NAME \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**YEAR 13**

**PLANT AND HORTICULTURAL SCIENCE**

**REVISION WORKBOOK**

****

**Glossary**

You need to understand the meaning of the following list of terms so that when they are used in an exam you recognise *exactly* the focus of the question. There have been rows left blank for you to add other terms that you think will be useful

|  |  |  |
| --- | --- | --- |
| Term | **Meaning** | **Named example** |
| **A Market** | *A place where buyers and sellers meet to* ***exchange*** *goods and services* |  |
| **Advertising** | *Generally use of media to promote the product* |  |
| **Asexual propagation** | Production of new plants from cuttings, division, budding and grafting |  |
| **Attribute** | ***Measurable*** *characteristic which effects* ***marketability*** *of primary product at harvest* |  |
| **Biological control** | *Controlling pest and diseases using* ***natural******enemies****.* |  |
| **Biosecurity** | *The careful* ***monitoring*** *of animals and plants coming in to and out of the country for* ***pests*** *and* ***diseases*** |  |
| **Branding** | *Giving the product a specific label which gives an indication of where it has come from* |  |
| **Breed selection** | *Choosing a breed of the selected crop which produces the right* ***quality*** *and* ***quantity*** *at the right* ***time*** *for the market* |  |
| **Brix level** | *Measurement of* ***sugar*** *level* |  |
| **Calendar of operations/ timeline** | *Outline of the* ***sequence*** *of husbandry* ***activities*** *required to grow a marketable product* |  |
| **CER** | *Common Economic Relations – international commodity agreement which removes all barriers of trade between countries except biosecurity.* |  |
| **Climate Change** | *The change of climate patterns over a period of time*  |  |
| **Commodity market** | *A generally large group of consumers who demand* ***large******volumes*** *of product with generic characteristics* |  |
| **Competition****(Production)** | *Where plants or animals compete for* ***nutrients****,* ***water****,* ***light****,* ***air*** *etc.* |  |
| **Competition (trade)** | *Where one grower or country is* ***rivaling*** *another for market share by changing* ***market******prices*** *or* ***production*** *output* |  |
| **Compliment** | *A product which can be consumed in conjunction with another product* |  |
| **Consumer** | *A person or group that* ***demand*** *and* ***purchase*** *primary products* |  |
| **Consumer preference** | *The product and its quality, quantity, timing and price that the consumer demands* |  |
| **Controlled atmosphere storage** | *Storage where oxygen is removed and* ***CO2*** *is increased. This reduces the* ***respiration*** *rate slowing continued* ***ripening*** *and reducing the activity of* ***disease****.* |  |
| **Cool storage** | *Where crops may be placed after harvest to* ***reduce******deterioration****. Temperatures usually kept at around 4oC* |  |
| **Costs of production and marketing** | *The money the grower has to pay to cover the production of the crop and the money involved in packaging, transporting and promoting the crop to the consumer* |  |
| **Cultivation** | *To turn over the soil to a fine crumbly structure with good aeration and drainage*  |  |
| **Cultural/environmental control** | *Management practices which involve making the environment or choosing a resistant crop, reduce the likelihood of disease in the crop* |  |
| **Demand** | *The product the consumer is willing to buy* |  |
| **Density** | *The average* ***number*** *of plants/animals per unit* ***area*** *usually measured in number/m2, number/ha* |  |
| **Deregulation** | ***Removal******government*** *control from grower organizations (producer boards)* |  |
| **Disease** | ***Bacteria****,* ***fungus*** *or* ***virus*** *that attacks a living animal or plant, reducing* ***productivity*** |  |
| **Drainage and aeration** | *A feature of soil which allows* ***water*** *to move freely through the* ***pore*** *spaces between* ***particles*** *and leaves sufficient* ***air*** *for* ***root******respiration*** |  |
| **Economic efficiency** | *Total* ***returns*** *divided by total* ***costs****>1= profit >1=loss 1=break even* |  |
| **Export market** | *Any market which NZ growers supply* ***overseas*** |  |
| **Fashions** | *Variable directions of consumer preference* |  |
| **Fertiliser** | *A mixture containing* ***nutrients*** *needed by plants for healthy growth* |  |
| **Fixed costs** | *Unavoidable annual costs- a predictable figure* |  |
| **FOB** | *Free On Board. The unit of* ***price*** *for* ***export*** *products.* |  |
| **Food miles** | *The distance travelled by a product from the producer to the consumer and the carbon footprint produced* |  |
| **Freight** | *Products* ***transported*** *commercially* |  |
| **Glut** | *Harvested crop that* ***exceeds*** *market demand* |  |
| **Gross margin** | *Total* ***income*** *less the* ***direct*** *(variable) costs associated with the enterprise* |  |
| **Grower** | *A person or group that grow and supply primary products* |  |
| **Grower cooperatives** | *A group of growers, often growing the same products, which sell their product under* ***one*** *brand, providing larger* ***volumes****, longer* ***supply*** *periods and* ***quality*** *control.* |  |
| **Grower manipulations** | *Management practices which produce the right* ***quantity*** *of the right* ***quality*** *at the right* ***time*** *for the right* ***price*** |  |
| **Grower organisations** | *Groups of growers that may market through one body or may use the weight of a larger group to help research and influence government decisions* |  |
| **Harvest** | *Picking, cutting etc of a crop when it is* ***ready*** *for* ***market*** |  |
| **Hydroponics** | *Growing plants in liquid, sand or gravel containing* ***nutrient*** *solutions* |  |
| **Inorganic** | *Fertilisers and pesticides of* ***manufactured*** *origin.* |  |
| **Inputs** | *All* ***materials****,* ***costs*** *and* ***labour*** *required to produce a crop* |  |
| **IPM** | *Integrated Pest Management .Use of* ***biological****,* ***cultural*** *and carefully controlled* ***pesticides*** *to combat pests and diseases* |  |
| **Irrigation** | *Supplying* ***water*** *to a crop by* ***artificial*** *methods* |  |
| **Life cycle** | ***Stages*** *of growth, form and function, of an animal or plant from seed/birth to harvest/death* |  |
| **Local market** | *The market which supplies consumers* ***within******NZ*** |  |
| **Locally produced primary product** | *Any primary product grown in the local area on a commercial basis.* |  |
| **Long term trends** | *Trends shown in prices, returns, volumes or yields over a period of* ***3******years*** *or more* |  |
| **Management practice** | ***Activities*** *which are used by the grower during the production process which produce a product with* ***attributes*** *required by a specific* ***market*** |  |
| **Market access** | *The opportunity to* ***export goods*** *to another country and the extent of* ***restrictions*** *that may be imposed by the importing country* |  |
| **Market manipulations** | *Various market* ***controls*** *imposed by governments or grower groups* |  |
| **Market opportunity** | *All aspects relating to a point of sale and/or end use of a primary product(provided the product is essentially in its raw form)* |  |
