



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

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

August 2010

**Compiled by ARC Infruitec-Nietvoorbij
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 vigour 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 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.

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 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, namely someone directly in charge of grape production.
- All course attendants will receive a certificate as proof that they completed an accredited IPW course.

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

areas, 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 (where applicable). The IPW Manual for Farms gives information regarding the identification of risks to the environment and how to compile conservation and environment management plans.

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 laid out 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 channelled to prevent soil erosion, erosion of river banks and silting up of wetlands.
- In view of the national water shortage, all water abstraction from a river or underground source must be registered with the Dept. of Water Affairs & Forestry. 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 waterflow, digging drainage ditches or infilling by dumping soil and rubble, without written permission from the relevant authority.
- Farm dams with a capacity >10 000m³ must be registered and dams with a capacity >50 000m³ must be licensed with Department of Water Affairs & Forestry.
- Minimize pesticide drift from vineyards onto natural areas. Where possible use IPM methods and try to avoid drift altogether.
- Minimize fertilizer run-off onto 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 efficiency of household water use, 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.
- During the design phase of new vineyard blocks layout, consider leaving corridors 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 advised to contact CapeNature regarding the most environmentally friendly and effective method of 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 tanks and filling areas for fuel on farms must be situated on an impenetrable cement slab, bounded by a wall of at least 20 cm high to prevent spilt fuel from contaminating the environment. 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.
- If household waste is not removed to a municipal waste disposal site, refuse disposal sites on farms must be fenced and be situated more than 100 m away from all water sources and sensitive environments. Leachate from waste disposal sites may not pollute groundwater.
- Waste from farm workshops (e.g. old 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 old oil. Oil should not be disposed of on farm roads, because it leads to soil and water pollution.
- Refer to the following sections for more detail on waste management:

Guidelines for farms:

Section 14 - Handling of Chemicals

Guidelines for cellars:

Section 8.1-8.4 - Wastewater management (including monitoring, the amount and quality of cellar waste water; storing and disposal of wastewater)

Section 10.1 - Disposal of solid waste

Section 10.2 - Cleaning of waste water dams, pipes and other equipment

- 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.
- 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 fire fighting.
 - Joining a Fire Protection Association (FPA) will help to ensure that you comply with legislation.
- 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 with the "carbon calculator" on the IPW website.
 - 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 IPW website. Summaries of annual energy consumption can be used to demonstrate that use is stable or has been reduced
- **Development/extension/changing 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, river banks 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 & 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 worked for more than 10 years is regarded as virgin soil.
- As of 2006, the removal of any natural vegetation comprising an area of 3 ha or more requires authorisation from the Provincial Department of Environmental Affairs.
- It is strongly recommended that producers who still have areas of natural vegetation, especially lowland vegetation types, enlist the help of the BWI extension officers or CapeNature (or your regional equivalent) to determine the conservation value of these areas. Not all natural areas have the same conservation priority. Land owners 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 to truly ensure that 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.
- 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, all water abstraction from a river or underground source must be registered with the Dept. of Water Affairs & Forestry. 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 waterflow, 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 water courses. The buffer width around wetlands depends on the characteristics of the wetland, but 25 - 75m is recommended. Buffer zones along rivers and water courses (riparian zones) should ideally be 30 – 40m wide. 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 allows 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 Conservation of Agricultural Resources Act (No 43 of 1983), is available on the downloads page of the BWI website.
- All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing.
- A general rule of thumb is to first target lightly infested areas before tackling densely invaded areas, and prioritize sensitive areas such as river banks and wetlands. For details on the recommended clearing methods for each common alien species, consult the CapeNature "Landowner Alien Clearing Manual", which is available on the BWI website (downloads page).
- 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 (e.g. Indian house crow, smallmouth bass, trout, carp, mallard ducks or feral pigs) is available in the IPW Manual.

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 actually 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.

- Incorporate a fire fighting plan for the natural areas into the fire fighting plan for the farm as a whole.
- 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.
- 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. 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 can be carried out in the prescribed season, a permit must be obtained from the local fire protection agency (if one exists in the area).

2.2.4 Biodiversiteit & Wyn Inisiatief (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. Producers can become recognised as **members** (entry level) or **champions** (exemplary level) of the initiative by setting aside an area of natural habitat for conservation and fulfilling other criteria. For more information, consult the BWI website [www.bwi.co.za] or contact Gareth Hardres-Williams (021 – 884 4789 or 082 304 8278) or Joan Isham (021 – 884 4789 or 082 376 3646).

