

Harris Ranch Napa Valley - Organic Liquid Fish Manual

History and Purpose of Fish as Fertilizer for Crops

The use of fish as fertilizers dates back to at least the era of the Pyramids in Egypt where farmers and homesteaders utilized the carcass and liquids from fish harvested from the Nile to provide important fertility to their crops. More recently North American Indians in the 16th century were observed placing whole fish into the soil beneath crops of corn and squash. The early agriculturists of this planet understood the importance of keeping their crops fertile for rapid healthy growth. They learned that all types of fish provided excellent results when used as fertilizers for their crops. Farmers all over the world have and continue to use fish as important sources of fertilizer. Historically fish was used both whole as caught as well as the portions left over from processing the catch. Today the majority of fish fertilizers are produced from otherwise waste fish and processing byproducts of ocean and fresh water fish harvesting. Modern fish fertilizers effectively recycle fertility which otherwise would be wasted and disposed in landfills.

Benefits of fish fertilizers

Fish fertilizers are excellent sources of nutrition for soils and plants as fish contain the full spectrum of nutrients found in the planet's waters. Plants rapidly respond to and grow vigorously when regularly fertilized with fish fertilizers. Fish fertilizers contain significant quantities of protein Nitrogen (an important source of balanced Nitrogen) as well as a healthy balance of all 18 nutrients known to be significant for crop growth. All of these mineral nutrients are in protein chelated forms which are usable by the crops and additionally are resistant to loss from leaching. Fish also contains more than 60 other trace minerals which have positive effects on soil biology and crop health. Fish based proteins and other nutrients are rapidly assimilated by crops when applied via the foliage or through irrigation. The nutrients in fish are a quick and direct stimulant to the plants roots and leaves. Fish applications can rapidly improve crop fertility in virtually all situations. Additionally fish provides both immediate fertilizer response as well as longer lasting fertility affect for later in the crops growth. The balanced, moderate levels of nutrients in fish products provide a broad spectrum of fertility without the problems associated with excess application of any one nutrients. This is especially important in regards to nitrogen. Nitrogen, which is indispensable for plant growth due to its effect on chlorophyll, protein and amino acid production, is used in large amounts by most plants. While it is very important to have adequate nitrogen for the crop, it is common for crops and soils to be easily overwhelmed by an excess supply of nitrogen in relation to the other essential elements. When crops contain excess nitrogen, particularly in the nitrate nitrogen form, plants become much more susceptible to problems associated with insects, diseases and susceptibility to weather related stress problems. Fish fertilizers provide balanced, moderate amounts of nitrogen and all of the other essential nutrients, plus many more trace minerals not found in chemical fertilizers. This balance helps to provide full spectrum fertility without excess of nitrogen and reduces problems with pests and diseases while supply fertility boost, increased plant growth and vigor. A significant additional benefit of fish as a fertilizer is the dramatic stimulation to the soils beneficial microorganisms such as bacteria and

fungi which consume, digest and release the abundant nutrients in the fish when it is applied to the soil. Fish products can make a significant contribution to the overall fertility of the soil and crop while at the same time stimulating the biological activity in the soil, thus improving the quality of the soil for many years to come. The increase in soil biology activity after fish has been applied is very significant and can be dramatic on weak or lower fertility soils which are in need of microbial stimulation. Even on the most fertile of soil applications of fish fertilizers have shown positive crop growth response as well as microbial population increases. Laboratory analysis of soil micro life has show major increases in populations of beneficial aerobic bacteria, fungi (*mycorrhizal fungi*), and Actinomycetes.

General Use and Storage information

Liquid fish is easy to use under most conditions but precautions must be utilized to avoid potential problems inherent with the use of any liquid fish products. The concentrated liquid fish as manufactured is transferred to clean plastic storage containers and held for delivery to the user or other distribution point. All liquid fish products have the tendency to separate from the homogenous liquid they were when manufactured. This separation causes the lightest fraction to float to the surface. It is important to regularly remix the liquid fish while it is in storage and again prior to dilution or application. For small containers vigorous shaking for 3-5 minutes every week and prior to each use is advised. For larger storage tanks it is necessary to reticulate the fish 2-3 times per week to keep it in adequate suspension and to minimize problems with anaerobic fermentation. A low to mid volume electric or gas pump must be used to circulate the liquid from the bottom to the top of the tank. For smaller size containers such as 5, 30 or 50 gallons, the container should be inverted regularly to maintain adequate mixing of the product. This is especially important before removing fish for application. For small containers vigorous shaking for 3-5 minutes every week and prior to each use is advised. For most applications the fish needs to be diluted with additional water. Thorough mixing with the delivery water whether fertigation or foliar feeding is important. For **fertigation** it is common to pump the fish into the irrigation system, first pumping the fish through a screen filter finer than the orifice size of the irrigation system to eliminate any potential problems associated with clogging. This is very important when injecting fish into drip, drip tape or low volume irrigation systems. Fertigation through regular impact sprinklers, flood or furrow irrigation generally does not require screening prior to injection. Application using a watering wand, watering can or similar device generally requires no filtering. If using a **sand media filter** it is important to inject the fish into the water after the sand filter but before a screen or disc filter. Injection into water systems can be accomplished with low volume pumps, specialty fertilizer injectors such as Dosmatic, or venture injectors such as Mazzei. For foliar feeding it is common to dilute the fish with 30 - 100 times the fish application rate with regular irrigation quality water when mixed into the sprayer to be used. A properly maintained and sized screen or disc filter is essential for use with a sprayer for foliar feeding. Thorough agitation and mixing should be accomplished in the spray rig prior to application. Do not leave diluted fish mixed with water or other ingredients in application equipment for more than a few hours after use. Settling and/or clogging problems greatly increase when diluted material is left in the application equipment. Rinse application equipment thoroughly with clear water. It is important to flush the fish from all irrigation lines after injection. The excellent biological stimulating