| **Market share** | *Portion of the market supplied by a grower, organisation or country* |  |
| **Market window** | *A* ***period*** *of* ***time*** *when there is* ***demand*** *for a primary product* |  |
| **Mulch** | ***Cover*** *of soil around plants to prevent* ***water*** *loss, keep roots* ***warm****, reduce* ***weeds*** *and white mulch (tyvec)* ***reflects*** *light into the tree*  |  |
| **Nationally significant primary product** | *Primary products that earn significant export earnings in unprocessed and processed form, or allow for self-sufficiency within New Zealand or employ a significant workforce during production and processing* |  |
| **Negative attribute** | *A attribute leading to* ***decreased*** *marketability* |  |
| **Niche market** | *A generally* ***small*** *group of consumers with particular demands – usually high quality* |  |
| **Non visible attribute** | *Internal attribute which cannot seen and generally influences the consumer when they* ***return*** *to buy* |  |
| **Organic production** | *Management practices using fertilisers solely of animal or plant origin* ***without*** *the aid of chemical fertilisers, pesticides etc.*  |  |
| **Outputs** | ***Yield*** *and* ***profit*** *made from sale of a crop* |  |
| **Packaging** | ***Enclosing*** *a crop to protect, reduce deterioration and promote the crop.* |  |
| **Pest** | ***Animals*** *that feed on or damage plants* |  |
| **Pest and disease control** | *A range of methods used to* ***reduce*** *of* ***kill******pests*** *and* ***diseases*** *attacking a crop* |  |
| **Photosynthesis** | ***Green*** *plant process. Where* ***water*** *and* ***carbon******dioxide*** *are combined by* ***energy*** *from* ***light****, absorbed by* ***chlorophyll****, to produce* ***sugar****.* |  |
| **Plant hormonal control** | *Use of* ***hormones*** *to encourage or reduce:* ***growth****,* ***flowering****,* ***flower*** *and* ***fruit*** *production* |  |
| **Political intervention** | *Where* ***government*** *legislation controls the* ***production****,* ***sale*** *or* ***importing*** *of product*  |  |
| **Positive attribute** | *A attribute leading to* ***increased*** *marketability* |  |
| **Prices of product** | *The cost of the product to the consumer* |  |
| **Primary product** | *A product which has been* ***grown*** *and is not processed (in its raw state)* |  |
| **Producer** | *A person or group that grow and* ***supply*** *primary products* |  |
| **Producer Boards** | *Boards created through* ***government******legislation*** *to control the sale of products* |  |
| Product timing | *A non-attribute. Either:** *When the crop is ready for harvest* ***or***
* *Aiming production at a specific market window*
 |  |
| **Production process** | *All* ***aspects*** *of* ***production*** *from site selection and establishment to when the product leaves the growers control.* |  |
| **Productivity** | *A measure of the* ***growth*** *(output) of a plant/animal or crop often in relation to the* ***management******practices*** *(input) used to produce it.* |  |
| **Promotion** | *Methods used to make the consumer aware of and attracted to the product* |  |
| **Propagation** | Production of new plants  |  |
| **Pruning** | ***Cutting******out*** *branches to remove* ***dead*** *and* ***diseased*** *growth and to control the* ***shape*** *and/or* ***size*** *of a tree* |  |
| **Quality** | *The* ***standard*** *required by the consumer generally measured in* ***grades*** *. Involves reliable* ***consistency****,* ***uniformity*** *and* ***presentation*** |  |
| **Quantity** | *The* ***volume*** *of a product produced. Generally* ***measured*** *in: kg, tonnes, trays, tray cartons* |  |
| **Quotas** | *The maximum* ***quantity*** *of primary product which will be accepted by an importing country to protect local producers.* |  |
| **Reliability of supply** | *Guaranteed quantity of good quality product*  |  |
| **Respiration** | *A cellular process of plant and animal cells. Where* ***energy*** *is released from food substances (often* ***sugars****) generally in the presence of* ***oxygen*** |  |
| **Returns to grower** | *The money the grower receives for the sale of the product* |  |
| **Schedule of operations** | *Consists of a* ***timeline****, a plant or animal* ***life******cycle****, husbandry* ***techniques*** *required at each stage of the life cycle and the effects of these techniques on the* ***marketability*** *of the product at harvest* |  |
| **Seasonal advantage** | *Supplying a primary product to another country when they cannot produce that product in that particular season.* |  |
| **Seasonality** | *Variation of supply and demand for a product governed by the seasons* |  |
| **Sexual propagation** | Production of new plants from seed |  |
| **Shelter** | ***Protection*** *from* ***wind*** *and or* ***sun****, provided by trees, shrubs or man made screens* |  |
| **Short term trends** | *Trends shown in prices, returns, volumes or yields over a period of up to* ***2******years*** *displaying* ***seasonal*** *variation*  |  |
| **Site selection** | *Choosing a site suitable to grow a* ***commercial******crop*** *taking into consideration, climate, soil, proximity to markets and transport* |  |
| **Strength of the NZ dollar** | *The* ***value*** *of the NZ dollar overseas which effects the* ***prices*** *of NZ* ***exports*** |  |
| **Subsidies** | *A* ***grant*** *made by the government to growers to assist them to make sufficient profit to survive, not considering the real commercial viability of the production* |  |
| **Substitute** | *A product that a consumer can use in the place of another i.e. it fills the same market niche* |  |
| **Supply** | *Growing and making a product available to consumers* |  |
| **Sustainability** | *Activities compatible with the earth’s ecosystem maintaining a natural balance* |  |
| **Tariffs** | *A schedule of duties or* ***payments*** *imposed by a government on imported products* |  |
| **Thinning** | ***Reduction*** *in number of* ***fruit*** *or* ***flowers*** *on a branch to reduce* ***competition*** *and* ***wind*** *rub and control fruit size suitable for the market* |  |
| **Traceability** | *The ability of the consumer to find out exactly where a product has been produced usually through bar code technology* |  |
| **Trade barriers** | *Where one country will not accept another’s primary products to maintain their own production without competition* |  |
| **Training** | *Supporting plants so that they look* ***tidy****, are easier to* ***maintain*** *and harvest* |  |
| **Transpiration** | *Loss of* ***water*** *from plant* ***leaves*** *and stems* |  |
| **Trends** | *Historical changes in supply and demand that allow forecasts to be made* |  |
| **Variable costs** | *Costs which may alter during production* |  |
| **Visible attribute** | *External attribute which can be* ***seen*** *easily by the consumer and may influence the* ***initial*** *sale* |  |
| **Weeds** | *A plant growing in the* ***wrong*** *place which may* ***compete*** *for nutrients, light water etc.* |  |
| **Yield** | *The* ***volume*** *of product per unit* ***area*** *of production e.g. kg/m2 , tonne/ha* |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number** | AS91531 | **Version** | 1 |  |

