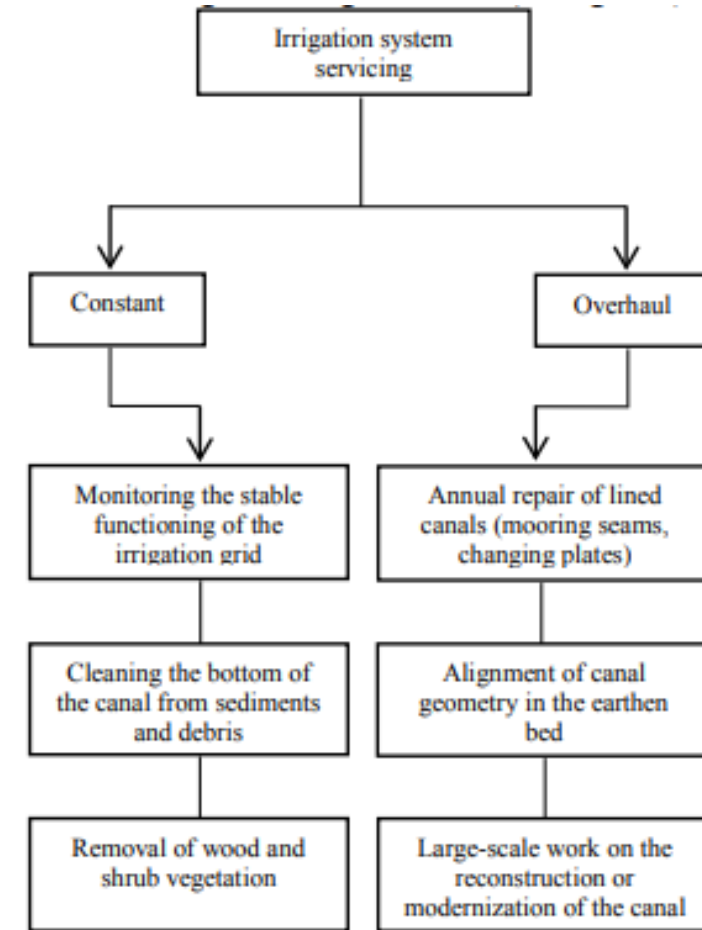


Fig. 1. – Irrigation system servicing operations.

- The operations described above are mandatory for irrigation canals in the earthen and lined bed. It is worth noting that these operations require the availability of specialized equipment, as well as direct and secondary costs for a number of works [5, 6]. As innovative technologies and materials develop every year, it is possible to apply them in the melioration industry to improve the irrigation grids and intensify the operations of the irrigation grid. Regarding the objective facts above, we propose to use better materials for irrigation canal facing that will thoroughly reduce the maintenance of the irrigation grid. Such materials are concrete canvas and composite geosynthetic materials for the lining of the canal. At the same time, the greatest preference in technical terms is given to the concrete canvas. These materials are presented in figures 2.1 and 2.2. [9–12].