properties of liquid fish also can encourage the growth of algae and slime which can affect irrigation equipment, especially drip, drip tape and low volume sprinklers. Run clear irrigation water into the system for as long as necessary to flush the fish fully from all parts of the system. An excellent technique to flush any fish remaining in the lines is to add an irrigation cleanser product during the clean waterflush cycle. Products such as Therm X70, a Yucca plant derived organic cleanser, Yeoman Infuse-O or Hydrogen Peroxide for organic operations or Drip-a-Tron irrigation cleanser is commonly used. The Therm X70 is applied at 2 ounces per acre during the flush cycle. For **direct soil application** such as side dressing, shaking or broadcast application to the soil it is not necessary to dilute the liquid fish, depending on the choice of equipment used for application. A reasonable level of ocean odor is normal with all fish products. This odor will dissipate within minutes of application. Do not apply foliar applications during windy periods if the area is upwind from sensitive sites such as schools and nearby neighbors. If an abnormal or foul odor emits from the storage container or tank, or during an application, there may be a problem with the fish. If you think the odor is objectionable, please call your supplier for further advice and resolution.

Combining Liquid Fish with other fertilizers, fungicides and pesticides

Liquid fish can and is combined with most other fertilizers, soil amendments, fungicides and pesticides via irrigation, foliar and direct soil application with excellent results. Fish is an excellent choice for combining with other materials for foliar feeding and pesticide application. The nutrients in the fish assist the uptake of the other fertilizers when applied to the plants foliage. However, due to the wide choice of such tank mixtures, and the variability associated with the water used, it is impossible to pretest all potential combinations. We highly recommend the applicator test apply the proposed mixture on a small area prior to full scale application to determine compatibility under all circumstances. Liquid fish, when applied at normal application rates, causes no problems with phytotoxicity or other soil or plant problems. An exception would be the use of fish with high calcium products such as lime or gypsum. Although not a common problem, it is possible for a reaction to occur between the phosphorus in the liquid fish and the calcium which would cause the development of sediment or precipitates when used in some types of irrigation water sources To check for compatibility with gypsum, lime, or other high calcium fertilizers or amendments a simple jar test is recommended. Combine the desired ratio of fish and calcium source with the water to be used in a jar. Agitate thoroughly and allow to stand at least 12 - 24 hours. Check the jar for particulate or sediments which may have formed. If little or no particulate have formed it is safe to combine the materials in this water. If curds or scum or other particulate form it is wise to apply the materials via separate applications. In all cases it is important to thoroughly flush the application system with clean water after use of the liquid fish.

Methods of Application

Liquid fish is applied in a wide variety of methods suited to any cropping system. It is extremely versatile in this regard. Liquid fish is commonly applied via irrigation water (fertigation) through sprinklers, micro sprinklers, foggers, spitters, drip emitters, drip tape, furrow, flood systems, and overhead sprayers (such as used in greenhouse fertigation). Liquid fish performs exceptionally well when foliar applied via a sprayer application. Foliar feeding is an excellent method for

providing a quick source of fertility directly to the growing crop. Liquid fish is readily absorbed and rapidly utilized by plants when foliar applied. It is commonly mixed with other foliar grade fertilizers to improve the uptake of the other materials and to provide a complete balanced source of organic fertility. Liquid fish is foliar applied with materials such as Liquid Fish Fertilizer Kelp Humate, kelp extracts, soluble phosphorus and potassium fertilizers and many trace mineral amendments. Liquid fish is also applied with direct soil application using liquid side and top dress equipment, liquid fertilizer shanks, ground directed sprayers or other application methods.