Achievement Standard

|  |  |
| --- | --- |
| **Subject Reference** | Agricultural and Horticultural Science 3.4 |
| **Title** | Demonstrate understanding of how the production process meets market requirements for a New Zealand primary product(s) |
| **Level** | 3 | **Credits** | 4 | Assessment | External |
| **Subfield** | Science |
| **Domain** | Agricultural and Horticultural Science |
| **Status** | Registered | **Status date** | 4 December 2012 |
| **Planned review date** | 31 December 2016 | **Date version published** | 4 December 2012 |

This achievement standard involves demonstrating understanding of how the production process meets market requirements for a New Zealand primary product(s).

**Achievement Criteria**

| **Achievement** | **Achievement with Merit** | **Achievement with Excellence** |
| --- | --- | --- |
| * Demonstrate understanding of how the production process meets market requirements for a New Zealand primary product(s).
 | * Demonstrate in-depth understanding of how the production process meets market requirements for a New Zealand primary product(s).
 | * Demonstrate comprehensive understanding of how the production process meets market requirements for a New Zealand primary product(s).
 |

**Explanatory Notes**

1. This achievement standard is derived from *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007, and is related to the material in the *Teaching and Learning Guide for Agricultural and Horticultural Science*, Ministry of Education, 2011 at <http://seniorsecondary.tki.org.nz>.
2. *Demonstrate understanding* involves explaining how the production process meets specific market requirements for a New Zealand primary product(s).

 *Demonstrate in-depth understanding* involves explaining, in detail, how the production process meets specific market requirements for a New Zealand primary product(s). The detail includes quantitative data.

 *Demonstrate comprehensive understanding* involves using detailed explanations to justify how the production process used meets specific market requirements for a *New* Zealand primary product(s).

1. *Production process* refers to the sequence of manipulated management practices from establishment until harvest.
2. *Market requirements* may include quality (product attributes and other considerations such as consistency, uniformity, or presentation); quantity; timing, and price.
3. *A New Zealand primary product(s)* is a nationally significant agricultural and/or horticultural product in unprocessed or processed form that earns significant export revenue or allows for self-sufficiency within New Zealand, or employs a significant workforce during production and processing.
4. Product attributesare measurable characteristics that affect the marketability of a primary product and may include, fat content, sugar levels, size, mass, diameter, tenderness, shelf life, and yield.
5. Assessment Specifications for this achievement standard can be accessed through the Agriculture and HorticultureResources page found at [www.nzqa.govt.nz/ncea/resources](http://www.nzqa.govt.nz/ncea/resources).

**Satsuma Mandarins**

A***market*** is all aspects relating to the ***point of sale*** and/or end use of the primary product (provided that the primary product is still essentially in its raw form). These include the ***consumer type***, ***quantity***, ***quality*** and ***time of sale***.

