COMUNE DI TERLIZZI

LIFE04 ENV/IT/000480

Progetto dimostrativo per la Dichiarazione Ambientale di Prodotto:i fiori di Terlizzi e il marchio ecologico locale

ECOFLOWER TERLIZZI

Task n.7

CONTRIBUTION TO THE DEFINITION OF THE ENVIRONMENTAL CRITERIA OF FLOWERS

Doc. n. 33/eng

Rev	Data	Descrizione	Redazione	Verifica	Approvazione
0	20/12/06	Redazione	F. Macchia (Università degli Studi di Bari)	F. Macchia (università degli studi di Bari A. Lomoro (Eco-logica)	M. Guastamacchia (Comune di Terlizzi)
1	27/12/06	Redazione	F. Macchia (Università degli Studi di Bari)		
2	11/01/07	Emissione documento finale	F. Macchia (Università degli Studi di Bari)		

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INTRODUCTION

This task 7 report gives additional information with respect to the product guidelines (Task 5). In order to quantify the environmental excellence of the flower product the main agronomical characteristics that determine environmental excellence were investigated, including internal microclimate that is connected to certain technological and systems aspects.

We gave particular priority to the following characteristics:

- CHOICE OF VARIETIES AND GRAFTING STOCK OF THE ORNAMENTAL SPECIES GROWN
- REQUIREMENTS OF THE YOUNG PLANTS UNDER CULTIVATION
- SYSTEM OF CULTIVATION: SOIL (T), HYDROPONICS (F.S.), POT (V)
- QUALITY OF THE AGRICULTURAL LAND
- QUALITY OF THE IRRIGATION WATER
- WATER CONSUMPTION
- MANAGEMENT OF THE NUTRIENT SOLUTION IN HYDROPONICS
- FERTILISERS
- PESTICIDES
- AUTOMATIC CLIMATE MANAGEMENT IN THE GLASSHOUSES
- COLLECTION AND USE OF RAINWATER
- COVERING SYSTEMS FOR ENERGY SAVING
- PRESENCE OF COOLING SYSTEMS
- PRESENCE OF HEATING SYSTEMS
- EFFICIENCY OF VENTILATION SYSTEMS

For each characteristic every nursery was given a score on the basis of the analyses carried out in tasks 2 and 7. The range is from 1 (very poor) to 10 (excellent).

The total score of each nursery gives a judgement on its agronomical practices.

The nurseries were compared in groups with the same product (rose, gerbera, cyclamen) and where possible with the same cultivation system (in earth, in pots, hydroponics).

Only for nursery 10 was it not possible to compare it with other similar nurseries since it is the only participant in the project that grows chrysanthemums.

1 NURSERY SCORES RELATED TO THE MAIN AGRONOMICAL GROWING CHARACTERISTICS OF THE FLOWER PRODUCT

1.1 CHOICE OF VARIETIES AND GRAFTING STOCK

From the scores given all the nurseries participating in the project use varieties of cultivar and grafting stock that are resistant to pathologies (viruses and fungi), and are therefore suitable for cultivation.

Table 1: Score for varieties and grafting stock for hydroponics cultivation of roses

Nurseries	1	2	5	9
Score	8	8	9	9

Table 2: Score for varieties and grafting stock for cultivation of roses on agricultural land

Nurseries	13	19
Score	8	8

Table 3: Score for varieties of Lisyanthus

Nurseries	11
Score	8

Table 4: Score for varieties for the cultivation of gerbera on land (nur. 17) and in hydroponics (nur. 20)

Nurseries	17	20
Score	8	8

Table 1: Score for varieties in the cultivation of cyclamen in pots

Nurseries	10	18
Score	8	8

Table 2: Score for varieties in the cultivation of chrysanthemum on land

Nurseries	14
Score	8

Table 3: Summary of score for varieties

Nurseries	1	2	5	9	10	11	13	14	17	18	19	20
Score	8	8	9	9	8	8	8	8	8	8	8	8

1.2 REQUIREMENTS OF THE YOUNG PLANTS

Regarding rose, gerbera and chrysanthemum cultivation, both on land and with hydroponics, the compliance to the needs of the young plants is given by two parameters: vigour and flowering.

