

## FARMING MOTOR PLATFORM FOR SPRAYING USED IN HORTICULTURE

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**Abstract:** This article presents the partial results of a research developed by INOE2000 - IHP, as well as a functional model of a motorized agricultural platform used for spraying in horticulture. This is part of a complex crop monitoring system that, with the help of a quad-copter, generates a map that is used later for remote guiding of the agricultural platform, which is equipped with tracks system and a differential steering system allows it to turn in place or with a very small radius to track as accurately as possible the trajectory generated by the remote guidance system. The spraying equipment of this agricultural platform is designed to be used in a wide variety of horticultural crops with the ability to adjust both the direction and the spraying distance.

**Keywords:** Horticulture, remote spraying, motorized agricultural platform, hydraulic automation.

### 1. Introduction

Considering that the world population is growing at an accelerated rate, agriculture must grow and have the best possible productivity to meet demand for food globally. Developing new spray technologies with herbicides and pesticides applied locally to limit environmental pollution is essential. [1] An example is shown in Figure 1.



Fig. 1. A new, environmentally-friendly, selective spraying solution [1]

In order to penetrate / market innovative high-quality products that ensure competitiveness and market continuity, together with the R & D service provider, the beneficiary SME proposes to set up a motorized agricultural platform used for spraying works, with remote guiding automation system. The necessity and usefulness of such equipment is due to the modernization of the equipment for the realization of the horticultural works, but especially the introduction of innovative technologies and equipment, ensuring both high productivity and the production of quality food, knowing that on the market, is an increasing demand for clean organic / ecological products to ensure healthy food for the population. One of the agricultural activities, which is quite frequent in the horticultural sectors, is the spraying of crops, both for outdoor purposes, but especially for crops growing in sheltered areas such as solariums, greenhouses, etc. The equipment / product proposed by this project relates to a plant spraying plant, including those grown in enclosed spaces where plants are grown which require their spraying all their height to provide access to the treatment solution against diseases and pests in their most hidden places. The usefulness of such equipment is supported by the high demand for healthy food, products obtained by applying the latest techniques. Knowing the market requirements very well, in order to be sure of a quality product, the beneficiary SME has proposed to the research-development services provider the collaboration within this CEC project, the provider having more than half a century of research experience. Nationally and internationally, there are a variety of spraying systems of different sizes, some worn / pushed by humans, another tractor, helicopter, airplane or self-propelled. In the world, there are many companies that produce and market, including in Romania [2], such as: ROYAL BRIKMAN, global specialist in horticulture, GREGSON-CLARK, focused on high-quality sprinkler equipment in green industry, EMPAS, in horticulture spraying equipment, HYDRO SYSTEMS EUROPE with irrigation and horticultural applications, MARTIN LISHMAN Ltd and others. In the Romanian market, apart from human ones, there are classical sprinkling systems, generally of large size, for irrigation and spraying with treatment solutions for large crops, with small productivity, not fully satisfying the market requirements, being necessary tools sized self-propelled dimensions that SMEs in horticulture need. Sprayed crops are sprayed using systems worn or towed by humans. In Romania there is no spraying technology and no specialized equipment. Recognizing this market failure, the beneficiary SME is requesting funding for this project, which will launch an innovative product based on new, productive and competitive technology, useful and necessary in horticulture in Romania.

## **2. General concept of the functional model**

As a result of winning a research competition, the INOE 2000 - IHP Research Institute in Bucharest conceived, physically designed and tested a functional model of a remote guided agricultural platform used in horticulture spraying works. Equipment's of this kind are also used outside the country. For the time being, there is no offer of such equipment in the country, which has led to its realization by its own forces. The motorized agricultural platform, which is the physical result of this project, is designed to be commanded by both ordinary manual commands and remote controls, which is an especially important innovation because by performing remotely spraying to combat pests and diseases, protects the operator against the harmful effect of chemical substances in the plant treatment solutions. The project idea belongs to the SME wishing a remote-controlled mobile machinery. In Figure 2, the concept of realization of the motorized agricultural platform, which consists mainly of a self-propelled platform (1), equipped with a thermal engine (2), which includes the fuel tank and the battery, is presented a mechanical transmission (3) for pulling a pump (4) which aspirates the liquid from a tank (5) through a suction line (6) and releases the pressurized liquid through the discharge pipe (7) into the injector (8) which injects the liquid of the spraying head (9) [3]. The remote control of the platform is carried out by means of hydraulic distributors (11), whose levers can also be actuated by means of cables, which allow interfacing with the remote control / guidance system (12), which respond to the orders given by remote operator via a command / programming console.



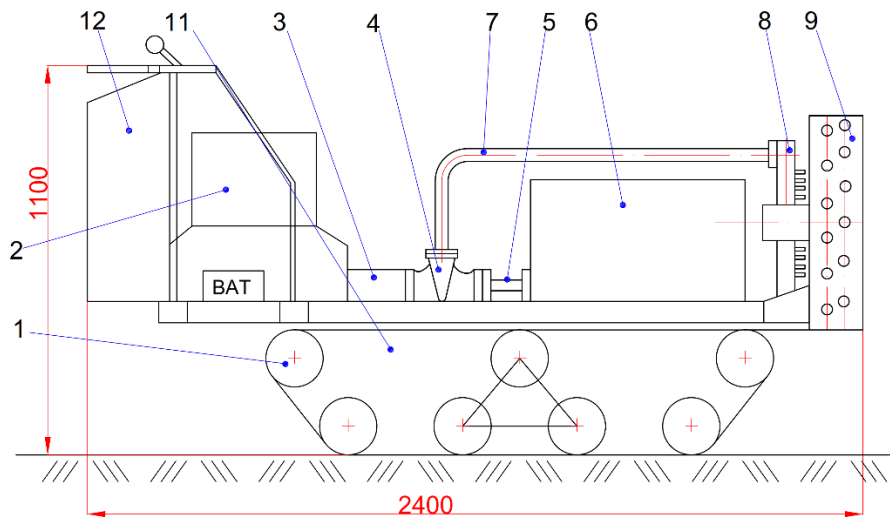


Fig. 2. General concept of the functional model

### 3. Physical realization of the agricultural platform and technical characteristics

Figure 3 presents the agricultural platform at the current stage of development by the end of the year, it will be equipped with three electro-valves that will allow it to selectively spray the plants.



Fig. 3. Physical realization of the agricultural platform

Technical characteristics:

Travel speed: 0 - 7 km / h;	Spraying pressure: 20 bar;
Engine power: 5.2 kW at 1800 rpm;	Spraying rate: 20 l / min;
Spraying tank volume: 100 l;	Spraying distance: 1 - 3 m.

#### 4. Conclusions

In this form, the platform was also presented at the national fair of agricultural products INDAGRA 2018. The stand at the fair is shown in Figure 4. Where the main technical features of the platform have been demonstrated.



Fig. 4. The stand at INDAGRA 2018 at which the agricultural platform was presented

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