**Market One: *Export to Japan***

***Consumer type:***

Celebration of youth and renewal represented by everything golden

Brought in by after WW2 to overcome depression after the atomic attacks

Mandarins given individually as small gifts

High cost – therefore purchased by people with discretionary income in a ***Niche market.***

**Requirements:**

***Quantity:***

Total of 700 tonnes during April🡪May, peaking at 200 tonnes mid May.

***Quality:***

|  |
| --- |
| Summary* Small size – 55-63mm diameter
* Brix acid ratio 10:1
* Easy peal, yet tight skin, removal in more than 4 pieces
* Cumulative blemishes – 0.5 cm2
* Defect tolerances 2%
 |

* *Cleanliness*: Washed, waxed, free of all dirt
* *Shape:* Oblate
* *Stem:* Cut flush with fruit – no long stems

| **Grade standard allowances** | **EXPORT/Progressive****Enterprises (Countdown)** | **Tag 1** | **Tag2** |
| --- | --- | --- | --- |
| ***Colour*** | Orange | 5% light green flashing | <20% green flashing |
| ***Maturity:*** Brix | Av Brix>9.5 | Av Brix>8.5 |  |
| Acid | <1.2 | 1.2 |  |
| **Defect allowances** |  |  |  |
| ***Major*:** Rots, physical, insect | NIL | NIL | NIL |
| ***Minor:*** Blemish, sunburn, etc. | 0.5cm2 | 0.5 – 1cm2 | 1-2.5cm2 |
| **Size** | **Export**: 45-65mm diameter | **Local:** 65 – 80mm |
| **Shelf life after arrival** | **Export:** 2 weeks |

***Time of sale:***

* Satsuma mandarins are a very popular fruit in Japan and large volumes are grown in the country.
* However there is a high demand during “Golden week” when the fruit are ***out of season*** in Japan and New Zealand is the only country that can provide the ***volumes*** needed of ***Japanese Wase*** varieties at the ***quality*** required.
* “Golden week” is between April –May
* This is a small **market window** to gain high export returns  **$4-6/Kg,** Mid may peak season **$3.50/Kg** compared with premium prices - **$3/Kg** early April shoulder **$5/Kg for the local market**
* If the market window is missed e.g. due to a cold winter which delayed flowering as in 2009, most of the mandarins have to be sold on the local market which can push prices down to below $1.50/Kg even down to 10c/Kg which is below the cost of production and wil not deliver a profit.

*Refer to Production notes P 15*

 **Reasons for requirements:**

* Small perfect fruit are given as individual presents ***therefore*** each fruit has to be very high quality
* Fruit for this Japanese market is not only viewed as an edible entity but also decorative. The Japanese “eat with their eyes” and “buy on the eye” - another reason for superior quality
* Quality is consistency, uniformity (sizes between ***55-63 diameter***, blemish free, oblate shape) and presentation (washed and waxed) all of which are required for this market
* The Golden colour is particularly appropriate for the Golden festival
* Local Japanese mandarins are out of season and not available
* Sweet, bland flavoured fruit are preferred by the Japanese consumers who have sweet palates developed from childhood and part of the Japanese culture.

**Market Two: NZ Local**

***Consumer type:***

Foodstuffs 🡪New World

Progressive enterprises 🡪 Countdown supermarkets,

Independent retailers 🡪Vegeworld, Nosh etc.

**Commodity market** aimed at wide range of domestic consumers

**Requirements:**

***Quantity:***

7000 tonnes per year

Volumes need to be kept below 600tonnes a week or the returns fall below $1.50 kg down to 10c which does not cover production costs.

***Quality:***

Preferred features of the fruit include:

* Large size – > 65mm diameter
* Easy peal, skin removal in one or two pieces
* Brix acid ratio 7:1.2
* Cumulative blemishes 0.75cm2 (medium) 1cm2 Large
* Defect tolerances ( shape, maturity, skin defects – colour, blemishes) 5% Tag 1-15% Tag 2

***Time of sale:***

* During the period of ***April/ May*** which is the export market window, all small, high grade fruit are picked and exported.
* All rejects are placed on the local market. Returns at this time tend to be low - $1.50 – 2.30/Kg.
* On the ***shoulders*** of the season in ***March*** returns can reach $5.00 and in ***July /August*** between $3 and $4/Kg.

**Reasons for requirements:**

* ***Easy peal*** Satsuma mandarins are a ***convenient*** fruit available in winter ***April🡪August*** when there is a limited fruit choice
* NZ consumers prefer ***larger*** fruit – ***>65mm*** diameter as they are viewed as better value for money. Fruit ***>72mm*** gain a premium price ***$4-5/Kg*** retail while smaller fruit ***<63mm*** only gain ***$2Kg.***
* NZ consumers are less fussy about ***blemishes*** and are more interested about the ***flavour*** of the fruit as it is viewed as a ***commodity*** to be eaten rather than for decorative purposes.
* NZ consumers prefer tarter fruit (***7 Brix: >1 acid***) with a distinct ***flavour***.

**Management practices which produce Mandarins fitting the market requirements of the TWO market opportunities**

REFER TO YOUR WORKBOOK (PAGE REFERENCES GIVEN TO YOU) AND YOUR FIELD TRIP NOTES FOR EXTENDED INFORMATION.