Fig. 2.1. – Concrete canvas-lined irrigation canal

Fig. 2.2. – Geosynthetic membrane-lined irrigation canal

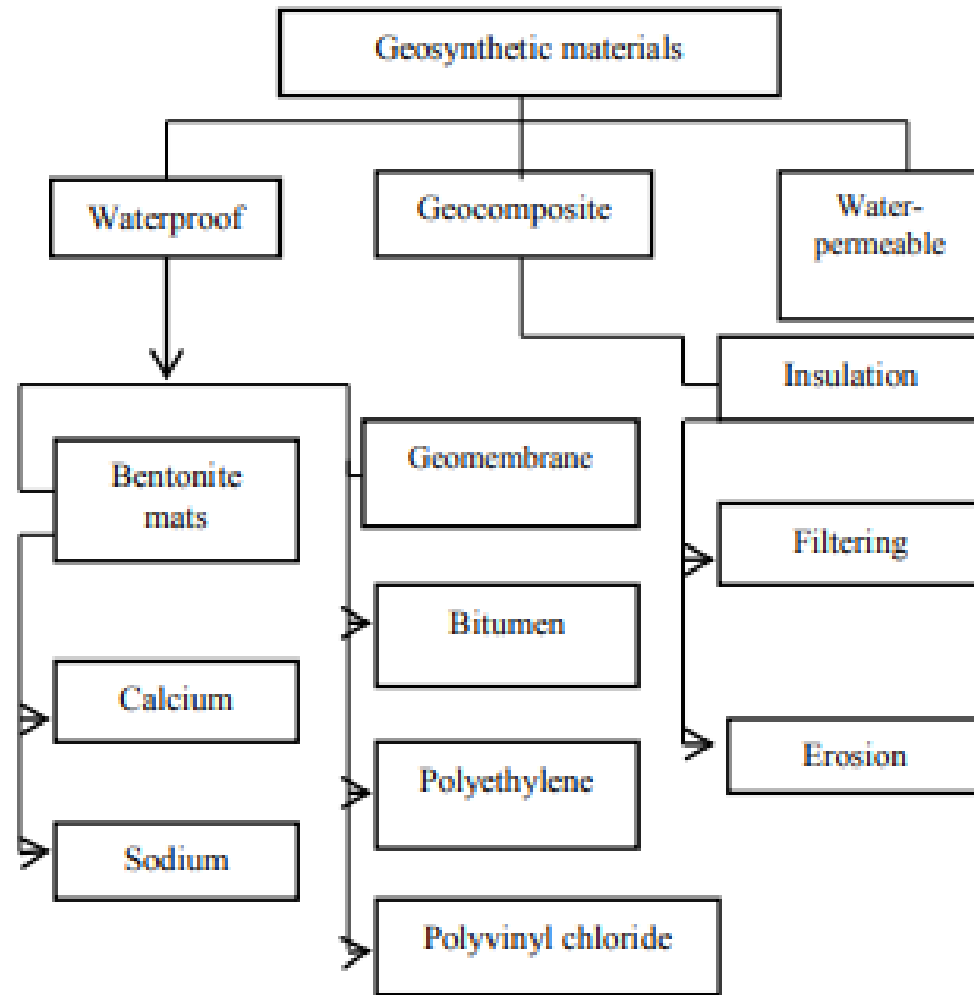
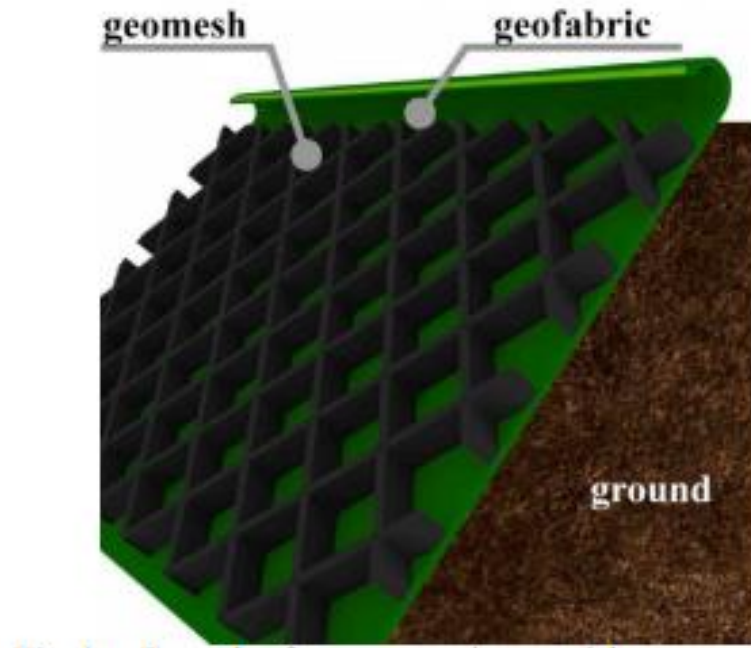


Fig. 3. – Classification of geosynthetic materials

Let us consider the classification for each of the proposed materials to make well-informed analysis. Geosynthetic materials are materials that come in forms of technical fabrics, meshes, rolls of waterproofing materials, as well as their combinations in the form of geocomposites or cellular frames. Such materials have a wide range of applications, one of which is waterproofing. Let us give a classification of these materials (see figure 3).

