



WINE GRAPES

NAANDANJAIN
Irrigation

HISTORY

Evidence of wine production can be found in archeological excavations dating back to 5,000–6,000 BC, both in Georgia and Iran. Nowadays wine grapes are cultivated on both hemispheres, mostly between 30 to 50 degrees north and south of the equator, from Central Otago in New Zealand to Flen in Sweden.

Top Ten Grape Wine Producing Countries*	Tons/Thousands	Worldwide Production (%)
Italy	8620	13
France	6771	10
USA	6327	9.6
Spain	5926	9.0
China	5600	8.5
Turkey	3650	5.5
Argentina	2830	4.3
Iran	2800	4.3
Chile	2250	3.4
Australia	2026	3.0

* FAO, 2005

Wine production integrates a wide range of factors, including grape variety, elevation, topography, direction of slope, soil type, climatic seasonal conditions and local yeast. These factors together form what is known as terroir, loosely translated as 'a sense of place'.

SOIL

Although grapevines can tolerate most soil, good drainage and adequate depth (70-100 cm) is important. The grape quality is affected by soil type. The optimal soil is medium with a certain percentage of lime, limestone and gravel. Soil that is too light is not suitable because of the risk of nematodes. Heavy soil is not good either. Grapevines can be grown in soil where the active lime is up to 40% and there are rootstocks that can withstand salinity conditions. An ideal pH level for grapes is 6.5, but they grow well between 6.5-7.5 pH.



IRRIGATION OF WINE GRAPES

Most wine-producing vineyards are rain-fed. The response of grapevines to water is well known. Irrigation contributes to higher yields, wider leaf area, stronger vegetative growth and larger berries.

Opinions differ concerning the impact of watering on wine quality, especially on red wines. The common opinion is that striving for higher yields has an adverse effect on wine quality - Fig. A.

Another opinion is that there is a yield limit for a high-quality wine - Fig. B.

Still other experts claim that higher yields will have no effect whatsoever on wine quality - Fig. C.

Fig. A

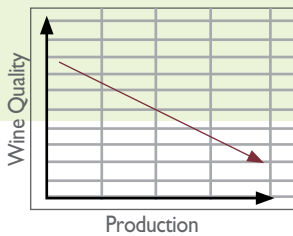


Fig. B

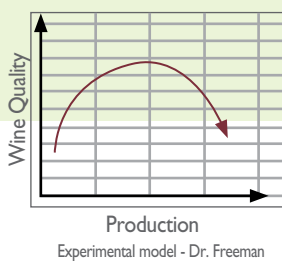
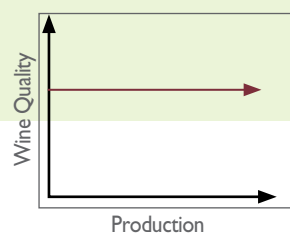


Fig. C



According to NaanDanJain professionals, irrigation is the best tool for maintaining wine quality and yield, even under deficit hydric conditions.

IRRIGATION MANAGEMENT

Accepting the concept that irrigating grapevines is no longer taboo has opened up the field for experimentation with the irrigation of wine grapes. Efficient new irrigation technologies have been developed and new irrigation management methods that do not have an adverse effect on wine quality are being tested. The combination of these new technologies and management methods has produced very good results.

CONTROLLED IRRIGATION (CI)

Water is applied according to the accepted seasonal Crop Coefficient (C_k) in the region.

REGULATED DEFICIT IRRIGATION (RDI)

During the phenological stage of veraison (the transition period from berry growth to the final stage of ripening), the plant is stressed by giving it less water than according to the $ET_o \times C_k$. The irrigation during this stage is strictly controlled. RDI uses less water; it produces a smaller canopy, which in turn has many advantages in obtaining a better quality wine.

SUPPLEMENTARY IRRIGATION (SI)

Vines need to be supplied with water only during short and critical phenological stages. Under supplementary irrigation conditions, water will be applied only during well-selected phenological stages—in limited amounts and for limited times. The optimal technology and the right amount of water are the key factors for the best results.

IRRIGATION MANAGEMENT FACTS

- Although RDI management methods use reduced amounts of the water compared to CI, no adverse affects on production or quality have been reported.
- Irrigation strategy should be adapted to terroir.
- Well-applied, well-managed deficit irrigation can simultaneously conserve water, enhance cold acclimation, control vigor and improve fruit quality.
- In general, for efficient deficit irrigation methods, the root zone should be carefully monitored with soil moisture sensors.

