

## CONSIDERATIONS REGARDING THE USE OF EQUIPMENT FOR THE ESTABLISHMENT OF WATER COLLECTION BASINS FROM PRECIPITATION AND FROM THE USE OF SPRAY IRRIGATION SYSTEMS

OPRESCU R.<sup>1)</sup>, DUMITRU I.<sup>1)</sup>, VOICEA I.<sup>1)</sup>, DUMITRU D.<sup>1)</sup>, VLADUT V.<sup>1)</sup>, BIRIS S.<sup>2)</sup>

<sup>1)</sup>INMA Bucharest / Romania, <sup>2)</sup>UP Bucharest / Romania  
E-mail: oprescu.remusmarius@gmail.com

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### ABSTRACT

*Global warming has been growing rapidly lately, which implies an increasing need for water for the good development of agricultural crops. To allow the recovery of a significant amount of water from rainfall or irrigation, reducing the amount of energy necessary for irrigation but also for soil losses caused by the phenomenon of erosion or puddling, works are introduced in crop technologies with the help of which this recovery can be achieved. This paper presents equipment used for the execution of rainwater catchment basins and the use of sprinkler irrigation systems.*

### INTRODUCTION

Recently, it has been observed that the process of climate change is intensifying. As the world's population grows rapidly, the area of productive land is shrinking, which makes it possible for food and medicine to run out in the not too distant future. Agricultural land is degraded or desertified and is thus less able to ensure a high production of food, feed and fiber, while becoming a growing source of environmental pollution.

Farmers are interested in conserving soil moisture and have been looking for ways to collect and store a maximum amount of water in the soil to meet the needs of crops. They acknowledge that, over several years, crop yields have been limited due to droughts in almost all areas of the country. Precipitation falls randomly, the amount of water not being in accordance with the needs of the plants. Most of the precipitation in the vegetation season falls during heavy rains. Only a small part of the rain from these showers infiltrates the soil, the rest causes excessive runoff and erosion. One way to accumulate water

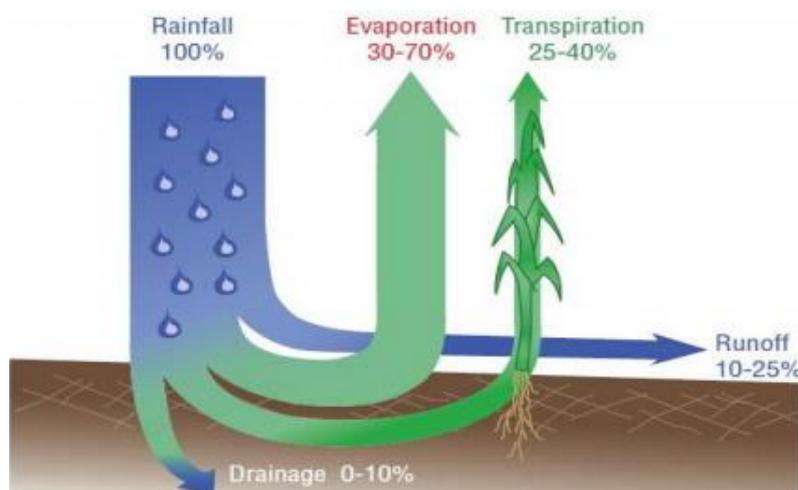
from rainfall is through cultural practice, consisting in the execution of compartmentalized furrows.[2]

