AUSTRALIAN NUFFIELD FARMING
SCHOLARS ASSOCIATION

1996 SCHOLARSHIP REPORT

By

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Topic: Sustainable agrochemical use in viticulture

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Acknowledgments

Australia

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The scholarship gave me the opportunity to broaden my horizons and see Viticulture on the World Stage. The credentials of Nuffield certainly opened doors where previously they may not have been, and opened my eyes to the scope and scale of agriculture around the globe. Being a "city" kid and working in a smaller area of agriculture it is very easy to be oblivious to the rest of the world.

There are many people who helped me get to Melbourne to the final round of interviews and I would specifically like to thank my referees, Mr Peter Dry and Mr Alex Sas in addition to Andrew Pike, David Shannon and my husband Jerome and the rest of the family.

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Objectives

The objective of my study tour was to investigate Sustainable Viticulture, specifically agrochemical use. In doing so I had four areas of focus:

- Avoiding and managing resistance to fungicides, insecticides and herbicides,
- Use of soft agrochemicals,
- Beneficial and predatory insects in vineyards, and
- Organic and IPM systems.

As many previous scholars have indicated, you often find other areas of interest once you start poking around on your travels. Two areas which came to my attention and tied in with my overall objective, were branding and genetic modification. Both of these are topics of debate and concern in agriculture and the marketplace.

The theme of my report focuses on "Lower/Modified Input Farming Systems" in viticulture. Specifically the formal systems i.e. Organic and Integrated Production and the less formal IPM. My report, gives the background to and current state of play for these systems.

Organic Farming - The Swiss Experience

FiBL, the Research Centre for Organic Agriculture is a private body which has set itself the task of serving the organic farming sector of Switzerland. This encompasses research, advice and training, and inspection. The centre is funded by the federal government, the cantons (states), private institutions and from funds generated through advisory and inspection services. It was traditionally funded by growers.

Agricultural production in Switzerland is dominated by dairying and arable crops e.g. cereals, maize, potatoes, sugar beet and canola, with viticulture and horticulture (apricots, peaches, etc..) also being present. As in the EU, agriculture in Switzerland is subsidised. The purpose of subsidies is similar to that in some areas of Britain, to maintain the rural fabric of Switzerland. Farming in these regions is generally not economic and to keep a rural population in place subsidisation is required.

There is a subsidy which is specific to `ecological ` production. Farms which are practicing either organic or integrated production are eligible for this subsidy.

Organic farming in Switzerland has been traditionally producer driven and it would be fair to say that Switzerland set the pace in both organic and integrated production in Europe. Bio-dynamic farming has been practiced since the `30`s and the first proprietary organic label - DEMETER - was established in 1954. There are now three branded organic regimes in Switzerland; Demeter, Biosuisse and Migros Bio Production.

Consumer Acceptance, Branding and Shelf Life.

When asking the question of why do consumers buy organic produce over conventional produce, the response was quite broad. There was the obvious answer that organic food is perceived to be more healthy and residue free. There is also confidence in the labeling of organic produce that it is actually organic.

But there was the comment that organic produce is often better quality and where the food is sound it often has a long shelf life.

In discussing shelf life it should be pointed out that within Europe, consumers tend to shop on a local basis at many small stores, either daily or every few days. Shopping at supermarkets once a week is not the norm.

"In 1980, the basic standards of the federation of Swiss organic farming organisations ("Vereinigung schweizerischer biologischer Lanbau-Organisationen",VSBLO) entered into force. One after the other , all the organic organisations came under the VSBLO umbrella." FiBL, 1996.

VSBLO standards have been the quasi-norm in Switzerland since the eighties, and these will be superseded or formalised by the introduction of the EU Regulation 2092/91 pertaining to organic agriculture. My understanding is that the Swiss standards exceed those being set by the EU.

Organic Viticulture in Switzerland

There is approximately 140 ha of vineyard under organic management in Switzerland, equating to 45 growers. This is a vast increase on one hectare, ten years ago.

The main difference between organic and integrated production systems in Switzerland is the use of synthetic chemicals, particularly fungicides.

Disease Management

Disease management under an organic regime is obviously preventative.

This is achieved by the use of products which provide a protective environment e.g. Copper, or a hostile environment e.g. acidified clay.

Biological substances are also being increasingly used e.g. fennel oil and AQ10 (see Disease Management section of this report).