NOTE: More detailed information and practical guidelines for biodiversity management are available in the IPW Manual for Biodiversity [see www.ipw.co.za or www.bwi.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
Environmental Conservation Act, No. 73 of 1998
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: 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 will adapt best.

- 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.
- 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 preparatory methods.

Conservation of Agricultural Resources Act, No. 43 of 1983
National Water Act, No. 36 of 1998
Atmospheric Pollution Prevention Act, No. 45 of 1965

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 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 taken into account 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 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 shoot growth 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 as soil potential changes.

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 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 AVCASA and/or ACDASA 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 plant growth should be allowed to establish, which can be 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 off 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 AVCASA and/or ACDASA 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 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. A table which groups registered herbicides according to mode of action and risk of resistance is available on the IPW web page under "IP Codings". Producers should try to alternate products from different groups as far as possible to minimise the risk of resistance.

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 fertilisation, 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 pH 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. 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 need not 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 (resistance lower than 300 ohm) potassium sulphate should be applied and not potassium chloride.
- 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.
- 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. Homemade compost should be analysed to determine the nutrient composition. Records of all analyses should be kept.
- Records of all soil and leaf analyses, as well as of all applications of nutrients (including micro nutrients) 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.

- 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 vineyards' 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.

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, strives 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.

12 GROWTH REGULATORS

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

- 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.
- For more even and higher percentage budding only cyanamide and Partner G may be used.

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 practices as discussed in the guidelines for IP are prerequisites for successful control.

Rating of pesticides and fungicides: all registered fungicides, pesticides and herbicides are rated by the AgChem Environmental Work Group, based on their potential impact on the environment. This rating allows producers to select products that will minimise the negative impact on the environment.

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 sterilants 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 red spider 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 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 November is important to avoid mealybug outbreaks later in the season.
- Pheromone traps can also be used in conjunction with the degree day model 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 guns or backpack sprays.
- Applications on ridges ("bankies") are not very effective, because the chemicals easily wash away into the soil and it is not environmentally friendly.
- Treat all vines, 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 guns 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 application of systemic products can be considered as an alternative to cover sprays.
- The IP-status of the appropriate agrochemicals are given in Appendix 3B in the IPW Manual.

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 guns (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 guns 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 in the IPW Manual.

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 in the IPW Manual.

General:

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

Erinose mite

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 in the IPW Manual.

General: A vine sulphur programme for the control of oidium will also suppress erinose 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.

3.2 Other pests

Fruit fly

Monitor:

- Place one pheromone trap per hectare or vineyard block 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.
- Spray host plants in home gardens and in the vicinity of vineyards with toxic bait. Start in winter and apply once a month on warm days.
- Full cover spray during growing season only if baiting programme was not successful.
- The status of the appropriate agrochemicals is listed in Appendix 3B in the IPW Manual.

Snails*Monitor:*

- Snail clearly visible before budding.

Control:

- Spray cover crop or weeds on "bankies" with herbicide before budding and immediately place toxic bait.
- Bait can also be placed during winter.

General:

- Ducks can also be used for biological control of ants.
- 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 in the IPW Manual.

Thrips*Monitor:*

- Monitor 20 vines per block during flowering.
- Hold white paper under 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.

Control:

- Dusting sulphur for oidium control will suppress thrips populations.

General:

- Thrips damage is normally negligible and can easily be confused with mechanical damage such as wind- or rubmarks. Thrips are seldom a problem on wine grapes.

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 in the IPW Manual.

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 in the IPW Manual.

General

If 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:

- Examine when vines grow or bear poorly in certain spots (as for nematodes).
- Have roots examined by an expert for the presence of phylloxera during the summer.

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. All diseases must be controlled preventatively.

Oidium (Powdery mildew)

Monitor:

- None (preventative control)

Control:

- Applications from budding (2-5 cm) 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 in the IPW Manual.

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.
- Use contact killers.
- Use systemic chemicals before and during flowering and/or when weather conditions favourable for 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 in the IPW Manual.

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 given 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 in the IPW Manual.

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) in vines where infection is suspected.

Control

- No chemical control.
- Plant certified 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.

Anthracoze*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 in the IPW Manual.

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 registered products are given in Appendix 3C in the IPW Manual.

