

## LIUJIA solar micro irrigation system

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Micro irrigation, also called the Drip system, is a new technology for agricultural irrigation. The Drip system saves through its drip-like irrigation an enormous amount of water. The plants absorb approximately 80% of the water in this novel irrigation system, while 70% of the irrigated water will evaporate in a conventional system. Thus the land area is used more economically and more ecologically.

Liujia Solar Corp. (Germany) offers a new kind of a micro irrigation system especially designed for families - for short, the LiujiaSD system. The heart of this system is the solar operated well pump. This pump is rather small. Furnished with plunger technology, the pump has only a diameter of 5.5 cm and a length of 37 cm. To operate the pump, a small solar module up to 12 Wp is needed; the amount of delivered water reaches up to 90 liters per hour and the delivering height is up to 10 meters corresponding to water pressure up to 1 bar (and in the case of the LJ20, up to 2 bars). In addition to the solar drip system, the pump can also be used for drinking water supply, water supply for animals, solar thermal installations or it can be applied for showers after swimming in the sea or lake.

The revolutionary innovation of this user-friendly irrigation system is based on the simple concept that combines a solar well pump directly with the Drip line, which supplies a smaller cultivated area up to 300 m<sup>2</sup>, depending on the plant type, sun intensity and the desired amount of water. This system saves energy and physical efforts. It also saves cable-laying as well as further financial purchases, e.g., a diesel generator for operating the water pump, a water tower for generating water pressure and automatic counters or valves. There is also no requirement for complicated calculations of the drip water lines, if irrigating bigger areas. This saves a lot of electricity and water.

Simultaneous however, the Liujia SD-System has the same possibilities as usual drip-irrigation systems. Beyond the mentioned advantages, many smaller cultivated areas can be used more individually, ecologically and reasonably and also for high-quality plants.



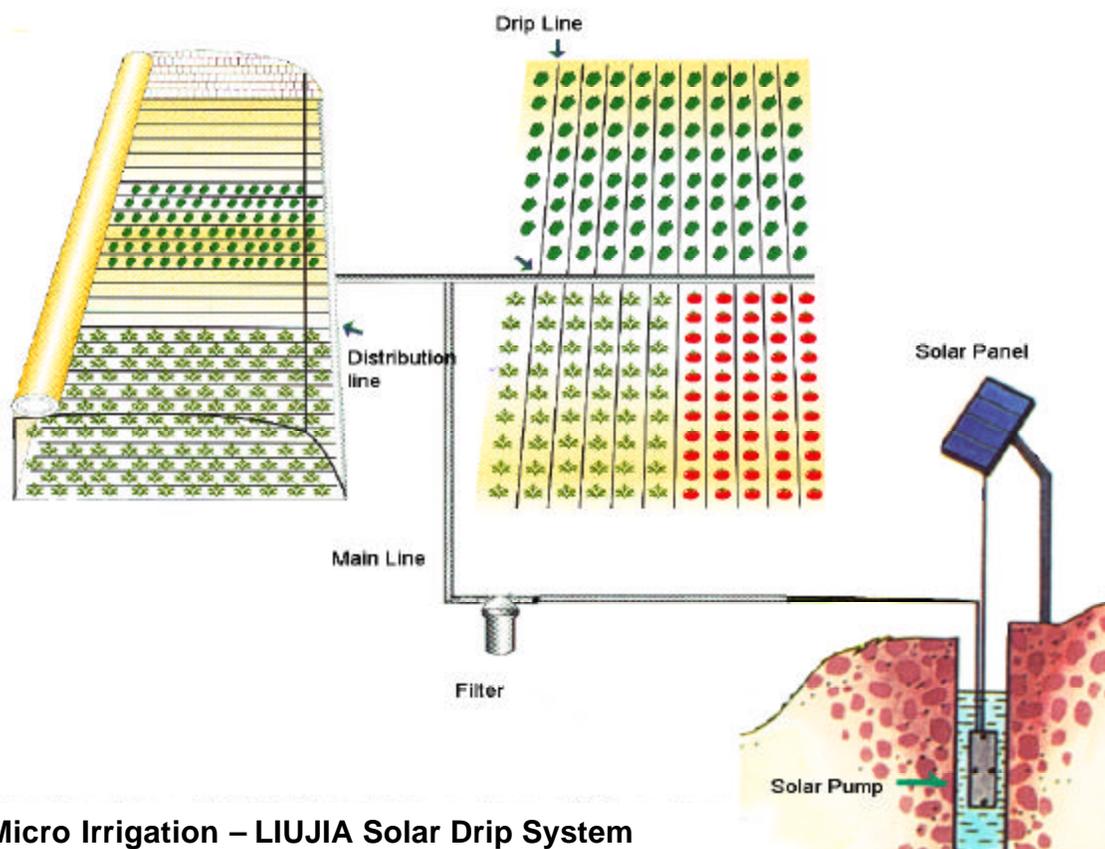
Fig. 1

Especially for smaller areas, in particular in developing countries, the drip system can be used for individual plans and in different geographic situations and simultaneously exploit all advantages of the drip system. Such small micro irrigating systems require pressurized water

just like traditional ones. This is, from an economic viewpoint, a renewable energy whose extraction represents an unmatched advantage. (See Fig. 1)

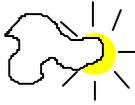
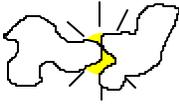
The results which are achieved with the LiujiaSD prove its reliability, strength and flexibility. In this way, purposeful water distribution achieves immensely higher profits than by traditional irrigation (flooding, furrows).

