INNOVATION ECOTECHNOLOGY

I would like to inform you about the possibility to be created:

Universal Computerized Decision Support Ecotechnology (CDSE) for Monitoring, New Estimating and Managing Agroecosystem Water Status to Obtain Efficient Crop Production and Protect the Environment

as a **market product** friendly for farmers and agrarian associations.

We look for end-users (farmers or agrarian organizations and associations) of the Ecotechnology to invest in its creation as **market product**. It is based on High Scientific Top Achievements and Innovations in Bulgaria and abroad for the first time around the world.

PROFITS ON ECOTECHNOLOGY APPLICATION

The needed investment to create the technology in one year for practical friendly application by agricultural farmers is **75 000 EURO**. This is offered and discussed by the **Sofia Solutions and Prof. I. D. Christov and Prof. A. N. Sadovski.** The contract with the **Sofia Solutions firm** is to be signed. **The commercial technology will be *expensive market product-tool*, which will save on average 30 % of the total irrigation water and increase the amount of maize-grain yield with 33-50 %** for farmers, agricultural producers and associations. The technology can be applied in growing all annual crops currently during growing season of each year.

The potential profits per each crop field under irrigation vary in different years, depending on the amount and distribution of rainfalls and the course of evapotranspiration sum from field. The price of irrigation water varies from 0.23 (gravitational flow) to 0.75 (pumping flow) Bulgarian leva per m^3 (no tax added), Written Order RD 09-162/17 March 2011 of the Bulgarian Ministry of Agriculture and Food.

Precise measurements accomplished in maize fields (hybrid H-708) during eight (8) year period (1981-1988) showed the following (Table 1).

Traditional irrigation schedule based on average climatic data over 50 years for the maize crop grown on Calcareous Chernozem soil in north-western Bulgaria (Z a h a r i e v et al., 1986, p. 74, ZEMIZDAT, Sofia) includes **6 times of watering** during the growing season each year with total irrigation norm equal to **3 600 m^3/ha** (1 mm water layer = 1 m^3/da = 10 m^3/ha) each year (**Table 1**). The grain yield based on applying climatic methods of evaluating water status on average reaches **6-8 t/ha.**

Applying the offered Decision Support Ecotechnology (with research version), the precise schedules include **3.125 times of watering** on average for 8 years with total irrigation norm equal to **2780 m^3/ha** on average for 8 years (**or 29.5 % less amount of water**). We obtained on average **12 ± 0.05 t/ha of grain** under appropriate *N*, *P* and *K* nutrition for each year (**Table 1**).

On average over 8 years, for example:

(1) 820 m^3/ha (or 29.5 %) less amount of irrigation water in maize field;

(2) 6 - 3.125 = 2.875 less mean number (or 47.9 % less number) of watering, which means less agricultural labour in maize field;

(3) precise plant nutrition adequate to the planned amount of yield, which prevents the deterioration of soil fertility or soil pollution in each field;

(4) from 4 to 6 t/ha (or 33-50 %) higher amount of maize grain yield;

(5) stable amount of planned crop yield each year;

are profits of applying Decision Support Ecotechnology in agricultural practices.

Applying the Decision Support Ecotechnology, we are precisely establishing the needed irrigation schedule currently during growing season each year to create the **necessary universal energy level L = 15 $J^{1/2}/kg^{1/2}$ of soil moisture** through implementing it. This level is recommended by us for all soils and crops in the agricultural practices.

The level L = 5 $J^{1/2}/kg^{1/2}$ of soil moisture belongs to the Biological Optimum of Plant Soil Water Comfort. We recommend it to be created in field using the offered Ecotechnology in order to obtain the crop yield, which is genetically possible for new sorts and hybrids.

The traditional irrigation norm is higher with 18, 87, 64, 20, 135, 48 and 14 % than the irrigation norms of water actually needed in 1981, 1982, 1983, 1984, 1986, 1987 and 1988, respectively. Only in 1985 (long-term and strong drought; we obtained only 0.6 t/ha maize grain yield of bad quality under no irrigation), we currently established that the traditional irrigation norm is 27 % less than the actually needed to keep the chosen energy level and obtain the mentioned amount of grain yield. Total amount of water entered the field is not in correlation with the quantity and quality of yield. The energy level of soil moisture is in very good correlation with those.

The risk coming from the influence of **the most important water factor** during growing season on agroecosystem productivity can be completely removed applying the **offered Decision Support Ecotechnology under conditions of ecologically-acceptable irrigation technical facilities and available water resources.** The price (cost) of water for irrigation varies.

The minimum total needed amount of water and its precise distribution during each growing season to obtain a planned crop yield can be reached using the offered Computerized Decision Support Ecotechnology (CDSE). This Ecotechnology is recommended for farmers who can organize good technical implementation of the agricultural activities in their crop fields. The offered Computerized Decision Support Ecotechnology (CDSE) ensures the amount of planned crop yield to be obtained and helps the exact calculation of nutrient rates necessary for the formation of planned crop yield.