Nutrient management i.e. avoiding excess situations, is also a significant part of the practice. Cultural practices such as canopy management and leaf plucking are also common place and a vital part of the system.

Programmes

Downy Mildew management is through the use of copper and an acidified clay product. There are two acidified clay products - Myco-San and Ulmasud which create a hostile acid environment which is not favoured by the disease.

The products are two different mixtures, and Myco-San is apparently superior with Ulmasud having a decline in efficacy under pressure.

There is a government restriction of 4kg/ha of copper per season and under the organic regime this is 3 kg/ha. Therefore the clay and copper products are used in a programme to provide season long control.

A short spray interval of 6-7 days is required for Downy control, particularly when there is lots of new growth or greater than 20mm of rain.

The clay products can not be mixed with copper as there is a herbicidal/phytotoxic effect, this is more severe in hot conditions; a point worth noting if this is to be tried in Australia. The use of the clay and copper also leads to a hardening of the berry skins which is also advantageous in disease control.

Phosphorous Acid is not used on the basis that it is not a suitable substance for use in the organic regime. The basis for this is that it is not a naturally occurring molecule, it is synthesised and that there are residue problems with phosphates(PO_3).

Powdery Mildew is controlled with a variety of substances - sulphur, an oil of fennel product and a soybean lecithin product. AQ10 a biological bacterial product from the USA is also being investigated. FiBL believe it to be efficient but are concerned that the control agents for Downy Mildew may kill the AQ10 bacteria.

Sulphur is used intensively during the season, with dusting sulphur being used by many producers, although wettable sulphur is preferred. Sulphur is used at rates much lower than in Australia as it is harmful to many beneficial insects. The fennel oil product is used from August onwards as there are winemaking implications with sulphur use late in the season. The fennel oil product (trade name Pandora) is fungastatic and apparently quite effective. Not much information was available about the soy bean lecithin product, trade name Bio-Blatt.

Canola oil products have been tried in the past and did not provide adequate efficacy and are therefore not used.

Botrytis and other rots are controlled with the products used for Powdery and Downy Mildew control. The comment was made that organic farmers have less problems with Botrytis than conventional farmers using botryticides.

Pest Control

Pest problems are not significant, with good predator and auxiliary populations. Approximately half the growers apply treatments for grape berry moth (*Lobesia botrana*), while the others do nothing. The treatments applied are Bt, as most vineyards do not have the critical mass required for pheromones to be effective.

Soil and Floor Management and Nutrition

Under the organic regime the vineyard floor should have green cover at all times. The purpose is to maintain soil structure and biodiversity of plant species. Monocultures, such as single species cover crops are not encouraged, although the adoption of cover crops over clean midrows is being adopted by many conventional growers in northern Switzerland.

In seasons where water stress occurs, growers are permitted to cultivate every alternate row. In the south western areas of Switzerland where the rainfall is lower and water stress conditions occur more frequently, herbicide is used to a large degree. These growers technically practise integrated production and the wines are marketed as such, rather than as organic.

Nutrition

With a permanent green cover and restricted nutrient inputs there is obviously a balance which needs to be achieved. It can take 5-10 years for this balance to be achieved, and the first 1 - 5 years are generally difficult. The difficult period can be longer in cool, humid environments.

Under the organic regime the following inputs are permitted : compost, manure, blood and bone, by products of oil production e.g. canola husks, Guano etc..

Permitted Practices and Substances

There was the situation a few years ago where it was difficult for organic producers to determine what products were both permitted and available for use. FiBL compiled a master list at the cost of 250 000 Sfr and this is updated on an annual basis at a cost of 100 000 Sfr. (The exchange rate is approx. 1:1.) There is no charge to the manufacturers for inclusion on the list.

When compiling the list, recipes for the different products were obtained, which did result in some products not being permitted for use in organic production.

The list is designed to serve all organic groups.

When a new product or mode of action e.g. antagonists become available a scientific report is prepared. This is then reviewed and discussed by a committee - which comprises of both scientists and growers. The decision to accept or reject the product is made not solely on a scientific basis. If at the end of the day the group do not feel comfortable including the product, it will be rejected. So 'gut feel' plays a role in the process.

