

**SOUTH AFRICAN WINE & SPIRIT BOARD
Scheme for Integrated Production of Wine**



**Integrated Production of Wine:
Guidelines for Farms**

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In consultation with the vine and wine industry**

CONTENTS

A INTRODUCTION

B APPLICATION OF INTEGRATED PRODUCTION BY THE INDUSTRY

C GUIDELINES FOR FARMS

- 1 IPW TRAINING
- 2 CONSERVATION AND IMPROVEMENT OF FARM AND VINEYARD ENVIRONMENT
- 3 SOIL AND TERRAIN
- 4 CULTIVARS
- 5 ROOTSTOCKS
- 6 VINEYARD LAYOUT
- 7 CULTIVATION PRACTICES
- 8 NUTRITION
- 9 IRRIGATION
- 10 PRUNING, TRAINING AND TRELLISING
- 11 CROP AND CANOPY MANAGEMENT
- 12 GROWTH REGULATORS
- 13 INTEGRATED PEST MANAGEMENT [IPM]
 - 13.1 Major pests
 - 13.2 Other pests
 - 13.3 Main diseases
 - 13.4 Other diseases
- 14 HANDLING OF CHEMICALS
- 15 RECORD KEEPING

D IPW EVALUATION: FARM

APPENDIX 1 - IPW EVALUATION FORM: FARM

TABLE 1 - EVALUATION: CONSERVATION & MANAGEMENT OF FARM AND ENVIRONMENT

APPENDIX 2 - EVALUATION OF SPRAY RECORDS

APPENDIX 2A - Evaluation of spray record: herbicides

APPENDIX 2B - Evaluation of spray record: insecticides & nematicides

APPENDIX 2C - Evaluation of spray record: disease control products

A INTRODUCTION

The consequences of increasing demands on natural resources and agricultural production systems by an ever-increasing world population have brought about an awareness of the **necessity to protect non-renewable natural resources and the environment in order to ensure man's future health and well-being, as well as sustainable, economically viable agricultural production.**

A key concept that is used to convey an understanding of the environment is biodiversity. Biodiversity means that nature is composed of significant variation of genes, species and ecosystems, and implies that dynamic processes maintain this diversity. This diversity allows ecosystems and species to recover from natural disasters and adapt more readily to changes in the environment. When genetic vigor and species are lost and ecosystem processes are impeded, nature responds unpredictably, thus affecting our ability to plan production and protect natural resources.

Integrated production [IP] aims to achieve this by using the latest information and technology available for all aspects of production in order to produce quality fruit in an environmentally friendly, sustainable manner. This concept is in accordance with the Constitution of South Africa, which determines that every person has the right to an environment which is not harmful to his/her health or well-being and to the conservation of the environment for current and future generations (Act 108 of 1996, Article 24).

B APPLICATION OF INTEGRATED PRODUCTION BY THE INDUSTRY

The Scheme for the Integrated Production of Wine (IPW) was promulgated under the Act on Liquor Products (Act No. 60 of 1989) in November 1998.

Application of IPW as a whole by the industry comprises the following:

- 1 Guidelines consisting of recommendations of what should be done, as well as minimum standards.
- 2 The implementation thereof through:
 - the application of the guidelines;
 - training of producers and managers;
 - extension;
 - research.
- 3 Control and auditing through periodic inspections and analysis of fruit and wine for chemical residues.

Disqualification:

If applicable legislation, as listed in the guidelines, is not complied with [e.g. cultivation of soil without the required permits, cultivation of river banks and alteration of river courses, use of agricultural chemicals that are not registered], and this action or omission impacts negatively on the environment, the IPW Manager can request the Wine and Spirit Board to suspend the member's membership temporarily or even permanently.

C GUIDELINES FOR FARMS

The guidelines will be revised every second year to incorporate the latest research results. The IP-coding of chemical sprays will be updated continuously. Since the IPW Scheme functions within existing legislation, the guidelines were compiled within the ambit of relevant legislation and the applicable acts are listed at the end of each of the guidelines.

Details and internet links of articles and pamphlets that provide further information regarding implementation of the guidelines and practical recommendations to enable compliance with the guidelines are available on the IPW website.

1 IPW TRAINING

To apply IPW successfully and effectively, a thorough knowledge of the principles involved is essential.

- The attendance of an IPW training course, including an integrated pest management [IPM] course, is therefore compulsory for at least one representative of a farm or cellar wishing to participate in the IPW scheme. **This representative must be a person in a managing or decision-making position who is directly in charge of grape production.**
- External consultants may assist with IPW management through document control and recordkeeping. However, unless it can be confirmed that the consultant has been appointed in a continuous decision-making position on the farm and is suitably trained, the consultant may not represent the farm or facilitate IPW third party audits on behalf of the farm.
- All course attendants will receive a certificate as proof that they completed an accredited IPW course.
- The guidelines are revised every two years, therefore attendance of a refresher course at least every 3 years is required.

2 CONSERVATION AND IMPROVEMENT OF THE FARM AND VINEYARD ENVIRONMENT

Integrated production is a holistic approach to the farm environment as a whole. It requires that all natural, as well as cultivated areas be managed in such a way that all possible negative impacts on the environment are limited to a minimum or eliminated altogether. IPW requires that each farm should have an environment management plan which addresses the environmental risks on the cultivated portions of the farm, and which includes conservation of the natural areas, i.e. non-cultivated areas (where applicable). The IPW Manual for Farms gives information regarding the identification of risks to the environment and on how to compile conservation and environment management plans. Table 1A & B is used to determine compliance with this guideline. **Table 1A must be completed for all farms. Table 1B is completed only if there are natural, i.e. non-cultivated areas on the farm that require conservation.**

2.1 Environment management for cultivated areas and farming activities

- To prevent unnecessary soil erosion, slopes with a gradient in excess of 20 percent (18°) should not be cultivated (as detailed in the Conservation of Agricultural Resources Act, 1983).
- Farm roads, particularly gravel roads, should avoid sensitive ecological areas such as wetlands or rare plant populations and must be designed and constructed so as not to cause or aid erosion. For example, contour drains, as well as drainage ditches and sumps filled with stones to decrease the flow rate of storm water can be used to prevent soil erosion in roads and vineyards. Regular maintenance is necessary to curb erosion and excessive dust.
- Storm water from buildings and farm roads must be channeled to prevent soil erosion, erosion of riverbanks and silting up of wetlands.
- In view of the national water shortage and in compliance with legislation, all water abstraction from a river or underground source must be registered with the Dept. of Water and Sanitation. All water catchments, including wetlands, are protected and may not be disturbed or polluted in any way that will impede their natural function. It is illegal to interfere with the flow regime of a river or wetland by canalizing water flow, digging drainage ditches or infilling by dumping soil and rubble, without written permission from the relevant authority.
- All farm dams with a capacity >10 000m³ must be registered and new dams with a capacity >50 000m³ must be licensed with the Department of Water and Sanitation.
- Minimize pesticide drift from vineyards onto natural areas. Where possible use IPM methods and try to avoid drift altogether – also see Guideline 14.
- Minimize fertilizer run-off into adjacent natural areas, and especially wetlands and rivers. This runoff favours the spread of alien plants and actively poisons many indigenous plant species and aquatic animals.
- Cleaning products for household use must be environment friendly to prevent pollution of water sources and soil by “gray water”.
- Implement measures to ensure efficient water use (cellar, irrigation and household) to prevent

waste/excessive use.

- When large, continuous areas of habitat are broken up into disconnected fragments, many ecological processes that keep these systems functioning are disrupted and many species disappear. Corridors of natural habitats are needed to link fragments to allow species movement, pollination and nesting to continue.
- When designing the layout of new vineyard blocks, consider leaving corridors of natural vegetation between blocks or establishing new corridors. Consult an indigenous landscaper for advice on species suitable for planting in your area. Corridors can also include river and stream bank vegetation and wide road-side verges. Where no natural land remains on a property, portions of old fields that are left to naturally rehabilitate can also act as animal movement corridors and provide shelter.
- Any rehabilitation or restoration efforts are valuable in re-creating habitats that have previously been disturbed. However, rehabilitation by means of re-planting can do more harm than good if incorrect species choices are made. For example, a number of Protea species (especially white proteas) are known to easily hybridise and alter the genetic integrity of indigenous species. Specialist advice is recommended, as restoration can be a costly exercise. Rehabilitate using locally collected seed or species that historically occurred in the area.
- Properly designed and managed farm dams can attract a variety of birds, insects and animals to the area and so contribute to conservation of biodiversity. Avoid stocking dams with alien fish such as small-mouthed bass and trout which decimate indigenous fish populations. Farm dams stocked with indigenous fish species can make a significant contribution to conservation.
- Wild animals (e.g. baboon & buck) have become a problem in many farming regions because we have made them a problem by introducing cultivated habitats and readily available food into their natural habitat. It is always advisable to contact CapeNature or your regional equivalent regarding the most environmentally friendly and effective methods for control for problem animals. Extermination by poisoning should be avoided at all costs! In some instances, CapeNature will offer assistance with trapping large animals (e.g. leopard) and relocating them to a suitable location.
- Control of household pests like rats and mice should utilize environment friendly methods to prevent poisoning of predators and raptors (e.g. owls).
- Fuel storage tanks and filling areas for fuel on farms must be situated on an impenetrable cement slab, bunded by a wall of at least 20 cm high to prevent spilt fuel from contaminating the environment. The volume of the catchment area must be 110% of the volume of the fuel storage tank. Precautions for fire control should be in place.
- Good waste management practices can make a profound contribution towards retaining biodiversity. Refuse/waste management must comply with legal prescriptions and may not pollute the environment (particularly wetlands and water sources) or create a health hazard. This applies to the disposal of both liquid & solid waste, such as that from a winery, as well as to household waste.
- Minimize solid waste by recycling as much as possible.
- Non-recyclable household waste should preferably be compacted and buried. According to Government Notice 718 (GG 32368 of 3 July 2009), if **household waste** is not taken to a municipal waste disposal site, and **<500 kg/month** is disposed of at a **site smaller than 50 m² the following regulations must be complied with:**
 - The site is situated outside a water resource and above the 1:50 year flood line.
 - The site is adequately fenced, locked and marked with relevant signs to restrict animals and unauthorized entry.
 - The site does not overlie an area with shallow or emergent water tables.
 - The waste does not cause any nuisance conditions due to the breeding of flies or other vermin.
 - Locate sites in previously disturbed areas, not in natural vegetation.
 - Recycle where possible (formal records of external removal must be available).
 - Educate farm workers and their families in waste management and recycling.

