



Pickled & Pressed Summer 2007

Here, somewhat belatedly, is the Summer edition of Pickled & Pressed. Our minds, like many of yours, have been fully focused on lack of water, lack of fruit due to frost and now on how to keep our morale up and get things going again when it rains. The average rainfall for Strathbogie is around 900 mm per annum but over the past 12 months we have had less than 400 mm. We do not irrigate, our dams are dry and we have had to buy in water for our household use and also for our newly planted trees. Happily we have not been affected by bushfires and we are lucky in that we do not depend on our olives to live but that is not the case for some of us – our thoughts are with you and please let us know if you need some help.

You will remember that Rob Mitchell sent out a questionnaire at the end of last year asking for your views on what events we should put on for this year. Rob will be sending the questionnaire out again so that when the Committee meets on 9th February we can make some decisions. Responses from members so far have indicated a preference for Quality Assurance, Processing, Fertilisation and Pest Control – but if you have anything to add to this then please let Rob know before 9th February – please take time to respond to his questionnaire.

You will also see that David Carmichael has produced some Approved Supplier Programme Guidance notes so that GSOGA members can act now to ensure that they can continue to sell their products to the Food Company and also on the open market.

There are a couple of articles from the Jan – Feb 2007 edition of Olivegrower and Processor that I have précised as I felt they would be of interest to all members – one on water management and the other on bird management.

I have also included the article that Ian Dwyer wrote for us on water management as I felt you might appreciate reading it again in Pickled and Pressed.

Irene Laing

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President's Report



7 litres per week of our precious water to each of the trees we planted last May

I hope you all had a great Christmas and a good start to the New Year.

Like most members we have been suffering from the drought and have had very limited water; our established trees have been happy enough – though with very little fruit after the frost – but we also have about 100 new trees, planted last autumn. A few have died, some have been attacked by grasshoppers, others by desperate kangaroos and inquisitive echidnas. On the good side, we have found that just a little water - seven litres a week per tree - combined with careful mulching, has been enough to keep most of the new trees reasonably happy and live to grow another day.

Now we have had a little rain – and we are back to our intensive program designed to improve the ph and fertility of our grove.

We meet again as the GSOGA Committee on the 9th February – to plan the program for 2007. Among the things we will be discussing will be:

1. The relationship with the Food Company – in a situation where many of our members, but by no means all, are members of the Company; and the Food Company is trading in a world which is becoming tougher and more competitive
2. The evolution of the Victorian Olive Council – VOC. The recent VOC discussion has been focussed on the restructuring of the Australian Olive Association – AOA – and how the VOC will operate as an element of the AOA. My take on this process is that the main driving force comes from the wish to make the AOA credible to Federal Government – by demonstrating that the AOA is well enough organised and has enough members to be taken seriously.
3. GSOGA Seminars for 2007; we have two planned at present – one is likely to focus on Quality Assurance and Processing on 3rd March and one on 14th July probably on Fertilisation and Pest Control – we hope these will fit well to the feedback you have given to Rob when you responded to his questionnaire but let Rob know if you have any further thoughts.

Let's hope that 2007 is kinder and wetter to us as we move into autumn.

With best wishes for healthy trees.

Andrew Laing



Pruning demonstration and Christmas lunch at Iain & Allana Tower's grove on 18th November



About 40 members turned up to watch and listen to Ben Lazorotto as he showed us how to prune some of Iain's 3 year old, mature and feral trees. As promised the trees had real wood that needed to come off – and it did!!



There was lots of lively discussion – some of us wanted more off than Ben felt was necessary. Some of us cheered when branches we had identified as needing 'to go' were felled. It was great to have so many members with their different ideas of what needed to be done and what could be left coming together and being able to have a full 'work-out'.

Ben was concerned that pruning should be done in stages so that enough leaf area remained on the tree to help with photosynthesis. Easy does it was his approach. Identifying a few branches that needed to come off this year, taking them off and then identifying what needed to be done next time.

Iain showed us some pneumatic pruners – that provoked more discussion between members – whether a hand saw was just as easy, less risk of pruning one’s fingers and also that one could attack larger branches with a hand saw and there was no noise from a compressor.