There is also a half way point, so to speak, where a product may be accepted with modification. For example, commercially available Pyrethrin for insect control is usually sold as a 1:4 mix with a synergist piperonylbutoxid. This is not acceptable under the organic regime, however a 1:1 mix is permitted. Note: in Australia only unmixed pyrethrin is permitted.

Care is taken not to set precedents which may be difficult to manage later.

FiBL considers itself a support organisation in partnership with the growers. It is not in a policy or dictating role.

Genetically Modified Organisms

Genetically modified organisms or by products of are and will not be permitted in the organic regime. This encompasses plants, animals, treatments etc.. For example any 'biological' treatments resulting from genetic modification would not be acceptable.

Organic Farming - Californian Experience

Background

Organic Agriculture in California is similar to Australia as there is a multitude of groups offering organic programmes, each with different philosophies, guideline and credibility. The State of California introduced the Californian Organic Foods Act in 1990, which both protects the word organic and sets enforcement provisions for it's use.

The Californian Certified Organic Farmers (CCOF) is the largest trade and certification group in California, representing organic farmers, processors and retailers.

CCOF 's definition of **Organic Agriculture is:**

"an ecological production management system that promotes and enhances biodiversity, biological cycles and soil biological activity. It is based on minimal use of off-farm inputs and management practices that restore, maintain and enhance ecological harmony. The principle guidelines for organic production are to use materials and practices that enhance the ecological balance of natural systems and that integrate the parts of the farming system into an ecological whole. Organic agricultural practices cannot ensure that products are completely free of residues; however, methods are used to minimise pollution from the air, soil and water. Organic food handlers, processors and retailers adhere to standards that maintain the integrity of organic agriculture's products. The primary goal of organic agriculture is to optimise the health and productivity of interdependant communities of soil life, plants animals and people." (CCOF,1997)

CCOF is affiliated with and accredited by the International Federation of Organic Agricultural Movements (IFOAM).

The CCOF perspective is more liberal than that of the organic-biodynamic regime in Europe and appears to have a more solid scientific basis.

The CCOF 'rules' permit the use of many substances which are not permitted by FiBL, under the Swiss Regulations.

"Fetzer" a Commercial Organic Vineyard

Fetzer Vineyards at Hopland, in Mendocino County, California have made a large commitment to organic viticulture, with 340 acres (140 ha) of vines managed under a certified organic regime, CCOF.

Fetzer have made a commitment to achieving the following under the organic regime :

- improved soil health and fertility to improved soil tilth, water retention, nutrient availability and ultimately a stronger vine;
- minimise impact on surrounding environment to foster a diverse community of plants, insects and animals;
- reduce use of fuels and off farm inputs and
- reduce tractor trips through the vineyard (Piper,1997)

The Fetzer operation appears to be very successful with the company launching a special range of organic wine under the "Bonterra" label. This range includes Sangiovese, Zinfandel, Syrah and whites. These wines are sold exclusively through cellar door and some premium outlets in the $20 + range. Not all the fruit is from Fetzer's own vineyards, with additional organic fruit being sourced from growers throughout California. This approach assists in spreading the risk of crop failure or crop loss at any one site due to extreme disease or pest pressure or loss of organic status e.g. from chemical tresspass.

The Hopland location at the southern end of Mendocino County is well suited to organic viticulture with low disease pressure, which is primarily due to little summer rainfall. Downy Mildew is not present (or does not typically occur) in California, which is obviously advantageous in this situation.

Disease Management

Powdery Mildew and Botrytis are the two disease problems which need to be managed on a preventative basis. The programme employed for Powdery control, is the traditional Californian Programme, minus DMI's, with wettable sulphur at 7.5cm shoots, followed at 7 - 10 day intervals with dusting sulphur.

Botrytis management is through leaf plucking i.e. increased exposure and airflow. It is not a problem every year, again the lack of rain post flowering helps in this case. If rain occurs, a copper spray is applied within a few days.

In most years no sprays are applied after veraison.

Floor Management

Cover crops have been established in the midrow with predominately native species of clovers and ryes. These are left to grow, being mown down at budburst to reduce the frost risk and then left to regrow and flower, with more mowings post flowering. The advantage of the native species is that they out compete many of the weeds as well as having a high survival rate. Species used include Bursean clover, faba beans, oats, winter peas, bell beans and radish. Radish is attractive to lacewings.

