TORO®

Drip irrigation for Hazelnut Trees

The element of success in modern hazelnut cultivation

hazelnut

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The element of success in modern hazelnut cultivation

The growing demand for hazelnut on the part of the food processing industry is inducing increasing numbers of farmers to produce it. The great variations in the offer and the quality of hazelnuts have the effect of making the price of the product extremely volatile. It is therefore of fundamental importance to stabilise production and guarantee regular supply of a quality product. The use of drip irrigation systems represents the best tool for achieving these aims, as it efficiently manages the farm's resources, i.e. water, energy, fertiliser and labour. In the new systems, drip irrigation results in a significantly early entry into production, giving the grower not only interesting results but also a rapid recovery of the investment expenditure.

Thus, in modern hazelnut cultivation drip irrigation is a production tool of special importance which can and must be used not only to eliminate the risks linked to unfavourable seasonality but also and especially for controlling production and improving quality.

ADVANTAGES FOR THE HAZELNUT GROVE IN GROWTH STAGE

In the early stages of hazelnut grove growth the main advantages connected to the use of a drip irrigation system are:

- Early entry into production (at least one year in advance);
- Uniform engraftment and plant growth;
- Zeroing of costs for emergency irrigation and replanting;
- Rapid development of trees, branch lengthening, trunk diameter growth and root system development;
- Even tree growth due to the high degree of emission uniformity, which ensures the same water and nutrient supply to all trees (including in the presence of steep slopes, thank to the use of Pressure-Compensating emitters);
- The ability to track the nutritional needs of the tree during the various phenological stages, with targeted management of fertigation.

ADVANTAGES FOR THE HAZELNUT GROVE IN PRODUCTION STAGE

Subsequently, during the production stage, the advantages linked to use of a drip irrigation system are:

- Larger production;
- Greater hazelnut calibre with a high percentage having diameters of more than 13 mm;
- Increase in shelled yield;
- Greater trunk diameter;
- Fewer empty shells;
- Reduction of the early drop phenomenon;
- Ability to develop and implement irrigation strategies that optimise and/or characterise the quality of the hazelnuts to protect the typical features of each planting areas;
- Better hazelnut appearance and food quality;
- In normal stages, the management of water stress allows constant production to be obtained over time, both in terms of quantity and quality;
- In particularly dry stages or in especially "arid" planting areas, the elimination of intense water stress and consequent protection of the production quality and quantity;

- Optimal distribution of the nutritional elements in relation to phenological stages thanks to the adoption of targeted fertigation methods (substantial reduction in total fertilizing units used and elimination of distribution costs with traditional methods);
- Possibility to intervene promptly with micro/macro-elements (also on heavy or hilly land);
- Improved tree equilibrium;
- Management of grassing and maintaining a more balanced and natural ecosystem with a consequent reduction of erosion phenomena in sloped terrains;
- Reduction of fungal pathologies facilitated by leaf wetting due to rescue operations using sprinkler systems.

How to irrigate

The hazelnut tree's water needs vary considerably in line with the various phenological stages. For this reason it is important to maintain optimal moisture, commensurate with the specific phenological stage. A useful control tool for this objective is constituted by the moisture sensors located in the terrain, which need to be consulted frequently and regularly to calculate the correct setting of the irrigation plan. Irrigation should not obey prefixed operating times and durations but should be subject to an irrigation plan that is correlated to the variable environmental conditions and the phenological stage. The irrigation plan should be bespoke and controlled using appropriate instruments, and if necessary changed on the basis of the controls carried out. During the forming stage of the hazelnut, proper water availability in the soil produces a constant growth of the nut. In especially dry years, drip irrigation is an indispensable tool for achieving a satisfactory production while totally safeguarding the harvest at the same time.

DAMAGE FROM WATER STRESS

- Reduction of photosynthesis, stomatal conductance and the LAIs (Leaf Area Index) (bringing about a reduction of nut growth and a drop in production);
- Limited formation of shoots and differentiation of flower buds;
- A greater predisposition to phytopathy;
- Early drop;
- Early leaf drop.