Use of Liquid Fish in Vineyards

Liquid fish is most commonly applied to these crops through the irrigation water. For many organic vineyards liquid fish is the main source of nitrogen for the rapidly growing crop. For best success with fertigation application should be done on a continuous basis. Most growers apply fish with every irrigation or every other irrigation from the early leaf development until veraison. Applications of fish fertigation when the vineyard is in the grand growth phase produce very good results. Fish is also excellent if the vineyards impacted by problems with phylloxera, nematodes or other factors which affect root development and the vines ability to forage for nutrients. The rates to use are determined by the size and age of the plants and the use or non use of other fertilizers on the crop being grown. Fish works best as a supplement to a complete fertility program which includes the use of composts, legume cover crops, and slow release organic fertilizers. In all cases regular applications of liquid fish applied at the lower use rates noted below work much better than sporadic applications at higher rates. Common application rates for crops grown using frequent fertigation range from 25 - 50 gallons per acre per application of irrigation water. In vineyards where irrigation is done infrequently (2 - 4 times per season) higher application rates may be beneficial, up to 100 gallons per acre per application. Post harvest irrigations is an excellent time to add fish to stimulate root development. Rates to use are 25 - 100 gallons per acre depending on the age and vigor of the vines. Plants under severe nitrogen stress may require even higher amounts. Liquid fish will make a positive plant response within 48 hours under most conditions. Liquid fish may be easily applied with sprinkler, flood or furrow irrigation. Please read the "General Use and Storage Information" section above for precautions when using liquid fish in drip or low volume irrigation systems.

Foliar Feeding

Liquid fish can be combined with most types of foliar feeds, fungicides and pesticides. Fish is an excellent choice for combining with other materials for foliar feeding and pesticide application. The nutrients in the fish assist the uptake of the other fertilizers when applied to the plants foliage. However, due to the wide choice of such tank mixtures, and the variability associated with the water used, it is impossible to pre test all potential combinations. We highly recommend the applicator test apply the proposed mixture on a small area prior to full scale application to determine compatibility under all circumstances. Liquid fish, when applied at normal application rates, causes no problems with phytotoxicity or other soil or plant problems. Fish foliar should be discontinued within 2 weeks of harvest, as there is the slight possibility of cosmetic staining of the fruit from applications on ripening crops. Application rates for foliar use of liquid fish should be determined by plant growth stage, health and fertility of crop and the need for

additional crop stimulation. To fine tune a foliar feeding program we highly recommend the use of plant tissue analysis in combination with the use of refract meters, nitrate meters and crop observation. Foliar feeding works best when utilized on a regular basis. Plants will rapidly consume a foliar application of liquid fish. Vineyards respond to 2 - 4 foliar applications of fish, and other foliar applied nutrients. Common timing for foliar is 2 applications, spaced 10 - 14 days apart within a month prior to bloom and again within one month of bloom. On weak or young vines further applications may prove beneficial. Typical foliar application rates for vineyards range from 1 to 5 gallons per acre, diluted in the appropriate amount of water for through coverage (commonly 30 - 100 gallons per acre). For smaller applications use 1 to 5 Tablespoons (up to 3 ounces) per gallon of water applied. The higher application rates are used on larger plants, crops in rapid vegetative growth or for crops in fertility stress.

Types of fish fertilizers

Fish fertilizers are manufactured by a number of different methods based on intended use and type of technology utilized. Some of the common fish fertilizers manufactured include fish meal, fish emulsion, dried fish soluble and enzymatically digested fish liquids. It is interesting to note that many growers have experienced different effects and reactions by plants often caused by the type of fish product used. Fish meal, for example, is normally applied to the soil around or under the crop and is used as a moderate to slow release fertilizer. The fish meal has been heated and the oils have been removed to make the dry meal is generally much lower than other types of cold temperature processed fish fertilizers. Microorganisms and plants do not rapidly utilize this type of fish, although it still provides a beneficial effect but takes longer to do so. Other types of fish fertilizers utilize low temperature enzyme digesting technology which does not denature the fish, thus making the end product a much more microbial beneficial fertilizer with nearly instant fertility for the crops where it is applied.

Advantages of enzyme digested fish fertilizers

Enzyme digestion of fish byproducts maintains the complete protein balance and mineral activity of the ocean fish. This process does not denature the proteins, vitamins, minerals and fatty acids (oil/lipids). The net effect is that Liquid Fish is very biologically compatible and stimulates soil and foliage biological activity. Liquid fish is rapidly assimilated by soil microbes as well as plant foliage. Foliar applications stimulate plant activity within 24 - 48 hours. Soil applications take only slightly longer. Soil biological activity is greatly enhanced by the application of liquid fish with water.

The preceding information is provided as a general information service and is not intended to act as a recommendation for this process or any other pest control technique. Use of these suggestions are strictly at the risk of the user. No warranties or guarantees are expressed or implied, and Harris Ranch Napa Valley accepts no responsibilities for any errors or omissions.