**Market One: *Export to Japan***

| **Market require -ment** | **Description of requirement** | **Reasons for requirement** | **Management practices** | **Manipulation of management practice** |
| --- | --- | --- | --- | --- |
| ***Specific market attributes*** | 1. Small size – ***55-63mm*** diameter
 | Small perfect fruit are given as individual presents ***therefore*** each fruit has to be very high quality.* Fruit for this Japanese market is not only viewed as an edible entity but also decorative. The Japanese “eat with their eyes” and they “buy on the eye”– another reason for superior quality
 | ***Controlled fruit thinning**** Use of gibberellins to thin flowers in citrus production of commercial size fruit (a rate of **50 ppm** is recommended in June)
* Hand thinning of developing fruit (**20-25 leaves** per fruit and **2-4 finger-diameter** between the fruit to achieve export size)

Refer to P 62 | Use of two methods to ensure uniform ***55-63mm*** is gained. GA is less labour intensive concentration has to be controlled carefully or too many flowers will be lost and large fruit will develop with the loss of ***competition***.***Insufficient*** hand thinning may result in a ***high volume of small fruit,*** but the stress on the tree may send it into ***biennial bearing*** which will result in low volumes the following year |
|  | 2. Brix acid ratio ***10:1***Kerisweet aims for a point of difference with high internal quality of maximum brix 01.5 and minimum acid 0.8 | * ***Sweet, bland flavoured*** fruit are preferred by the Japanese consumers who have ***sweet palates.***
 | ***Trickle*** irrigation using **double-line** drippers is provided to the trees from October to the end of December. During this time the fruit size increases.Then ***deficit*** January 🡪March to build up brix***Dump*** irrigation in last week before harvest will swell the fruit giving tight skins and reduce acid.Moving to mini-sprinklers which give better and more even irrigation.No irrigation 🡪no mandarins | . ***Controlled irrigation***Deficit irrigation soil left to dry out then flooded to 70Kpasc in Northland, Then trees allowed to dry out again. Is provided from January to the end of March. This stresses the trees which causes the Brix levels to increase to 10.Combined with similar withholding of nitrogen 🡪fertiliser stress.The later irrigation “dump irrigation” ( 10 days before harvest) reduces the acid to 1% which tends to build up during stressing.Drying out trees also hardens skin.Last flush of water swells flesh tightening the skin. |
| ***Quality******(uniformity, consistency and presentation)*** | 1. Consitency/uniformity | Uniformity of size – 55-65mm diameterSmall perfect fruit are given as individual presents ***therefore*** each fruit has to be very high quality. | ***Controlled thinning***(see above) |  |
|  |  | Total of ***700 tonnes*** during ***April🡪May*** peaking at 200 tonnes mid May. Uniform acid:brix ratio 10:1 to meet sweet fruit preference of Japanese consumer. All fruit must be of consistent quality throughout the season. Fruit from each grower is **traced** using bar codes on boxes.It is essential that all fruit sent to japan is of highest quality as the reputation of the NZ industry relies on guaranteed high quality product. | ***Reflective mulch***Extenday’ reflective mulch placed under the trees reflects light up into the underside of the tree.This gives even light throughout the tree ensuring that ***photosynthesis*** is at its optimum throughout the tree, producing a consistent yield of fruit (***a minimum of 45kg/tree***), at the uniform high brix level of 10. | ***Timing***Placed under the trees at the end of ***December*** and is lifted at the end of ***March*** once fruit have formed.***The mulch also stops rain*** getting to the shallow roots of the trees during ***deficit irrigation***, which also increases brix levels and controls ***competition*** from ***weeds*** which may impact on uniform fruit size. |
|  | rots NIL0.5sq/cm insect damage | Export quality fruit has to be almost perfect (colour blemishes etc.)There are also ***biosecurity*** regulations to follow. | ***Pest and disease control.***Satsumas have been selected over the centuries in Japan for their tolerance to wet weather diseases. The fruit rinds are resistant disease **Melanose** and **Anthracnose are** the main rind blemishing diseases, but they are only a problem during excessively wet springs and early summers. | Copper or ***mancozeb*** sprays at ***petal fall*** in November are recommended, repeated 2-3 times at three week intervals until mid-January, depending on rainfall. Annual ***removal*** of all **dead wood** and twigs from the centre of tree canopies will dramatically reduce infection. |
|  | 2. Presentation  | No blemishes, clean, no stem just a button  | ***Harvest and post harvest***Satsuma rinds are very sensitive to rough handling during harvest. Wherever possible, fruit should ***not*** be picked while still ***wet*** from rain or dew. The fruit needs to be **double cut,** second cut clipped ***flush at the button***, but great care must be taken not to cut the rind during clipping. Stalks may pierce the skin of other fruit and result in disease entry. *(refer to P 67 notes)* | It is often better to use ***two actions*** - stalk clipping, and then trimming at the button. (double clipping)***Waxing*** fruit post harvest gives a uniform ***shine*** and ***prevents disease*** entry. |
| ***Quantity*** | Total of ***700 tonnes***Maximum productivity of trees - ***15-25Kg*** per tree. | * Satsuma mandarins are a very popular fruit in Japan and large volumes are grown in the country.
* There is a high demand during “Golden week” when the fruit are ***out of season*** in Japan and New Zealand is the only country that can provide the ***volumes*** needed of ***Japanese Wase*** varieties at the ***quality*** required
 | ***Fertiliser Application**** Nitrogen applied - ***Nitrphoska*** – encourage tree growth and leaf formation. 100kg/ha in Autumn
* Magnesium required for chlorophyll formation - ***Calmag. 45kg/ha*** *Spring*
* Increase photosynthesis – tree growth carry larger yield ***and*** increase Brix levels of fruit.
* 70kg/ha P – roots – Spring
* 45kg/ha – flowers/fruitlets - Spring
* Applied through ***irrigation*** system.