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

Environment Conservation Act, No. 73 of 1998

National Water Act, No. 36 of 1998

Atmospheric Pollution Prevention Act, No. 45 of 1965

National Environmental Management Act, No. 107 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 10206:2005** and encompass the following:

- The local authority (local fire authority, public health, sewerage, building inspectorate, ect.) must give permission to erect a pesticide store on a farm and a certificate of occupancy must be issued in accordance with the national building regulations.
- In the case of existing pesticide stores, a site plan must be submitted to the town planner/building inspectorate at the local authority in order to obtain a certificate of occupancy.
- 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, temperatures must 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.
- 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.
- 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.
- Refill points should be designed to prevent pollution of water sources and the environment.
- A record must be kept of supplies, usage and disposal of chemicals.
- The prescribed protective clothing must be used during the handling and application of chemicals.
- Handlers of chemicals and spray operators must be declared medically fit to work with agricultural chemicals and must undergo annual medical examinations (consult district surgeon) for signs of pesticide exposure and poisoning.
- Handlers of chemicals and spray operators must 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). Keep certificates at hand as proof of training.
- Left-over chemicals may not end up in ditches, rivers or storage dams.
- **Empty containers may not be burned/incinerated on farms.** Empty containers should be triple-rinsed, rendered unserviceable (puncture or cut up) and removed for recycling. Consult the IPW Manual for further information. Alternatively, empty containers (plastic, metal and other) and obsolete or unwanted chemicals should be removed for disposal at a registered hazardous waste landfill site by a company such as Wastech or Wasteman.

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: 2007 applicable to grapevine growers.
- A checklist which summarises 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.
- SANS10206 is available from all regional offices of the SABS.

*SANS 10206:2005. Edition 2. The handling, storage and disposal of pesticides.
Fertilizer, Farm feeds, Agricultural remedies and Stock remedies Act, No. 36 of 1947
Environment Conservation Act, No. 73 of 1998
National Water Act, No. 36 of 1998
Atmospheric Pollution Prevention Act, No. 45 of 1965
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:

- 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.
- Irrigation: measurements, scheduling and volumes applied.
- Calibration certificates of spray application equipment, issued by an accredited person/organisation.
- Proof (certificate/diploma) that spray operator was trained 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.
- 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 done: 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).
- Written instructions to spray operators for each application of agricultural remedies are recommended.
- **The IPW Proof of Registration and IPW Certificate of the farm, the IPW Training certificate of the producer/manager, as well as a copy of the latest set of evaluation forms supplied to the cellar 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 evaluation tables and tables with the **coding** of agrochemicals and application methods are given in the **IPW Manual**. Use the IPW Manual to complete the evaluation forms.

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 <i>Use Table 1A & B to calculate the score out of 20</i>				
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				
14.2 Filling points				

14.3 Medical examinations & records				
14.1 Training of spray operators				
14.5 Protective gear, ablution facilities				
14.6 Disposal of empty containers				
15 Record keeping [X2]				
TOTAL OUT OF 200				

Qualifying score: Minimum 130 points out of 200 [$\geq 65\%$]

Disqualification :
 1. If non-permitted residues appear in grapes.
 2. If withholding periods are exceeded.
 3. If unregistered chemicals are used.

CUT-OFF POINTS FOR EVALUATION OF SPRAY RECORDS

Appendix 2A: Herbicides

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

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

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

Hereby is confirmed that the evaluation forms were completed and submitted as prescribed, together with any action plans required, if any of the criteria to qualify for an IPW certificate under 2.3 of Section D were not complied with.

 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, one mark is filled in under the column "NA" in Table 1B.

Table 1A. Environment management of farming activities			
	Yes (1)	No (0)	
1. Do you have an environment management plan for the farm (farming activities)?			
2. Are action plans completed and objectives reached?			
3. Is storm water from buildings and roads suitably channelled to prevent erosion of soil and river banks, and silting up of wetlands?			
4. Is all water usage (e.g. bore holes, dams/weirs, extraction from river, modification of river banks) registered at or authorised by the Dept. of Water Affairs?			
5. Efficient use of water: are measures in place to ensure that irrigation and household use do not waste water unnecessarily?			
6. Water quality – are measures in place to ensure that sewerage systems and storm water do not affect quality of water sources negatively?			
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)
7. Have you left sufficient buffer zones for natural vegetation along water courses and around dams to prevent soil erosion?			
8. Did you improve/enlarge any farm dams to increase their value as habitat for wildlife (e.g. planting of indigenous plants on dam walls, restocking with indigenous fish species) ?			
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) ?			
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?			
11. Does storage of fuel (fuel tank) comply with guidelines?			
12. Does disposal of household and other solid waste (e.g. dirty oil, oil filters, batteries, scrap metal) comply with guidelines and legislation?			
13. Is any waste recycled or sent away for recycling?			
14. Are alien invasives (declared weeds) in/around vineyards, orchards, fields & home cleared according to a plan and recommended methods?			
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).			
16. Has provision been made for the impact of tourism on the infrastructure & environment?			
17. Do you have a fire fighting plan for the farm and have all fire hazard priority areas been identified?			
18. Is the farm equipped with sufficient, regularly maintained fire fighting equipment?			
19. Are you a member of a Fire Protection Association?			