How rainwater reaches the plant and how much of it can actually be used depends on the characteristics of the land on which they fall. We have soils that can store large amounts of water, up to 1000 cubic meters per hectare, the amount needed for a period of up to 30 days to ensure the development of plants if it does not rain during this period. There are soils that can not store more than 600-800 cubic meters per hectare, but where the rains are more frequent in normal years, agricultural crops do not suffer and we have the most difficult situation for our country, that of sandy soils that do not can store more than 400 cubic meters per hectare enough for a maximum of 8-10 days, here agriculture is possible without major risks only by using irrigation. Another important factor that influences the use of rainwater is the shape of the relief. In the case of sloping land, rainwater drains to the surface of the soil, so it is not used by plants and

also causes soil degradation by erosion, an extremely serious process encountered in one third from the agricultural surface of the country and at the bottom accumulating too much water, which causes flooding of plants. On about one-fifth of the country's agricultural area we have the situation of the existence of excess water on flat lands quite often due to the lack of water drainage conditions during periods of heavy rains, as well as heavy soils with a very compact layer on a depth of several tens of centimeters, a layer that does not allow deep water infiltration. We have lands where the water from the depth of the soil, also called groundwater, is found at a relatively small depth, below 2-3 meters, with negative effects on crops, in rainy years drainage works are needed to lower it, but which can have favorable effects in normal and even dry years because crops can benefit from part of it and irrigation is less necessary.[13] .

Soil cultivation is a very important practice in agriculture and one of the main consumers of energy in agricultural production; its efficiency is measured by energy consumption. [1]

In the case of irrigated crops, the development of optimal water management for irrigation is important for water productivity and improving food security. Therefore, the introduction of knowledge on the need for water for crop-specific irrigation is essential.[4] The water from precipitation is distributed in the soil and in the atmosphere in percentages, according to Fig. 1.[3] In Fig.2. it is observed how the surplus water from the slopes that has not infiltrated into the soil moves in depressions where it produces puddles [12].



**Fig.1. How water is distributed from precipitation**



**Fig. 2. Manifestation of the puddle phenomenon [12]**

Land with high slopes has high risks of run off, by concentration, in case of heavy rainfall, so it is preferable to plant on the contour and divide the field into plots by using tree or shrub barriers. In our country, drought is an important factor in obtaining low agricultural production. In the hilly and plain regions we have a deficit of humidity or an unfavorable distribution of precipitation in relation to crop requirements. High winds and temperatures during the summer sweating to increase the process by which a significant amount of water is lost. Over time, agricultural practice has highlighted the fact that even in sub-humid and humid areas of the country periodically shows a lack of moisture for most crops, making it necessary to intervene with higher irrigation in July and August. The natural environment and socio-economic conditions of our country

are relative advantageous for the process of irrigation. We have a well-distributed hydrographic network, with relatively easy water supply possibilities, large agricultural areas with fertile soils and a suitable relief as well as other important factors that facilitate the development of the irrigation network. [8]

Current scenarios predict that climate change will increase water shortages in southern Romania [6] Climate change has the potential to affect agriculture through changes in temperature, distribution and rainfall. Rainfall changes will be one of the most critical factors that will determine the global impact of climate change. This problem indicates the need to develop integrated technologies that increase the efficiency of water use in rainfall and support the quality of the soil and the environment by ensuring higher agricultural production at lower costs.[7]

## MATERIAL AND METHOD

One of the mechanical works used to combat water stagnation or uncontrolled runoff is soil modeling. Soil surface modeling works are carried out to facilitate the management of water along the row of plants or its uniform storage. The paper presents three equipments used for the execution of water catchment basins from precipitation and from the use of sprinkler irrigation systems.

### **1 Pocket Pitter narrow crop equipment (short row crops)**

One of the ways to accelerate the secondary succession to a productive and sustainable ecosystem is the work of land footprint. This work is performed with equipment equipped with special impression rotors. Fingerprinting improves the infiltration process and the penetration of moisture is deeper. In the

absence of fingerprints, infiltration is slow again moisture penetration is superficial, conditions that are not favorable for the development of perennial species.

The Pocket Pitter equipment is designed to provide the benefits of water accumulation work in tanks in narrow crops, such as onions, carrots, sugar beet, beans or for crops planted with several rows on the bed. A long, narrow pit is created, with a minimal disturbance of the crop, because no screws are needed between them, Fig. 3 [10]. Specially designed chrome parts are available in a heavy 4 "version or in a lighter 2.5" version.