(*refer to P53 notes)* |  ***Timing*** of fertilizer application: ***February – 2/3rds*** fertilizer to encourage fruit production and sugar build up.***July/August – 1/3rd*** encourage flower and fruit formationFertiliser applied at the right time ensures that the trees are at peak production April/ May.Can be applied through irrigation ***fertigation*** |
|  | April🡪May, peaking at 200 tonnes mid May. | The height of the season is mid May when demand is at its highest | ***Pruning* -** using the new **layer** methodallowing better light penetration into the middle of the tree. Gives higher production yet removing less branches. Up to 40-45 tonnes/tree.Considered more important than thinning. Maintains tree vigour as Mandarin trees considered “quiet vigour” trees. Helps control biennial bearing. Easy picking and spray penetration.(*refer to p58 notes and field trip worksheet and notes))* | Trees pruned in **July** when harvest has finished.When trees are semi dormant. A balance is maintained between fruiting (shoots with buds on - 1 year old branches) and non-fruiting wood which photosynthesises.  |
| ***Timing*** | April🡪May, peaking at 200 tonnes mid May | There is a high demand during “Golden week” when the fruit are ***out of season*** in Japan and New Zealand is the only country that can provide the ***volumes*** needed of ***Japanese Wase*** varieties at the ***quality*** required. This gives New Zealand a monopoly of supply as long as the high quality is continued to be provided to maintain the reputation. | ***Deficit irrigation***.(See above) |  |
|  |  |  | ***Reflective mulch****(see above)* |  |
|  |  |  | ***Choice of rootstocks (NOT a seasonal practice ONLY use if the question has no reference to the calendar of opps at the front.)***The rootstock choice can affect: sugar and acid levels, fruit size, thinner rinds, **time of fruit maturity,** controlled tree vigour, and yield. The rootstocks generally used are either **trifoliata, C-35 citrange or savage citrange.** These rootstocks overcome the problem of **cool soils** in New Zealand which can reduce the tree **yields** and **fruit quality. (**Refer to P46 notes) |  Use of rootstock which resists cool soil conditions enables the Scion to produce Wase Satsumas of the required quality ***earlier*** and thus able to meet the April/May peak demand period. |
| ***Price*** | Focus on achieving maximum returns of ***$4-5/Kg*** and above Minimum of ***$3.50Kg*** | To gain maximum returns to cover costs (***need to be at least $1.00Kg***) and make maximum profit in the short market window. | ***deficit irrigation***, ***pruning*** and ***controlled thinning***, probably have the greatest impact on producing export quality fruit. | ***Timing*** of use of practices ensures high levels of Tag 1 fruit produced on time to meet short market window. |
|  | Producing ***Consistent, uniform, high quality fruit*** during the ***April/May*** period which will deliver maximum returns. |

**Market Two – NZ Local market TRY to use DIFFERENT management practices than those selected for Market Opportunity One**