Weeds are a part of the system and these are primarily managed through undervine cultivation and discing in spring. Undervine cultivation is achieved using either a twin mounted Clemmens, to enable two rows to be done at once, minimising tractor passes and labour, or with a Kimco. The Kimco unit is a front/side mounted unit, which has both an undervine cultivating and a slashing attachment. It is quite slow at 10 acres/day.

The soil management program includes ripping the midrows every three years to break up any pans.

Composting

Composting is a big part of Fetzer's nutritional programme. All the marc from the winery is composted for a period of 15 months before being applied at a rate of 1t/acre on a three year cycle around the vineyard. Before the compost is spread on the main vineyard area, any new plantings or problem areas are attended to first.

Guano is also used to provide phosphorus.

Insect Pest Management

The main insect pests are leafhoppers and mites. Mites are managed through the use of the stalk waste. The stalk waste left after vintage is left in a pile for about 6-8 months and in the later part of the next season it is spread on the roadways around the vineyard to assist in dust minimisation. Mite problems are generally worse on the ends of rows or in areas where it is dusty.

It is unknown if the dust causes the mites to do more damage or the dust puts the vine into some sort of stress, making it more susceptible to damage. The comment was made by all vineyard managers I met that both mite and leaf hopper damage is worse where vines are under some sort of stress. It is therefore extremely important in an organic situation to keep the vines in a very healthy, unstressed state, as it is more difficult to reverse a stress situation and manage the secondary problems that follow, than in a conventional situation.

Leafhoppers are not a significant problem for Fetzer, and this may be due to a combination of factors such as the presence of beneficials, resulting from covercrop selection and the presence of riparian areas with diverse plant species (effectively hosts), the nil use of broad spectrum insecticides, the site and other cultural factors.

Cultural practices which may assist in minimising leafhopper populations include : leaf plucking at flowering to reduce nymph numbers, keeping weeds under control through mowing and maintenance of *Anagras* (a parasitic wasp) populations.

Why does it work?

After visiting this operation I came away with two main thoughts about why the Organic approach works for Fetzer.

- Site. Fetzer have a site which makes this possible. With little or no rainfall post flowering, the disease risk is lower and also much easier to manage. The absence of Downy Mildew is a huge advantage. The site is also to some degree isolated, with only one other vineyard nearby and a pear orchard adjacent to one vineyard.

- Commitment. There is a huge commitment to making the organic approach work. Time, money and relationships have been invested and developed to make it work, and it would appear that the size of operation (medium) probably help in this situation. For example Fetzer have made a commitment to buying and trying many different pieces of soil/weed management equipment. They have persevered with them and have developed relationships with machinery manaufacturers to continually improve the equipment. They are prepared to accept higher costs e.g. in capital cost in purchasing the necessary machinery, having a greater time input e.g. 10 acres/day is not particularly fast (or efficient) , and a cost in regular replacement of parts and equipment due to the number of machinery hours the equipment is doing.

- Fetzer also do a significant amount of collaborative work with both UC Davis and Fresno State, looking at cover crops and other problems.

- There is a team approach in working with the winery to utilise their waste - marc and stalks, as well as an active interest from the winemakers and marketing people. On the day I visited, both the winemaker and marketing manager, stopped the manager to discuss a 'special' fruit parcel and talk about the grower's vineyard. Everyone in the operation is committed to the project. The bottom line is they have persevered, asked questions and implemented the recommendations (at a higher cost) to make it work. They have kept going when the going has been tough.

Integrated Production - What is it ?

The IOBC is an Organisation which is based in Europe which promotes and regulates Integrated Production Systems in Agriculture.

The IOBC Short Definition of Integrated Production is:

"Integrated Production (Integrated Farming) is a farming system that produces high quality food and other products by using natural resources and regulating mechanisms to replace polluting inputs and to secure sustainable farming.

Emphasis is placed on a holistic systems approach involving the entire farm as the basis unit on the central role of agro-ecosystems, on balanced nutrient cycles, and on the welfare of all species in animal husbandry. The preservation and improvement of soil fertility and of a diversified environment are essential components.

Biological, technical and chemical methods are balanced carefully taking into account the protection of the environment, profitability and social requirements." (IOBC, 1993)

The first Principle, that IP is not a mere combination of IPM with other elements, sets the tone that Integrated Production is a holistic approach, not just another system.