Table 4: Score for the needs of the young plants in the cultivation of roses in hydroponics

Nurseries	1	2	5	9
Score	8	6	8	8

Table 5: Score for the needs of the young plants in the cultivation of roses on agricultural land

Nurseries	13	19
Score	8	8

Table 6: Score for the needs of the young plants in the cultivation of gerbera on agricultural land (n. 17) and in hydroponics (n. 20)

Nurseries	17	20
Score	8	8

Table 7: Score for the needs of the young plants in the cultivation of chrysanthemums on agricultural land

Nursery	13
Score	8

Table 8: Score for the needs of the young plants in the cultivation of Lisyanthus on agricultural land

Nursery	11
Score	8

Regarding the cultivation of Cyclamen in pots, the compliance to the needs of the young plants is shown by certain parameters: central flowering and leaves that are not slack.

Table 9: Score for the needs of the young plants in the cultivation of cyclamen in pots.

Nurseries	10	18
Score	9	9

Table 10: Summary of score for the needs of the young plants

Nurseries	1	2	5	9	10	11	13	14	17	18	19	20
Score	8	6	9	9	9	8	8	8	8	9	8	8

1.3 SYSTEM OF CULTIVATION: SOIL (T), HYDROPONICS (F.S.), POT (V)

There is no doubt that the system of hydroponics cultivation, if in a semi-closed or closed cycle, has agronomical and environmental advantages over cultivation on agricultural land, such as savings on water, fertilisers and pesticides, and a lesser impact on the environment.

On the other hand, if the quality of the land is still good (after years of growing a single crop), in particular in terms of a good amount of residual fertility, an absence of nematodes and of salinity, changing from land to hydroponics is not convenient, neither from an agronomic nor from an economic point of view (because of the high cost of the structure).

As regards cultivation in pots, it would be a good idea, given the economic possibility, to adopt flow and return irrigation systems which would allow good management of the nutrient solution; if not, a drip system guarantees water saving with respect to a sprinkler system.

Table 11: Score for the system adopted in hydroponics rose cultivation

Nurseries	1	2	5	9
Score	8	7	10	10

Table 12: Score for the system adopted in hydroponics gerbera cultivation

Nurseries	20
Score	7

Table 13: Score for the system adopted in rose cultivation on land

Nurseries	13	19
Score	9	8

Table 14: Score for the system adopted in gerbera cultivation on land

Nurseries	17
Score	9

Table 15: Score for the system adopted in chrysanthemum cultivation on land

Nurseries	14
Score	6

Table 16: Score for the system adopted in Lisyanthus cultivation on land

Nurseries	11
Score	6

Table 17: Score for the system adopted in cyclamen cultivation in pots.

Nurseries	10	18
Score	8	8

Table 18: Summary of score for the adopted system of cultivation

Nurseries	1	2	5	9	10	11	13	14	17	18	19	20
Score	8	7	10	10	8	6	9	6	9	8	8	7

1.4 QUALITY OF THE AGRICULTURAL LAND

Table 19: Guide values for the texture of the land

Determination	Unit of measurement	GUIDE VALUES
SKELETON	%	0-10
SAND	% of the TF	25 - 55
SILT	% of the TF	25 - 50
CLAY	% of the TF	10 - 30

Table 20: Score for the quality of the land texture

Nurseries	11	13	14	17	19
Score	10	10	10	10	10

Table 21: Guide values for the electrical conductivity and the organic substance content of the soil

Determination	Unit of measurement	Guide values
Electrical conductivity (EC) in an extract of saturated paste	mS/cm	1-2
Organic substance	g/Kg of the TF	12-38

Table 22: Score for the electrical conductivity and the organic substance content of the soil

