International Conference
1ST International Conference on Innovations, Recent Trends and Challenges in Mechatronics, Mechanical Engineering and New High-Tech Products Development
MECAHITECH'09

Bucharest, 8-9 October 2009

Modern Methods for Irrigation and Monitor the Crops by Optimizing the Water Consumption and by Nutritive Substances, Reduce Electricity Consumption and the Use of Unconventional Energy

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Water deficit is deeply felt in the territory with high risqué of deforestation and drought and also the un uniform distribution of the water resources on the country territory and the insufficient regularization of the flow on the water courses. For compensating this deficit during the dry periods had been created irrigation systems having as the main source the water from the Danube.

Taking into consideration the water deficit in some arias with intensive agriculture, this paper refers to the rational use of the water for irrigation, the use as much as possible of the water from rains and protects the ground around the plant, on a rather big surface, against the ground water evaporation and do not allow the other plants – that are not included in the crop – in the vicinity of the protected plant.

Thus the main positive effect is the decrease of the water consumption for the above mentioned grounds having favorable implications over the energy consumption and over preventing the appearance of the negative effects over the grounds. This may be accomplished practicing a precision agriculture.

The precision agriculture is:

- the most advanced form of agriculture practiced in the most developed UE countries and USA on small surfaces, using the most modern control methods for the quality status of different environment resources, optimal application of all the technological components and thus a strict control over the factors that may determine the environment degradation;
- tied by economical, social and environmental conditions. The accomplishment of these conditions is the most important condition for introducing and promoting the sustainable agriculture;
- is possible only where mentality and education are according to the present reality and it is based and it is based on the respect for the environment of all those working in the agriculture.

At the international level for irrigating the vines, bean plants and the tree saplings are used:

- gravimetric wetting method (by plows prone land),
- subterranean wetting method (by porous or perforated pipes),
- wetting by aspersion method (by artificial rain),
- wetting by aerosol method (by artificial fog),
- wetting by drops method

The quantity of water a plant eliminates during its life is 100 times bigger than the weight of the green plant. A big quantity is lost by direct evaporation from the ground and another quantity is infiltrate as groundwater.

When the water reserves in the ground are small and the roots can not complete the lost water, the plants stop to raise and die, mainly in arias with high temperatures and dry winds.

From studies resulted that for achieving 1 tone of product are necessary 100 tones of water.

The daily water consumption during the hot month for 1 ha is estimated to 45-60 m. c. In a hot day, by the plant it is lost a quantity of water bigger than the plant weight (a well developed cabbage in one day of July/August loses by evaporation till 5 liters of water).

The water consumption is according the ridiculer system development, foliar surface, specie, stage of vegetation, temperature, wind.

According to the water consumption and the water absorption capacity the bean plants are divided into 4 groups:

- tomatoes, carrots, parsley, melons having a reduced water consumption
- cabbage, cauliflower, cucumbers, salad, spinach, green paper, celery, beam, kohlrabi, radices with a small capacity of water absorption
- potatoes, beets have a big capacity of water absorption
- onion, garlic, beam have a small water consumption and small absorption capacity

The originality and complexity of the proposed solutions

The project proposes the achievement of a autonomous wetting of the young plantations of vines, fruit trees and beams having a vertical development and planted on the field or in the green house, using pluvial water as alternative to the water in the irrigation net and which is designed starting from the idea that each plant needs its own wetting regime during the growing process.

The system includes devices for each plant.

The collector has the possibility to collect and stock the water poured on the cap whose geometry provides efficient stocking of the pluvial water which penetrates in the stocking cavity by the hole from the central aria of the collector.

The device attached to the plant has the possibility to collect the pluvial water and to direct it to the root in a controlled way.

The water collected in a vessel is stopped to evaporate in time and will all be used for irrigation. When the collecting vessel has water, the irrigation will automate stop and it will be switched to the irrigation using the pluvial water.

The irrigation of the plant is done in the moment when the ground from the plant root has a very reduced humidity and will stop when the ground humidity has arrived to the pre established value.

The device attached to each plant will provide the necessary water to the plants roots according to each plant need.

The water quantity to irrigate each plant is according to the type of crop, the growing speed, the deepness of the phreatic layer, ground permeability correlated to the necessary provided by the rain.

At national and world wide level it is not envisaged each plant but a lot, meaning a whole surface/aria of crops and also the water provided by the rain is not collected and used efficiently for irrigation but by accumulation lakes (usually natural ones) and with an electricity

consumption is brought to the plant root.

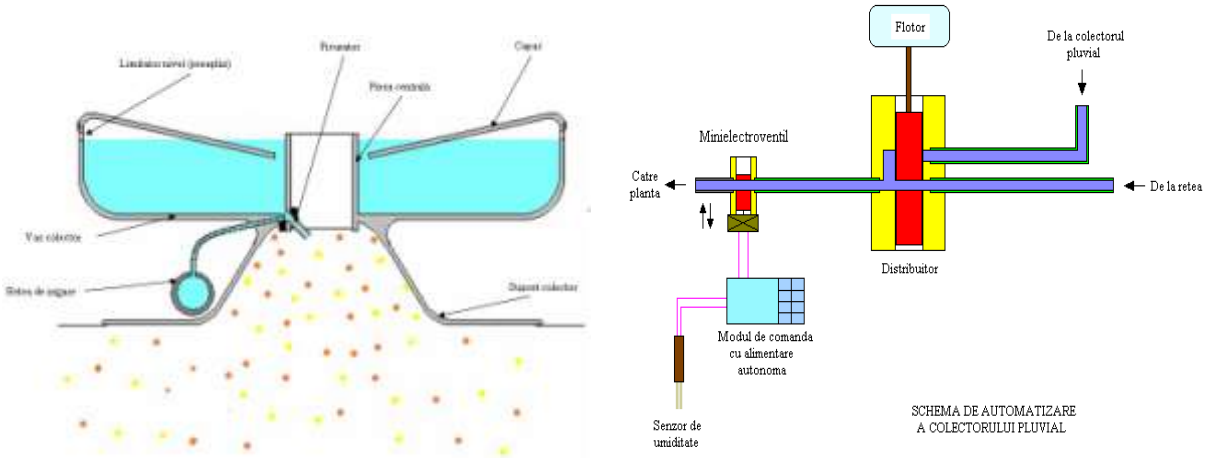
This device saves the water for irrigation, saves the electricity. In the growing, developing and production process each plant/culture has different needs of watering, minerals and nutritive substances. That is why each plant must be treated like an alive system and must be provided with the necessary development conditions and disturbing factors must be eliminated during the plants life.