PERIODS OF MAXIMUM CRITICALITY FOR WATER STRESS

(when it is more important to irrigate and fertigate)

- From the formation of the embrio to the complete formation of the nut, i.e. in the summer (according to various studies when the available water in the terrain reaches 60-65%) with points of maximum criticality during the rapid growth stage of the nuts);
- During a dry seasonal trend, it is worthwhile irrigating even after the hazelnut picking, the period of greatest root system activity and the formation of the tree's reserves (post-harvest).

Sub-Irrigation

Using a Sub-surface Drip Irrigation (SDI) brings further advantages:

- An increase in irrigation efficiency thanks a reduction to lower losses through evaporation;
- Increased fertigation effectiveness with a consequent saving on fertilizers;
- A high degree of absorption effectiveness of low-mobility substances such as phosphorus and potassium because they are distributed close to the root system;
- Absence of tubing outside the hazelnut grove, with a consequent facilitation of the main cultivating operations, and a lower-profile visual and environmental impact.

POSSIBLE CONFIGURATIONS FOR YOUR HAZELNUT GROVES

CONFIGURATION WITH AQUA-TRAXX® AND NEPTUNE PC FOR DRIPLINE SUB-IRRIGATION

- In the growth stage, use Aqua-Traxx® PBX with a 60 cm spacing and 0.87-1.14 l/h flow rate, at a depth in the terrain of 20-40 cm and positioned at 10-30 cm from the plant. Aqua-Traxx® PBX buried in the ground will ensure that the water and nutritional demands of the growing plant are met and this will reduce the time for bringing the tree into production by at least a year.

- During the production period, use the Neptune PC AS dripline (Pressure-Compensating and Anti-Siphon): one line if the rows are 3 meters apart, two lines if the rows are 5 meters apart (60-80 cm emitter spacing, 1.2 or 2.4 litres/hour flow rate), buried at a depth of 30-45 cm. In any case positioning the dripline at 1.5 meters from the row. With both a single and a double row, the system will optimise water distribution and the nutritional elements necessary during the production stage.

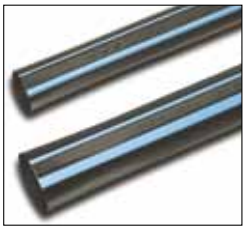
CONFIGURATION WITH DRIPLINE UNDER-CANOPY

- This system has a single Neptune PC dripline, with a 60-80 cm spacing, with a flow rate of 1.6 or 2.4 litres/hour, located at 1.5-2.0 metres from the ground, i.e. around the tree canopy. This solution means it is not necessary to carry out further work once the system has been set up during the tree growth stage. While not being as efficient as the previous solution, this system is equally effective and leads to excellent results.

