RESOLUTION OIV-VITI 422-2011

OIV GUIDELINES FOR SUSTAINABLE VITICULTURE ADAPTED TO TABLE GRAPES AND RAISINS: PRODUCTION, STORAGE, DRYING, PROCESSING AND PACKAGING OF PRODUCTS

THE GENERAL ASSEMBLY

Following the proposal of the Scientific and Technical Committee and having considered the works of the Commission I "Viticulture" and the Sub-commission “Table grapes, raisins and unfermented vine products”,

WHEREAS resolution CST 1/2004 establishes guidelines for the production of grapes, wines, spirits and other vine products in accordance with the principles of sustainable development applied to vitiviniculture,

WHEREAS resolution CST 1/2008, “OIV Sustainable Vitiviniculture Guide: Production, processing and packaging of products”, establishing guidelines for sustainable production, transformation and packaging of vitivinicultural products.

DECIDES to adopt the following guide for implementing environmental sustainability in the sector of table grapes and raisins.

RECOMMENDS that Member States make reference to this guide, as appropriate, as a basis for the development, updating and/or review of national or regional procedures for environmentally sustainable production of table grapes and raisins, principally concerning production, storage, drying and processing of grapes, in addition to packaging of these products.

RECOMMENDS that periodically, in line with the revision of resolution 1/2008, the OIV review and revise, as necessary, this guide, taking in consideration the operational experience and feedback from Member countries.

OIV Sustainable Guide for table grape and raisins production: Environmental Issues

INTRODUCTION

Sustainable vitiviniculture is defined by the OIV as a “Global strategy on the scale of the grape production and processing systems, incorporating at the same time the economic sustainability of structures and territories, producing quality products,

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considering requirements of precision in sustainable viticulture, risks to the environment, products safety and consumer health and valuing of heritage, historical, cultural, ecological and landscape aspects."

In order to comply with this definition, this document constitutes an implementation guide for environmentally sustainable production in the table grapes and raisins sector (specifically production, storage, drying and processing of grapes, in addition to packaging of products), while acknowledging the broader considerations for sustainable production.

1. GENERAL PRINCIPLES

Activities in the table grapes and raisins sector are highly dependent on natural resources: solar energy, climate, water, soils and the successful integration of these elements with ecological processes. Therefore, protection, and preservation of these natural assets through environmentally sustainable practices are imperative for the long-term viability of viticultural activities.

The following principles constitute a base from which to promote a coordinated and efficient approach to the international table grape and raisins sector's commitment to environmental sustainability.

1. The selection of an appropriate environmental sustainability program should be based on the program's ability to satisfy three aspects of sustainable development: economic, environmental and social sustainability. It is acknowledged that the triple bottom line balance will vary between individual enterprises, and that enterprises will require flexibility in establishing programs of environmental sustainability in their individual operating environments.
2. The development of sustainable activities is based on an environmental risk assessment. Priority should be given to risks of significance in individual geographic regions where vineyards, storage, drying, processing and packaging plants and are located.
3. Environmental risk assessment should consider, but not be limited to:
    a. Site selection (for new vineyards)
    b. Biodiversity
    c. Variety selection (for new vineyards)
    d. Solid waste

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e. Soil management
f. Energy use
g. Water management
h. Air quality
i. Wastewater
j. Neighbouring land us
k. Human Resource Management
l. Agrochemical use

4. A process of planning for environmental sustainability activities, implementation of the activities, assessment of their effectiveness and modification of the activity for application in the future should be established to ensure continuous control and improvement.
5. Table grapes and raisins environmental sustainability programs should incorporate 'self-assessment' and other forms of evaluation to gauge deficiencies and improvements in environmental performance.
6. The improvement of information and education opportunities linked with challenges facing sustainable development about sustainability issues should be undertaken to build overall awareness of the international table grapes and raisins sector.
7. The international vine and wine sector should recognise the importance of intra and inter-sectorial cooperation for natural resources management, improving the sector's sustainability and for an optimal ecological and social management, including in particular, inputs and equipment.