20. Are risks of other farming activities (e.g. dairy, quarry) sufficiently addressed and relevant legislation complied with?			
21. Are records of fuel consumption and regular maintenance and service of implements and machinery kept? Are measures in place to limit fuel consumption?			
22. Are records of energy consumption (electricity, gas, etc.) kept? Are measures in place to reduce consumption or make it more efficient?			
23. Development & expansion: were required permits and/or rezoning obtained, were required impacy assessments done?			
Bonus points (see Note 1)			
Subtotal for Table 1A			
TABLE 1B. Conservation and management of natural areas			
2.1.1 Threatened ecosystems	Yes (1)	No (0)	NA (1)
1. Have you obtained ploughing permits for all developments on virgin soil? Note: Since July 2006 you must obtain authorization from the Dept of Environment Affairs (DEADP) to remove <u>any</u> natural vegetation >3 ha.			
2. Have you investigated the conservation value of the farm's natural habitats (i.e. vegetation survey by a specialist, species-list, etc.) ?			
3. Do you have a conservation management plan/policy drawn up for the farm (See IPW manual)?			
4. Are action plans implemented and objectives reached?			
5. Have the natural areas been awarded some form of formal protection (i.e. conservancy, Special Management Area (SMA), Private Nature Reserve)?			
2.1.1 Rivers and Wetlands			
6. Do you have adequate buffer zones along rivers and wetlands? (Recommended width of natural vegetation buffers are 30-40m on either side of a river and 25-75m around a wetland).			
7. Is the flow of all rivers and water sources feeding into wetlands still in a natural state (i.e. natural flow not altered or interfered with)?			
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 river banks with indigenous vegetation)?			
9. Are the wetlands on the property still in a natural state?			
2.1.2 Invading Alien Species			
10. Have you begun with alien clearing operations?			
11. Do you have an alien clearing schedule/clearing plan, or at minimum a record of cleared areas?			
12. Have you used the recommended herbicides for alien clearing, correct dosages and prescribed application methods (see guidelines)?			
13. Have you attempted to control/mitigate against alien invasive grasses or have you attempted to remove/control other alien species, besides alien trees (e.g. mallard ducks, feral pigs, bass, trout)?			
2.1.3 Fire Management			
14. Is a fire management plan for the natural areas in place and is the firefighting equipment adequate for control of veld fires?			
15. Have any farm workers received formal fire-fighting training?			
16. Are there adequate firebreaks/roads to access the natural areas and			

have all the areas with high fire-risk been identified?			
17. Is the age of the veld known and is there a plan for controlled burns which includes correct burning frequency and season?			
Bonus points (see Note 2)			
Subtotal for Table 1A			
Subtotal for Table 1B			
Total out of 40			
POINT TRANSFERRED TO APP. 1 (IPW EVALUATION FORM) = TOTAL OUT OF 40 DIVIDED BY 2			

NOTE 1: Bonus points (maximum of 2 points) can be 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 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 CODING [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, i.e. 100% = 1.0 and 10% = 0.1

EVALUATION OF SPRAY RECORD: PESTICIDES AND NEMATICIDES

APPENDIX 2B

NAME AND FORMULATION OF PRODUCT/ACTIVE	IP RATING [A]	Coding of application method [B]	STAGE OF SEASON APPLIED [C]			% vineyard area treated* [D]	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, i.e. 100% = 1.0 and 10% = 0.1

EVALUATION OF SPRAY RECORD: DISEASE CONTROL PRODUCTS

APPENDIX 2C

NAME AND FORMULATION OF PRODUCT/ACTIVE	IP RATING [A]	Coding of application method [B]	STAGE OF SEASON APPLIED [C]			% vineyard area treated * [D]	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, i.e. 100% = 1.0 and 10% = 0.1