OUR EXPERIENCE, OUR SOLUTIONS

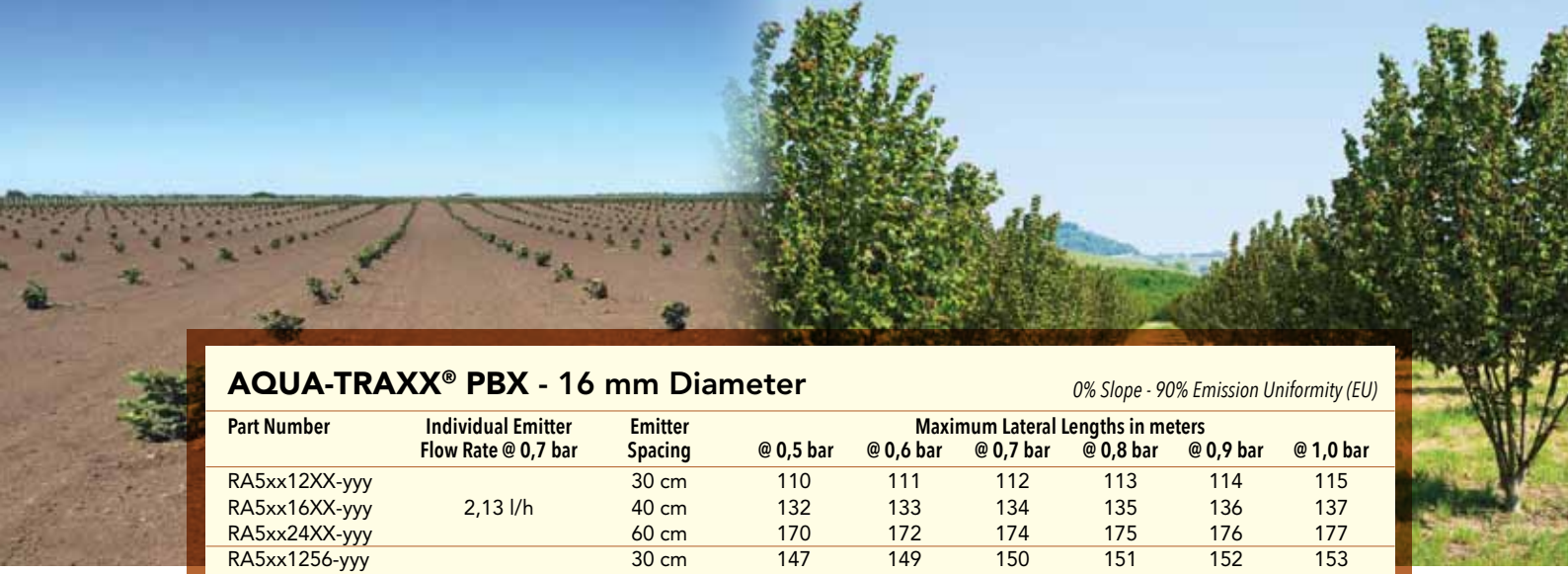
Toro has been successfully manufacturing dripper irrigation systems for hazelnut groves all over the world since the 1990s. After a series of experimentation in the field, Toro has settled on three state-of-the-art irrigation solutions for hazelnut groves:

Aqua-Traxx® PBX: this is a Toro drip-tape ensuring the highest performance on the market, with excellent uniformity of distribution and extraordinary quality;



Aqua-Traxx® FlowControl™: this Toro drip-tape uses a special FlowControl™ system to guarantee uniformity of water even in challenging topographical conditions, especially on undulating terrains;

Neptune PC AS: is the Pressure-Compensating Anti-Siphon dripline by Toro which ensures an extraordinary resistance to clogging and excellent emission uniformity in the most challenging topographical conditions, especially on undulating terrains.



AQUA-TRAXX® PBX - 16 mm Diameter

0% Slope - 90% Emission Uniformity (EU)

Part Number	Individual Emitter Flow Rate @ 0,7 bar	Emitter Spacing	Maximum Lateral Lengths in meters @ 0,5 bar	@ 0,6 bar	@ 0,7 bar	@ 0,8 bar	@ 0,9 bar	@ 1,0 bar
RA5xx12XX-yyy		30 cm	110	111	112	113	114	115
RA5xx16XX-yyy	2,13 l/h	40 cm	132	133	134	135	136	137
RA5xx24XX-yyy		60 cm	170	172	174	175	176	177
RA5xx1256-yyy		30 cm	147	149	150	151	152	153
RA5xx16XX-yyy	1,41 l/h	40 cm	168	170	172	173	174	175
RA5xx24XX-yyy		60 cm	218	220	222	224	226	227
RA5xx1245-yyy		30 cm	170	172	173	175	176	177
RA5xx1634-yyy	1,14 l/h	40 cm	204	206	208	209	211	212
RA5xx24XX-yyy		60 cm	253	255	257	259	261	262
RA5xx1234-yyy		30 cm	206	208	209	211	212	214
RA5xx1625-yyy	0,87 l/h	40 cm	246	250	252	254	256	257
RA5xx24XX-yyy		60 cm	305	308	311	314	316	318

AQUA-TRAXX® PBX - 22 mm Diameter

0% Slope - 90% Emission Uniformity (EU)