2. ORGANISATIONAL ISSUES

In compliance with regional, national and international regulations applicable to the table grapes and raisins sector and to agricultural practices, the management of vineyards, storage, drying, processing and packaging facilities should at least include the following steps:

- identification of areas to be protected because of their environmental and

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landscaping interest and in addition to, if necessary, implementation of improvement measures at the level of the vineyard, buildings and elaboration facilities;

- regular updating of information on grape production, drying and processing techniques which contribute to sustainable development;
- provision of in-house or external training for personnel in the application of sustainable development techniques relating to environmental issues;
- traceability of interventions and the use of inputs at the various production stages;
- adaptation of work in order to optimise energy use;
- production of a diagnosis, a quantitative inventory and a management plan for effluents and waste, focussing on their reduction, recycling or reusing.

3. SITE AND INFRASTRUCTURE

All infrastructure and equipment related to vineyard, storage, drying, processing and packaging facilities should be selected in accordance with continual improvement principles which take into account issues such as the environmental performance of the supplier and optimal use of energy and water, durability of service and item in addition to recycling possibilities.

a. Conception

- Buildings and associated infrastructures should be designed and constructed with due regard to visual and functional compatibility with the local environment, the optimal use of water and the need to minimise pollution and degradation of the environment.
- The storage, drying, processing and packaging installations should integrate, if necessary, effluent and waste management.
- Loading and unloading bays and wash-down areas should be planned. Sealing materials and fitting out of those impermeable areas should be appropriate for the degree of wear and for occasional risks.

b. Selection of the site (vineyards and infrastructure)

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- From a pedoclimatic vantage point, vineyards for the production of table grape or raisins should be set up in areas, which allow the correct maturing of the grapes, with low rainfall during the growth cycle (especially between veraison and harvest for table grapes, and between veraison and drying for raisins), to avoid being susceptible to pathogens, and with irrigation where possible. Negative effects of some climatic factors (precipitation) during phenological periods, before veraison, should not be overlooked.
- Vineyards, buildings for raisin processing, storage and packaging of products should be established in full recognition of the adverse aspects linked to proximity to high density housing, and risks linked to mining activity and heavy industry. Likewise, sites which are in regions with hydrographically sensitive drainage basins, high water-table level or risk of flood should be avoided as far as possible.

c. Construction

- During soil preparation/cultivation for vineyards, processing and packaging infrastructure, the damage and harmful effects caused to the landscape and environment should be limited insofar as possible.
- The choice of construction material should take into account thermal inertia and insulation in view of optimal energy management.

4. INPUTS AND PRODUCTION EQUIPMENT

Input control is a fundamental principle of environmentally sustainable production.

Materials and viticultural inputs, such as plastic covers, plant protection products, fertilizers and soil conditioners, gibberellins or other growth regulators, pre-drying products, as well as dipping solutions and packaging materials, should limit environmental impact to a minimum and favour renewable resources. Their use should be restricted to the minimum quantities necessary to achieve the desired outcomes.

Management of processing aid usage, both pre- and post-treatment, is a significant practical issue and should take into account issues of waste reduction, waste storage and its disposal.

a. Water and energy

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- Water and energy required for cultivation, grape production, storage, drying operations, raisin processing and packaging should be controlled through optimisation of infrastructure, equipment and processes with the most water and energy efficiency. In this manner, we limit waste water generation and reduce energy use and chemical inputs.

b. Equipment

- Vineyard equipment, raisins processing, and product packaging equipment should be designed with due regard to: respect for the product, safety, and operational efficiency, particularly with regard to energy, water, hygiene management, noise and environmental pollution reduction.
- Refrigerants should be selected for their low impact potential on the environment (ozone layer, greenhouse gas).
- Insect control in grape and raisins storage and packaging buildings and related zones (for example the floor around stacks of unprocessed raisins), should be carried out using environmentally-friendly methods. Fumigation should be avoided, and fogging with pyrethrins should be preferred, in accordance with the practices suggested by the manufacturers.