Ian Dwyer was also there to answer queries members had about water management and irrigation.

We then all sat down on Iain and Allana’s verandah or under their gum trees to a magnificent meal of chicken, salads, desserts and Christmas cake that Allana produced.

Thank you Iain and Allana for your hospitality.



Water tips for dry times and bird problems – a précis of articles that appeared in the latest edition of Olive Grower & Processor

Critical water periods for olives: One is in the Spring during flower bud development, blooming, fruit set and the first stage of fruit growth when cell division takes place. The other critical time is coming up for us – the lead-up to harvest when oil accumulation and cell expansion is happening. Water stress at this point can lead to smaller fruit and less oil.

In young olive trees appropriate watering at the early stages of root development can determine the plant’s stability as a mature tree.

Reducing water loss

Use drip instead of spray methods, keep grass under the trees and mulch strategically. Learn to recognize when the soil and tree have had enough water to avoid waste and problems from water logging. Research has detected a tendency in some olive growers using fine-tuned irrigation such as drippers and micro-sprinklers to ‘make sure’ which led to over-watering. It is important to irrigate on the basis of need, soil moisture conditions are important indicators for this, not calendar dates.

Bird Problems

We have tried holographic tape – it worked for a while but was not good on dull days nor on days when there was no wind. We also tried Judy’s flying bird scaring kites that are regularly advertised but found rosellas took no notice and happily munched their way through our olives right under their noses. We also tried Bird Bane from Hybrid Industries but were not convinced it was effective for more than a few days. Ron Turner reckons he doesn’t have problems with birds eating his olives as he feeds them sunflower seeds. If you have some more thoughts then let me know because it looks as if the problem is not going to go away.

According to University of Adelaide ecologist David Paton who specialises in management of bird populations in fragmented landscapes - drought conditions may potentially reduce bird numbers due to less favourable breeding conditions but on the other hand, birds will search for ‘greener’ pastures and may apply more concentrated pressure to alternative food sources, such as olives.

David Paton’s theory is that due to the drought there will be very little new bud development between now and autumn on eucalypts, which will mean few eucalypt flowers and nectar. So the upshot of this is that potentially by autumn, honey-eaters, lorikeets, silvereyes and other native birds will switch to fruits such as our olives because there may not be sufficient floral sources around. Shooting birds doesn’t provide a lasting solution but putting the right habitat back for these birds will help address the underlying issues of why they are an increasing pest risk for olive growers. David Paton suggests that we should look at landscapes for our native birds and plant these.



Approved Supplier Program - Grower Guidance

Introduction:

Suppliers of Olive Products are being required to implement a Food Safety System, known as HACCP (Hazard Analysis and Critical Control Points), in order to control potential hazards to food safety.

The GOSGA Food Company along with other Olive Product Suppliers now have requirements for Growers to have an Approved Supplier Program, (ASP) in order to supply product, (unprocessed fruit, bulk oil, or pickled fruit) to those companies. The ASP is a quality management and assurance system for supplies of products to further processors.

These notes have been prepared by David Carmichael, an experienced quality and safety Auditor who is also a trained Olive Care Australia™ Auditor. As the respective companies go through their HACCP implementation, these requirements may change, but the following article is intended to provide you some general guidance as to how GSOGA Members need to act now to ensure a sale for your product in coming years.

Typical steps in Implementing an ASP by a Grower:

1. Establish contact with the companies that you may be supplying product and confirm their requirements for the current and if known the next few seasons. See notes below on GSOGA Food Co requirements.
2. Select a suitable ASP; see notes below on Olive Care, to meet those requirements.
3. Arrange to undertake a training course with that ASP provider.
4. Commence to implement the ASP within your grove.
 - A good first step is to undertake a self assessment of your grove. This may have been done in your training course and will give you a feel for the areas you need to focus your attention.
 - In the early stages of HCAPP implementation, processors and purchasers may only require such a self assessment. This was the case for the GSOGA Food Co for fruit from the 2006 harvest. See notes below on GSOGA Food Co requirements.
5. As soon as practical, establish contact with an approved Auditor. These should be available from the ASP Provider websites, or else contact them directly. Discuss the commercial arrangements that will apply, eg, location of auditor to your site(s) may involve travel and accommodation.
6. The Desk Top verification and validation reviews:

This is carried out off farm by an accredited Auditor. Most people will not pass the various reviews on the first submission, so it is recommended that you try and work ahead of the deadlines and use this process to help you refine your implementation.