Nurseries	11	13	14	17	19
Score	7	10	10	10	10

Table 23: Guide values for the content of available phosphorus and exchangeable potassium

Determination	Unit of measurement	Guide Value

Available phosphate	mg/Kg of the TF	27 - 32
Exchangeable potassium	mg/Kg of the TF	300

Table 24: Score for the content of available phosphorus and exchangeable potassium

Nurseries	11	13	14	17	19
Score	5	4	5	7	7

Table 25: Summary of score for the quality of the agricultural land

Nurseries	11	13	14	17	19
Average score	7,3	8	8,3	9	9

1.5 QUALITY OF THE IRRIGATION WATER

Table 26: Guide values for the quality of the irrigation water

Parameter	Unit of measurement	Guide value
pH	----	6 - 8
EC	dS/m (25°C)	< 0,75
Calcium	ppm	< 150
Magnesium	ppm	< 35
Sodium	ppm	< 50
Chlorides	ppm	< 50
Carbonates and bicarbonates	ppm	< 250
Solphates	ppm S	< 50
Iron	ppm	< 1,0
Manganese	ppm	< 0,6
Copper	ppm	< 0,3
Zinc	ppm	< 0,3
Boron	ppm	< 0,3
Molybdenum	ppm	< 0,05
Surfactants	ppm	< 0,5
Cadmium	ppm	< 0,01
Chrome	ppm	< 0,1
Nickel	ppm	<0,2
Lead	ppm	< 5,0
Mercury	ppm	< 0,002
Fluorides	ppm	< 1,0
Suspended solids	ppm	< 30

Table 27: Average score for the quality of the irrigation water

Nurseries	1	2	5	9	10	11	13	17	18	19	20
Average score	8	8	8	8	8	8	8	8	8	8	8

1.6 WATER CONSUMPTION

SPECIES	**GUIDE VALUES**
ROSE IN SOIL	**30.000 m^3/HA**
ROSE IN OPEN CYCLE HYDROPONICS	**0,60 litres/plant/day**
ROSE IN CLOSED CYCLE HYDROPONICS	**0,28 litres/plant/day**
GERBERA IN SOIL	**6.000 m^3/HA**
GERBERA IN HYDROPONICS	**0,30 litres/plant/day**
CHRYSANTHEMUMS IN SOIL	**7.000 m^3/HA**
LISYANTHUS IN SOIL	**7.000 m^3/HA**
CYCLAMEN IN POTS	**5000 m^3/HA**

Table 28: Average score for water consumption

Nurseries	1	2	5	9	10	11	13	14	17	18	19	20
Score	9	6	10	10	8	7	9	8	8	8	7	8

1.7 MANAGEMENT OF THE NUTRIENT SOLUTION IN HYDROPONICS

Table 29: Score: Open cycle (8), partially closed (9), closed (10)

Nurseries	1	2	5	9	20
Score	9	7	10	10	7

1.8 FERTILISERS

The fertilising elements taken as indicators of correct agronomical dressing practice are electrical conductivity and the pH of the nutrient solution, and the nutrient element contents of nitric nitrogen and ammoniac nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and various trace elements.

Table 30: Guide values for EC and pH in the nutrient solution for flowering species according to Sonneveld (1995)

PHYSICAL DETERMINATION	GUIDE VALUE
EC (Electrical conductivity)	1,5-1,6
pH	5,5 – 6,5

Table 31: Guide value for the mineral element content of the nutrient solution for flowering species according to Sonneveld (1995)

MINERAL ELEMENT	GUIDE VALUE (mg/l)
N-NO3	154
N-NH4	18
P	39
K	200
Ca	140
Mg	18
S	40
Fe	1,60
Mn	0,27
Zn	0,23
B	0,20
Cu	0,05
Mo	0,05

Table 32: Score attributed to the nutrient solution on entry in hydroponics cultivation of rose and gerbera

Determination	Nursery 1	Nursery 2	Nursery 5	Nursery 9	Nursery 20

pH	10	9	10	10	10
Electrical conductivity (EC)	10	7	10	10	10
Total Nitrogen	8	6	6	6	8
Ammoniac Nitrogen	6	6	6	6	10
Calcium	10	8	10	10	8
Sodium	8	8	8	8	8
Magnesium	8	8	4	4	8
Iron	8	8	4	4	8
AVERAGE SCORE	**8.75**	**7,5**	**8.28**	**8.28**	**8,75**

Table 33: Guide values of the physical parameters and of the average mineral element content of the nutrient solution for flowering species grown in soil.