| **Market require -ment** | **Description of requirement** | **Reasons for requirement** | **Management practices** | **Manipulation of management practice** |
| --- | --- | --- | --- | --- |
| ***Specific market attributes*** | Large size – > 65mm diameter  | NZ consumers prefer ***larger*** fruit – ***>65mm*** diameter as they are viewed as better value for money. Fruit ***>72mm*** gain a premium price ***$4-5/Kg*** retail while smaller fruit ***<63mm*** only gain ***$2Kg.*** | ***Vigourous fruit thinning**** Use of gibberellins to thin flowers in citrus production of commercial size fruit (a rate of **100 ppm** is recommended in June)
* Hand thinning of developing fruit (**30 leaves** per fruit and **hand span-diameter** between the fruit)
 | Reduced competition between fruit for nutrients and ***less stress*** on trees produces larger fruit which are more acceptable for the local market. Also ensures no ***biennial bearing***. |
|  | * Easy peal, skin removal in one or two pieces
* Brix acid ratio ***7:1.2***
 | * ***Easy peal*** Satsuma mandarins are a ***convenient*** commodity fruit
* NZ consumers prefer tarter fruit ***(7 Brix: >1 acid***) with a distinct ***flavour***.
 | ***Harvest***“The best place to store mandarins is on the tree”.The longer mandarins are left on three the looser the skins become and easier to peal.The acidity also tends to build up. | Selection of the larger fruit at export picking, leaving the fruit on the tree until it is required for the local market.This allows control of volumes going onto the market keeping below ***600 tonnes*** per week maintaining prices at a minimum of ***$1.50/Kg.*** |
| ***Quality*** | * Cumulative blemishes 0.75cm2 (medium) 1cm2 Large
* Defect tolerances ( shape, maturity, skin defects – colour, blemishes) 5% Tag 1-15% Tag 2
 | NZ consumers are less fussy about ***blemishes*** and are more interested about the ***flavour*** of the fruit as it is viewed as a ***commodity*** to be eaten rather than for decorative purposes.However blemished fruit will only give low returns below $1.50/Kg. | ***Pest and disease control.***Satsumas have been selected over the centuries in Japan for their tolerance to wet weather diseases. The fruit rinds are resistant disease **Melanose** and **Anthracnose are** the main rind blemishing diseases, but they are only a problem during excessively wet springs and early summers. | Copper or ***mancozeb*** sprays at ***petal fall*** in November are recommended, repeated 2-3 times at three week intervals until mid-January, depending on rainfall. Annual ***removal*** of all **dead wood** and twigs from the centre of tree canopies will dramatically reduce infection. |
|  | Consistent and uniform large size > 65mm diameter | NZ consumers prefer ***larger*** fruit – ***>65mm*** diameter as they are viewed as better value for money. Fruit ***>72mm*** gain a premium price ***$4-5/Kg*** retail while smaller fruit ***<63mm*** only gain ***$2Kg.*** | ***Pruning* -** using the new **layer** methodallowing better light penetration into the middle of the tree. Gives higher production yet removing less branches. Up to 40-45 tonnes/tree.Considered more important than thinning. Maintains tree vigour as Mandarin trees considered “quiet vigour” trees. Helps control biennial bearing. Easy picking and spray penetration.(*refer to p58 notes and field trip worksheet and notes))* | Pruning should be carried out mid June - August. The aim of pruning is to prevent shading of branches, and to accentuate those shoots which will carry ***high quality fruit.*** Horizontal fruiting wood is left - tins produces fruit that hang down on thin stalks, and have the highe***st quality.*** Pruning also helps alleviate ***alternate bearing.*** |
| ***Quantity*** | ***7000 tonnes per season*** | ***Easy peal*** Satsuma mandarins are a ***convenient*** fruit available in winter ***April🡪August*** when there is a limited fruit choice | Planting density4X1m between trees and rows gives a potential yield of between 40-80 tonnes per canopy hectare.***OR******Controlled thinning*** to reduce ***biennial bearing*** | Young trees may be planted at ***2x1*m** density to give a high volume quickly of 40 tonnes per canopy hectare at 6 years old. These trees are then thinned to ***4x1*** as the trees reach maximum size to reduce competition and ensure a consistent volume of fruit. |
|  | Volumes need to be kept ***below 600tonnes a week.*** | Too great a volume on the small local NZ market will cause the returns to fall below $1.50 kg down to 10c which does not cover production costs | ***Harvest***See above BUT don’t use twice! |  |
| ***Timing*** | Production of fruit early and late in the season | On the ***shoulders*** of the season in ***March*** returns can reach $5.00 and in ***July /August*** between $3 and $4/Kg. | Early fruit will be ready using reflective mulch.Late fruit will maintain quality with continued irrigation. | Reflective mulch used in ***December🡪 March*** will make fruit available earlier due to increased photosynthesis and build up of sugars in ***march.******Controlled irrigation*** ensures fruit stays swollen in the skins and do not dry out which may occur if the fruit are left too long on the trees. |
|  | ***Easy peal*** Satsuma mandarins are a ***convenient*** fruit available in winter ***April🡪August*** when there is a ***limited fruit choice*** | Too gr on the small local NZ market will cause the returns to fall below $1.50 kg down to 10c which does not cover production costs eat a volume | ***Harvest***See above BUT don’t use twice! |  |
| ***Price*** | To gain a minimum of ***$1.50/Kg.*** Fruit can get as low as ***10c/Kg*** if too much fruit is on thye small market at once | * During the period of ***April/ May*** which is the export market window, all small, high grade fruit are picked and exported.
* All rejects are placed on the local market. Returns at this time tend to be low - $1.50 – 2.30/Kg.
* On the ***shoulders*** of the season in ***March*** returns can reach $5.00 and in ***July /August*** between $3 and $4/Kg.
 | ***Early fruit*** will be ready using reflective mulch.***Late fruit*** will maintain quality with continued irrigation. | Reflective mulch used in ***December🡪 March*** will make fruit available earlier due to increased photosynthesis and build up of sugars in ***march.******Continued irrigation*** ensures fruit stays swollen in the skins and do not dry out which may occur if the fruit are left too long on the trees. |
|  | Placing **large** fruit **>65mm** diameter on the market for maximum returns. | NZ consumers prefer ***larger*** fruit – ***>65mm*** diameter as they are viewed as better value for money. Fruit ***>72mm*** gain a premium price ***$4-5/Kg*** retail while smaller fruit ***<63mm*** only gain ***$2Kg*** | ***Controlled thinning***See above |  |

**REVISION EXERCISES**

***1. Calendar of operations:***

***Satsuma mandarins – export (Complete and Learn)***

|  |  |
| --- | --- |
| **Management practices** | Month |
| **jan** | **feb** | **mh** | **apr** | **ma** | **jun** | **jul** | **au** | **sep** | **oct** | **no** | **dec** |
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2. Use your workbook notes to complete these graphs. Make them simple and easy to replicate in an exam.

***Graphs***:  **Satsuma Mandarins:**

**Export**

## Volume

## Price

## Local

## Volume

## Price

***3.* Summary exercise:**

 Using the information above select the best management practices for each of the market requirements. You need TWO for each requirement.

You will be expected to have different management practices for each question.

There are three questions so you need to know SIX management practices well.

You will find it useful to put in key values and words/definitions for each practice.

The first one has been done for you.

|  |  |  |  |
| --- | --- | --- | --- |
| **Market requirement** | **Management practices** | **Key words** | **Key values** |
| Quantity | 1. Fertiliser application | Nitrophoska - nitrogenCalmag - magnesiumFertigation | 70 kg/ha45 kg/ha |
|  | 2. |  |  |
| Quality | 1. |  |  |
|  | 2. |  |  |
| Specific attributes | 1. |  |  |
|  | 2. |  |  |
| Timing | 1. |  |  |
|  | 2. |  |  |

**4. Practice questions:**

**Product: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Market \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**List seasonal production practices for your chosen product and market in order:**

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

question ONE: Quality requirements

**Name of Primary Product \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Name of selected market\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. Describe the quality supplied to a selected market.
2. Explain how TWO management practices from your list above carried out during the production process impact on the quality of produce being supplied to the market.

Management practice 1:

Management practice 2:

1. Consider the management practices explained in part (b).

**Select and justify** the most significant manipulation of the two management practices in terms of **maximising** the quality of product that is required for the selected market

question two: A specific product attribute

**Name of Primary Product \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Name of selected market\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. Describe the specific market attribute supplied to a selected market.
2. Explain how TWO management practices carried out during the production process, different from those selected in question one, that impact on the specific market attribute of the product being supplied to the market.