This picture shows the classification of waterproofing materials, water-permeable materials have been mentioned because they are part of geosynthetic materials, but not part of our study. The advantages of this material are its durability and cost-effectiveness. For additional information about this material, we will give a visual image of geosynthetic material on the example of a geocomposite version (see figure 4).



This picture clearly shows several levels of different geosynthetic materials that form a geocomposite. The technical meaning of this material is to avoid the loss of water resources in all possible ways, if specificity regarding irrigation canals is necessary.

Fig. 4. – Example of a geocomposite material

Now we will consider the next innovative material recommended for use as a facing solution for irrigation canals. Such as the concrete canvas. The concrete canvas consists of:

- fibrous surface, absorbing the humidity;
- matrix that strengthens the fibers;
- dry concrete mixture;
- waterproof polyvinyl chloride pads. We will give a classification of concrete canvases in Figure 5.

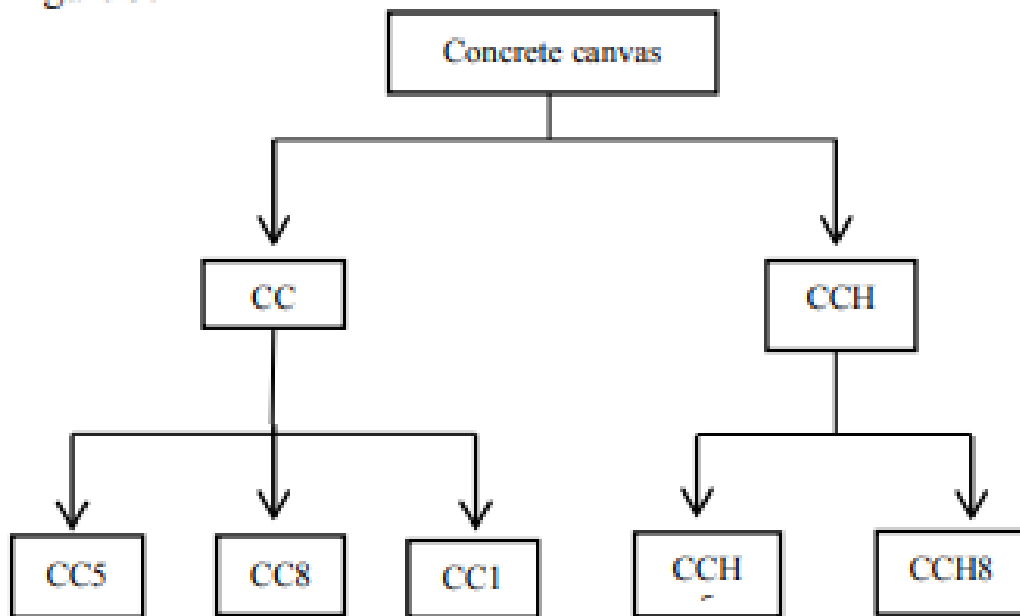


Fig. 5. – Classification of concrete canvases



## Conclusions

Thus, we can state that the use of modern materials can improve the performance of the irrigation canal, as well as reduce the maintenance load on irrigation canals, both technically and financially. At the same time, the required volume of irrigation water will be supplied in a timely manner. The illustrations presented and the mathematical justification proves that the technology we have proposed to intensify melioration, by reducing the maintenance load on irrigation canals, is and should be used in melioration. The concrete canvas is more applicable for installation in irrigation canals because of its physical properties, simplicity of maintenance and service, and the fact that it prevents vegetation growth, which makes it optimal and effective.

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