MINERAL ELEMENT	GUIDE VALUE (mg/l)
pH	5,5 -6,0
EC	1,5- 1,6
N	120
P	60
K	240

Table 34: Score attributed to the nutrient solution for flowering species grown in soil

Determination	Nursery 11	Nursery 13	Nursery 14	Nursery 17	Nursery 19
pH	8	10	8	10	10
Electrical conductivity (EC)	8	10	8	10	10
Nitrogen	9	10	9	10	10
Phosphorus	4	8	4	8	8
Potassium	6	8	6	8	8
Average score	**7,0**	**9,2**	**7,0**	**9,2**	**9,2**

Table 35: Score attributed to the nutrient solution for flowering pot plant species

Determination	Nursery 10	Nursery 18
pH	8	8
Electrical conductivity (EC)	8	8
Nitrogen	8	8
Phosphorus	8	8
Potassium	8	8
Average score	**8**	**8**

1.9 PESTICIDES

Regarding pesticides we were interested in consumption, respect of the safety intervals and adoption of integrated protection techniques.

A score of 10 is the optimum, all scores <10 are not following correct agronomical practice.

1.9.1 Pesticide consumption

Table 36: Score for consumption

Nurseries	1	2	5	9	10	11	13	17	14	18	19	20
Score	8	7	9	9	8	9	4	8	8	8	8	8

1.9.2 Respecting the safety interval

Table 37: Score for respecting the safety interval

Nurseries	1	2	5	9	10	11	13	14	17	18	19	20
Score	8	7	9	9	8	9	6	8	8	8	8	8

1.9.3 Adoption of integrated plant protection techniques

Table 38: Score for adoption of integrated protection techniques

Nurseries	1	2	5	9	10	11	13	14	17	18	19	20
Score	8	7	9	9	8	9	9	8	8	8	8	8

Table 39: Average score for the pesticides category

Nurseries	1	2	5	9	10	11	13	14	17	18	19	20
Average score	8	7	9	9	8	9	6,3	8	8	8	8	8

1.10 AUTOMATIC CLIMATE MANAGEMENT IN THE GLASSHOUSES

Climate control in glasshouses is of fundamental importance for the correct management of plant growth and for water saving during irrigation as well as for reducing parasite infestations.

There is no doubt that computerised climate management (score = 10) is the best choice, but this can only be practical in medium and large sized nurseries, given the high cost of the computer, the software and the probes.

Table 40: Score for automatic glasshouse climate management

Nurseries	1	2	5	9	10	11	13	17	18	19	20
Average score	8	8	10	10	8	8	8	8	8	8	8

1.11 RAINWATER COLLECTION

The use of rainwater collected in concrete pools for flower irrigation has agronomical advantages because of the lack of salts dissolved in it, but also has clear economic and environmental advantages through non-consumption of other water sources and the preservation of the saline interface of the groundwater of the territory of Terlizzi.

Table 41: Score for rainwater collection

Nurseries	1	2	5	9	10	11	13	17	18	19	20
Average score	8	10	10	8	10	10	10	10	10	10	10

1.12 COVERING SYSTEMS FOR ENERGY SAVING

From the results of task 3 we can see that the burning of fossil fuels for heating has the most impact for the environment for those flowers that need heat. Glasshouses are heated particularly for rose production where it has a quantitative and qualitative importance. If a nursery has double glazing of glass or EVA and uses thermal screens it scores 10, if it has double glazing in EVA or glass it scores 9, if it uses a double layer of PE 8, if it uses a single layer of EVA or glass with thermal screening 7, if it uses a single layer of PE with thermal screening 6, if it uses a single layer of EVA or glass 5, if it uses a single layer of PE 5.