- This is required by the GSOGA Food Co for fruit from the 2007 harvest. See notes below on GSOGA Food Co requirements.
 - The aim of the Desk Top Audit is to establish that you have planned to put in place the systems as required under your ASP.
 - This can be undertaken by posting records to the auditor, or the auditor visiting your grove. But as the name implies, this is done at a desk, the Auditor does not physically go into your grove.
 - The auditor has no need or right to retain any of your records or details, so if you have concerns for the confidentiality of your records or details then you would be advised to have an at farm Desk Top Audit, or arrange to visit with the Auditor at some other mutually suitable location for the Desk Top Audit.
 - It is not advisable to postpone this Audit until you are really confident that you will pass. Whilst there is not yet an established history from this industry, the experience with implementing quality management programs in other industries is that very few people will pass the audit on the first go. It makes good sense to use the audit to push you up to the level required. If you are doing more than required, the Auditor is not going to advise you to do less.
7. The On Farm verification and validation and compliance reviews:
 - This is required by the GSOGA Food Co for fruit from the 2008 harvest. See notes below on GSOGA Food Co requirements.
 - Here the Auditor physically visits your site(s) and is looking for “objective evidence” that what you have said you will be doing, you are doing. The Auditor is trained to approach the audit in an objective manner, he is not there to express opinions on what you are doing, so the motto is “if it is not directly observable or documented then it was not done”.

8. From each audit you will receive a written report with observations and verification of your status in regard to the audit.

Being Reviewed:

Listed below are some of the common concerns and questions of people being audited:

Q How long does an Audit take?

A A Desk Top Audit would take approximately 1 hour and an On Farm Audit 2-4 hours per site.

Q What does an Audit Cost?

A In the case of Olive Care, all Auditors are expected to charge a rate advised by Olive Care, which is currently \$88/hr incl GST. Fair expenses for travel and if required accommodation would be additional to this.

Q Can I dispute or argue with the Auditor?

A You are entitled to query the audit report, but 'dispute' or 'argue' is perhaps too strong an approach. Phrases such as, "my understanding of this from our training course was", or "I felt that by keeping these records, I was complying" etc, are likely to be a more productive approach.

Q Do I have to be present for an On Farm Audit?

A Apart from the safety issues of an Auditor wandering around a potentially dangerous area, it is essential that a guide is available who has knowledge of the site(s), can show records, and answer questions, etc. See notes below on being a Guide for an Audit.

Q Can an Auditor advise me on what I must do?

A An Auditor must remain unbiased and so can not be an advisor to you on how to implement your ASP. However, as noted above, you can use the audit process to help you refine your system. An Auditor however may make suggestions and observations on how certain issues are met by other growers. Pay careful attention to suggestions and observations made in the Audit.

Q Can the purchaser of my product request additional verification and validation and compliance reviews?

A The basis of an ASP is that as it is a quality assurance program, it generally is intended to provide the downstream processors of assurance that your product is up to the required quality, however, as noted in the GSOGA Food Co notes below, the purchaser of your product will reserve the right to request additional testing if they have concerns that your product will jeopardize their HACCP requirements.

Q Who can I go to if I am not happy that I have had a fair verification and validation and compliance review?

A If you are unhappy about your review, try to discuss the issue with your Auditor, but if still not happy then you should contact your ASP Provider. I know that Olive Care intends to conduct random checks on Audits to ensure consistency and fairness of their Auditors.

Q What if I don't know the answer to the question or the location of requested information.

A The review is not a test of the guide, it is a check of the system, so don't lie, you will invariably be found out, simply explain you don't know and offer to find someone that does, or to look up the information and provide later in the review.