Management practice 1:

Management practice 2:

1. Consider the management practices explained in part (b).

**Select and justify** the most significant manipulation of the two management practices in terms of **maximising** the specific market attribute of product that is required for the selected market

question THREE: QUANTITY requirements

**Name of Primary Product \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Name of selected market\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Growers follow a sequence of **management practices** in order to produce a product that meets the **quality** requirements of a market opportunity.

(a) On the Ganntt chart (calendar of operations) below, outline **in order** the management practices that are carried out by the grower to produce the **quantity** required by the chosen market.

 Use arrows (🡸🡺) to accurately show **the time(s) of year** when each management practice is carried out.

|  |  |
| --- | --- |
|  | **Time of year** |
| **Management practices(in the order that they occur)** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** |
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1. Describe ONE **quantity** requirement that growers must meet when supplying the selected market.
2. Explain how TWO management practices carried out during the production process shown on the Ganntt chart impact on the quantity requirement described in (a).

Management practice 1:

Management practice 2:

1. Justify the use of a specific manipulation of one of the management practices in terms of the grower maximising the quantity of produce.

QUESTION FOUR: timing requirements

Answer this question on Primary product **ONE**

**Name of Primary Product ONE\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Name of selected market\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. Describe the timing requirements when supplying the selected market. You should draw a graph to support your answer.



1. Explain how a specific management practice carried out during the production process results in the product meeting the timing requirement you have described in (a).
2. Justify the use of a specific manipulation of the management practice that growers carry out, to the best of their ability, in order to meet the market’s timing requirements.

Achievement Standard

|  |  |
| --- | --- |
| **Subject Reference** | Agricultural and Horticultural Science 3.5 |
| **Title** | Analyse a New Zealand primary production environmental issue |
| **Level** | 3 | **Credits** | 5 | **Assessment** | External |
| **Subfield** | Science |
| **Domain** | Agricultural and Horticultural Science |
| **Status** | Registered | **Status date** | 4 December 2012 |
| **Planned review date** | 31 December 2016 | **Date version published** | 4 December 2012 |

This achievement standard involves analysing a New Zealand primary production environmental issue.

**Achievement Criteria**

| **Achievement** | **Achievement with Merit** | **Achievement with Excellence** |
| --- | --- | --- |
| * Analyse a New Zealand primary production environmental issue.
 | * Critically analyse a New Zealand primary production environmental issue.
 | * Comprehensively analyse a New Zealand primary production environmental issue.
 |

##### Explanatory Notes

1. This achievement standard is derived from *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007, and is related to the material in the *Teaching and Learning Guide for Agricultural and Horticultural Science*, Ministry of Education, 2011 at <http://seniorsecondary.tki.org.nz>.
2. *Analyse an environmental issue* involves:
* explaining the environmental issue arising from primary production management practices
* explaining potential courses of action to mitigate the negative impacts of the management practices
* recommending course(s) of action to support sustainable management practices.

 *Critically analyse* *an environmental issue* involves:

* explaining, in detail, the environmental issue arising from primary production management practices
* evaluating potential courses of action to mitigate the negative impacts of the management practices. This may include comparing and contrasting alternative courses of action
* recommending course(s) of action to support sustainable management practice(s) that best address the issue.

 *Comprehensively analyse* *an environmental issue* involves:

* justifying course(s) of action to support sustainable production management practice(s) that best address the issue; this includes environmental, economic, political, and/or social considerations.
1. An *environmental issue* results from agricultural or horticultural primary production in New Zealand.
2. Impacts of production management practice(s) may be environmental, economic, political, and/or social.
3. *Courses of action* refer to responses carried out by the producer that may, potentially, mitigate the negative impacts of the production management practice(s).
4. Sustainable production management practices refers to the management of parts of the environment eg water, soil, and/or air to ensure continued use of these natural resources in primary production practices and to minimise negative impacts on the wider environment.
5. Production management practicesmay include: fertiliser application, irrigation, cultivation, effluent management, pest and/or weed control, harvesting, grazing management.
6. Assessment Specifications for this achievement standard can be accessed through the Agriculture and HorticultureResources page found at [www.nzqa.govt.nz/ncea/resources](http://www.nzqa.govt.nz/ncea/resources).

**Topic Studied:**

the use of water in agricultural / horticultural systems

Note that this may include:

o supply / availability of water to producers

o water quality issues.

Also note the Agricultural and Horticultural Science NZ Scholarship Assessment Specifications

**Make your own summary notes using the following framework:**

**Nutrient management:**

Use your resource book on **nutrient management** to complete the following:

1. Explain the following impacts of nutrient management on production:

Impact on the environment One : (Negative)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Impact on the environment Two : (Positive or negative)

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Economic impact:

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Social impact:

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Sustainable courses of action that can be taken by the grower/farmer to solve any negative impacts explained above:

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Justify why agricultural/horticultural **nutrient management** is so important economically, politically and socially

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**Water quality:**

Use your resource book on water quality to complete the following:

1. Explain the following impacts of **agricultural and horticultural intensification** (increasing production in the same area) on New Zealand nutrient management.

Impact on the environment One : (Negative)

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Impact on the environment Two : (negative)

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Economic impact:

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Social impact:

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Discuss sustainable courses of action that can be taken by the grower/farmer to solve any negative impacts explained above:

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Justify why improving agricultural/horticultural practices to maintain better **nutrient management** is so important economically, politically and socially

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