Project executive summary

by the team "AgroFlow"[1]

Nowadays around 40% of agricultural water goes to waste due to the inefficient irrigation in large farms. Our team wants to solve this problem and provide water savings, improved crop yields and environmental sustainability. Our main customers are agricultural enterprises and government agricultural agencies. The market is being pushed forward by the technological advancements, government regulation and the consumer demand itself. It is expected to reach up to $2.6B by 2026 with a CAGR of 15.52% from 2021 to 2026 all over the globe.

The existing solutions to our problem are the drip irrigation and the drone application. Drip irrigation implies dripping the plants in the near-root zone droplet-by-droplet. This technology suffers from the risk of clogging of pipes and root zone limitation. Also the problems with pressure variation have been reported, when using this type of irrigation. Speaking of irrigation management drones, there is obviously a problem of weather dependency, battery lifetime, limited capacity and high cost of investment and maintenance. The closest analogue of our solution is the so-called "GramworkX", an IoT and AI-enabled smart farm resource management tool to provide irrigation schedules. There is plenty of purely academia research groups, occupied with the same issue, for example, Department of Geography and Regional Planning of University of Benin.

Before rushing into the industry we have performed Porter's 5 forces analysis. Threat of new entrants in our case is medium due to the need in branding and capital investment requirement. We face medium power of buyers, since we expect them to be skeptical, but we benefit from their number. Power of suppliers is our finest issue, because the hardware components are in abundance, so is the open-source software. Threat of substitutes is low thanks to inefficiency of traditional methods and aforementioned limitations of drip irrigation and drones. And, finally, the competitors impose medium to high threat: the market is growing rapidly.

Now, being prepared, we want to develop an AI model for precision irrigation to address water wastage in agriculture and enhance farm productivity. To the best of our knowledge, integrating diverse data sources, real-time regulation, and predictive modeling with advanced technology in this field has not been performed at its' finest yet. Such approach will improve water usage efficiency by 30%, fostering optimal crop growth. And by using data collection from both sensors and remote sensing, as proposed in our solution, we expect to get several advantages compared to "GramworkX" approach.

The solution works as follows. First, we gather the data from crops, from weather forecasts and from remote sensors in real time. Then we transmit it to the computational center. There, by means of an AI model the decision is made on whether to prolong irrigation or to stop it. This way, the proper irrigation schedule is set. The solution is indeed realistic, because many research centers are working on this topic and report certain results and we believe that the set of parameters that we take into account is sufficient to estimate the necessity in irrigation. And the solution is feasible as well, since all its' parts (sensors, ML model, transmission) are in our disposal.

The idea is formulated, but do we possess enough resources to start? Firstly, team with diverse backgrounds provides a valuable resource (although, not rare and not hard to imitate). Secondly,

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Skoltech network is all in one: valuable, rare, hard to imitate and well-organized: we can proactively seek feedback from the researchers to enhance the quality of the work. Thirdly, Skoltech labs and facilities are valuable, hard to imitate and properly organized (but not rare): we are able to utilize these facilities for prototyping and experiments. Finally, we have access to Skoltech patents, which are all in one again: possibility to efficiently select and incorporate these technologies into our project is a great advantage.

From stated in the previous paragraph our strengths are evident: we are a cross-disciplinary team with adaptive and comprehensive technology, access to Skoltech resources and ability to perform cost-effective operations. With this at hand we are able to fulfill growing market demand and exploit current technological trends. Things that could stop us are the skepticism of buyers, absence of client base and of UI and difficulties in data labeling. These weaknesses impose the following threats: losing on a competitive market, suffering from the regulatory changes and the potential problems with investments.

Although, things are not that grim due to the promising market trends. To begin with, farmers are increasingly investing in new irrigation technologies: the water becomes more expensive and the crop productivity is of great demand. Then, growing demand for sustainable irrigation solutions is evident and is caused by the growing scarcity of water resources and increasing concern about the environmental impact.

We plan to enter the market with focus on differentiation, since we seem to have a “know-how”. Our market segment, AI and IoT in crops irrigation, is rapidly growing. We plan to offer three types of subscription for B2C: basic, standard and premium, which will differ in features included. And for B2B we aim at contract-based arrangements.

The core of our platform will be the AI model and the modules will be the ground and remote sensors. Being a small startup, we aim to stick to the scheme of single sponsor and single provider. We want to be as specific as possible, like we have already stated in the previous paragraph.

Needless to say, strategic alliances are highly desirable for us. We could try to make friendly relationship with the competitors, “GramworkX”, by signing licensing agreement with them to get access to the data to power our AI model. Also we could involve ourselves into joint research with multiple research institute to get valuable research insights and access to their expertise.

Our roadmap is the following. In short term we have to define technical specifications, perform research and data gathering, initialize prototyping. In mid-term we will do prototype testing, algorithm optimization, UI development. Finally, the long term poses hardware compatibility assuring, software Platform Development and consultation and support services. The main KPIs for us would be the amount of labeled data by the time period, ML metrics of our model on the test data and the speed of operation for a particular amount of crops.

Please meet our team: Fizza Munawar (agricultural expert), Uyen Vo (business analyst), Danil Ivanov (ML engineer), Ivan Kudryakov (UI developer), Muhammad Afaq (automation specialist), Ali Alabbas (robotics expert).

To wrap up, let us list our future requirements: $800k of funds in the long run, contacts of open-minded agricultural enterprises and a contract with at least one company to start deployment, indispensable source of understanding the weak spots of our solution.