Disposal of general waste to land covering an area in excess of 50 m² or capacity exceeding 25 000 tons per year is defined as a "listed activity" and anyone who wishes to dispose of any general waste to land covering 50 m² to 200 m² or capacity exceeding 25 000 tons per year, must conduct a Basic Assessment as part of a Waste Management License Application. Should general waste be disposed of to land covering an area in excess of 200 m² an EIA should be conducted as part of a Waste Management License Application.

- General household waste to a maximum of 10 kg/day may be incinerated in a purpose-built incinerator, provided that the temperature is high enough to ensure that it does not smoulder and that there is no danger of air pollution. Waste may, however, not be burned in a waste disposal pit. Large incinerators with a capacity of 10 kg/hour and more require an Environmental Impact Assessment (EIA) as part of the Waste Management License application and must comply with additional requirements, including specific minimum requirements, an Environmental Authorization, adequate measures to prevent air pollution and continued monitoring of prescribed parameters.
- Waste from farm workshops (e.g., used oil, oil filters, batteries, paint, tyres, scrap metal) and other farm activities that may not be disposed of with normal household waste must be handled in a responsible and environment friendly way. For example, arrange with a recycler to remove used oil. Oil should not be disposed of on farm roads, because it leads to soil and water pollution.
- Sewerage systems should be adequate to process the maximum volume of sewerage generated on the farm. Make provision for additional volume during the peak tourist season. Overflow from sewerage systems and the use of “French drains” may not lead to pollution of soil and water sources. Should removal/disposal of sewerage be undertaken by an external company, records should be available as confirmation of the removal and safe and legal disposal of sewerage. For direct disposal into the municipal sewer, municipal invoices should be provided as proof.
- Invasive alien plants have a significant negative impact on the environment by causing direct habitat destruction, increasing the risk and intensity of wildfires, and reducing surface and sub-surface water. Landowners are under legal obligation to control alien plants occurring on their properties. This includes cultivated areas of the farm. Further details are given under point 2.1.2 of the guidelines for conservation and management of natural areas.
- Air and noise pollution can be limited by regular maintenance of vehicles, machinery and implements, and by avoiding unnecessary use (e.g. plan & combine trips to town or far-away vineyards). Keep records of service and maintenance for auditing purposes.
- Tourism: infrastructure such as roads, sewerage systems, waste management, etc. must be able to cope with the additional pressure of tourists on the environment.
- Light pollution: security lights left on during the night can disturb nocturnal organisms. Placement of lights and the use of screens over lights to protect bats and other flying organisms should be considered.
- Fire management: as a landowner, you are responsible for the prevention and management of all fires that occur on your land, in terms of the National Veld and Forest Fire Act of 1998.
 - Sufficient fire breaks, free of combustible material, are required. Farm roads in cultivated areas can also serve as fire breaks.
 - Compile a fire fighting plan for the farm.
 - Sufficient fire-fighting equipment must be supplied and maintained.
 - Farm workers should receive training in firefighting.
 - Joining a Fire Protection Association (FPA) will help to ensure that you comply with legislation and to avoid being deemed negligent in terms of the act, should a fire spread from your property to adjoining properties.
- Fuel use: the aim is to keep fuel consumption on the farm as low and efficient as possible.
 - Keep records of all consumption (petrol, diesel, gas, coal) for auditing purposes and so that the carbon footprint can be calculated using the link to the “carbon calculator” on the IPW website. Use the link via the IPW website or directly go to <https://www.climatefruitandwine.co.za/>.
 - Summaries of annual fuel consumption can be used to demonstrate that use is stable or has been reduced.
 - Regular maintenance of vehicles, machinery and implements ensure efficient operating and fuel consumption – keep records for auditing purposes.
- Electricity: the aim is to keep consumption as low and efficient as possible. Keep record of consumption for auditing purposes and so that the carbon footprint can be calculated with the “carbon calculator” on the Confronting Climate Change website (www.confrontingclimatechange.co.za). Summaries of annual energy consumption can be used to demonstrate that use is stable or has been reduced.

Note: Calculation of the carbon footprint with the carbon calculator” on the Confronting Climate Change website (www.confrontingclimatechange.co.za) will become compulsory for farms in 2024. In the meanwhile, farms can earn 5 bonus points for doing the calculation (see Appendix 1) by.

- Development/extension/change of farming and other activities on the cultivated areas of the farm:
 - Ensure that all permits for soil preparation, applications for rezoning of land use and environment impact studies/assessments required by law, are in place and on record.
 - Measures must be taken to mitigate the impact of building activities on the environment (dust, noise, disposal of rubble, use of heavy machinery).
 - Plan for provision of water, sewerage systems and electricity to new structures.

2.2 **Conservation and management of natural areas**

All producers with areas of natural vegetation and/or threatened ecosystems such as wetlands, riverbanks or endangered veld types on their farms, must incorporate a conservation plan which addresses the specific risks pertaining to these areas in their environment management plan.

2.2.1 **Conservation and management of threatened ecosystems, rivers & wetlands**

Threatened ecosystems, especially lowland vegetation types, rivers and wetlands, are protected by law and may not be disturbed, degraded or developed without special permission from the relevant authorities.

Threatened ecosystems

- New vineyards should ideally be developed on old agricultural lands and not on virgin soil with pristine natural vegetation. A ploughing permit must first be obtained from the National Department of Agriculture in order to develop virgin soil. Any land that has not been cultivated for more than 10 years is regarded as virgin soil. Please consult with WWF Conservation Champions Programme or an environmental consultant to confirm whether the clearing of natural vegetation will require environmental authorisation from the Department of Environmental Affairs.
- A national assessment, updated in 2018, of every vegetation type in SA classifies them as critically endangered, endangered, vulnerable or least threatened, according to how much remains compared to its original extent and/or how many Red List threatened plant species are present. In the Western Cape alone, there are 20 vegetation types that are already critically endangered (e.g. Swartland Shale Renosterveld). It is therefore strongly recommended that before any development is contemplated, that you contact the CapeNature representative in your area to determine the conservation value of any virgin land and consider alternatives. CapeNature's formal comment is likely to be required by the permitting authorities in any event.
- Critical Biodiversity Areas (CBA's), Ecological Support Areas (ESA's), Threatened Ecosystems and Biodiversity Sector plans are CapeNature products that should be used with any land use-planning and decision-making. CBA's should guide the landowner where cultivation can take place and where alien clearing and fire management should be prioritized.
In terms of the National Environmental Management Act (NEMA) the expansion of vineyards may trigger listed activities per the scheduled activities listed in (GN) Reg No. 327 and 324 under NEMA. Before the mentioned development could take place, it is required that an environmental process be undertaken. The following listed activities may apply to the proposed development and or expansion:

Environmental Impact Assessment Regulation Listing Notice 1 of 2017:

27. The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation.

Environmental Impact Assessment Regulation Listing Notice 2 of 2017:

15. The clearance of an area of 20 hectares or more of indigenous vegetation.

Environmental Impact Assessment Regulation Listing Notice 3 of 2017:

12. The clearance of an area of 300 square meters or more of indigenous vegetation.

In Western Cape.

- Within any critically endangered or endangered ecosystem listed in terms of section 52 of NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;
- Within critical biodiversity areas identified in bioregional plans;

- It is strongly recommended that producers who still have areas of natural vegetation, especially lowland vegetation types, enlist the help of CapeNature (or your regional equivalent) to determine the conservation value of these areas. Not all natural areas have the same conservation priority. Landowners with pristine habitats, especially critically endangered and endangered vegetation types, on their farms should consider setting these areas aside for conservation. In the Western Cape, the Stewardship Programme of CapeNature may be applicable to high priority habitats to give these areas secure conservation status, and truly ensure these areas remain conserved for future generations.
- Draw up a simple conservation management plan for a farm with natural areas, including time-bound management action schedules (see IPW manual for farms).
- Introduction of game into natural vegetation should be carried out on advice from the relevant conservation agencies and adhere to relevant policies and permit procedures. Too many game animals or animal species unsuitable for the area can damage remaining natural vegetation.

Rivers & wetlands

- In view of the national water shortage and in compliance with legislation, all water abstraction from a river or underground source must be registered with the Dept. of Water and Sanitation. Volumes of water abstracted must be measured and recorded. All water catchments, including wetlands, are protected and may not be disturbed or polluted in any way that will impede their natural function. It is illegal to interfere with the flow regime of a river or wetland by canalizing water flow, digging drainage ditches or infilling by dumping soil and rubble, without written permission from the relevant authority.
- Buffer areas of undeveloped land that are free of alien plants should be retained around wetlands and along rivers/water courses. The buffer width around wetlands and along rivers will depend on the characteristics and size of the wetland/river. The well-being of river ecosystems is largely dependent on the health of the adjacent natural vegetation (or “riparian habitat”). Riparian vegetation stabilises the riverbank, filters pollutants, helps maintain a natural water temperature, contributes organic matter in support of aquatic life and acts as a buffer to adjacent land uses.