5. EFFLUENTS AND WASTE

Management of effluent, by-products and waste is a fundamental consideration in environmentally sustainable table grape and raisins production. Emphasis should be placed on initiatives for waste reduction at the source and on recovering useful and active materials from waste products, recycling waste components as part of selective management by appropriate supply channels. In general, the elimination of waste and effluents should minimise its impact on the environment and the local community.

The end use of effluents should determine the treatment and the choice of chemicals to be used as disinfectants and cleaning agents.

A regular quantitative and qualitative inventory of by-products and waste facilitates the adaptation of viticultural practices and raisins processing, equipment and the choice of management methods. This inventory is especially important for specific waste (batteries, drainage oil, hydraulic oil, dipping solutions, etc).

The separation and promotion of by-products during the raisins processing, such as stems, cap-stems, grit and other foreign matter are important imperatives for

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sustainability. In order to facilitate waste recovery or purification, and to minimise the quantity of residual waste or pollutants it is important to limit the presence of solid matter and reduce use of chemicals.

The quantitative and qualitative characterisation of effluents should be based on analytical parameters such as Biochemical Oxygen Demand (BOD) or Chemical Oxygen Demand (COD), pH and possibly electrical conductivity and Sodium Adsorption Ratio (SAR). This characterisation enables the identification of the treatment required and the optimisation of the choice and capacity of the treatment device or process.

Emphasis should be placed on ensuring optimum waste and by-product management or water treatment and notably suspended particles and sludge.

Areas should be set up downstream for equipment and machine wash-down (tractors, sprayers), as well as fuel separation and water treatment systems in compliance with local environmental regulations. When harvesting machines are used (raisins production), these should undergo the same treatment, in order to minimise the environmental impact of their use.

Handling or washing of mobile equipment near a water-course or sampling site should be avoided.

5.1. Waste storage and conservation

- Storage and treatment of effluent and solid waste should be carried out in dedicated areas which minimise the risk of their alteration or contamination, either of or by other materials. These areas should be located in a manner which also minimises their sensory impact and pollution potential with respect to the community and landscape.
- Solid waste should be selectively sorted and stored to facilitate its reprocessing, recycling or adapted, low environmental impact disposal.
- Store non-useable or out-of-date phytosanitary products in their original packaging separate from useable products; dispose of them via a supply channel that avoids any risk for the environment.
- Store empty phytosanitary, fertiliser and growth regulators packaging, if necessary rinsed and drained, in a sheltered area limiting the risks for the environment. Packaging must be eliminated in accordance with local regulations.
- Waste soiled by phytosanitary products must be kept in storage facilities for

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phytosanitary products or in a sheltered place, limiting the risks for humans and the environment.

5.2. Treatment and recovering

- Separation of contaminated and uncontaminated liquid waste is an essential consideration at all sites. Ideally, design should be adapted to facilitate liquid waste separation and to minimise potential air-borne contamination.
- Effluent treatment systems should be adapted to the size of the processing plant and its peak effluent generation periods. Treatment systems should favour agronomical or biological processes with an efficient use of energy.
- Application of treated wastes in vineyards, orchards and fields should take into account the characteristics of the soil and crops.
- Monitoring of treatment provisions should be carried out based notably on the following criteria: BOD or COD and pH. On the basis of specific local risks, the monitoring may be complemented by analyses such as: electrical conductivity, sodium absorption ratio.

6. SUSTAINABLE PRODUCTION APPLIED TO GRAPE PRODUCTION OPERATIONS

6.1. Establishing the vineyard

The following criteria must be followed when establishing a vineyard:

- Determine the viticultural aptitude and potential of the site.
- Before any soil preparation/cultivation, carry out a soil study, taking into account pedological issues.
- Take into account water availability and water protection requirements.
- Ensure, by appropriate installations:
    - Biodiversity maintenance
    - Surface water management in order to limit the risks from run-off and