The On-Farm Review:

1. Prior to the verification and validation and compliance review, the Auditor should advise the scope of the audit, so that you can plan to have guides available and access to the required records.
2. The review commences with an Opening Session. All guides should be present and introduced. It is often appropriate and quite acceptable to have multiple guides, so that the working of the grove is not unduly interrupted and also various members of the grove may well have the knowledge of various aspects.
3. The auditor should discuss the scope. The Auditor should understand that some operational issue could impact on the review and if there has been some last minute issue, eg a prospective guide

not reporting to work, this should be discussed, and arrangements made as to how that aspect of the review can be handled. However, Auditors didn't come down in the last shower and if an Auditor believes this is stalling or the review will be ineffective, he may request the whole review be aborted.

4. The review may well advance in a direction not obvious to the guide, as often the Auditor, through experience will follow not follow the logical sequence of a procedure, but rather will follow a thread such as when a particular item was brought and used and the results, in order to show the procedure is working. That is if the outcome is correct, the process is correct. But different Auditors will have different styles.
5. When asked questions, only answer the question, don't provide additional detail not requested. It is up to the Auditor to ask the questions he wants answered.
6. At the completion of the review, the Auditor will require some time to write up the results of the review.
7. After completing the Report, the Auditor will provide a closeout meeting at which the results of the review will be provided and explained and questions will be answered. At the completion of discussion of any issues, you will be required to sign the Report and provided with a copy.
8. As noted above, the Auditor is not entitled to take copies of any of your documentation; the Report as signed by you is the only record that is retained by the Auditor.

Being a Guide for an On-Farm Review:

1. Ensure that the guide is freely available to the Auditor, so it is not a good idea to book the review at a time of peak activity or when the guide is likely to be called away to other duties.
2. The guide does not need to be the owner, or the manager of the grove, but must have knowledge of the operation to be able to answer questions. Multiple guides are quite acceptable.
3. The guide should plan to stay with the Auditor, however the Auditor may wish from time to time to spend some time reviewing a particular record and indicate to the guide, that they are not needed for a period, in which case the guide should make sure the Auditor can make contact when required. Note also that you do have a duty of care for the Auditor whilst on your property.

Olive Care:

Olive Care is one of the available ASP's provided by Olive Care Australia™. It is not the only acceptable ASP, but has been developed specifically for olives and so does not include some of the requirements of, for instance, Freshcare. If you are intending to supply fresh fruit to the Melbourne Fruit Market you will require Freshcare. All the basic elements of Olive Care are the same as Freshcare, and as Freshcare, only Freshcare is a more extensive program. Like wise SQF 1000 is a more rigorous, requiring two On Farm Audits annually. The various organizations providing Organic Certification are also more rigorous, so any of these are more than satisfactory to meet the GSOGA Food Company requirements, providing you are implementing them in line with the GSOGA Food Co implementation schedule, outlined below.

General Guidance Notes on Implementing your ASP:

Some general guidance notes specifically related to Olive care are given below. These may not be exhaustive, but will help guide you through what at first glance can be a bit of a jungle. They will also assist with other ASP's.

Olive Care does not mandate written Standard Operating Procedures, (SOP's), but these will most likely be needed for some basic activities on your grove. It is strongly recommended that SOP's be prepared for harvesting, storage, transport, personnel hygiene, pest control and pre-harvest inspection, as these are the activities where you will most likely bring others into the grove, and it is easier to demonstrate that you comply with the requirements if you have written SOP's. Remember, that there is an underlying premise in reviewing quality systems, "if it was not documented, it was not done".

SOP's don't need to be complex, they can be basic A4 size instructions, or check lists, mounted at locations like washing facilities, near where you store fertilizers, fuel, chemicals etc, to prompt or remind people about the task. These SOP's can just pretty much be transcribed out of the relevant section of the Olive Care Australia™ Training Manual, with a bit of tailoring for your specific grove. It is also a good idea to have an induction check list for pickers and harvest assistants coming onto the

grove, as this is an area that is bringing a lot of people in contact with your fruit, who may not have a lot of food handling skills. It is quite cheap to have SOP's laminated for durability.

It is also a good idea to have a register of signatures, this helps in identification if you have seasonal workers signing various records.