2.2.2 Invading Alien Species

- Invasive alien plants have a significant negative impact on the environment by causing direct habitat destruction, increasing the risk and intensity of wildfires, and reducing surface and sub-surface water. Landowners are under legal obligation to control alien plants occurring on their properties.
- Alien control programs are long-term management projects and a clearing plan, which includes follow-up actions for rehabilitation of the cleared area, is essential. This will save time, money and significant effort.
- Collective management and planning with neighbours allow for more cost-effective clearing and maintenance, considering that alien seeds are easily dispersed across boundaries by wind or water courses.
- A list of declared weeds and invader plants, according to the National Environmental Management Biodiversity Act (Act no 10 of 2004) Alien Invasive Species Regulations is available on the following website: www.invasives.org.za.
- All clearing actions should be monitored (e.g., fixed point photography) and documented to keep track of which areas are due for follow-up clearing.
- If a herbicide is used, the name and formulation of the product, application rate, time and method of application must be recorded.
- A general rule of thumb is to first target lightly infested areas before tackling densely invaded areas and prioritize sensitive areas such as riverbanks and wetlands. For more detailed information see point 2 of the WWF Biodiversity Management Guidelines on the IPW website.
- Alien grasses are among the worst invaders in lowland ecosystems adjacent to farms but are often the most difficult to detect and control.
- To avoid alien grass invasion, a buffer of at least 30m should be left along the edges between pristine natural areas and vineyards, other agricultural lands & compost or manure piles. This can prevent disturbance, edge effects and nutrient run-off into the veld, which promotes alien grass invasion.
- Information regarding removal and management of /regulations regarding other alien invaders (like Indian house crow, small-mouth bass, trout, carp, mallard ducks or feral pigs) is available on the IPW website in the WWF Guidelines for Biodiversity management.

2.2.3 Fire Management in natural areas

Fires occur naturally from time to time in fynbos and renosterveld ecosystems. Many plants in these systems need fire to propagate. In the long run fire is necessary for the survival of these plants. Although fynbos is adapted to occasional fires, just one or two fires at the wrong time of the year can result in the extinction of many species.

- A detailed Fire Management Plan (FMP) must be drafted for the farm, a detailed template of the minimum requirements for an FMP can be found at:
- https://www.westerncape.gov.za/sites/www.westerncape.gov.za/files/western_cape_provincial_government_veld_fire_plan_2019_2020-final_-_0.pdf.
- Every property must have a system of fire breaks in place. The breaks must be on the boundary of the property, unless there is an exemption granted by the Minister or an agreement with the adjoining landowner that the firebreak be located somewhere else within an FPA. For additional guidelines on the construction of fire breaks and for more information regarding the National Veld and Forest Fire Act No 101 of 1998 search "National Veld and Forest Fire Act" on the internet or go to the following link:
<https://www.gov.za/documents/national-veld-and-forest-act#:~:text=The%20National%20Veld%20and%20Forest,to%20provide%20for%20related%20matters>.
- Firebreaks must be wide enough to provide access for the control of wildfires and must not be burnt during times when there is a high fire risk. A sensible firebreak width is usually not wider than 10m for most fynbos and renosterveld vegetation, as soil erosion problems are created when firebreaks are too wide.
- Owners should ensure that firebreaks are positioned and prepared in such a way as to cause the least disturbance to soil and biodiversity. Firebreaks should be free from combustible material, e.g. vineyard prunings.
- Fire intervals: Keep record of all fires, based on a map which indicates the ages of the various sections of natural vegetation. The intervals between fires should primarily be determined by the growth tempo of the natural vegetation. No fire should be allowed in fynbos until at least 50% of the population of species that are slowest to reach maturity (e.g., Protea species) has flowered for three consecutive seasons. Research showed that a burn frequency of between 8 and 20 years should be applied to fynbos under natural conditions.
- Intensity: The intensity of a fire depends on the fuel load, relative humidity of the fuel and wind speed. Exotic plants have a serious impact on fire intensity due to the flammable oils they contain and their greater biomass, which is a result of their infestation density. It is therefore very important to control alien vegetation before a controlled burn is planned.
- Season: Because of the Mediterranean climate (with dry summers) in most of the fynbos biome, unplanned and incidental fires mainly occur in summer.
- Generally, a late summer or early autumn burn is best for fynbos species, but due to the risk of runaway fires at that time, controlled burning is usually only feasible in March and April.
- Proportion of the area burned: It is important to retain a mosaic of vegetation of different ages on any piece of land.
- Permission to burn: Before a controlled burn may be carried out in the prescribed season, a permit must be obtained from the local fire protection agency (if one exists in the area) or local fire chief.

2.2.4 WWF Conservation Champion Programme – (Previously called BWI).

The Biodiversity & Wine Initiative (BWI) is a partnership between the conservation sector and the wine industry to minimise the loss of threatened natural habitat and contribute to sustainable wine production. After 10 years of successful implementation (2005-2015) and an identified shift in needs from the industry and membership base, the programme has refocused under the new name of **WWF Conservation Champions**. Previous BWI members (entry level) can in future make use of the Sustainable Wines of South Africa seal to validate their compliance with minimum environmental criteria, and producers that are able to meet leading best practice criteria relating to continual improvement of production and biodiversity conservation can become recognised as **WWF Conservation Champions**, with the sugar bird and protea logo. For more information contact Jacques van Rensburg – Head of extension (021 – 881 3086 or 082 748 6623) or Shelly Fuller - Programme Manager (021 881 3086 or 084 555 6068).

NOTE: A more detailed document: WWF Conservation Champion Biodiversity management guideline is available on the IPW website [www.ipw.co.za].

Constitution of the Republic of South Africa, Act 108 of 1996
National Environmental Management: Biodiversity Act, No. 10 of 2004
Conservation of Agricultural Resources Act, No. 43 of 1983
National Veld and Forest Fire Act, No 101 of 1998
National Water Act, No. 36 of 1998
National Environmental Management Act, No. 107 of 1998
National Environmental Management: Waste Act, Nr 59 van 2008
National Environmental Management: Protected Areas Act, No. 57 of 2003
Subdivision of Agricultural Land Act, No. 70 of 1970
Western Cape Nature Conservation Laws Amendment, Act No. 3 of 2000

3 SOIL AND TERRAIN

Soil and terrain have a definite effect on the performance of the various grapevine cultivars and also on wine quality, be it directly or due to the meso-climate created by soil/terrain interaction. IPW requires that cultivars be planted where they are best adapted.

- The suitability of the terrain for the specific grape cultivar regarding aspects such as vigour, delayed budding, disease pressure, ripening and quality must be determined.
- To plant grapevines on virgin soil or soil that has not been cultivated for 10 years or more, a cultivation or ploughing permit must be obtained from the National Department of Agriculture – see also Guideline 2.2.1.
- The suitability of the soil for a specific cultivar/rootstock combination should be determined by means of comprehensive soil profile studies, as well as macro- and meso-climate studies. Long term weather data can also be used for a climate study.
- The soil preparation action must be based on profile studies and must not lead to secondary problems such as poor drainage, ploughing up of chemically or physically undesirable soil layers, erosion or disturbance of healthy soil microbes. Soil preparation should not be done when the soil is too wet or too dry.
- Chemical adjustments of macro- and micro-elements must be done according to the analysis of representative sub- and top-soil samples, with due consideration of the production level of the vineyard.
- Soil and root samples for nematode analyses must, where required, be taken before existing crops or vegetation are removed and soil preparation commences.
- Tractor and implement traffic on the prepared soil before planting must be kept to a minimum to prevent soil compaction.
- Ridging of soil should only be done if the optimum soil depth cannot be obtained by other soil preparation methods.

Conservation of Agricultural Resources Act, No. 43 of 1983
National Water Act, No. 36 of 1998
National Environmental Management: Air Quality Act, Nr 39 of 2004

4 CULTIVARS

- Cultivar has a decisive effect on disease susceptibility, use of chemicals, quality, etc, and only cultivars which can ensure economically viable crops of quality grapes with minimum intervention by man, must be used.
- Certified planting material should be used.

5 ROOTSTOCKS

Rootstocks differ in their resistance to subterranean pests and disease and suitability for soil-physical and -chemical conditions and are therefore critical to the successful cultivation of quality grapes.

- Rootstocks should be selected in consultation with experts, taking into account soil conditions, vigour, disease and pest resistance, scion cultivar, previous rootstock on the soil, etc.
- Certified planting material should be used.

6 VINEYARD LAYOUT

The layout of the vineyard can contribute significantly to combat erosion in vineyards on gradients, as well as the micro-climate in the vineyard, which in turn influences disease susceptibility, ripening and grape quality.

- Vineyards must be laid out in such a way that row direction, plant width, training system and vine development ensure optimum air movement and sunlight exposure and do not contribute to soil erosion.
- Required precautions such as construction of contour drains, drainage ditches and sumps filled with loose rocks to reduce water flow speed, etc. must be taken to prevent soil erosion in vineyards during heavy rain.
- The following factors should be considered during the layout of a vineyard: row direction; gradient; prevailing summer wind directions; rootstock and scion characteristics; economic considerations.
- Where wind is a problem, windbreaks should be planted, or indigenous vegetation retained to combat wind erosion.
- The use of growth tubes during establishment to speed up vine growth and development must be managed responsibly. Tubes should be removed and re-used or recycled to avoid environmental pollution.
- If black plastic is used during planting, it should be biodegradable or it should be removed before it starts disintegrating. Under no circumstances may plastic end up in rivers and water sources or cause any other form of environmental pollution.
- The trellising system must be large enough to accommodate expected shoot growth and vigour, and should not restrict it (unnecessary topping results in dense canopies).
- Vine spacing should be adapted to the soil potential to prevent excessively dense canopies and uneven shoot development. Row width should remain as narrow as is practical, whilst the distance between vines in the row changes according to soil potential.

Conservation of Agricultural Resources Act, No. 43 of 1983

National Water Act, No. 36 of 1998

Fertilizer, Farm feeds, Agricultural remedies and Stock remedies Act, No. 36 of 1947

7 CULTIVATION PRACTICES

The favourable conditions created by soil preparation and correct vineyard layout, can be undone by incorrect cultivation practices such as injudicious chemical or mechanical weed control.