Part Number	Individual Emitter Flow Rate @ 0,7 bar	Emitter Spacing	Maximum Lateral Lengths in meters @ 0,5 bar	@ 0,6 bar	@ 0,7 bar	@ 0,8 bar	@ 0,9 bar	@ 1,0 bar
RA7xx12XX-yyy		30 cm	194	196	198	200	201	202
RA7xx16XX-yyy	2,13 l/h	40 cm	233	236	238	240	242	243
RA7xx24XX-yyy		60 cm	302	305	308	311	313	315
RA7xx1256-yyy		30 cm	248	252	254	256	258	259
RA7xx16XX-yyy	1,41 l/h	40 cm	298	302	305	307	309	311
RA7xx24XX-yyy		60 cm	386	390	394	398	401	403
RA7xx1245-yyy		30 cm	302	305	307	309	311	313
RA7xx1634-yyy	1,14 l/h	40 cm	361	365	368	370	373	375
RA7xx24XX-yyy		60 cm	447	453	457	461	464	467
RA7xx1234-yyy		30 cm	365	368	372	375	378	381
RA7xx1625-yyy	0,87 l/h	40 cm	418	422	426	429	432	435
RA7xx24XX-yyy		60 cm	542	547	552	556	560	564

Aqua-Traxx® PBX is also avilable in other models. Ask for more information.

AQUA-TRAXX® PBX:

- Emitter spacing: 30, 40, 60 cm
- Wall thickness: 10, 12, 15 mil;
- Diameter: 16 mm (5/8”), and 20 mm (7/8”)
- Emitters: 2,13 / 1,40 / 1,14 / 0,87 l/h a 0,7 bar

AQUA-TRAXX® FLOWCONTROL™

- Emitter spacing: 30, 40, 60 cm
- Wall thickness: 10, 12, 15 mil;
- Diameter: 16 mm (5/8”), and 20 mm (7/8”)
- Emitters: 1,01 l/h a 0,7 bar

AQUA-TRAXX® FLOWCONTROL™ - 16 mm Diameter

0% Slope - 90% Emission Uniformity (EU)

Part Number	Individual Emitter Flow Rate @ 0,7 bar	Emitter Spacing	Maximum Lateral Lengths in meters @ 0,7 bar	@ 1,0 bar	@ 1,4 bar	@ 1,7 bar
EAFC5xx1245-yyy		30 cm	194	206	216	226
EAFC5xx1634-yyy	1,01 l/h	40 cm	230	245	260	271
EAFC5xx2422-yyy		60 cm	301	320	337	350

AQUA-TRAXX® FLOWCONTROL™ - 22 mm Diameter

0% Slope - 90% Emission Uniformity (EU)

Part Number	Individual Emitter Flow Rate @ 0,7 bar	Emitter Spacing	Maximum Lateral Lengths in meters @ 0,7 bar	@ 1,0 bar	@ 1,4 bar	@ 1,5 bar
EAFC7xx1245-yyy		30 cm	336	361	384	390
EAFC7xx1634-yyy	1,01 l/h	40 cm	404	430	458	465
EAFC7xx2422-yyy		60 cm	526	556	590	604

Aqua-Traxx® FlowControl™ is also avilable in other models. Ask for more information.

NEPTUNE PC:

- 2 emitters' versions: Anti-Siphon (AS) e No-Drain (AL);
- 16 mm diameter, wall thickness 0,9 / 1,0 / 1,1 mm;
- 20 mm diameter, wall thickness 0,9 / 1,0 / 1,2 mm;
- 4 Emitters Pressure-Compensating: 1,2 / 1,6 / 2,4 / 3,8 l/h between 0,5 and 3,5 bar;
- Emitter spacing from 30 cm.

