Optimization of agricultural land use in Russia on a landscape-ecological basis: from data to decision-making

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Introductions, Methods

Currently, the achievements and recommendations of scientific institutions in Russia are not integrated into scientific and innovative systems and are not adequately differentiated considering the soil and landscape conditions. To overcome the existing problem, it is necessary to effectively provide scientific and innovative support for agriculture in the form of decision support system (Fig. 1) for managing the agro-industrial complex at different levels of its organization. Prototypes of such DSS make it possible to monitor the crops condition, predict and plan land use and land management for stakeholders and farmers.

The presented concept is implemented in the form of software implements a user interface and an algorithm for developing and optimizing crop rotations in the methodology of adaptive landscape farming by processing heterogeneous data on soil and landscape conditions (land register), biological requirements of crops and their varieties (register of varieties), a set of interrelated technological operations for cultivation crops (agrotechnology's register).

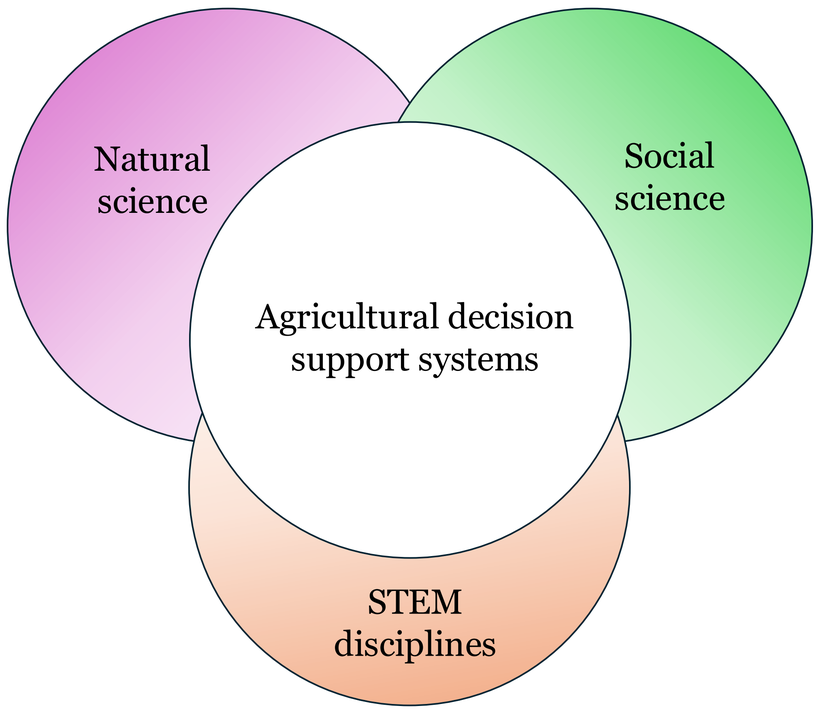


Fig. 1. Ensuring the integration of science for DSS creation

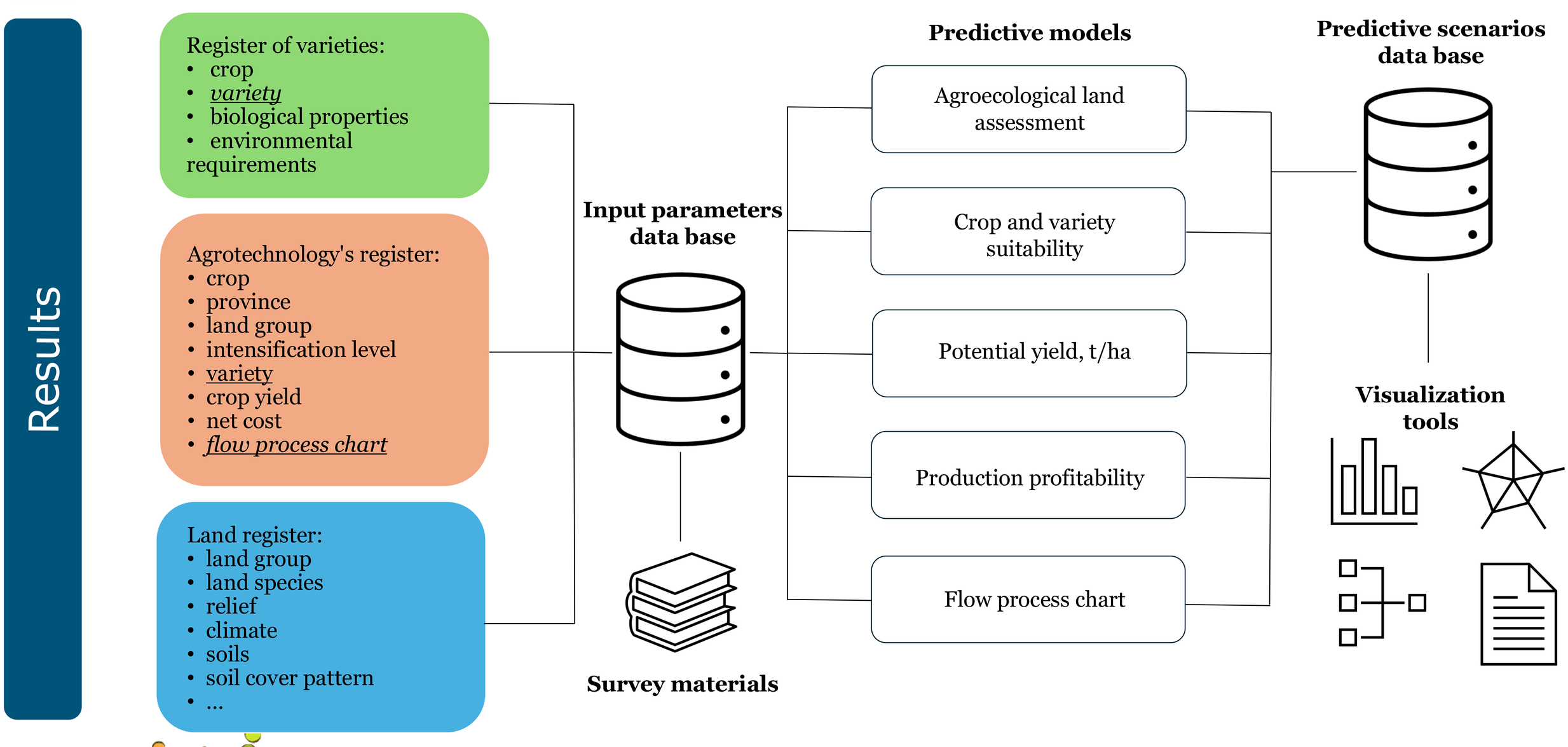
The crop rotation development block includes several successive stages:

1) uploading information about fields;
2) data entry (results of agroecological land survey);
3) lands agroecological grouping;
4) land use planning.

The variety of agroecological conditions and various biological features of crops determine the differentiation of tillage systems carried out by land type. In respect to land type, flow process charts are formed taking into account agrotechnology's of the target level of planned yield or the cost of final products.

Access to the service is carried out on the web. The system supports registration, authentication and authorization of users, uploading, storing, and visualizing data.

Results



Conclusions. Software has been developed, an intelligent system of land use planning and agricultural technologies at the local level in the methodology of land assessment. The system supports the registration, authentication, and authorization of users. It also loads, stores, and visualizes data from various registers. The system also manages projects for determining the structure of land use on specific farms. It loads, stores, visualizes the fields boundaries and their main characteristics, as well as the results of soil and landscape mapping, including the agroecological land typology. Additionally, the system designs, stores, and visualizes the structure of land use, selecting optimal crops for different types of farmland and determining the necessary level of technology for achieving optimal yields and profits.

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