There is a requirement to assess for persistent chemicals and heavy metals. These show up highest in the soil, then the trunk, then the leaves and ultimately in the olives in fairly rapidly descending amounts. So, the best test is done on the olives. Some initial indication can be established from testing your soil, (and water, if water is to come in contact with the olives). Obviously if the soil and water do not have persistent chemicals and heavy metals these contaminants are not going to be in the olives.

You also need to have the specifications of mulches and fertilizers as they are a potential source of persistent chemicals and heavy metals on to your grove.

See further notes below on soil sampling for persistent chemicals and heavy metals.

Outline of GSOGA Food Company Implementation Requirements

For the supply of fruit from the 2007 harvest, growers must supply the Company by the end of March 2007.

- Provide the Company a copy of a letter of conformance from an approved Auditor that their ASP, for the property(s) supplying the olives in the product to the Company, has passed a Desktop verification and validation review.
- If any tests on a growers 2006 product indicate concerns over the implementation of their ASP, an On Farm verification and validation may be requested, before product can be supplied to the Company from the 2007 harvest.
- An Affidavit that you have no GMP olives in your product.

For the supply of product from the 2008 and subsequent seasons, growers must supply the Company by March of the harvest year.

- A copy of an On Farm verification and validation of their ASP, undertaken by an approved Auditor during the previous twelve months.
- If a property supplying olives to The Company is being audited by an Organic Certification Body, a copy of that Body's On Farm verification and validation review will normally be acceptable, unless any tests on their prior season product indicate concerns over the implementation of their Approved Supplier Program.
- An Affidavit that you have no GMP olives in your product.

The Company have noted that if they have any concerns over the implementation of the Grower's ASP, it reserves the right to undertake compliance visits by its staff or a representative acting for the Company.

The costs of all Desk Top and On Farm verification and validation and compliance reviews, is the responsibility of the Grower.

Other Purchasers and Processors:

Growers should clarify the requirements of any other purchasers or processors they may wish to deal with. Whilst all purchasers and processors are being required to implement HCAPP, the flow down of ASP requirements to the grower may be different to those of the GSOGA Food Co.

Items to watch for the 2007 Harvest:

In 2007, you will to have passed a desk top verification and validation.

- Make sure your submission covers:
 - Product and Handling specifications. As issued by each purchaser of your olive products.)

- A Grove Plan. This doesn't have to be an elaborate plan prepared by a surveyor, however a surveyor prepared plan may be assistance for other grove planning, eg irrigation and fertilizer requirements.
- Grove Application Records.
- Stock Usage Records.
- Harvest and Transport Records.
- Training Records.
- Product Identification and Traceability.
- An Internal Review fully filled out and signed and dated from the current season.
- If relevant, you also need to supply:
 - A copy of SOP's.
 - Storage Monitoring Records.
 - A copy of Signature Register.
- Make sure you include your Affidavit that you have no GMP olives in your product.
- Send to Food Co before the end of March 2007.

Items to watch for the 2008 Harvest: verification and validation and compliance reviews. Again, apply for this early and use the submission process to help you refine your implementation. The process in most cases will cost less than \$500. Whilst a desk top verification and validation can be carried out by an approved auditor locate anywhere in Australia, an On farm verification and validation is best carried out by a Victorian based Auditor, to reduce travelling and where possible to arrange for several groves in the same area to be visited on the same day. If you have already implemented your ASP for over 12 months, than I would advise you move to an On Farm verification and validation as soon as you have passed the desk top review.

The names of approved Auditors can be obtained from the Training Organization who provided your ASP. There are currently about thirty trained Olive Care Auditors in Australia of which four are in Victoria.

- Include a copy of your On Farm verification and validation of their ASP, undertaken by an approved Auditor during the previous twelve months.
- Make sure you include your Affidavit that you have no GMP olives in your product.
- Send to Food Co before the end of March of the Harvest Year.

