Statement

Save Irrigation Water using the Innovative Machine of Soil and Water Management for Rice Crop Cultivation (SWMR)

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Introduction

Irrigated rice receives an estimated 34–43% of the total world’s irrigation water, or about 24–30% of the entire world’s developed fresh water resources. There are about 150 million hectares of rice land, which provide around 550–600 million tons of rough rice annually (Maclean et al 2002). Rice crop is considered one of the most important foods and export crops in Egypt. In the last ten years, the annual cultivated area increased from 1.08 to 1.56 million feddans (0.65 million hectares), and the grain yield increased from 3.14 to 5.80 million tons. The average grain productivity was 3.42 tons/fed. (Ghoneiy and Rostom, 2002). There's the modified method of cultivation rice in the bottom and strips (Yousri Ibrahim Atta, 2008), it also saves a lot of water, but reduces the used land area according to the description of a new method (Top of furrow 45cm. And 35 cm of the bottom), by the same token, the yield of hectare is reduced. It means there are the rice intensity is two plants per 80 cm crosswise, while in this innovative method there are four plants in 80 cm crosswise. It's meant the double yield of the new technique.

1. The innovation description

Soil and Water Management Machine for Rice Cultivation (SWMR) will save water, nutrients, time, efforts, applied energy, and operating costs and of course the ratio of weeds growing will be reduced. The new technique needs an innovative machine to manage soil for 20 cm depth, so the next is designing of soil and water management machine for rice cultivation, (SWMR) will be designed and manufactured to be suitable to the hard environment work conditions like water, heavy and compacted soil. Fig.6.

SWMR Machine will be Manufacture of a cylinder rule having many of circular protrusions around the basic cylinder rule to roll after subsoil chisel of depth 25 cm under the soil surface, behind the tractor on soil and printed the designed formed of cross section of trenches which faces the transplanted rice rows, all of rule machine will moving on axe by suitable ball bearings and connected to frame having a three kink points to tractor.section of trench width (20 cm) of the furrow edge space (reformation of soil surface to Furrows having the (V) shape, beside the modification of transplatier float by installing the modified wheels to be suitable to the furrow shape, Fig. 1, 2, 3, 4 and 5.
Fig.1. The side view of zigzag shape which reformation the soil surface.

Fig.2. The innovative machine of soil and water management (SWMR).
2. How the innovation save the water?

The new technique of rice cultivation depends on translating rice in the bottom of a long trench have cross section V shape, like that the rice didn't have any water stress and the volume of water becomes about 50% of the irrigated water under the traditional method.

Rice was cultivated under two methods traditional method \( (W_T) \) and modified innovative method \( (W_m) \) in furrow bottoms. The cross section of furrows such as a zigzag shape using a soil management and soil bed preparation (soil surface shape) using innovative machine to soil bed preparation to harvest irrigation water. Without any reducing of rice intensification, and rice is
transplanted at 20 × 20 cm in both of two cultivation methods. The amounts of applied irrigation water were measured and calculated and water use efficiency Fig.1, 2, 3, 4, 5 and 6.

Irrigation requirements:
Irrigation water requirements for rice will be calculated according to the local climate station data at Kafr El-Sheikh Governate, the Central Laboratory for Agricultural Climate (C.L.A.C.), Ministry of Agriculture and Land Reclamation.

Measurements and calculations:
Irrigation water saving percentage:
Water saving = (If – In) / If x 100
Where: If=Water use for control treatment (m³/ha), and In=Water use of various treatments (m³/ha).

Irrigation water use efficiency:
(IWUE) (kg/m³). Irrigation water use efficiency calculated according to Viets (1962).

Fig. 6. Cross section (water flow area) of traditional and modified rice furrow irrigation.

Results and Discussions
The investigation results show that, the amounts of applied irrigation water are 13104 and 6897 m³/ha for the traditional and modified method of rice cultivation respectively, and then the Irrigation water saving percentage, it's meant the applied water of modified is lower than the traditional method by 47 %. The rice crop yield of one hectare is 8580 and 8978.4, kg/ha. for W_T and W_M.
respectively. While the irrigation water use efficiency is 0.65 and 1.3 kg/m$^3$ for $W_T$ and $W_M$, respectively, Figs. 7, 8, 9 and 10.

It’s clear the positive influence of a modified method of rice cultivation on the parameters of rice crop production, it’s crystal clear the highest result values of rice crop yield of one hectare are modified method.

According the saving of irrigation water in the modified method of rice cultivation, which harvest both of water and nutrients around the rice seedlings in the v shape of furrow irrigation, which include the rice plants and reduce the water losses by evaporation and runoff beside, reduce the environmental hazards of traditional method which present a full surface of irrigation water Hence, present a perfect environment for mosquito and weed
3. How the innovation introduced and spread?

The innovation introduced and spread as follows:

1) Recorded the innovation as an Egyptian patient to spread it under the Intellectual Property Rights, Fig. 12.

2) During the media, where the nominee prepares and presents a TV program about the innovation in the national TV channel (UNIVE1), Fig. 13.

3) A generalization of a new method cultivation using the new innovation machine of soil and water management of rice crop (SWMR) on stakeholders by the agricultural station, which belong to the ministry of agricultural and land reclamation beside the other stations which belong to the water resources and irrigation and water resources ministry.

4) Represent many copies of (SWMR) and distribute them on the Establishment of workshops, symposiums, conferences, training courses and exhibitions to discuss and raise the awareness of stakeholders and their inquiries and requests to develop and use the new method of rice cultivation using the soil and water management of rice crop (SWMR).
5) The merging of a new method in the fifth planning and strategic planning to save about 50% of the irrigation water of the rice crop and use the save water in the new land reclamation in Egypt.

6) The marketing of a new method of rice cultivation using the soil and water management (SWMR) in the global cities which interested in the rice crop production and trading.

7) During the rural extension and agricultural cooperative associations.

![Fig.13. The national TV channel(Unive1).](image)

4. The scope for the further expansion of the innovation.

In Egypt and the most of the riverine communities, the farmers tend to extravagance uses of water that causes several problems, poor drainage, poor ventilation, and eventually reduce the productivity and quality of rice crops. Beside the next challenge of Ethiopian Dam, which is built on the Nile river resource in Ethiopia, it reduces the Historical share Egypt of Nile water amount about 20% (12 BCM), the dam begins to work and drought will be in one or two years caused degradation about one million hectare from the old fertile land, The famine and drought is imminent in Egypt, beside the rice irrigated water amount is about (12 BCM). This proposal can help to mitigate the water shortage disaster by reducing the rice water consumption more than 50% (6 BCM) and this saved water can use in the horizontal agricultural further expansion, beside the saved nutrient more than 25%. By the same token, the innovation (SWMR) spreads on a global scale, to save the irrigation water of paddy, nutrients, effort, time, energy, fuel, money. In addition to Increasing rice water use efficiency and achieve higher productivity and quality of rice yields.

5. The role of individual nominee.

The Innovative Machine of Soil and Water Management for Rice Crop Cultivation (SWMR) was designed, manufactured, tested, developed and recorded as a patent by Dr. Mohamed ElSayed ElHagarey, researcher (PhD) of irrigation and drainage unit, Desert Research Center, Cairo, Egypt. And now he is the president of the research station (AlKantra Shark).