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erosion

- Surface and subsoil drainage

- Eliminate vine stumps and other plant remains likely to contaminate the soil with pathogens.
- If necessary, leave the soil fallow or establish a cover crop for a certain time before replanting always adapted to the local context.
- When required (and permitted), limit to a strict minimum any chemical disinfection of the soil and adapt it to local environmental requirements.
- Establish initial and amended fertilisation methods and input quantities for fertilizer maintenance based on, in particular, representative soil and sub-soil analyses and carry them out according to regional requirements.
- Use plant material (vine type and rootstock) free from serious viral diseases and suitable for the local conditions and the required type of production. L
- Choose a vine training system compatible with sustainable production, taking into account the following items:
    - water requirement
    - grape quality
    - soil protection
    - soil potential
    - vine vigour
    - reducing risks of pests and disease
    - application of phytosanitary products
    - density and layout of the vines
    - protection of landscapes values

6.2. Nutrition

Nutrition should be based on the nutrients exported via the vine and the mineral and organic reserves of the soil, as well as the soil type:

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- fertiliser input should be compatible with the production of quality grapes, the health of the vine, the maintenance of balanced soil fertility and be mindful of the extent of soil exploitation by the root system;
- the quantity and the nature of input should be controlled and based in particular on a soil and/or plant tissue analysis (basic analysis and regular fertility controls) and observation of plant vigour;
- nitrogen input and the times of application should be evaluated in relation to the needs of the vine, the quality of the grapes, the green covering or cover cropping technique, the type of soil and the risks of leaching;
- fertilization should be applied according to regional references if they exist, soil types, the vine's uptake and the risks of deficiencies;
- preference should be given to recycling organic source nutrients across the vineyard;
- fertilisers or soil conditioners, containing substances toxic or dangerous for the environment, such as heavy metals, organic micro-pollutants or pathogenic micro-organisms, should satisfy national and/or international standards;
- foliar top-dressing should be used only to prevent or treat clearly established or clearly anticipated deficiencies, or activate plant growth.

6.3. Soil maintenance

Soil maintenance is designed to create optimum conditions for the plant, to prevent erosion, soil compaction, and leaching of nutrients, while promoting biological diversity.

All the appropriate measures to protect the soil against erosion should be taken: green covering, cover cropping, ground coverage or mulches (straw, compost etc), site adaptation, terrace maintenance, soil cultivation, input of lime and organic soil conditioners.

Green covering must be evaluated on the basis of the following items:

- level of precipitation and soil water reserves
- risks of erosion, leaching and soil compaction
- vine training system

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- age of the vine
- grape quality and output,
- frost risk.

Preference should be given to plant coverage of the soil in winter in order to fix nitrogen and prevent losses by leaching and winter erosion.

The technique and the timing of mechanical cultivation should take into account environmental concerns and the prevailing and forecast weather conditions.

In the case of raisins production, minimum soil cultivation should be preferred after veraison, to prevent ochratoxin-A formation.

The introduction of mulch should take into account the timely release of nutrients, the risk of fire spreading and the possible presence of potentially toxic elements (heavy metals, organic micro-pollutants).

The use of herbicides should be limited to the absolute minimum and their implementation optimised, while emphasising weed control using direct application products.

The type of weeding should be chosen on the basis of effective control, taking into account the energy impact and environmental impact (risk of residue build-up in the soil, soil degradation and contamination of water resources).

6.4. Irrigation

Recognising OIV Resolution VITI 2/2003 for vineyard water management and irrigation programmes, it is recommended to take into account the following items:

- all the techniques for limiting water requirements (tolerance to water stress, viticulture techniques etc.) should be implemented first and foremost;
- water input should be based on needs related to table grapes and raisins production objectives at the various stages of the vine development, the type and specific nature of the grape , taking into account the water balance of each vineyard;
- irrigation should stop before harvest to reach higher sugar concentration for the production of raisins;
- the risks of environmental impact, in particular in terms of soil salinity and underground water, should be avoided in order to ensure sustainable viticulture;

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- preference should be given to irrigation techniques designed to optimise water efficiency, such as micro or drip irrigation, and to considering their effects on the distribution of the root system.
- Similarly, over time evaluation of measures of soil water reserves and vine water status should be prioritised as the basis for determining volume and timing of irrigation water supply.