Table 42: score for the adoption of covering systems that allow energy saving

Nurseries	1	2	5	9	10	11	13	17	18	19	20
Average score	6	5	6	6	9	6	6	6	6	6	6

1.13 PRESENCE OF COOLING SYSTEMS

The presence of cooling systems made of evaporating panels or a fog-system allows for better climate management in glasshouses and above all extends production to periods when it would otherwise be too hot in the glasshouses. This also allows greater use of the structures and systems for cultivation and increases production, thus reducing impact.

Table 43: Score for use of cooling systems

Nurseries	1	2	5	9	10	11	13	17	18	19	20
Average score	8	8	10	8	8	8	10	8	8	8	10

1.14 PRESENCE OF HEATING SYSTEMS

The use of heating systems on the one hand increases environmental impact through the burning of petroleum products, but on the other, especially in the winter, helps to control relative humidity in the glasshouses which is the main cause, when too high, of the development of pathogens with a consequent need for pesticide use.

Table 44: Score for use of heating systems

Nurseries	1	2	5	9	10	11	13	17	18	19	20
Average score	10	10	10	10	10	10	10	8	10	10	10

1.15 EFFICIENCY OF VENTILATION SYSTEMS

Again to control relative humidity in the glasshouses, and therefore to limit the use of pesticides, it is important for them to have suitable ventilation systems that keep air speed on the plants at a maximum of 1m/s. Glasshouse ventilation should exploit natural ventilation caused by convection as much as possible and only when this is not possible resort to mechanical means. The presence of windows in the roof and at the sides is an indication of ventilation efficiency and energy saving for the ventilators.

Table 45: Score for the efficiency of the ventilation systems

Nurseries	1	2	5	9	10	11	13	17	18	19	20
Average Score	10	9	9	7	7	8	7	7	7	8	7

2 *SUMMARY OF NURSERY RESULTS FOR ALL THE CATEGORIES REGARDING AGRONOMICS AND CLIMATE MANAGEMENT*

Nurseries	**1**	**2**	**5**	**9**	**10**	**11**	**13**	**14**	**17**	**18**	**19**	**20**
Varieties Score	8	8	9	9	8	8	8	8	8	8	8	8
Score for young plants needs	8	6	9	9	9	8	8	8	8	9	8	8
Score for growing system	8	7	10	10	8	6	9	6	9	8	8	7
Score for quality of the agricultural land	-	-	-	-	-	7,3	8	8,3	9	-	9	-
Score for quality of the irrigation water	8	8	8	8	8	8	8	8	8	8	8	8
Score for water consumption	9	6	10	10	8	7	9	8	8	8	7	8
Score for hydroponics system management	9	6	10	10	-	-	-	-	-	-	-	7
Score for fertilisers	8,75	7,5	8,28	8,28	8	7	9,2	7	9,2	8	9,2	8,75
Score for pesticides	8	7	9	9	8	9	6,3	8	8	8	8	8
Score for computerised climate management	8	8	10	10	8	8	8	8	8	8	8	8
Score for collection and use of rain water	8	10	10	8	10	10	10	10	10	10	10	8
Score for energy saving systems	6	5	6	6	9	6	6	6	6	6	6	6
Score for cooling system	8	8	10	8	8	8	10	8	8	8	10	8
Score for heating system	10	10	10	10	10	10	10	8	10	10	10	10
Score for ventilation efficiency	10	9	9	7	7	8	7	7	7	8	7	-
Average total Score	**8,34**	**7,54**	**9,16**	**8,73**	**8,38**	**7,88**	**8,32**	**7,74**	**8,3**	**8,23**	**8,3**	**7,9**

Bari, 27 December 2006

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