Vine row (ridges/"bankies")

- Any cultivation of the vine row must be aimed at improving water retention and soil structure, and/or at controlling unwanted weeds.
- To control weeds on the ridges ("bankies"), pre- and post-emergence herbicides should be considered judiciously. To prevent the development of resistant weeds, herbicides with different modes of action should be used in rotation.
- When considering **pre-emergence herbicides**, soil type and soil pH must be borne in mind. Recommendations in this regard should preferably be made by an expert accredited to CropLife SA and must be kept on record. If a consultant is not used, the producer must be able to **motivate** why a pre-emergence herbicide was required, in other words the particular **problem weed/s, weed situation or anti-resistance strategy** must be **identified** and be available on record.
- Mechanical cultivation should only be considered for the control of specific weeds that are difficult to

control, such as morning glory, perennial grasses or shrub-like weeds. Where possible, this should be done in combination with suitable herbicides.

Work row

- Clean cultivation increases the risk of soil erosion by wind and water, and can also affect soil structure, water infiltration and water retention negatively.
- Cover crop cultivation should be done in every row, wherever possible, to reduce the use of chemical herbicides and to combat soil compaction, especially where mechanical pruning, canopy management and harvesting is used. Other advantages include improvement in soil structure, water infiltration and water conservation, increases in organic content of the soil, stabilising of soil temperature and provision of overwintering sites for some natural enemies.
- Where cover crop cultivation is impossible or impractical due to soil type or circumstances, a cover of natural/volunteer plant growth should be allowed to establish, which can be managed as a cover crop and mowed ("bossiekapper") to make other cultivation practices easier.
- The use of post-emergence herbicides in the work row should be limited to a minimum. It can be used to kill the winter cover crop and to control unwanted weeds like morning glory and perennial grasses. Spot sprays rather than full cover sprays should be considered to control undesirable weeds.
- The use of pre-emergence herbicides in the work row should be avoided as far as possible. Under unusual circumstances and where specific weeds require it, it may be considered as a temporary measure. Recommendations in this regard should preferably be made by an expert accredited to CropLife SA and must be kept on record. If a consultant is not used, the producer must be able to **motivate** why a pre-emergence herbicide was required, in other words the particular **problem weed/s, and situation or anti-resistance strategy** must be **identified** and be available on record.
- Mechanical cultivation in the work row should be avoided and may only be done to establish a cover crop or to control undesirable weeds that can not be controlled chemically.
- Record must be kept of all herbicide applications. The name, formulation, dosage applied and application method (ridge only/work row only/full surface) are required to complete the evaluation of the herbicide programme in Appendix 2A.

Note 1: Only registered herbicides may be used, strictly according to registration conditions - see Appendix 3A in the IPW Manual.

Note 2: Reports of weed resistance to herbicides are on the increase, therefore it is extremely important that producers and their advisors/consultants ensure that all herbicide spray programmes include an anti-resistance strategy. Producers should try to alternate products from different groups, i.e., products with different HRAC Herbicide Group Codes on the label, as far as possible to minimise the risk of resistance. Biological farming practices can be implemented to move away from the use of pesticides and herbicides.

Conservation of Agricultural Resources Act, No. 43 of 1983

National Water Act, No. 36 of 1998

Fertilizer, Farm feeds, Agricultural remedies and Stock remedies Act, No. 36 of 1947

8 NUTRITION

Balanced nutrition of the vine is necessary for optimal growth, yield and grape quality. **Unnecessary applications of nutrients can contribute to the pollution of rivers, dams and other water sources through leaching from the soil.** Excessive fertilization, especially nitrogen, causes excessive growth and leaf density, which favours the incidence of diseases and hampers penetration of chemicals. Excessive nitrogen also increases the susceptibility to fungal diseases and certain insects. Excessive potassium may even affect wine nutrient negatively.

- The underlying principle of vine nutrition is that only the nutrients removed from the soil during the growing season should be replaced. Consult the IPW Manual for more information in this regard.
- Representative soil samples should be taken for analysis every three years on sandy soils and every four to five years on heavier soil. Sometimes elements are present in the soil, but not accessible to the plants due to an imbalance of certain elements.
- Soil nutrient content must be established through proper soil sampling procedures and analysed at an

ISO 17025 accredited laboratory using accredited methods (SANAS or the IAF – International Auditing Forum), or that partakes in the Agri-LASA proficiency testing scheme. Analyses should indicate soil texture and at least include phosphorus, potassium, nitrogen, calcium, magnesium and micro-nutrients (manganese, boron, zinc, copper), as well as carbon. Technical interpretation of soil analyses is required. It should take into consideration crop nutrient requirement, soil type, climatic conditions and irrigation practices. Excessive build-up of a particular nutrient must be avoided, since it has various detrimental effects, e.g., on soil stability and the availability of other nutrients. Representative leaf samples should be analysed in conjunction with soil samples to identify imbalances rapidly.

- Nitrogen should be applied according to growth and vigour (take effect of rootstock into account) and not necessarily according to production levels. The percentage carbon in the soil is a good indication of the nitrogen delivery potential of the soil and should be determined during soil analyses. On sandy soils nitrogen should be applied in installments to limit losses due to leaching.
- Phosphate and potassium fertilisers should be applied according to soil analyses. Because phosphorus (P) is not prone to leaching, it does not need to be applied every year. The amount required over three or four years can be applied as one installment.
- Potassium leaches out easily and on sandy soils maintenance nutrition should be applied in two installments (after budding and after fruit set). On saline soils (nutrient lower than 300 ohm) potassium sulphate should be applied and not potassium nutrient.
- Organic fertilisers (manure or compost) may not contain unprocessed sewage, heavy metals or plastic. Ensure that municipal compost or processed sewage complies with these specifications before using it. Amounts applied must be in accordance with the amount of nutrition required, based on analyses.
- After the application of ameliorants during soil preparation, maintenance liming and gypsum application should be done according to soil analyses and soil texture.
- Foliar feeds must only be applied where deficiencies or imbalances cannot be rectified by soil applications. These applications must be made according to leaf analyses and recommendations. Deficiency and toxicity levels of boron are very close to each other and unnecessary boron applications can be very dangerous.
- Efficient fertigation can reduce the total amount of nutrients applied. Applications must, however, not deviate from irrigation and nutrition recommendations (based on analyses) for individual vineyards.
- Only registered fertilisers may be used. Compost should be analysed to determine the nutrient composition and commercial suppliers should provide this information. Records of all analyses should be kept.
- Records of all soil and leaf analyses, as well as of all applications of nutrients (including micronutrients) should be kept in order to prove that only enough was applied to satisfy the actual requirements of the vines and that no unnecessary nutrients were applied.

Conservation of Agricultural Resources Act, No. 43 of 1983

National Water Act, No. 36 of 1998

Fertilizer, Farm feeds, Agricultural and Stock remedies Act, No. 36 of 1947

9 IRRIGATION

Irrigation is a human intervention in nature. Incorrect irrigation practices can cause environmental problems, such as waterlogging, salinisation, soil compaction and susceptibility to diseases, and can also have an adverse effect on grape quality.

- Abstraction, storage and use of water must be done, measured and recorded according to the DWS General Authorisation as published in Government Notice No. 538 on 2 September 2016 (See IPW webpage or http://www.gov.za/sites/www.gov.za/files/40243_gen538.pdf).
- Due to soil, canopy and climatic differences, the water requirements for all vineyards are not the same. Vineyards should, therefore, be irrigated according to their individual requirements where necessary.
- Irrigation scheduling must be done in accordance with the water retention ability of the soil, the physiological stage of the vineyard, the crop factor and climatic conditions.
- The use of crop factors and evaporation pans, as well as tensiometers and neutron moisture meters is recommended.
- The irrigation system must be designed to ensure effective water distribution in the particular soil type without wetting bunches regularly.

- The irrigation system must at all times be used correctly and be maintained in good working order.
- Fertilisation through the irrigation system (fertigation) may only be used if the particular system has been designed accordingly and the nutrients applied do not exceed the recommended rates for soil application.
- Record of all measurements/determinations regarding each vineyard's water requirements, as well as of all applications of water should be kept to prove that sufficient water was given to satisfy requirements, but no more.
- Producers must set objectives to improve water use efficiency (WUE) continually. This entails a recorded calculation of liters water consumed per kilogram of crop produced and where possible, should be calculated separately for each block/cultivar. Records of water balance sheets and classification of water use types, as well as rainfall must be available.
- Chemical composition of irrigation water used on the farm must be established at least annually through proper water sampling procedures and analyses at an accredited laboratory using accredited methods (SANAS). Analyses should at least include pH, electrical conductivity, sodium adsorption ratio (SAR), potassium, calcium, magnesium, sodium and chloride. Technical interpretation of water analyses is required. It should consider the soil chemical composition, crop nutrient requirement, soil type, climatic conditions and irrigation practices to avoid excessive build-up of a particular nutrient or salt in the soil. Water quality can also affect the efficacy of herbicides and pesticides.

National Water Act, No. 36 of 1998

Conservation of Agricultural Resources Act, No. 43 of 1983

10 PRUNING AND TRELLISING

The pruning system, vine shape and training system largely determine canopy density, crop load, air movement, sunlight exposure of leaves and bunches, and efficacy of crop protection.

- The pruning system, vine shape and trellising system must ensure the availability of sufficient well-spaced shoots for optimum harvest.
- The trellising system must accommodate the vigour of the vines, ensure good distribution of shoots, leaves and bunches.
- In view of concerns being raised about the potential negative health and environmental impacts of trellising posts treated with creosote, it may be wise to consider alternatives.
- Pruning wounds on trunks and bearers must preferably be covered by a wound sealer immediately after pruning to prevent wood rotting (dying arm).
- In the case of mechanical, minimum or no pruning, strive for good canopy management principles in order to prevent excessive canopy density.

