The background.

Drip irrigation is the slow and frequent application of small amounts of water through emitters or tiny holes spaced along polyethylene tubing or tape. It also is called trickle, subsurface, or micro irrigation. Growers of high-value crops, such as tomato, pepper, strawberry, and melons, were among the first to embrace this technology.

Drip (trickle) irrigation offers the potential for precise water management and divorces irrigation from the engineering and cultural constraints that complicate furrow and sprinkler irrigation. It also provides the ideal vehicle to deliver nutrients in a timely and efficient manner. However, achieving high water- and nutrient-use efficiency while maximizing crop productivity requires intensive management[1].

Optimizing economic returns from drip irrigation in vegetables requires customization of drip/crop configurations, irrigation frequency and soil water management[2]. Many factors influence appropriate drip irrigation management, including system design, soil characteristics, crop and growth stage, environmental conditions, etc[3]. Farmers and researchers are still experimenting with various arrangements of bed size, crop rows per bed and rows of drip tape per bed. Issues include investment costs in reconfiguring bed-forming and planting machinery, meters of drip tape per ha (including fittings), and agronomic impacts of different crop row / drip tape configurations. The current rationale for most growers is to achieve maximum lateral spread from the drip tape, and thus reduce the amount of drip tape they require in their crop.

Parallel to common application of single drip line alongside plant's row, there are tendencies of using two parallel lines per row. The main application of this method is its use in irrigation of such plants as grapevine, where partial root zone drying is employed[4]. Researches performed in this respect show that such root zone drying that is obtained by withholding the irrigation in a controlled manner, improves water use efficiency while maintaining crop yield and quality. Some authors report about the use of this technique in order to improve tomato fruit quality, but not much is said about the use of double drip irrigation lines in order to increase watermelon production.

Demonstration set up and results.

A high percentage of early watermelon plots in Albania is located in light sandy soils. The sandy soils are characterized by a very specific mode of water distribution during drip irrigation. The wet bulb created by running water is deep and narrow. Because of that, there was raised the hypothesis that this might negatively affect plant growth and watermelon productivity, assuming that root system would not been supplied with enough water, and will remain not enough spread over plant's row.

For that purpose, demonstration plots were settled, respectively in Lushnje (Divjake) and Berat (Drenovice) to test the efficiency of having an additional irrigation line, next to each

[1] T.K.Hartz. 1999. Water management in drip irrigated vegetables. University of California, Davis.
[2] C.W.L Henderson. Customizing drip irrigation for profitable vegetable production.
[3] T.K.Hartz. 1999. Water management in drip irrigated vegetables. University of California, Davis.
[4] US Patent 6540158 - Double-line irrigation hose.

common irrigation line alongside the plant's row. Good farmers were selected based on a share cost agreement. Each plot a labor and input costs were provided by farmers, while AAC has contributed with the cost of double drip lines for each demonstration.

The expected outcomes of the proposed technology included;

1. Improved operational efficiency/productivity.
2. Expanded market opportunity (earliness).
3. Increased farmer's sales.
4. Increased profit due to price premium.

The planned parameters to be recorded included; days to first flowering, days to first/last harvest, the incidence of pests and diseases, marketable yield and the respective prices.

According to farmers participated in these demonstration there was an increase of about 5 t/ha, due to double drip lines[5]. The increased production was evidenced as the total production. No evidence was on the increase of early production. AAC field officers reports for a slightly higher production (up to 10 t/ha)[6].

There is no important increase on production cost due to double drip lines. The drip lines are supposed to be used for 5 years. Because of that, there is only a slight increase of depreciation cost (262 versus 142 euro/ha, Table 1). There is of course some additional labor needed for installation and removal of additional drip lines.

Assuming an increase of 5 t/ha, a slightly higher net income is calculated (about 300 euro/ha). The effect seems to be much less compared with the significant increase on farmer's profit due to other innovations proposed (honey bee use and thermal plastics).

Indeed, the use of double drip lines is not encouraged by data reported in literature. According to Henderson, there are significantly increased material, installation, maintenance and disposal costs associated with double the number of drip lines per hectare. In his experiment, the only material benefit from this marked increase in irrigation investment was the reduced water use, as there was no crop performance benefit[7]. In a situation where availability of irrigation water is not limiting production, it is highly unlikely that the savings in water cost would justify the increased investment in drip infrastructure required by two drip lines per bed. However, the situation changes when water is a limiting resource (Henderson 2003; Hickey *et al.* 2006) [8]. In that situation, water saved can be used to grow additional hectares of profitable crop, so although the $/ha return may be lower, the increased production area more than compensates.

[5] Gjergji Todi & Jorgji Krruti. Personal communication.
[6] Lyto Goga. Personal communication.
[7] C.W.L Henderson. Customizing drip irrigation for profitable vegetable production.
[8] References from Henderson.

Table 1. Summary of crop expenditures and incomes (euro)

Incomes			
Planted area	10000	Single drip line	Double drip lines
Yield (kv)		**660**	**710**
Average price (ALL/kv)		**1850**	**1805**
Sell's incomes			
Watermelon		9768	10243
Total sells		**9768**	**10243**
Direct costs			
Mashinery costs		187	187
Labor		1455	1512
Seedlings		1400	1400
Fertilizers		960	960
Pesticide		120	120
Fuel		0	0
Electric power		800	800
Plastic films		520	520
Total of direct costs		**5442**	**5499**
Indirect and administrative costs			
Depriciation		142	262
Maintenance		0	0
Administrative costs		100	100
Non planned costs		263	266
Total of indirect costs		**505**	**627**
Incomes without interests and taxes		**3821**	**2766**
Bank interests costs		**0**	0
Taxes		**0**	0
Credit loans		**0**	0
Total expenditures		**5947**	**6126**
Net incomes		**3821**	**4117**

Discussion and recommendations.

Double drip irrigation lines is not a wide spread practice. It might provide a slight increase in yield, but still farmer's profit is questionable.

Double drip line should be used in areas where water availability is limited, as a mean to save water and increase its coefficient use.

The use of double drip irrigation lines should not be promoted. Its efficiency is questionable and quite inferior compared to other demonstrated innovations.