Some Notes on Heavy Metal and Persistent Chemicals Testing:

Soil testing that has been carried out for fertilizing will not normally show persistent chemicals and heavy metals, unless this is specifically requested. In regard to soil testing, the method of sampling can be done in accordance with the guidelines in the Victorian Department of Primary Industries Notes, AG0376, "How to sample soils used for flower, fruit grape and vegetable production". The sampling depth for heavy metals however is not provided in that publication. It is recommended for heavy metals that the sample be taken at a depth of least 100 mm and not more than 150 mm.

For soil testing for persistent chemicals reference should be made to the Victorian Department of Primary Industries Notes, AG0889, "Guidelines for sampling soils, fruits, vegetables and grains for chemical residue testing".

Concluding Comments:

Having read the above, as I noted in the steps above, don't panic! Firstly you are not the only one going through this process of adjustment and also the Auditors will not be looking for perfection on day one, but rather to see growers seriously implementing the program and continually improving. The ASP's are not very onerous or expensive and include features that will assist you to manage your grove in a sound way, ensure a better market for your product and manage the risk of being in legal hot water from providing product that may make someone seriously sick or even die.

Disclaimer:

Whilst all care has been taken in the preparation of these notes, these notes are intended to provide general guidance and should not be taken as a specific recommendation for a particular grower and as such, neither the Author, the Goulburn Strathbogie Olive Growers Association, the GSOGA Food Company or their employees or Office Bearers can be held responsible for any business decision taken in regard to the issues covered in the above guidance notes.



During the last 2 months I have been to several groves and the question I am constantly being asked is "I don't have enough water so what do I do?" – Ian Dwyer

During the past seven years I have been fortunate enough to see the results of over and under irrigation. The results of either practice has a huge effect not only on the growth and production of olive trees but also in the area of nutrient management and assessment.

Olive trees are evergreen and require water all year round. For all of us as growers the timing of the irrigation applications has a huge effect on the vegetative growth and the amount of fruit produced not only now, but for the following seasons. The amount of water to be applied is determined by many factors, soil type, soil profile, tree canopy size in relation to the amount of possible photosynthesis that may take place, nutrient uptake and availability to name a few.

The irrigation season is best started in late August with an evaluation of the irrigation systems performance. For correct application of water this practice is of great value. A simple method of doing this is presented below.

BEFORE YOU START.

Check for leaks Have a clean filter Flush the system to remove any debris.

Caution should be considered as the water coming out of the flush valves can contain bacteria that may make you sick. .ALWAYS wash your hand before smoking or eating.

Measure the output of several sprinklers/drippers per row throughout the grove by placing a bucket under each one and collecting the water for 1 minute. Once several samples have been collected, add the total amount of water and divide by the number tested. This will give you the average per minute. Then multiply by 60 minutes to get the amount per hour.

Eg. dripper 1=0.6 litres dripper 2=0.5 litres dripper 3=0.4 litres. $0.6+0.5+0.4=1.5$ litres

1.5 litres divided by 3=0.5 litres per minute (average)

0.5×60 minutes = 30 litres per hour per dripper. This is the average per hour.

There may be some variation across the grove and if so, ALWAYS use the lowest average output as the average output.

Once this has been carried out, you then have an accurate indication of your systems performance rather than relying on what the sprinkler/dripper has stamped on it. You may be surprised.

Most growers this season have little to no water at all. The olive tree is hardy and will tolerate dry conditions. However for high production water is essential.

WHAT DO I DO IF I DON'T HAVE ENOUGH??????

A point to consider; Olive trees are often water stressed long before showing visible signs.

In Drought conditions, the critical time of water application is between September and early December depending on your local climatic conditions. During this time the tree is producing new shoot growth

for the following season along with buds and flowers that bloom 2nd 3rd week in November. If the trees are water stressed at this time, the tree will favour leaf development over buds and flowers.

If you have plenty of water keep to your irrigation plan. If after flowering you don't have enough water keep going as long as possible. It is extremely important to remember to reduce the amount of fertilizer applied in relation to the reduction in irrigation.

WHAT WILL HAPPEN TO THE TREES???

The important thing to remember is, to achieve heavy crops we need to have new shoot growth. To achieve this we need to apply WATER WATER WATER.

I believe it is better to start the season early and keep the soil profile at field capacity for as long as possible. I have spoken to growers that (in times past) have held off watering until the warmer months, hoping to save water to pump up the fruit later in the season, only to watch the remaining water evaporate from their storage and then wonder why the following crop is small.