Conservation of Agricultural Resources Act, No. 43 of 1983

11 CROP AND CANOPY MANAGEMENT

- Crop control must be done at pruning through the allocation of the correct number of bearer eyes for the particular cultivar according to vigour.
- Healthy, good quality grapes can only be obtained from vines with a good balance between vigour and crop load. Too low or too high crop loads cause an unbalanced growth:yield ratio and poor grape quality.
- Summer manipulation in the form of suckering, shoot thinning and positioning must complement winter pruning. In cases of dense canopies tipping, topping (only on upper side of canopy) and leaf removal can be used to ensure optimal leaf functioning, efficient disease control and better grape quality.
- Avoid excessive summer manipulations. Excessive vigour and canopy density should first of all be addressed by selecting the correct rootstock, trellising and training system, as well as by correct pruning. Water and fertiliser applications must also be adjusted to avoid excessive growth. The aim with summer manipulation of the canopy is not to correct mistakes made with the above-mentioned actions/practices.
- See also practical guidelines for producers to manage vineyards during drought:

<http://iqws.co.za/article/guidelines/drought-conditions/management-of-grapevines-during-drought-periods>

12 GROWTH REGULATORS

Cultivars and clones that are ideally adapted to the environment should not require the use of growth regulators and stimulants.

- Registered growth regulators may only be used in special circumstances, strictly in compliance with registration conditions. Growth regulators are used to stimulate normal physiological processes in vines and must result in better functioning of the vine and better grape quality.

Fertilizer, Farm feeds, Agricultural and Stock remedies Act, No. 36 of 1947

13 INTEGRATED PEST MANAGEMENT [IPM]

IPM is the application of all available management practices and control measures to control pests and diseases, and to eliminate chemical control as far as possible or to apply it more judiciously.

Although the guidelines for the control of different pests and diseases are discussed separately, it must be viewed as part of the whole and be applied as such. By only following the guidelines for one aspect, IPM cannot be successful. ***In order to apply IPM successfully, regular, comprehensive monitoring of pests and natural enemies is essential.*** When sprays are applied, it must be done thoroughly and effectively.

Pests and diseases must not be controlled directly with chemicals only, but other cultivation and alternative control practices as discussed in the guidelines for IP are prerequisites for successful control.

Rating or coding of pesticides and fungicides: all fungicides, pesticides and herbicides registered for use on wine grapes under Act 36 (1947) are rated or coded according to their potential impact on the environment. This allows producers to select products that will minimize the negative impact on the environment.

Note: Some countries or markets to whom wine is exported do not allow the use of certain pesticides or fungicides, even though they are legally registered in South Africa. It is the responsibility of each producer/IPW member to consult with the marketer(s) of their wine to ensure that they are informed of and conform to the specifications of the buyers.

Warning: no unregistered products may be used in IPW. Sterilizing agents such as chlorine and hydrogen peroxide have no residual action and do not provide any protection once they are dry. These products are indiscriminate sterilizers that kill all microbes, including beneficial microbes like *Trichoderma* species that help to suppress diseases like Botrytis. These products can also be harmful to natural enemies if they are wetted directly.

13.1 Major pests

The major pests of wine grapes are mealybug, ants, weevils and bud mite. These pests have a close relationship with each other, as chemical control of one kills the natural enemies of the other. These pests must therefore be viewed and controlled in a collective context.

Mealybug and ants

Mealybug is the most important vector of leafroll viruses, therefore effective mealybug control is a prerequisite to limit the spread of leafroll infection.

Note: Foundation and mother blocks are handled according to specific protocols for these plantings.

Monitor:

- Inspect new growth of 5 vines per section ("vakkie") in 20 sections evenly spread through the block ($\leq 2\text{ha}$) or vineyard for the presence of mealybug. Inspect the whole vine for the presence of ants. This takes approximately 20 min. per block.

- Start monitoring early in the season. Thorough monitoring during October/November is important to avoid mealybug outbreaks later in the season.
- Pheromone traps can also be used to monitor mealybug males – see Winetech Protocol. As soon as trap catches of males exceed 65 males over a period of two weeks, physical inspections should be done in the relevant block. If mealybug infestation exceeds 2%, control should be applied.
- Mark all other infested vines during the growing season, harvest or in winter during pruning. During winter infested vines can be identified by the black sooty mould which grows on the honeydew excreted by mealybugs.
- The presence of ants in vines is a good indication of the presence of mealybugs.
- If infestation levels can be maintained below 2% early in the season (November), biological control ought to keep the mealybug population low enough so that little or no yield losses occur.

Ant control:

- To achieve effective ant control with stem treatments, no weeds/cover crops should be growing into the vine canopy and no vine shoots should be hanging onto the ground, as these provide ants with alternative access to vines.
- Place sticky or pesticide-treated barriers around the trunks of vines, trellising poles and anchor wires for the control of ants.

OR

- Spray only the bottom 20 cm of the trunks of the vines, trellising poles and anchor wires above the irrigation jets as soon as ants start to move into vines.
- Cocktail ants nest in vines and chemical control should be applied during winter (dormancy).
- Ant control should be applied with hand lances or backpack sprays.
- Treat all vines, trellising poles and anchor wires in a block where ants are active, since ants can move between vines via the trellising wires.
- In the case of bush vines, trunk barriers are not practicable and the whole vine can be sprayed during late winter just prior to budding.

Mealybug control:

- Biological control by means of augmentative releases of commercially available natural enemies can be applied, provided the mealybug population is low enough (infestation level <2%). Biological control alone is not effective under outbreak conditions.
- Vineyards or areas in vineyards where 2% and more mealybug infestation occurred during the previous season, should be treated during dormancy (after leaf drop and before budding).
- Dormancy sprays are recommended to protect natural enemies as much as possible. Only vines on heavy soils or against steep slopes, which are too waterlogged to spray before budding, can be sprayed earlier during autumn, if necessary.
- Wet vines thoroughly [2-3 l spray mixture/vine] with hand lances at high pressure.
- If monitoring during the season indicates mealybug infestation of 2% before the end of November, infested vines as well as the two adjacent vines or infested areas in the block should be treated.
- If outbreaks of more than 2% infestation occur later in the growing season, use a chemical with a short withholding period that breaks down rapidly, so that natural enemies have enough time during the remainder of the growing season to re-establish.
- Sprays after harvest should preferably be limited to instances where infestation is so severe that vines lose their leaves prematurely and vines may not be able to ripen the canes properly or may die.
- Post-harvest sprays are allowed only if monitoring records indicate that the infestation early in the season did not exceed 2% and that the outbreak really only occurred later. These applications may be made with hand lances only. Ensure that the whole vine (foliage, cordon, crutch and stem) is thoroughly wetted. Spot applications must be made, unless monitoring indicates that the infestation is so widespread throughout the block that spot sprays are not feasible.
- If 75% or more of mealybugs are parasitized after harvest, spraying is not required, since most mealybugs will be dying anyway.
- Soil or trunk and foliar applications of systemic products can be considered as an alternative to cover sprays.
- The status of the appropriate agrochemicals is listed in Appendix 3B, Insecticides, on the IPW website..

General:

- The presence of a negligible percentage of mealybug infestation is required for biological control to be successful.

Weevils*Monitor:*

- Remove bark of 20 vines/ha (evenly spread through vineyard) and place one corrugated cardboard band around the trunk of each vine before 10-cm shoot length. Inspect every week.
- OR
- Leave wild shoots on 20 vines/ha and inspect weekly for feeding damage.

Control:

- Place sticky trunk barriers around trunks of vine, training poles and anchor wires.
- OR
- Spray only the stems of vines in infested spots with hand lances (not the whole block) when the first weevils appear.
 - In the case of bush vines stem barriers are difficult to apply and the spraying of infested vines is allowed. Try to prevent shoots and bunches from touching the ground as far as possible. Hand lances should be used so that insecticides can penetrate properly under loose bark and into cracks where weevils hide.
 - The status of the appropriate agrochemicals is listed in Appendix 3B, Insecticides, on the IPW website.

General:

- Pyrethroids are exceptionally harmful to the natural enemies of mealybug and red spider mite and their use can lead to outbreaks of secondary pests.

Bud mite*Monitor:*

- Inspect vines during growing season for shoot, leaf and bunch symptoms.
- AND
- Have buds analysed microscopically during pruning if infestation is suspected.

Control:

- Apply control measures only if bud analysis indicates that the infestation warrants control.
- The status of the appropriate agrochemicals is listed in Appendix 3B, Insecticides, on the IPW website.

General:

- Pay special attention to susceptible cultivars such as Muscat, Cabernet Sauvignon, Frans and Fernao Peres.

Leaf blister mite ("Knoppiesblaarmyt")*Monitor:*

- Inspect vines during the growing season for leaf symptoms.

Control:

- Apply control only if severe symptoms occur on young growth and limit normal growth.
- The status of the appropriate agrochemicals is listed in Appendix 3B, Insecticides, on the IPW website.

General:

A sulphur programme for the control of oidium will also suppress leaf blister mite.

Red spider mite*Monitor:*

- Inspect 20 leaves/ha every week until October with a magnifying glass, and fortnightly thereafter until harvest.
- If more than 5 mites per leaf occur, contact an expert for advice.

- Pay special attention to young vines in blocks with a history of spider mite infestation.

Control:

- Fewer sprays for weevils, mealybug and ants will benefit the biological control of mites.
- No chemicals are registered for chemical control on vines.

13.2 Other pests

Fruit fly

Monitor:

- Place one pheromone trap per 2 hectares from pea-size stage.
- Commence control when first fruit flies are found in traps.