IRRIGATION PRACTICES AND QUANTITY

As a result of the growing market demand for higher quality and quantity, more and more emphasis is being placed on irrigation in order to achieve these goals. There are a number of irrigation methods for grapevines, including surface, sprinkler and drip irrigation systems. These irrigation techniques differ not only in cost, but mainly in water use efficiency. As irrigation water becomes scarcer worldwide, water-efficient drippers and micro-sprinklers are gaining ground in grapevine irrigation.

The amount of available water is only one of the main issues. Water quality (increased salinity) is a major problem that needs to be considered and controlled. The various irrigation techniques mentioned, each address the issue of salinity control in a different way.

NaanDanJain field experts are always available to help you choose the most suitable emitter for your specific irrigation needs. This is not only a matter of price. The choice requires consideration of all short- and long-term factors regarding you and your vineyard.

WATER MANAGEMENT

The water requirement of wine vineyards depends not only on climate. The targeted quantity of grape yield, variety and wine quality should all be taken into account when calculating the total amount of water to be applied. Specific water management should be conducted according to the location of the vineyard, the grape variety and the grower's specific experience.

There are three main stages to relate to:

First stage: from bud break to fruit set

Irrigation should facilitate growth.

Second stage: from the end of fruit set to veraison

Irrigation should be reduced in order to reduce growth.

Third stage: from veraison to ripening

Irrigation should be adjusted to minimize or prevent vegetative growth.

Irrigation Guidelines for Young Vineyards

Irrigation intervals: once every 7 days

Water quantity per irrigation:

- First year: 50–70 m³/ha
- Second year: 50–90 m³/ha
- Third year: 60–100 m³/ha

Irrigation Guidelines for Water quantity mm/day (Mediterranean climate) mature vineyards

Irrigation intervals: every 5–7 days, according to soil type

Harvest time	May	June	July	Aug	Sept	Oct	Total m ³ /ha
Harvest 15/8	0.8-0.9	1.6-2.0	2.6*	2.5*	0.8	0.7-0.6	2650
Harvest 15/9	0.8-0.9	1.6-2.0	2.6*	2.5*	2.5*-2.3	0.7-0.6	3120

*If expected yield is not heavy, it is possible to reduce irrigation before harvest by 50%.

NAANDANJAIN IRRIGATION SOLUTIONS FOR WINE GRAPES

DRIP SYSTEM PRODUCTS

There is a range of solutions according to the local conditions:

1. Integrated PC drippers: 2.1, 3.8 l/h, 16-23 mm
For undulating field conditions and modern intensive cultivation
2. Traditional labyrinth integral drippers: 1.6-4.0 l/h,
16, 20, 23 mm diameter
3. Button PC drippers: 4.0 l/h
For existing mature vineyards with wider spacing



NaanPC 20mm



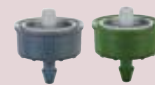
AmnonDrip

AmnonDrip PC
2,2, 3.8/lh

Basic Design

Single Lateral 1-2 Drippers per Vine

The driplines can be installed on the surface or hanging on the wire.



ClickTif HD PC/ CNL

On undulating ground it's advisable to add special rings to prevent drops from running along the dripper tubes.



Vine drip clip



SDI

Sub-Surface Drip Irrigation in vineyards is a relatively new approach. It can provides solutions to two main problems :

1. Free surface with no obstacles allows for machinery movement and other activity in the modern vineyard.
2. Positioning the water source at the root active area keeps soil surface dry and reduces soil compaction.

The Amnon Drip AS is specially-designed for these conditions.

The drip laterals can be close to the row or in the middle, between the rows.

When deciding which way to go, consider the row spacing, whether the vines are young or mature, and other local conditions.

FERTIGATION

Fertigation, the practice of applying fertilizers with the irrigation water, is part of the general concept of chemigation. In today's advanced agriculture, irrigation is synonymous with fertigation.

In grapevines, mineral nutrition is of great value for controlling vegetative growth and yield, as well as for the quality of the end product—the wine. Fertigation is the optimal method for accurate efficient fertilizers supply.

