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91290



Draw a cross through the box (X) if you have NOT written in this booklet

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Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 2 Agricultural and Horticultural Science 2023

91290 Demonstrate understanding of techniques used to modify physical factors of the environment for NZ plant production

Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of techniques used to modify physical factors of the environment for commercial plant production in New Zealand.	Demonstrate in-depth understanding of techniques used to modify physical factors of the environment for commercial plant production in New Zealand.	Demonstrate comprehensive understanding of techniques used to modify physical factors of the environment for commercial plant production in New Zealand.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

If you need more room for any answer, use the extra space provided at the back of this booklet.

Check that this booklet has pages 2–12 in the correct order and that none of these pages is blank.

Do not write in any cross-hatched area (DO NOT WRITE). This area will be cut off when the booklet is marked.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

Achievement

TOTAL 09

Page 1

QUESTION ONE: Greenhouses



Source: <https://www.tomatoesnz.co.nz/assets/Uploads/EJJ9595.jpg>

(a) How do commercial greenhouses allow the grower to modify TWO physical factors to improve crop production?

Physical factor (1):

B *I* U

Surfaces of greenhouses are built using transparent materials. This is done to maximise plant exposure to sunlight. Light is a crucial aspect of the photosynthesis process in which; light, water and carbon dioxide are used by the plant for glucose and oxygen production.

Physical factor (2):

B *I* U

Because greenhouses are closed environments and also have transparent walling, the light that is let in heats up the greenhouse and heat cannot escape easily. Trapping heat increases the temperature of the environment within. Germination is the process in which a seed grows to become a seedling. Surrounding temperatures as well as water and nutrient access are key to this process.

(b) Justify the use of greenhouses for a commercial crop in terms of crop yield and timing. In your answer consider the economic and environmental impacts.

B *I* U    

Crop growth is largely dependant on the time of year because each season has differing climates which may or may not be fit for a crop. The climate within greenhouses can differ from the one outside. This means, year round, a grower can cultivate crops suited for warmer climates. Greenhouses also allows for cultivating crops from other climates, such as those grown in tropical or equitorial environments because there is increased humidity and temperature.

Greenhouses are economically viable in the long run as they rely on sunlight for lighting and temperature. Therefore artificial lighting doesn't need to be pursued. Doing so would add to maintainence and electrical costs. Humidity within the greenhouse as a result of temperature increase and condensation helps with the irrigation of the plants, and so costly irrigation systems aren't needed either.

Page 2

QUESTION TWO: Irrigation systems

Source: <https://www.kirrirrigation.co.nz/k-line.jpg>

- (a) How can irrigation systems modify TWO aspects of the growing environment for commercial plant production?

Aspect (1): rain

B *I* U    

Irrigation systems remove a reliance on natural percipitation. This means crops can be grown in drier regions which don't see much percipitation. This widens the window of time for the growth of a crop, especially in the transition from rainier to drier seasons. It also allows for plant processes like photosynthesis to be carried out longer.

Aspect (2): humidity

B *I* U    

Water from irrigation systems can evaporate in warmer climates, this makes the surrounding environment wetter and warmer. Humidity encourages the growth of fungi, especially in pasture fields.

- (b) Justify the use of an irrigation system in a commercial crop in terms of crop yield and quality.

In your answer consider the environmental and social impacts.

B *I* U    

A big wheel, pivot or 'boom' is an irrigation system which rotates a beam connected to a central pivot around a field. The beam is supported by smaller wheels in the middle and a larger one at the outward tip. The beam showers the crops below and slowly circles the field. The radius of the beam can differ in length and can extend for tens of metres. A larger radius can irrigate more crops, thereby increasing crop yield.

Environmentally, big wheels take up a lot of space. A longer irrigation beams generally means more water needs to be used. Water can be sourced from natural resovoirs; lakes, rivers and whatnot, although these might be shared with the public for their needs as well.

Page 3

QUESTION THREE: Light

Source: <https://www.hortnz.co.nz/>

(a) How are TWO management practices used to modify access to light in outdoor plant production?

Management practice (1): Plant spacing

B *I* U

Strategically spacing plants apart from each other can maximise the plants' exposure to sunlight. In spacing out plants, growers aim to reduce sunlight blocking by other plants as seen in compact planting. A smaller example of blocking lighting can be seen in weed growth where weeds can grow to the size of the host plant and overshadow it, taking resources for itself.

Management practice (2): Pruning or cutting

B *I* U

Plants can be planted more closer to each other, but to maximise sunlight exposure they need to be pruned or cut. This technique removes parts of a plant which might block access to sunlight for neighbouring plants.

(b) Justify the use of one of these management practices in terms of crop quality and timing. In your answer consider the economic and social impacts.

B *I* U

Spacing out plants maximises not only exposure to sunlight but also rainwater. More access to resources needed for photosynthesis means the plant is able to more efficiently grow. In orchard farming (where spacing is more likely to be used), produced glucose contributes to fruit growth. So by letting photosynthesis occur more, growers can cultivate quality crops.

Achievement

Subject: Agricultural and Horticultural Science

Standard: 91290

Total score: 09

Q	Grade score	Marker commentary
One	A3	The candidate discussed the factor of how heat is trapped inside glasshouses and increases the heat, which in turn improves photosynthesis.
Two	A3	The candidate gave a nice little discussion about how water from irrigation allows people to grow in areas of low precipitation. They gave a brief description about how a pivot irrigator works.
Three	A3	The candidate described how spacing helps to improve the amount of light a plant receives and touched on the increased rate of photosynthesis.