Control:

- Splash or spray large droplets of toxic bait weekly on alternate rows only.
- Apply toxic bait to host plants in home gardens and in the vicinity of vineyards. Start in winter and apply once a month on warm days.
- The status of the appropriate agrochemicals is listed in Appendix 3B, Insecticides, on the IPW website.

Snails

Monitor:

- Snail clearly visible during autumn and before budding.

Control:

- Spray cover crop or weeds on "bankies" with herbicide before budding and immediately place toxic bait at the bases of vines.
- Bait should also be placed during autumn when snails become active and lay eggs.

General:

- Ducks can also be used for biological control of snails.
- Where heavy infestations occur, plant cover crops that are not attractive to snails.
- Pay attention to breeding places of snails outside the vineyard, e.g., along ditches.
- The status of the appropriate agrochemicals is listed in Appendix 3B, Insecticides, on the IPW website.

Thrips

Monitor:

- Monitor twenty (20) vines per block during flowering: Hold white paper or a white container under the flowering bunch and tap bunch lightly. Thrips will fall onto paper and are clearly visible.
- If more than 10 thrips occur per bunch, contact an expert for advice.
- Inspect new shoots, especially growth tips, after harvest for signs of thrips feeding damage.

Control:

- Sulphur sprays for oidium control will suppress thrips populations if numbers are low.

General:

- Thrips are seldom an economic problem on wine grapes. Thrips damage to grape berries is normally negligible and can easily be confused with mechanical damage such as wind or abrasion marks. Severe feeding damage during the late season occurs occasionally and can be managed with appropriate insecticide sprays to protect the secondary growth that is responsible for accumulation of reserves in grapevines.

Leafhoppers

Monitor:

- Inspect underside of leaves for presence of nymphs.
- Inspect leaves for feeding damage/symptoms.

Control:

- Apply chemical control only when leafhopper numbers are extremely high or when more than 40 % of leaves show symptoms of feeding damage.
- The status of the appropriate agrochemicals is listed in Appendix 3B, Insecticides, on the IPW website.

Vinegar flies (*Drosophila*)*Control:*

- No chemical control must be applied.
- Avoid physical damage by birds, oidium, botrytis, fruit fly and compact bunches that can lead to sour rot.

General:

- Vinegar flies do not cause sour rot, but merely lay eggs in damaged berries. Larvae feed on yeasts in rotting berries.

Nematodes*Monitor:*

- If vines grow or bear poorly in certain spots, soil must be examined by means of profile holes.
- Take soil and root samples and have nematode analyses done by an expert. Take 20 sub-samples at 15-45 cm soil depth distributed throughout the vineyard, mix well and take a combined sample of approximately 2 kg soil and roots for analysis.
- Also examine for other soil-borne pests.

Control:

- If vines are planted in soil where rootknot nematodes occur, use the best resistant rootstocks as recommended by an expert.
- If nematode analyses show that high numbers of harmful nematodes are present before planting or in established vineyards, apply chemical control. Chemical control may only be applied if soil analyses indicate that it is required.
- Correct all other soil-restricting factors with the assistance of an expert.
- The status of the appropriate agrochemicals is listed in Appendix 3D, Nematicides, on the IPW website.

General

If rootknot, ring or dagger nematodes occur in the soil, consult an expert to select a cover crop that is not a host to these nematodes.

Phylloxera*Monitor:*

- If vines grow or bear poorly in certain spots, take soil and fine root samples during summer. Take soil and root samples during the summer. Phylloxera will not be detected on roots during winter or early spring.
- Have fine roots examined by an expert for the presence of phylloxera.

Control:

- Use resistant rootstocks.
- No chemicals registered for control.

Other insects

Do not apply control without expert advice.

13.3 Main diseases

The main diseases are oidium, downy mildew, Botrytis and sour rot. Diseases are mostly controlled preventatively, although registered products with curative action are available.

Oidium (Powdery mildew)

Monitor:

- None (preventative control)

Control:

- Applications from budding (2-5 cm shoot length) until before harvest, taking retention periods into account.
- Applications early in the season, as well as during flowering and pea size are essential.
- Compliance with anti-resistance strategies to prevent development of resistance to fungicides is crucial. Keep to restrictions regarding the number of applications per season and alternate between different chemical groups of systemic fungicides.
- The status of the appropriate agrochemicals is listed in Appendix 3C, Fungicides, on the IPW Website.

General:

- Oidium causes berries to burst and gives rise to serious secondary Botrytis and sour rot damage.
- Wine quality is reduced when infected bunches are used.

Downy mildew

Monitor:

- None (preventative control).

Control:

- Applications from 10-cm shoot length until before harvest, taking retention periods into account.
- All growth stages are very important, especially from flowering until pea size. Larger berries are resistant to the fungus, but berry and bunch stems remain susceptible right up to harvest.
- Use systemic chemicals before and during flowering and/or when weather conditions favouring the development of downy mildew are forecast.
- Compliance with anti-resistance strategies to prevent development of resistance to fungicides is crucial. Keep to restrictions regarding the number of applications per season and alternate between systemic fungicides of different chemical groups.
- The status of the appropriate agrochemicals is listed in Appendix 3C, Fungicides, on the IPW Website.

Botrytis

Monitor:

- None (preventative control).

Control:

- The following factors are critical to reduce the incidence of botrytis: irrigation, fertilisation and canopy management (see guidelines 8, 9, 10, and 11).
- If serious Botrytis problems are experienced in a particular area, apply fungicides from flowering until harvest, taking withholding periods into account. Control from véraison until harvest is very important when conditions are favourable for the disease.
- Compliance with anti-resistance strategies to prevent development of resistance to fungicides is crucial. Keep to restrictions regarding the number of applications per season and alternate between different chemical groups of systemic fungicides.
- Control of insects and other pests that damage berries is very important.
- Limit all work actions that can result in damage to berries.
- The status of the appropriate agrochemicals is listed in Appendix 3C, Fungicides, on the IPW Website.

Sour rot*Monitor:*

- None (observe physically during ripening).

Control:

- Avoid physical damage by birds, oidium, Botrytis, fruit fly and compact bunches.

General:

- Preventative chemical control not known.
- Harvest selectively so that bunches with sour rot do not end up in the cellar.

Leafroll

Leafroll disease is caused by a complex of viruses, restricted to the phloem tissue of the vine. It affects ripening and quality of grapes negatively and also shortens the lifespan of vines. Leafroll viruses are transmitted by grafting and by insect vectors. Grapevine mealybug is the most important vector of leafroll viruses.

Monitor:

- Note symptoms in the vineyard: leaves curl downwards, areas between veins turn yellow (white cultivars) or red (red cultivars), while the veins remain green.
- Virus determination (ELISA or PCR) in vines where infection is suspected.

Control

- No chemical control.
- Plant certified virus-free material.
- Control vine mealybug and ants – see Guideline 13.1.
- Limit the spread of leafroll by following the appropriate Winetech Protocol, available on www.ipw.co.za

13.4 Other diseasesDead arm*Monitor:*

- Monitor symptoms on shoots early in season, especially in wet conditions shortly after budding.

Control:

- Control from budding until before flowering.
- The status of the appropriate agrochemicals is listed in Appendix 3C in the IPW Manual.

Anthraxnose*Monitor:*

- Monitor symptoms on shoots and leaves early in season.

Control:

- Control from budding until véraison.
- The status of the appropriate agrochemicals is listed in Appendix 3C, Fungicides, on the IPW Website.

General:

- Anthracnose generally occurs in summer rainfall areas only.

Die-back*Monitor:*

- Mark infested plants during spring/early season when symptoms are obvious.

Control:

- Preventative treatment of pruning wounds.
- Avoid pruning during rainy weather.

- Remove infected arms/cordons to prevent spreading of disease.
- Burn infected wood immediately – do not leave wood piles, as spores can spread from there.

General

- The fungus destroys the woody parts of vines, causes dwarfing and malformation of new growth and destroys bunches, resulting in decreased overall vigour and yield, and eventual death of vines.

Petri disease (previously Black goo) and Black foot disease

Monitor:

- Monitor symptoms on young vines (1-5 years).

Control:

- Plant certified material only.
- Apply good establishment practices carefully.
- Avoid stressing vines, especially during planting and vine establishment.
- **Avoid excessively high crop loading during first year of harvest.**
- No chemical control registered.

Phytophthora root rot

Monitor:

- Monitor symptoms especially where wet (waterlogged) soil conditions occur.

Control:

- Plant resistant rootstocks.
- Treat nursery vines with hot water before planting.
- Avoid bad drainage and/or excessive irrigation.
- Foliar sprays with phosphonates.
- The status of the appropriate agrochemicals is listed in Appendix 3C, Fungicides, on the IPW Website..

Agricultural Pests Act, No. 36 of 1983

Fertilizer, Farm feeds, Agricultural remedies and Stock remedies Act, No. 36 of 1947

Conservation of Agricultural Resources Act, No. 43 of 1983

National Environmental Management: Waste Act, Nr 59 van 2008

National Environmental Management: Air Quality Act, Nr 39 of 2004

National Environmental Management Act, Nr 107 of 1998

National Water Act, No. 36 of 1998

Occupational Health and Safety Act, No. 85 of 1993

Health Act, No. 63 of 1977

14 HANDLING OF CHEMICALS

Incorrect usage of agricultural chemicals, particularly pesticides and fungicides, can cause irreparable harm to man and the environment. Procedures and requirements pertaining to the handling, storage and disposal of agricultural remedies on farms are contained in **SANS 10206:2010**. Pay particular attention to the following:

Storage of agricultural remedies (Annex D in SANS 10206)

- The store must comply with the national building regulations to ensure that chemicals are not kept in ramshackle buildings that may collapse in extreme weather.
- All chemicals must be locked in a separate store, which complies with the legal requirements. Stores must be watertight, well lit so that labels can be read easily, well ventilated to prevent build-up of irritating and toxic fumes, have sufficient isolation to ensure that the temperature does not rise too high, precautions must be taken to prevent environmental pollution in case of spillage, must have measuring facilities, must have washing facilities for people and clothing, and different types of agrochemicals must be stored separately and not directly on the floor - see note.