6.5. Vine training and canopy management

The best time for winter pruning should be selected according to local climatologic conditions in order to:

- limit phytosanitary contamination risk
- limit pruning wounds and thus reduce the risk of wood rotting diseases. (Resolution VITI 02/2006)
- limit the usage of dormancy breaking agents and other substances with hormonal action.

The vine should be pruned, formed and trained, through canopy management, in order to ensure a good balance between plant development and production.

Canopy management, in particular tying, disbudding and summer pruning operations, should enable satisfactory ventilation of the grapes as well as good penetration of light and phytosanitary products.

6.6. Pest and Disease Management

a. Basic strategy

The purpose of phytosanitary protection is to effectively protect the vine against pests and diseases, while respecting the environment.

All preventative measures are to be implemented in priority before using direct control methods.

When direct pest control is required, priority should be given to cultural, mechanical, biological or biotechnical control methods. This control should be based on tolerance thresholds, risk assessment and information provided by technical advisory services.

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Risk assessment should be based on the following items:

- Monitoring (records to be kept)
- The indications of warning services
- Pest/Disease forecasting models and risk assessment
- The biological follow-up of diseases and pests

Preventative treatments should be evaluated according to risk potential for developing diseases and pests.

The following preventative measures are invaluable in aiding vine protection (these are also identified by Resolution VITI-OENO 1/2005):

- The use of suitable vine types and rootstocks
- The use of suitable vine training systems
- The choice of crop cultivation methods in order to limit the pressure of diseases and pests (balanced fertilisation, controlled irrigation, canopy management, etc.)
- Soil maintenance (green covering, soil cultivation period)
- Preserving beneficial organisms.

Annual and updated regional information documents, as well as fungal disease and insect forecasting models, if they exist, should be used as the basis for a protection strategy.

Products should be used within the currently enforced regulatory framework. For the uses mentioned, the registered dosage and the interval indicated (pre-harvest timeframe) should be respected.

The strategy for use of phytosanitary products should be dependent upon the classification of products on the basis of their toxicity and environmental impacts.

The products and quantities used should be those which are compliant with legal restrictions, label guidance and which ensure effective control of pests and diseases, taking into account the following issues:

- The phenological stage and the surface area of the plant to be protected
- Undesirable effects on beneficial fauna and non-target organisms

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- Toxicity in particular for bees, aquatic organisms and other beneficial organisms
- Risks of developing resistance
- Risks of water or soil pollution
- Risks of residues in the grapes

b. Handling and application of phytosanitary products

The application technique, the choice and setting of the appliance and the weather conditions should enable optimum and targeted distribution of the plant protection products.

It is recommended to use spraying equipment that reduces the level remaining in the tank and which is easy to clean.

During the handling and application of phytosanitary products, it is specially recommended to:

- Have available a filling area with a system which avoids possible water network contamination and a system which limits the risk of accidental overflows or spillage;
- If topographic conditions allow so, rinse the tanks of the spray onto the parcel, then spray the vine with the diluted rinsing water;
- Forbid any handling or washing of the spray equipment near a water-course or sampling site.

Maintenance and calibration of the pesticide application equipment should be regularly carried out by the user and, if necessary, it should be periodically tested by an approved procedure.

Techniques and suitable protective equipment should be used by the spray operator in order to avoid any risk of intoxication/contamination associated with the preparation of the mixture and with spraying.

c. Storage of phytosanitary products

The management of phytosanitary products should at least comply with the following recommendations:

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- Store products in a clearly identified area specifically reserved for this purpose, aired or ventilated, locked with a key and organised to avoid any contamination or accidents, and in compliance with local regulations.
- Keep phytosanitary products in their original packaging with the label.
- Store non-useable or out-of-date phytosanitary products in their original packaging separate from useable products;
- Retain safety factsheets for products used.

