

## Evaluating efficiency of automatic surface irrigation for soybean production

Ki-yuol Jung, Sang-hun Lee, Hyen-chung Chun, Young-dae Choi, Hang-won Kang

*National Institute of Crop Science, RDA, Miryang, 50424, Rep. of Korea*

### Abstract

Nowadays water shortage is becoming one of the biggest problems in the Korea. Many different methods are developed for conservation of water. Soil water management has become the most indispensable factor for augmenting the crop productivity especially on soybean (*Glycine max* L.) because of their high susceptibility to both water stress and water logging at various growth stages. The farmers have been using irrigation techniques through manual control which farmers irrigate lands at regular intervals. Automatic irrigation systems are convenient, especially for those who need to travel. If automatic irrigation systems are installed and programmed properly, they can even save you money and help in water conservation. Automatic irrigation systems can be programmed to provide automatic irrigation to the plants which helps in saving money and water and to discharge more precise amounts of water in a targeted area, which promotes water conservation. The objective of this study was to determine the possible effect of automatic irrigation systems based on soil moisture on soybean growth. This experiment was conducted on an upland field with sandy loam soils in Department of Southern Area Crop, NICS, RDA. The study had three different irrigation methods; sprinkle irrigation (SI), surface drip irrigation (SDI) and fountain irrigation (FI). SI was installed at spacing of 7×7m and 1.8m<sup>3</sup> /hr as square for per irrigation plot, a lateral pipe of SDI was laid down to 1.2 m row spacing with 2.3 L h<sup>-1</sup> discharge rate, the distance between laterals was 20 cm spacing between drippers and FI was laid down in 3m interval as square for per irrigation plot. Soybean (Daewon) cultivar was sown in the June 20<sup>th</sup>, 2016, planted in 2 rows of apart in 1.2 m wide rows and distance between hills was 20 cm. All agronomic practices were done as the recommended cultivation. This automatic irrigation system had valves to turn irrigation on/off easily by automated controller, solenoids and moisture sensor which were set the reference level as available soil moisture levels of 30% at 10cm depth. The efficiency of applied irrigation was obtained by dividing the total water stored in the effective root zone to the applied irrigation water. Results showed that seasonal applied irrigation water amounts were 60.4 ton 10a<sup>-1</sup> (SI), 47.3 ton 10a<sup>-1</sup> (SDI) and 92.6 ton 10a<sup>-1</sup> (FI), respectively. The most significant advantage of SDI system was that water was supplied near the root zone of plants drip by drip. This system saved a large quantity of water by 27.5% and 95.6% compared to SI, FI system. The average soybean yield was significantly affected by different irrigation methods. The soybean yield by different irrigation methods were 309.7 kg 10a<sup>-1</sup> from SDI 282.2 kg 10a<sup>-1</sup> from SI, 289.4 kg 10a<sup>-1</sup> from FI, and 206.3 kg 10a<sup>-1</sup> from control, respectively. SDI resulted in increase of soybean yield by 50.1%, 7.0% 9.8% compared to non-irrigation (control), FI and SI, respectively. Therefore, the automatic irrigation system supplied water only when the soil moisture in the soil went below the reference. Due to the direct transfer of water to the roots water conservation took place and also helped to maintain the moisture to soil ratio at the root zone constant. Thus the system is efficient and compatible to changing environment. The automatic irrigation system provides with several benefits and can operate with less manpower. In conclusion, improving automatic irrigation system can contribute greatly to reducing production costs of crops and making the industry more competitive and sustainable.

Keywords: Automatic irrigation system, Drip irrigation, Sprinkle irrigation, Soil moisture, Soybean

Corresponding author\*

Ki-yuol Jung

Address : 20<sup>th</sup> Jeompilijar-ro Miryang-si, Gyeongsangnam, 50424, Rep. of Korea

Tel : +82-10-2509-8358, Fax : +82-55-352-3059

E-mail: jungky@korea.kr