NEPTUNE PC - AS e AL - 16 mm Diameter

0% Slope

Part Number	Individual Emitter Flow Rate between 0,5 bar and 3,5 bar	Emitter Spacing	Maximum Lateral Lengths in meters @ 1,0 bar	@ 1,5 bar	@ 2,0 bar	@ 3,0 bar	@ 3,5 bar
PPx16xx4012	1,2 l/h	40 cm	126	161	185	221	236
PPx16xx6012		60 cm	177	226	261	312	333
PPx16xx8012		80 cm	222	285	329	394	420
PPx16xx10012		100 cm	265	339	392	470	501
PPx16xx4016	1,6 l/h	40 cm	115	147	169	203	216
PPx16xx6016		60 cm	155	198	229	274	292
PPx16xx8016		80 cm	190	243	281	337	360
PPx16xx10016		100 cm	222	284	329	396	421
PPx16xx4024	2,4 l/h	40 cm	88	113	130	155	166
PPx16xx6024		60 cm	119	152	176	211	224
PPx16xx8024		80 cm	146	187	216	259	276
PPx16xx10024		100 cm	171	219	253	303	323
PPx16xx4038	3,8 l/h	40 cm	66	84	97	115	123
PPx16xx6038		60 cm	89	113	131	157	167
PPx16xx8038		80 cm	109	140	161	193	206
PPx16xx10038		100 cm	127	163	189	226	241

NEPTUNE PC - AS e AL - 22 mm Diameter

0% Slope

Part Number	Individual Emitter Flow Rate between 0,5 bar and 3,5 bar	Emitter Spacing	Maximum Lateral Lengths in meters @ 1,0 bar	@ 1,5 bar	@ 2,0 bar	@ 3,0 bar	@ 3,5 bar
PPx20xx4012	1,2 l/h	40 cm	210	267	309	368	392
PPx20xx6012		60 cm	285	364	420	502	535
PPx20xx8012		80 cm	351	450	518	620	661
PPx20xx10012		100 cm	411	526	607	728	776
PPx20xx4016	1,6 l/h	40 cm	169	216	249	298	317
PPx20xx6016		60 cm	230	294	339	407	433
PPx20xx8016		80 cm	284	365	419	503	536
PPx20xx10016		100 cm	332	426	492	591	630
PPx20xx4024	2,4 l/h	40 cm	130	166	191	228	243
PPx20xx6024		60 cm	177	226	261	312	332
PPx20xx8024		80 cm	219	280	323	386	412
PPx20xx10024		100 cm	256	328	379	454	484
PPx20xx4038	3,8 l/h	40 cm	97	123	142	170	181
PPx20xx6038		60 cm	132	168	194	232	247
PPx20xx8038		80 cm	163	208	240	287	306
PPx20xx10038		100 cm	191	244	282	338	360

Neptune PC is available in other models. Ask for more information.

TESTIMONIALS

Fulvio De Carlo
"De Carlo Irrigazioni"
Villa Adriana, Tivoli, Rome, Italy

"A drip irrigation system is now the best investment for guaranteeing the productivity of a hazelnut grove.
Among the various hazelnut grove systems that have been set up, in Northern Serbia we installed a completely automated irrigation system with fertigation, aimed at obtaining a world-class hazelnut production. The system covers a surface of more than 650 hectares and it was entirely constructed using the 1.6 litres/hour Neptune PC. On the basis of the planting space, a spacing of 0.7 metres was adopted to ensure maximum irrigation uniformity. Thanks to its anti-siphon feature Neptune PC dripline was buried making the irrigation system even more effective. A state-of the art drip system, with high-quality products, ensures a constant production, with high standards, over many years, even in particularly dry years".

Lorenzo Corbisiero
"Azienda Agricola Corbisiero"
Teano, Caserta, Italy

"The Corbisiero Farm installed the first Sub-surface Drip Irrigation (SDI) system for hazelnut groves in the Caserta area. The SDI system extends for about 30 hectares. The main objective of the system is to manage the growth and maintenance of the hazelnut grove by the use of fertigation, thus also improving nut quality and yield. The system includes a single Pressure-Compensating dripline per row, with a 20mm diameter, 40 cm spacing and a flow rate of 1.6 litres/hour. The use of drip irrigation represents an early entry into production of the hazel grove and then safeguarding of the production in dry years. SDI system allows a high level of irrigation efficiency, while keeping the terrain compact and free of limitations to use of machinery; so we can carry water and nutritional substances to the plants on the basis of their needs and independently of the surface working plan. The decision to use the Toro dripline was the result of a painstaking evaluation of the quality of the products, their reliability and the professional approach of the manufacturer".

TORO®

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