FERTILIZERS AND FERTIGATION

BEFORE PLANTING

Deep manuring at 30–80 ton/ha will provide minerals that are not very mobile in the soil (P_2O_5 , K_2O , MgO) and will correct high acidity that may induce Al or Cu toxicity. In fields that have only low pH (below 6), liming at 2 -10 ton/ha will bring the alkalinity up to desirable level.

Phosphorus and potassium are key elements in the development of young vines. Sub-optimal amounts of these nutrients in the soil may result in a delay in the start of the production stage. Nitrogen should be applied at this stage in small quantities, as it may be lost by leaching.

Soil analysis can assist you in selecting the right fertilizer program. When designing the program, you should also take into account the grape variety and wine quality target.

Fertigation is recommended for maximal efficiency and labor saving.

Annual Fertilizer Quantity (kg/ha) Guidelines for Mature Vineyards (2000 plant/ha)

*N	P_2O_5	K_2O
80-150	50	**100-200

*Stop nitrate application 8 weeks before harvest.

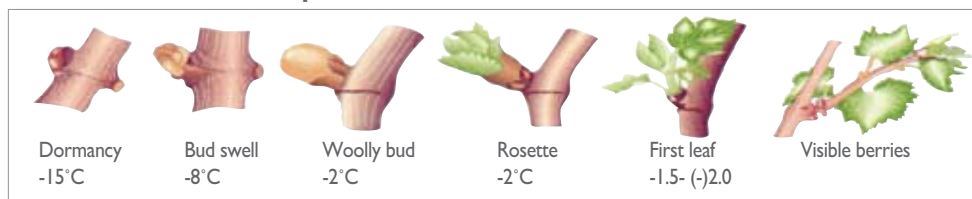
** Apply from start of irrigation till veraison.

A range of fertilizer injection methods is available through NaanDanJain.

SPECIAL USES OF IRRIGATION SYSTEMS

Worldwide climatic changes, primarily due to global warming, have already affected terroir in various parts of the globe. Modified terroir affects the distinguishing regional qualities of wine. A more drastic consequence of global climatic change, which can destroy entire yields, is early spring frost, which occurs mostly during flowering and fruit setting. Early spring frost is becoming more frequent, and is now affecting regions which were previously frost-free.

Grapevine Physiology Stage and Scale of Sensitivity to Frost Critical Threshold Temperatures Levels



There are various frost protection methods, but today the most accepted, efficient and environment-friendly method is timely irrigation.

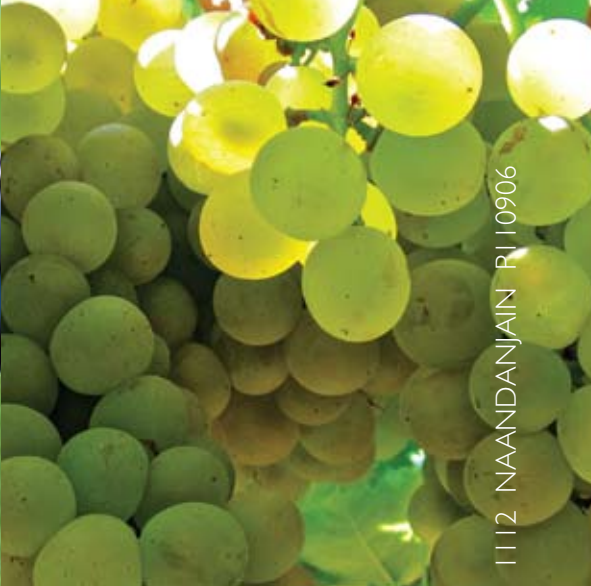
NaanDanJain has a wide variety of emitters especially designed for frost protection.

Flipper is uniquely designed for vineyard frost protection. It spreads water in a long, narrow strip to enable watering the vine rows only, without wetting in between the rows. Flipper is the only emitter that provides frost protection while using 15-20 m³/ha/hr of water, as opposed to the traditional 40 m³/ha/hr. This means that you can double the protected area using the same quantity of water. The water distribution pattern and droplet size are the key factors in ensuring highly efficient water use for frost protection.

Double System

Drip and frost control with flipper, using the same water pipe network.





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NaanDanJain is committed to finding the ideal solution for your wine grapes crop, tailored to your local climatic conditions, soil, water properties, and budget. Contact our office or your local dealer for further information.

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All information should be used only as a guideline.
For specific recommendations contact your local agronomist.



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