Other kinds of risk in agriculture are coming from:

(1) insufficient nutrients added in soil for plants (macro- and micro-elements) and their uneven distribution in the area (Application of the offered CDSE strongly decreases this kind of risk); **(2)** inappropriate plant density and its uneven distribution in the area of crop field; **(3)** inappropriate soil tillage; **(4)** inappropriate planting date; **(5)** lack of plant protection; **(6)** hailstorm or other natural and anthropogenic disasters. **Managing technologies can be developed to minimize or remove the risks numbered from 1 to 5.**

Table 1. Irrigation schedules created by the ecotechnology for H-708 maize, through which we realized the energy level L = 15 $J^{1/2}/kg^{1/2}$ in Experimental field (Lom, Bulgaria) in 1981-1988. Equivalent energy levels L_e for different water statuses of corresponding years (no irrigation) are shown in blue. We compare the traditional schedule shown in red (Zahariev et al., 1986, p. 74, ZEMIZDAT, Sofia) with precisely determined irrigation schedules (shown in green) needed to obtain 12 t/ha of grain for each meteo-specific year

Year and L_e ($J^{1/2}/kg^{1/2}$)	**Ecotech-Irrigation schedules (dates and gross watering rates)** (m^3/da)			**Total number of watering**	**Total irrigation norm** (m^3/da)
	June	**July**	**August**		
1981 **(19)**	16.06 75	10.07 110	3.08 120	**3**	305 (+18 %)
1982 **(16)**	24.06 79	24.07 114	–	**2**	193 (+87 %)
1983 **(20)**	2.06 60	–	2.08 17.08 118 41	**3**	219 (+64 %)
1984 **(25)**	27.06 78	15.07 100	4.08 122	**3**	300 (+20 %)
1985 **(32)**	10.06 28.06 65 85	14.07 30.07 103 120	13.08 120	**5**	493 (-27 %)
1986 **(22)**	–	–	6.08 27.08 123 30	**2**	153 (+135 %)
1987 **(26)**	24.06 82	27.07 119	25.08 42	**3**	243 (+48 %)
1988 **(26)**	16.06 70	15.07 31.07 97 112	18.08 38	**4**	317 (+14 %)
Mean 8 y	**1**	**1**	**1.125**	**3.125**	**278 (30 %)**
Tradition for each year	2 times of watering Decades: 1st and 3rd	3 times of watering Decades: 1st, 2nd, 3rd	1 watering Decade: 2nd	**6 times each year**	**360 (each year)**

For the first time in world agricultural sciences and practices,

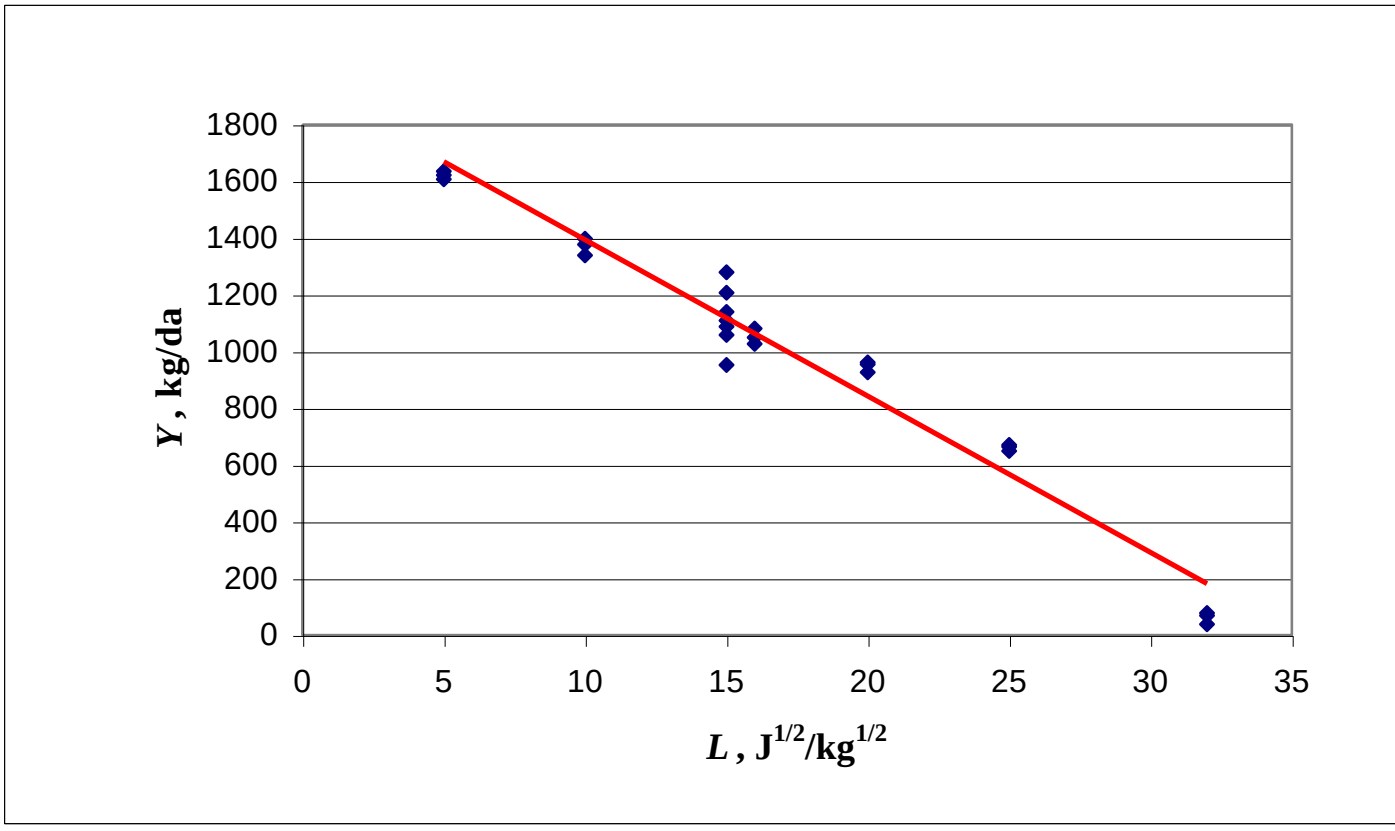
we can measure the water status of agroecosystems and