6.7. Use of covering material of the vines

In regions where coverings or plastic netting are used, in order to enable the anticipation of the maturation and harvest period or the maintaining of grapes on the vine while delaying harvest time, certain principles should be respected:

- introduction of biodegradable material, if available;
- maintenance strategy for increasing life span
- elimination in accordance with environmental standards;
- reduction of impact on landscape

6.8. Harvesting

Table and dried grape harvest operations present some specific challenges with respect to inputs, pollution management of by-products and effluents.

a. Harvesting operations

- Harvest and transportation must be carried out in order that grape quality is maintained and guaranteed while limiting energy consumption linked to the transportation of grapes to be dried, and to the transportation and the cooling of table grapes during storage. Grapes to be dried should have minimum 22% sugar in order to obtain better quality.

b. Contamination risks

- Harvest time must be selected in accordance to the safety period of active

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substances used for phytosanitary protection and in accordance with the MLR objective standards. Grape bunches are selected in accordance to physical integrity and absence of apparent rotting.

- In raisins production, rotted or cracked berries should not be mixed with healthy ones on drying sheets to minimise toxigenic fungi formation risks.
- Physical cleaning of grape handling baskets and equipment with hot water should be favoured over the use of chemical cleaning agents. Consideration should be given however to water availability, energy balance and potential of greenhouse gas emissions as part of the decision making process.
- Solid and liquid by-products of operations of the table grapes and raisins should be stored in a manner which minimises the risk of their alteration or contamination and reduction of their environmental impacts pending management or treatment.

6.9. Drying

Operations during raisins physical processes, such as separation of the good fruit from stems, capstems, poor fruit, grit, etc., should take into account hygiene, energy use and management of by-products (or solid waste).

- Physically undamaged grape bunches should be laid on polythene sheets, paper trays or rack systems to avoid direct contact with soil.
- Material to be used during drying should be clean and free from biological and chemical contaminants.
- For the raisins production, percentage of water, olive oil and potassium carbonate in dipping solution is regulated according to the temperature and sugar content of grapes.
- Thickness of grape layer to be laid should be suitable not to delay the duration required for drying of dipped and undipped grapes.
- Moisture of dried grapes should be kept under 18% to prevent grapes from microbiological activities.

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7. POST-HARVEST, PROCESSING AND STORAGE

Procedure concerned	Recommendations for Table Grapes	Recommendations for Raisins
7.1. Conservation in cool temperatures	The temperature and additives used for cool storage should be selected considering : • the length of time foreseen for cool storage, • the control of fungal alterations, (*Aspergillus spp., Botrytis cinerea* and *Penicillium spp.),* • the product quality and energy required Consideration should be given to hygiene, energy use, application of technology auxiliaries, operator safety and managing of by-products with regard to operations involving physical procedures Particular consideration should be given in relation to the effects of cooling agents to the ozone layer	For long term periods the temperature (< 10°C) used for cool storage should be selected considering : • the length of time foreseen for cool storage, • the control of fungal alterations, (*Aspergillus spp., Botrytis cinerea* and *Penicillium spp.),* • the product quality and energy required Consideration should be given to hygiene, energy use, application of technology auxiliaries, operator safety and managing of by-products with regard to operations involving physical procedures Particular consideration should be given in relation to the effects of cooling agents to the ozone layer Conservation should be carried out in recipients (boxes or sacks) of maximum 50 kg, in order to protect from physical damage and to be kept in better moisture balance. These materials should be recyclable and washable/re-usable.
7.2. Storage of dried fruit	No particular comments	Particularities related to insect control, etc...

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7.3. Packaging	Special effort should be made to efficiently manage packaging materials when they are no longer usable. The possibility for recycling of packaging elements should be the first option. The following material are recyclable and efforts should be made to efficiently manage this waste: • packaging containers made of wood, plastic, or plastic-lined paper or metal products, • Container seals made of plastic or plastic-coated metal products Packaging materials should be minimised while still permitting an optimal conservation and presentation of the products. Cleaning and sterilisation of packaging equipment surfaces which come into contact with product should favour physical treatments, such as hot water or steam, rather than utilising chemical cleaning or sterilising agents while taking into account energy consumption and water availability	
7.4. Transport	For the transfer in long distance, in low temperature, the grapes should be already cooled, before being loaded onto the means of transport	-

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