Within the IOBC there is an expert working party dedicated to Viticulture, which has developed technical guidelines for Integrated Production. These guidelines are global guidelines in the sense that they are the approach which the IOBC wishes to take, but may need specific regional guidelines to complement them. This is due to the regional climatic and topographic variation which occurs within Europe.

Integrated production - The Swiss Experience

The Wadenswil Model is relatively widely known as a 'regulated' integrated production system in viticulture. (Wadenswil is the Swiss Federal Research Centre for Horticulture and Viticulture; Contact : Pierre Basler). The model was set up in the mid eighties, with 40 vineyards involved in trialing the system. It has progressed with ongoing refinements and continues to do so, as the system is a dynamic one. It is reviewed on a regular basis as growers overcome the challenges and continue to innovate. In 1989 the growers involved in the trial set up an association and the project has progressed from a trial to being a certified

system. Each year the association meets, discusses the experience of the last season and reviews the protocols. Any changes to the protocols are carried out on democratic basis i.e. the changes are not dictated by the personnel at Wadenswil, it is grower driven.

The system is different to many of the organic or integrated production system we are familiar with as it has a minimum performance criteria for growers to achieve to become 'certified' and then a bonus system which enables the growers to have a higher level of certification. Both the Wadenswil Model and system used in the Rheinland-Pfalz (see Germany) fall under the IOBC guidelines (see above). IP is not recognised at EU level, although organic production is. There is hope that the EU will adopt and recognise the IOBC Guidelines, which would make sense as the IOBC appears to be the peak body for Integrated Production in Europe.

Approximately two thirds of grapegrowers in Eastern Switzerland actively participate in Integrated Production (IP) i.e. they achieve at least the minimum level of certification. Achievement of the minimum certification enables the grower to receive the Ecological Subsidy, from the Swiss Federal Government. This subsidy is currently 1200 Sfr/ annum/ ha, approximately $1200 (pers comm Pierre Basler).

If a grower achieves the minimum level and scores greater than 15 bonus points they are permitted to label their produce with the IP brand " Vinatura".

Motivated growers want the IP Guidelines to progress further and are somewhat disappointed that they are not becoming more challenging. Other growers within the association are participating in IP primarily to be able to receive the Swiss Ecological Subsidy, or because the winery which purchases their fruit requires it. These growers are not interested in change. As any changes to the guidelines are by majority, there needs to be a significant number of growers desiring further challenges for change to occur. Pierre Basler indicated that the motivated growers are looking for something which is between IP and Organic.

Growers are required to keep records of inputs and cultural practices and are inspected on an annual basis until certification is achieved and then on a less frequent basis, based on performance (compliance). As this system is grower driven, producers are audited by other growers, although obviously not by themselves or by their immediate neighbours. Audit/inspection teams are other growers participating in IP and may include a representative from the IOBC committee.

Branding

The Vinatura brand is not well known by consumers, unlike the Organic brands used in the market place (refer to the Organic Viticulture section of this report). This may be due to many of the producers who are entitled to use the Vinatura brand, not applying it to their produce.

There is also a perception in the market place that IP is not really special, in the sense that it is only goes half way, and that organically produced produce is special.

IP is seen as the minimum, i.e. this is just best practice agriculture, and it is how you should be farming anyway. (I did not gauge what the consumer thinks of conventionally produced agriculture).

Integrated Production - The German Experience

Integrated Production in Germany is managed and controlled by the government of the area. For example in the Rheinland-Pfalz, the official guidelines for Integrated Production were established in 1990. The guidelines may vary in different areas but are based on the IOBC guidelines.

The IP programme in the Rhein-Pfalz is known as Environmentally Friendly Production or Eco-friendly Production, this name change came about due to consumers not understanding what IP was. There is a branded logo which is also used to identify wines made under the IP guidelines.

For growers to enter the IP programme they must sign a 5 - 10 year contract, which commits them to the IP strategies, and enables them to receive a 900DM/year ecological subsidy. If a grower breaks the contract prior to the completion of the term, all subsidy monies must be repaid. There is currently 2000 ha under this programme in this area.

The Principles which drive Eco-Friendly Production are:

- Advancement of soil fertility;
- Avoidance of passing of detrimental substances into the environment;

- Cultivation Systems aiming for and environmentally protective production in regard to ecological systems.