create specified water status with minimum amount of water to

obtain planned amount and quality of crop yield,

applying the offered ecotechnology

(Maize Example)



Фиг. 1. Yield ***Y*** (kg/da) of maize grain (*H-708*) obtained under appropriate rates of nutrition with ***N, P*** and ***K*** in dependence on the water statuses of Calcareous Chernozem (Lom, Bulgaria), which were estimated with the new integral biophysical index *L*, $J^{1/2}/kg^{1/2}$ of Christov (introduced for the first time in the world agricultural sciences and practices), and created in fields

1 ha = 10 da = 10 000 m^2

Top Scientific Achievements Will Be Innovations in Agriculture through Creating and Applying the Offered Ecotechnology as Market Decision Support Tool

The ecotechnology will use **new method and new integral index** for estimating of the soil-and-crop water status in each agricultural field **for the first time in the world.** This technology will be a New High Scientific tool in both agrarian sciences and practices, which is based on tested knowledge and experience under field conditions (Please, see the attached documents).

The ecotechnology will function on **new complete scientific basis**, which includes: • 7 current daily meteorological indices; • physical characteristics of the soil profile; • biological function for each crop; • fundamental (physical and biological) laws and established regularities of the soil-crop-atmosphere processes.

The research version of the ecotechnology was tested in field experiments over 30 years. The complex scientific base and many results are **accepted by scientists working** at the University of California (USA); University of Moscow (Russia); Land Reclamation Institute of Sindos (Thessaloniki, Greece); University of Beijing (China); Aegean University of Izmir (Turkey); Institute of Water Problems and National Institute of Meteorology & Hydrology, both at Bulgarian Academy of Sciences, Sofia (Bulgaria); and Poushkarov Institute for Soil Science, Agrotechnology and Plant Protection, Sofia (Bulgaria).

The ecotechnology gives different crop irrigation schedules. Their accomplishment:

♣ creates **specified energy levels of soil moisture in the crop field**, and

♣ ensures the necessary soil water status to **obtain a planned amount and quality of yield**, taking into account financial and technical potential of the farm.

Enormous losses of energy, fuels, water, fertilizers and human labour are due to the lack of current representative monitoring and integrated scientific management of **each agricultural field** under irrigation. It is also **new scientific tool** in modern research for creating and examining new sorts and hybrids.

Farmers should be able to:

(1) produce cheaper goods with high quality;

(2) protect the environment and human health;

(3) economize the used energy, water, fertilizers, human labour, and maximize their effectiveness in crop production.

The environmental damages in traditional agricultural activities can be reduced or completely removed by farmers applying the ecotechnology. This is one of the main European requirements for development of **sustainable agriculture**.

The possibilities to use the commercial ecotechnological product are:

- to buy and put into practice it by the farmer,
- to buy and create Centre for Agricultural Recommendations, which will sign ***Fee-contracts with farmers*** concerning each field and crop for current recommendations during the growing season of each year,
- to teach operators and irrigation specialists with training courses in applying the technology,
- to buy and put into agricultural practice of each farmer.

The product will be created by the **Sofia Solutions firm** under the management of Prof. I. D. Christov (soil hydro-physicist and biophysicist) and Prof. A. N. Sadovski (mathematician) in **one year** under an **officially signed contract.** Both of these scientists have worked in agricultural sciences and practices more than thirty years.

We need an investment to begin the work for creating this ecotechnology as **market product**. Its research version was created and tested over 30-year period. We have a lot of data proving that the ecotechnology adequately describes the water status of agroecosystems.

BEST REGARDS.

Sincerely,

Prof. Ilia D. Christov, D.Sc.
Phone/Fax (++359 2) 862 25 82
Mobile phone (++359) 888 191 483
E-mail: ichristow@gmail.com