Considering the required amount of water needed by the plant type, either one or two main lines can be used per row. Because of its improvement of cultivated area, the LiujiaSD system provides the possibility of efficient and economical irrigation for small farmers to grow high-quality plants. Planning the LiujiaSD system is relatively simple. After a short instruction, one is able to carry out the planning and the installation for the system alone. Because of its mobility, it also can be quickly used as "first aid" for high-quality plants in times of drought. In the winter, dismantling this system is equally easy, so it can be taken home for the winter.



**Micro Irrigation – LIUJIA Solar Drip System**

**water quantity / pumping height (Type LJ20)**

	 full sunshine	 some clouds	 hazy
<b>5 Meters</b>	<b>106 Liters/h</b>	<b>63 Liters/h</b>	<b>28 Liters/h</b>
<b>10 Meters</b>	<b>77 Liters/h</b>	<b>49 Liters/h</b>	<b>23 Liters/h</b>
<b>15 Meters</b>	<b>62 Liters/h</b>	<b>37 Liters/h</b>	<b>18 Liters/h</b>
<b>20 Meters</b>	<b>44 Liters/h</b>	<b>28 Liters/h</b>	<b>12 Liters/h</b>

**water quantity / pumping height (Type LJ10)**

<b>3 Meters</b>	<b>80 Liters/h</b>	<b>40 Liters/h</b>	<b>25 Liters/h</b>
<b>5 Meters</b>	<b>65 Liters/h</b>	<b>33 Liters/h</b>	<b>19 Liters/h</b>
<b>7 Meters</b>	<b>50 Liters/h</b>	<b>28 Liters/h</b>	<b>17 Liters/h</b>
<b>10 Meters</b>	<b>40 Liters/h</b>	<b>18 Liters/h</b>	<b>11 Liters/h</b>

**An example:**

A family garden has 30 two-year-old fruit trees, 50 one year old flowers and 10 one year old bushes. Every fruit tree uses approximately 2 l of water per day, every flower needs approximately 1.50 l per day, and every bush uses approximately 2.50 l of water per day: this makes  $30 \times 2 = 60$  plus  $50 \times 1.5 = 75$  plus  $10 \times 2.5 = 25$ . Altogether the garden owner requires approximately 160 liters of water. If s/he waters the plants with conventional methods, s/he needs 800 liters of water; wasting five times more water in order to achieve the same result.

After the required water quantity is determined, the garden owner must now find a water source. Rainwater tanks, wells, creeks or lakes are conceivable. Here are some points which should be followed:

1. The water pressure of the main water line and the water pressure in the distributor water line must be well synchronized, because their sum is the entire produced pressure of the pump. The LJ10 reaches a maximum of 10 m, i.e., this pump produces a pressure of max 1 bar (and the LJ20 produces max 2 bars). If the owner uses LJ10 in a 6 m deep well (0.6 bar for the well), there still remains 0.4 bars of pressure for the water lines. A higher pressure in the water lines has many advantages. In the same case, the pump LJ20 produces 1.4 bars of pressure in the water line to deliver the same amount of water per hour. This depends on the financial aspect and preferences of the end-user. The LJ10 cannot be used for deeper wells over 10 m deep.
2. As you can see here, it is advantageous to use water from rainwater collectors, from creeks or lakes, because of their small water delivering height. Longer distances to such water resources do not cause any problems for the Liujia Solar pump. Based on our experience, the pump loses at a distance of 100 m approx. 0.1 bar through friction loss.
3. The garden owner would like to be sure that his flowers are supplied when he is on vacation. He installs a LJ10 in the well, so that his flowers and trees are automatically

irrigated with the LiujiaSD system. Since the entire system is very low-priced and easy to extend, he has only to take care of the hidden installation of the water lines in the garden. It is important here to regulate the pressure of the main water line and the distributor water line. The garden owner can use a 13 mm black PVC main line, while the distribution line has an internal diameter of 4 mm. In order to achieve a regular pressure in the main line, it should not be longer than 30 meters and should be placed in a circle or a figure-8.

4. At appropriate points along the main line, the garden owner taps the water with a coupler to connect it with the distribution line, which is then connected to dripping heads. Every distribution water line should be combined with no more than 10 water heads, because of its small water flow. The distance between these heads should be no more than 1 m. It is possible to try out all combinations, in order to find the ideal dripping head for every plant.
5. In the conventional drip irrigation system, one dripping head often has water output of 2 l/hour. Since this is too much for a plant, some computer-controlled valves must be installed, which can be switched off in certain time intervals. But the LiujiaSD system is so flexible that the dripping heads can supply every plant with its individual water requirement.
6. At the end, the main water line should be connected to the solar pump with a filter. The filter is used to prevent particles in the water from clogging up the dripping heads. Of course, this filter must be cleaned from time to time depending on water quality. The pushing movement of the pump also keeps the water heads cleaner than conventional pumps.
7. Once all drip heads have been connected, the garden owner can start the pump. On sunny days, the water pours through the network very fast. The pressure in the water lines must now be adjusted so that all distributing lines are supplied. First, turn on those drip heads where no water comes out. The second water line accumulates air which hinders the water, so after all the air leaks out, slowly adjust all dripping heads until water drips out. This increases the pressure of the water line and guarantees sufficient pressure for remote distribution lines. Adjustments are made ideally over a period of two weeks until the dripping heads supply every plant with its individual water requirement.

Of course, there are details which cannot be explained in a short overview. But this shows that the Liujia Solar Drip System is an "open" system, which can be individually combined and extended with professional support from the distributor.