- A record (stock control) must be kept of supplies, usage and disposal of chemicals.
- Fertilisers must be stored under cover away from direct sunlight. Piles of gypsum, lime, compost and manure should be covered and precautions must be taken to prevent leaching into water sources during rain.

Note: Farms that only store small volumes of agrochemicals on the premises, may use a storeroom as indicated in Annex C in SANS10206, provided that volumes/amounts **do not exceed** the maximum quantities specified in Annex C.

Handling and application

- Statutory prescriptions regarding the handling of chemicals must be adhered to. Use of any agricultural chemical in a way other than prescribed on the label, is an offence.
- The prescribed protective clothing must be used during the handling and application of chemicals.
- It is a legal requirement that handlers of chemicals and spray operators receive thorough training in the safe handling and application of agricultural remedies, as well as in basic first aid (at least one operator per team). To comply with best practice and international standards, training in safe handling should be done every four years (certificate valid for 3 years).
- Keep certificates at hand as proof of training
- Handlers of chemicals and spray operators must be declared medically fit to work with agricultural chemicals by an occupational health practitioner (medical doctor qualified in occupational health).
- Handlers of chemicals and spray operators must undergo medical examinations by an occupational health practitioner at least once every 2 years. This examination includes a blood test for cholinesterase enzyme activity to determine if there are any signs of pesticide exposure. Depending on which agrochemicals are used and how often spraying is done, the occupational health practitioner may recommend that these examinations and blood tests be done more frequently (e.g. annually). Results of all tests must be available for auditing.
- Consult www.sasom.org to find your nearest occupational health practitioner.
- No workers may be present in a vineyard while spraying is being done, no matter what is being applied.
- No workers may enter a vineyard until the spray residue has dried completely.
- Some products have additional restrictions regarding re-entry periods. This is a legal instruction which will be indicated on the product label and must be obeyed.

Filling stations

- Refill points should be situated away from water sources and designed to prevent pollution of water sources and the environment.
- All filling stations on the farm must have a floor of non-porous material (waterproof cement or concrete) bounded by a retaining wall.
- Excess spray mixture and water used to rinse off and rinse out spray tanks may not contaminate the soil or end up in ditches, rivers or storage dams.
- Construct a shallow, waterproof evaporation pit into which contaminated water can be channeled. Cover with a metal or wire mesh to prevent animals and birds from drinking the water.
- Add a handful of agricultural lime after every spray session to increase the pH, as this helps to break down the active ingredients more rapidly.
- U-V radiation (sun) and high pH break down the active ingredients and the water evaporates.
- Cover the pit when it rains to prevent rainwater from filling the pit.
- Alternative: install a tank to contain contaminated water from the filling station. The contents should be removed by a registered hazardous waste disposal company.
- The Dept. of Water and Sanitation (D.W.S.) confirmed that rock or seepage drains and “French drains” are not legally accepted for disposal of pesticide-contaminated run-off water in South Africa.

Spray drift

- Take all precautionary measures as indicated on product labels during application of pesticides to prevent spray drift from polluting the environment, natural water sources or adjacent properties.
- Do not spray if the wind speed exceeds 10 km/h or the wind direction takes spray drift in the direction

of water sources or neighbours.

- Calibrate spray equipment regularly.
- Choose the correct droplet size: too small droplets will evaporate or drift away before reaching the target crop, thereby reducing efficacy of pest and disease control.
- Aim spray nozzles at the canopy and not up into the air.
- Plant a double windbreak to catch any possible spray drift which could pollute adjacent properties or natural water sources and courses.

Disposal of empty containers

To qualify for IPW members must comply with the principle of environmentally safe and sustainable disposal of all containers of agrochemical products, including herbicides, insecticides, nematicides and fungicides, in accordance with South African legislation. Detailed guidelines on the cleaning, disposal and recycling of different types of containers are available on the CropLife SA website:

www.croplife.co.za/container-management/

- **Empty plastic pesticide containers may not be buried or burned/incinerated on farms.** Empty containers should be triple-rinsed, rendered unserviceable (puncture or cut up) and removed for recycling. In order to manage potential risk for the farm management/owner, recyclers of plastic agrochemical containers should supply a letter on the letterhead of the company (including registration number), stating that the containers are destined for recycling and that they are transported, stored and processed according to relevant legislation and SANS regulations (10406:2014 and 10206:2010).
- A list of CropLife South Africa approved collectors and recyclers is available under Waste Management on www.croplife.co.za.
- **Other pesticide containers**, like paper bags and cardboard boxes, foil-lined paper bags, aluminium containers for phosphide pesticides and glass bottles should be cleaned and disposed of as described on the CropLife SA website (www.croplife.co.za/container-management/).

NOTE:

- A document entitled *Guidelines for handling, storage and disposal of agrochemicals in the South African wine industry* is available on the Winetech website [www.winetech.co.za]. It discusses the requirements of SANS 10206 applicable to grapevine growers.
- A checklist which summarizes specifications for the pesticide store, the handling and application of agricultural remedies and the disposal of empty containers according to SANS 10206 is available in the IPW Manual for Farms.
- SANS10206: 2010 can be freely downloaded from:
<https://law.resource.org/pub/za/ibr/za.sans.10206.2010.pdf>

SANS 10206:2010. Edition 2. The handling, storage and disposal of pesticides.
Fertilizer, Farm feeds, Agricultural remedies and Stock remedies Act, No. 36 of 1947
National Environmental Management: Waste Act, Nr 59 van 2008
National Environmental Management: Air Quality Act, Nr 39 of 2004
National Water Act, No. 36 of 1998
National Environmental Management Act, No. 107 of 1998
Occupational Health and Safety Act, No. 85 of 1993
Health Act, No. 63 of 1977

15 RECORD KEEPING

Participants are required to keep the following records for auditing purposes:

- Environment management plan for the farm and conservation management plan, where appropriate.
- Records of energy (electricity) and fuel consumption.
- All results from analyses and recommendations, i.e. soil analyses, profile studies, recommendations regarding which cultivars and rootstocks to plant, etc.
- All results of soil and leaf analyses, recommendations and applications of nutrients/fertilisers and other

ameliorants (note registration number of fertilisers). Results of analysis of organic fertilisers (compost or manure) and amounts applied, should also be kept.

- Volumes of water abstracted from water sources and volumes applied to vineyards must be measured and recorded.
- Proof (certificate/diploma) that spray operator training was done by an accredited person/organisation.
- Written instructions to spray operator/applicator for each application of an agrochemical, signed by the operator and the person who ordered the application are recommended.
- All recommendations regarding pest, disease and weed control by an expert or accredited advisor.
- Complete spray record of all insecticide, fungicide, herbicide, as well as growth regulator applications. Spray records **must** contain the following information, otherwise the evaluation and calculation of the score cannot be completed: trade name or active ingredient/-s of the product; date and time of growing season applied, dosage (amount of product per 100 L water); spray volume (L) per hectare (amount of tank mixture/ha) applied (example available in IPW Manual).
- **The IPW Certificate of the farm, as well as the IPW Training certificate of the producer/manager must be available on the farm at all times for auditing purposes.**

D IPW EVALUATION: FARM

Appendix 1, Table 1 A & B, as well as Appendix 2A, 2B and 2C must be completed annually to evaluate compliance with the Guidelines for farms and to determine whether the farm qualifies for an IPW certificate. **Detailed instructions** for completion of these tables are given in the **IPW Manual**. Use the IPW Manual to complete the evaluation forms. The tables with coding of agrochemicals and application methods are available on www.ipw.co.za.

IPW EVALUATION FORM: FARM

APPENDIX 1

Evaluation per item according to guidelines	Good 5	Average 3-2	Poor 0	Total
1 IPW training				
2 Farm and vineyard environment				
2.1 Use Table 1A to calculate point out of 60. 5 bonus points awarded for carbon footprint calculation.				
2.2 Use Table 1B to calculate the point out of 30 (only if natural areas on the farm that have to be conserved)				
3 Soil and terrain				
4 Cultivars				
5 Rootstocks				
6 Vineyard layout				
7 Cultivation practices				
7.1 Cover crop cultivation				
7.2 Herbicide programme (App. 2A) [X2]				
8 Nutrition [X2]				
9 Irrigation				
10 Pruning, training and trellising				
11 Crop and canopy management				
12 Growth regulators				
13 Integrated Pest Management [IPM]				
13.1 Monitoring [X2]				
13.2 Practices [X2]				
13.3 Spray programme (App. 2B & C) [X10]				
14 Handling of chemicals <i>Use checklist in manual.</i>				

14.1 Store for chemicals [X2]				
14.2 Filling points [X2]				
14.3 Medical examinations & records [X2]				
14.4 Training of spray operators [X2]				
14.5 Protective gear, ablution facilities [X2]				
14.6 Disposal of empty containers [X2]				
15 Record keeping [X2]				
TOTAL OUT OF 270 (Only Table 1A completed)				
TOTAL OUT OF 300 (Tables 1A & B completed)				

Qualifying score: Farms without natural areas: Minimum 176 points out of 270 [$\geq 65\%$]
 Farms with natural areas: Minimum 195 points out of 300 [$\geq 65\%$]

CUT-OFF POINTS FOR EVALUATION OF SPRAY RECORDS

Appendix 2A: Herbicides

0-10 = Good, 5 points transferred to guideline 7.2 in Appendix 1
 11-20 = Average, 2-3 points transferred to guideline 7.2 in Appendix 1
 >20 = Poor, 0 points transferred to guideline 7.2 in Appendix 1

Appendix 2B & C: Insecticides, nematicides & disease control products

0 – 50 = Good, 5 points transferred to guideline 13.3 in Appendix 1
 51 – 100 = Average 2-3 points transferred to guideline 13.3 in Appendix 1
 >100 = Poor 0 points transferred to guideline 13.3 in Appendix 1

Hereby is confirmed that the evaluation forms were completed and submitted as prescribed.