The Strategies which form part of the IP programme in the Rheinland-Pfalz are:

- use of prognosis systems where possible;
- use of pheromones and Bt for insect control (Although other insecticides may be permitted, after vineyard inspection for once off application for second generation pests);
- limits on Nitrogen additions of 40kg/ha/annum (if humus levels are below 2.5%)

Integrated Pest Management

IPM differs from the previous mentioned farming systems in the sense that it is not a formal system. There is no certification or brand that says, "These grapes are grown in accordance with the formal rules of IPM". Rather IPM is a concept and changes as our knowledge base grows. You could go as far as to say that IPM is "best practice agriculture" or "responsible agriculture".

IPM encompasses most farming practices and is ultimately a holistic approach. You can't do one thing in isolation to other activities, they all tend to link together.

Although IPM can be seen as having it both ways e.g. you can spray when the going gets tough, but not otherwise, it is more sustainable than traditional management and rigid organic management.

IPM - The Californian Experience

In California the Lodi-Woodbridge Winegrape Commission has a mission regarding grapegrowing, that is : "Growing Winegrapes in a long term way using a combination of farming techniques (biological, chemical and cultural) that minimise economic, health and environmental risks."

This is essentially IPM, although the LWWC is selling IPM under a project name of BIFS - Biological Integrated Farming Systems.

The Lodi-Woodbridge area is a similar to Australia's Riverland-Sunraysia districts, it is a warm area where "broadacre" viticulture is practiced. The grapes are of commercial to semi-premium quality.

It is also an area where traditional grapegrowing is practiced e.g. calendar spraying, cultivation etc..

The LWWC are encouraging the adoption of BIFS as better agricultural practice, maintaining/improving the farm for the next generation and to improve the perception of the area.

As there is no subsidy or branding advantage from adopting BIFS, the grower must want to adopt BIFS for one of the above mentioned reasons.

The focal points of BIFS are:

- Pest management
- Soil building i.e. the removal of pre-emergent herbicides and introduction of cover cropping;
- Water management and;
- Nutritional management (nitrate contamination of ground water).

The LWWC are delivering BIFS through a three stage programme:

I - Grower Outreach i.e. grower eduction; II - Implementation i.e. demonstration through projects and encouragement; and III - Evaluation.

Strategies which are in the Implementation programme are:

- 12 month vineyard management plan
- Weekly vineyard monitoring
- Use of economic thresholds. These need to be further researched, some thresholds from Davis are currently used, these need to be reviewed and extended to more pests.
- Use of beneficial arthropods e.g. predatory mites

- Use of soft chemicals
- Cover crops
- Leaf plucking - quality impacts and leaf hopper management
- Compost additions - urban green waste
- Reduced use of pre-emergent herbicides, encourage use of contact herbicides and mechanical weeding.
- Drip irrigation (moving away from furrow)
- Use of Powdery Mildew model, this could be very advantageous for small growers who have the ability to spray with short turn around times. A potential saving of 2 sprays per season exists.
- Owl boxes for rodent control

The implementation and adoption of BIFS is a medium - long term project and there will be varying degrees of success. At this stage the LWWC staff are encouraged when a farmer adopts one practice or a few practices on part of their farm. Obviously farmers need to get runs on the board before having the confidence to go further.

Conclusion

There is a multitude of formal and informal farming systems used in viticulture around the world, and each has been developed for different reasons. The move to formal "low input" systems in Europe stems from a history of high input viticulture, in what is essentially areas where there is high pest & disease pressure and difficult terrain. Farm subsidies, ground water pollution from nitrates etc.. also drive the bandwagon for lower inputs and changed cultural practices. There is however a point where you have to question the sustainability of some of the restrictions which go with pure organic farming e.g. by not using input x in a timely fashion as an eradicant, the problem has to be managed with multiple protective treatments. This is ultimately more inputs, so the gain is questionable.

In areas of "New World" viticulture e.g. California and Australia where vineyards have generally been planted in areas with lower pest and disease pressures the use of formal systems is somewhat easier. However as the pressure is lower, inputs are also generally lower.

As discussed in the section on the Fetzer operation in California, there are a few secrets to success. These "secrets" apply whether you are using a formal system or are trying to adopt and maintain best practice agriculture on your farm. Site and Commitment. Do the right type of farming in the right place, and be committed to make it work.

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