“USE IT DON'T LOOSE IT” - WILL THE FRUIT HANG ON???

In most cases the fruit will hang on. In many cases it will shrivel as some growers have observed , however with rain fall it will recover to a degree.

If you run out of water after flowering, foliar sprays will prevent serious tree decay.

The current drought index is at 100% and this is shaping up to be the driest season on record. The last driest season was in 1914.

This being the case the trees will not be going into the growing season with the soil at field capacity in the root zone unless soil moisture has been kept in check and irrigation applied when needed.

Another important aspect of irrigation is the soil type and structure within the root zone. Many soil types exist from sandy soils to very heavy clays.

Water can only enter the soil at a certain rate. And the longer water is applied the slower this rate becomes. This is know as the infiltration rate.

- With surface irrigation systems, the application at any one point must be long enough to allow enough water to enter the soil profile.

Irrigation depends on soil structure, texture, porosity and density, slope will also influence it. Infiltration rates usually decrease with soil depth so application rates may need adjustment if the water movement through the sub soils is slower than through the top soil.

AVERAGE INFILTRATION RATES FOR SOME SOILS.

TEXTURE GROUP	INFILTRATION RATE (mm/h)
SANDS	50-700
SANDY LOAMS	50-700
LOAM	3-300
CLAY LOAM	2.5-300
LIGHT CLAY	0.5-40
MEDIUM-HEAVY CLAY	0.1-40

Another consideration in the equation is the sub soil profile.

That is, what types of soils are below the surface and how deep is each horizon?.

An example of this is shown below.

GROUND LEVEL

A	horizon	0-30cm	Loam
B	horizon	30-45 cm	Sandy Loam
C	horizon	45-60 cm	Clay Loam
D	horizon	60-80 cm	Light Clay
E	horizon	80-150 cm	Heavy Clay

Pasture root zone.

Other indicators of soil types.

Indication of soil types by color.

- Dark colors.....indicates organic matter
- Light colors.....can indicate leaching of nutrients
- Rusty mottling and soil mottling.....indicates periodic water logging
- Red colors.....generally very good drainage
- Yellow colors.....indicates poor drainage
- Blue/Grey color.....very bad drainage

Note; These charts are used as general guide only.

The best way to determine the soil profile is to dig a soil pit to approximately 1.5 meters. It is then possible to assess the different soil horizons, soil types and the infiltration rate of each. It is then possible to adjust(in some cases upgrade) the irrigation system based on the data and the water requirements for trees at full maturity(around 500 liters per week per tree with no rainfall). It can also be used in conjunction with other data to create an accurate watering schedule as the trees mature.

WHEN TO WATER???

Olive trees will shut down on hot summer days and will come back on line once the temperature drops in the late afternoon early evening. There is no point in pouring loads of water on during times of excessive heat. Late afternoon/early evening is best, as the trees will use it more effectively. Early morning before the temperature gets to hot is also a good time.

Many growers are weekenders and are not equipped with automated systems and therefore a good long drink once a week may keep the soil moisture at an acceptable level until the next watering. This practice is site specific and should only be used in extreme cases. Ideally 3-4 waterings per week is the better option in conjunction with soil moisture monitoring.

IN CONCLUSION.

Many types of soil moisture monitoring devices are available today. They range from a simple auger to Gypsum block readers and tensiometers. Then the latest Enviro-Scan units and Gopher soil probes that send constant soil moisture readings to a main data base. The later being very expensive to buy and install.

For small to medium size groves the best piece of soil moisture monitoring equipment is a simple auger. They are not expensive and stainless steel versions are available (great for soil analysis samples). They can also be made from a length of thin walled steel tubing.

It is inserted into the ground and a soil core is extracted. Depth will vary depending on age of trees. In general terms the soil should be damp and cool to the touch with out being soaking wet. Moisture monitoring with an auger is best carried out 3-4 hours after the irrigation has been turned off. It is an easy way to evaluate what is going on in the subsoil in your grove and then adjustments to the watering schedule can be made.

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