The device collects the pluvial water noticed by the mechanism float switching/changing the way.

At a certain level of the water, the float acts over the changing way plunger to the open position for the water that is in the collector and to the shut position for the water coming from the irrigation net.

The control for beginning and stopping the irrigation process is controlled on the base of monitoring the ground humidity by a specialized sensor placed in the ground between the plant root branches at a preestablished deepness.

The signal coming from the humidity sensor is then amplified and sent to an execution element – mini electro valve ON-OFF allowing the water to penetrate the ground to the plant root.



When the stocking capacity of the pluvial water has been overcame, the surplus is ejected through the holes of the upper side of the lateral wall of the collector.
Evaporation of the stocked water is stopped by the cap.

The collector has the inferior part according to the ground surface geometry where the plant is sprout.

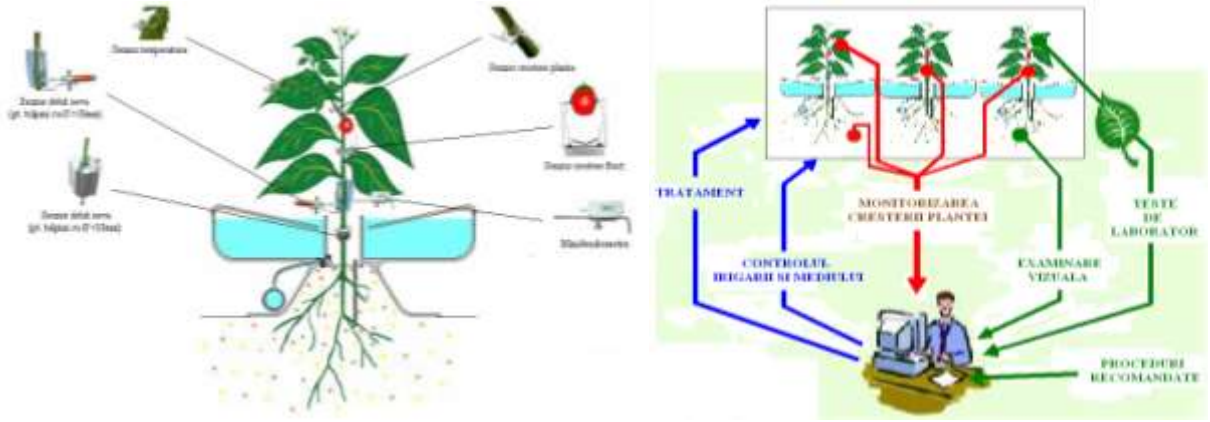
The surface needed to put the collector is according to its stability needs.
The shape of the collector provides the mechanized stages allowing additional transducers, execution elements and an autonomous block to supply with electricity.

The plant irrigation starts in the moment when the ground in the vicinity of the plant root has a humidity under the inferior level varying according to the min. necessary specific to the crop kind. The irrigation process, realized with bigger flows opposite to those specific to the drop irrigation will be stopped when the ground humidity from the level of the plant root arrives to a pre established value.

This device attached to each plant will provide the plants water necessary according

to each request. The water quantity to irrigate each plant is according to the type of crop, the growing speed, the deepness of the phreatic layer, ground permeability correlated to the necessary provided by the rain.

Monitoring the plant on a pre established crop surface allows the farmer to adopt the necessary measures on irrigation and the nutritive substances needed according to the information sent by sensors and by the inscriptions of the afferent soft.



Advantages:

1. Each plant may receive the necessary water quantity and nutritive substances;
2. providing water to plants and nutritive substances is done permanently. Under these conditions the plant consumes a min. of energy for providing the water and food;
3. The water consumption for irrigation and nutritive substances is considerably diminished because of the crop and plant monitoring and also of the reduced loses caused by the evaporation ground and air;
4. Providing water only to the beds of plants, the space between the beds remains dry, allowing the agriculture works in good conditions, thus the weeds are not that much;
5. Direct watering of the ground, without wetting the plants, stops the appearance of diseases and bugs. Some chemical treatments are decreased or avoided, stopping the crops pollution.
6. It is the only watering method allowing total automation because of the precise adjustment of the flow and of the water pressure and of the watering beginning on the basis of the information sent by the sensors, about the ground humidity.

Disadvantages:

1. High price of the installation/equipment. Irrigating by dropping is a watering method and in the mean time a kind of an equipment needing a specific investment for the surface unit.
2. To be profitable, the equipment for watering by monitoring the plant must also have protection and control of water quality devices, equipments for measurements and control of the pressure and water volumes distributed in the net, allowing some chemical treatments and fertilization by the irrigation water and equipments to water adapted to the crop conditions and relief providing quality watering. The watering installation must be reliable and with a parts life of min. 5-10 years in good use conditions.