 Name of farm

 Telephone number

 Producer's name

 Signature

 Date

TABLE 1. EVALUATION OF CONSERVATION AND MANAGEMENT OF FARM AND ENVIRONMENT

Table 1A must be completed by all farms. If no natural areas occur on the farm, Table 1B is not completed.

TABLE 1A. Environment management of farming activities				
	Yes (1)	No (0)	Total	
1. Do you have an environment management plan for the farm (farming activities)? X3				
2. Are action plans in the environment management plan completed and objectives reached? X3				
3. Is storm water from buildings and roads suitably channeled to prevent erosion of soil and riverbanks, and silting up of wetlands? X1				
4. Is all water usage (bore holes, dams/weirs, extraction from river, modification of riverbanks) registered at or authorised by the Dept. of Water and Sanitation? X5				
5. Efficient use of water: are measures in place to ensure that irrigation and household use do not waste water unnecessarily? X1				
6. Water quality – are measures in place to ensure that sewerage systems and storm water do not affect quality of water sources negatively? X1				
Do you comply with the guidelines and are measures, practices or procedures in place to address the following risks?	Yes (1)	No (0)	NA (1)	Tot
7. Have you left sufficient buffer zones for natural vegetation along water courses and around dams to prevent soil erosion? X2				
8. Did you improve/enlarge any farm dams to increase their value as habitat for wildlife (e.g. planting of indigenous species around the dam, create a wetland at inlet of dam, re-stocking with indigenous fish species)? Enlargement of dams can only be done with authorisation from the Dept. of Water and Sanitation. X1				
9. Are problem animals and household pests (rats, mice, etc.) controlled or managed in an environment friendly way (methods acceptable to conservation bodies like CapeNature and WWF SA)? X1				
10. Effect of habitat disturbance on wildlife – natural vegetation corridors left or established between blocks, actions to mitigate effects, e.g., posts and platforms for raptors, nesting boxes for owls or bats? X2				
11. Does fuel storage (fuel tank) comply with guidelines & legislation? X5				
12. Does disposal of household and other solid waste (e.g., dirty oil, oil filters, batteries, scrap metal) comply with guidelines and legislation? X5				
13. Is any waste recycled or sent away for recycling? X3				
14. Are alien invasive plants (declared weeds) in/around vineyards, orchards, fields & home cleared according to a plan and recommended methods? X5				
15. Are measures/practices in place to reduce air and noise pollution by implements and machinery (regular service and maintenance of compressors, vehicles, other machinery)? X1				
16. Has provision been made for the impact of tourism on the infrastructure & environment? X1				
17. Do you have a fire-fighting plan for the farm and have all fire hazard priority areas been identified? X2				
18. Is the farm equipped with sufficient, regularly maintained fire-fighting equipment? X2				

19. Are you a member of a Fire Protection Association?	X1				
20. Are risks of other farming activities (e.g. dairy, quarry) sufficiently addressed and relevant legislation complied with?	X2				
21. Are records of fuel consumption and regular maintenance and service of implements and machinery kept? Are measures in place to limit fuel consumption?	X4				
22. Are records of energy consumption (electricity, gas, etc.) kept? Are measures in place to reduce consumption or make it more efficient?	X4				
23. Development & expansion: were required permits and/or rezoning obtained, were required impact assessments done?	X5				
5 Bonus points for carbon footprint calculation (see Note 1)					
TOTAL for Table 1A [point out of 60 – transfer to App. 1 (IPW evaluation form)]					
Table 1B. Conservation and management of natural areas					
2.2.1 Threatened ecosystems		Yes (1)	No (0)	NA (1)	Tot
1. Have you obtained ploughing permits for all developments on virgin soil? (Note: see regulations under 2.2.1 Threatened ecosystems).	X5				
2. Have you investigated the conservation value of the farm's natural habitats (i.e. vegetation survey by a specialist, species-list, etc.)?	X1				
3. Do you have a conservation management plan drawn up for the farm (See IPW manual).	X3				
4. Are action plans in the conservation management plan implemented and objectives reached?	X1				
5. Have the natural areas been awarded some form of formal protection (e.g., WWF Conservation Champion status, Special Management Area, Private Nature Reserve)?	X1				
2.2.1 Rivers and Wetlands					
6. Do you have adequate buffer zones along rivers and wetlands?	X2				
7. Is the flow of all rivers and water sources feeding into wetlands still in a natural state (natural flow not altered or interfered with)?	X3				
8. Have you improved/enlarged any aquatic habitat (farm dams, river edges, wetlands) to increase their value as wildlife habitat (e.g. alien clearing, rehabilitation of riverbanks with indigenous vegetation)?	X2				
9. Are the wetlands on the property still in a natural state?	X2				
2.2.2 Invading Alien Species					
10. Have you begun with alien clearing operations?	X2				
11. Do you have an alien clearing schedule/clearing plan, or at least a record of cleared areas?	X1				
12. Have you used the recommended herbicides for alien clearing, correct dosages and prescribed application methods (see guidelines).	X1				
13. Have you attempted to control/mitigate against alien invasive grasses or have you attempted to remove/control other alien species, besides alien trees?	X1				
2.2.3 Fire management in natural areas					
14. Is a fire management plan for the natural areas in place and is the firefighting equipment adequate for control of veld fires?	X2				

15. Have any farm workers received formal fire-fighting training? X1				
16. Are there adequate firebreaks/roads to access the natural areas and have all the areas with high fire-risk been identified? X1				
17. Is the age of the veld known and is there a plan for controlled burns which includes correct burning frequency and season? X1				
Bonus points (see Note 2)				
TOTAL for Table 1B [point out of 30 – transfer to App. 1 (IPW evaluation form)]				

NOTE 1: Bonus points for carbon footprint calculation (5 points) are awarded in Table 1A if records for fuel and other energy consumption (e.g. electricity) are used to calculate the farm's carbon footprint with the aid of the Carbon Calculator on the Confronting Climate Change website (www.climatefruitandwine.co.za). The carbon calculator report must be uploaded onto the IPW website.

NOTE 2: Bonus points (maximum 2 points) can be awarded for the following type of activities: You have gone out of your way to protect biodiversity or implemented innovative environmental best practices (e.g. recycling programme for all farm waste, Environmental Education activities for farm workers or schools, established an indigenous nursery or plant herbarium, etc.). You must have a **written motivation** to substantiate any bonus points you award yourself.

EVALUATION OF SPRAY RECORD: HERBICIDES

APPENDIX 2A

NAME AND FORMULATION OF PRODUCT/ACTIVE	IP CO-DING [A]	Amount of active (kg) applied per hectare [B]	APPLICATION METHOD [C]						% of vineyard area treated [D]*	Within guidelines X1 Outside guidelines X10 [E]	Point per Application [AxBxCxDxE]
			Pre-emergence products			Post-emergence products					
			Ridge [X2]	Work row [X3]	Full surface [X5]	Ridge [X1]	Work row [X1]	Full surface [X2]			
TOTAL FOR HERBICIDE SPRAY PROGRAMME											

* % area expressed as decimal: 100% = 1.0 and 10% = 0.1

EVALUATION OF SPRAY RECORD: PESTICIDES AND NEMATOCIDES

APPENDIX 2B

NAME AND FORMULATION OF PRODUCT/ACTIVE	IP CODING [A]	Coding of application method [B]	STAGE OF SEASON APPLIED [C]			% vineyard area treated [D]*	Within guidelines X1 Outside guidelines X10 [E]	Point per Application [AxBxCxDxE]
			Harvest to leaf drop [X4]	Leaf drop to full bloom [X1]	Full bloom to harvest [X2]			
TOTAL FOR PESTICIDE SPRAY PROGRAMME (Transfer to 2C below)								

* % area expressed as decimal: 100% = 1.0 and 10% = 0.1

EVALUATION OF SPRAY RECORD: DISEASE CONTROL PRODUCTS

APPENDIX 2C

NAME AND FORMULATION OF PRODUCT/ACTIVE	IP CODING [A]	Coding of application method [B]	STAGE OF SEASON APPLIED [C]			% vineyard area treated [D]*	Within guidelines X1 Outside guidelines X10 [E]	Point per Application [AxBxCxDxE]
			Harvest to leaf drop [X2]	Leaf drop to full bloom [X1]	Full bloom to harvest [X2]			
TOTAL FOR FUNGICIDE PROGRAMME (Appendix 2C)								
TOTAL FOR PESTICIDE PROGRAMME (Appendix 2B)								
TOTAL FOR SPRAY PROGRAMME (2B + 2C)								

* % area expressed as decimal: 100% = 1.0 and 10% = 0.1

CODING OF APPLICATION METHODS FOR PESTICIDES

APPLICATION METHOD	CODING	REMARKS
<i>INSECTICIDES, MITICIDES-AND MOLLUSCICIDES</i>		
Toxic bait – granules, coarse droplets	1	E.g. snail bait, fruit fly bait sprays.
Stem treatments with hand lances, knapsack sprayers, ring applicators.	1	E.g. ant and weevil (snoutbeetle) control.
Spray applications during Dormancy: - Hand lances, knapsack sprayers - Spray pumps	2 4	E.g. mealybug control before budding.
Spot sprays with hand lances or knapsack sprayers during season	2	Only treat infested vines and adjacent ones.
Soil application of systemic insecticides	3	E.g. mealybug control with imidacloprid.
Full cover sprays during season	4	
Dusting powders during season	4	
<i>DISEASE CONTROL PRODUCTS</i>		
Full cover sprays during season	1	
Dusting powders during season	4	Greater risk of pesticide drift, resulting in exposure of non-target organisms and habitats.
<i>NEMATOCIDES</i>		
Soil fumigation	4	
Soil application of granules, liquid	3	