Fig. 3 shows the lands marked with the equipment for narrow crops and the reservoirs created by it.



**Fig.3. Pocket Pitter equipment for making micro-tanks in narrow-row cultures [11]**

Pocket Pitter was developed for onions and narrow crops or bed crops, but has been used with excellent results not only in onions but also in beans, grass seeds, peas, wheat, greens, sugar beet, garlic, corn and potatoes. Pocket Pitter uses a heavyweight, heavy-duty five-spoke wheel to create an 18-inch tank or narrow slice between rows or on top of the bed. The advantage, in addition to the creation of a water storage tank, is that there is very little disturbance of the soil, as the wheel, on a common shaft, rotates between rows of plants..

Pocket Pitter is designed for long life with minimal maintenance requirements.

## **2. Dammer Diker equipment for storage tanks**

One type of storage tank is the Dammer type compartment, which uses blades (shovels) mounted in a wheel arrangement Fig.4, to make small tanks or tanks, Fig.5, [11]. Dammer Diker equipment is simple, but the effect is substantial. It greatly improves the access of each plant to moisture, nutrients, temperature and air.



**Fig.4. Dammer Diker equipment for storage tanks [16]**



**Fig.5. Storage tanks formed using Dammer Diker equipment [15]**

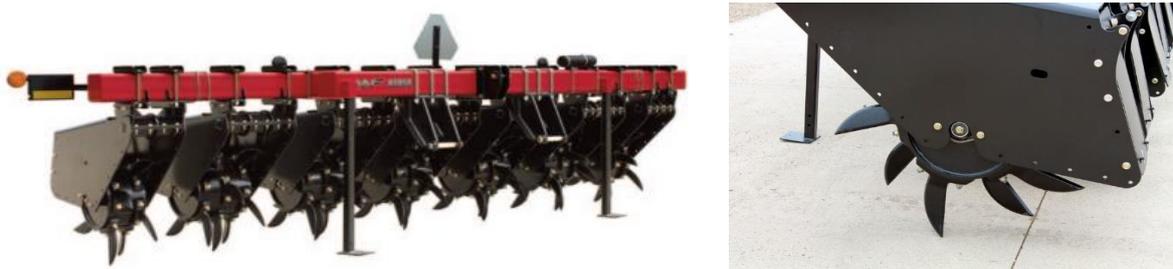
## RESULTS AND DISCUSSIONS

Dammer Diker equipment can be used to reduce erosion and water loss in crops and in aggregate with other machinery, while carrying out such work, for example with potato planting equipment, weed seeders, cultivators and others.[14]

### 3. Equipment for creating RT850 catch basins

The RT850 equipment is used for the execution of soil loosening works and the execution of basins for capturing water for weeding crops, (Fig.6), [9]. During the working process it incorporates dry fertilizers, aerates the soil, reduces pollution and improves crop yields through the process of water and soil conservation.





**Fig.6. Equipment for creating RT850 catch basins [9]**

The RT850 is a simple and robust piece of equipment. It consists of a metal frame coupled to the tractor by the three-point fastening system on which a number of sections corresponding to the crop sowing scheme are mounted. The sections are composed of rotors on which the blade-shaped active members are mounted. The blades are made of abrasion resistant metal, interchangeable and inclined left and right.

When the blades encounter an obstacle, there is the possibility of rolling, avoiding their damage. The rubber rod assemblies also play a protective role, which, when obstacles arise, allow the sections to move, thus avoiding the appearance of additional forces on the support frame and on the three-point fastening system on the tractor.

## CONCLUSIONS

Creating water catchment wells is a practice of soil and water conservation that can be applied to crops whose technology includes or does not include irrigation. The price of the equipment is low and it can be recovered by the production surplus obtained even after the first year of use.

By using this equipment, depressions are created to capture precipitation, reducing runoff and

erosion, increasing soil aeration, improving permeability in the ground what contributes to the growth of roots and plants.

The influences on the products obtained in the case of the crops in which the alveoli were made are variable depending on the precipitation.

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