National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

# Exemplar for Internal Achievement Standard

# Agricultural and Horticultural Science Level 1

This exemplar supports assessment against:

Achievement Standard 91928

Demonstrate understanding of how a life process is managed in a primary production system

An annotated exemplar is a sample of student evidence, with a commentary, to explain key aspects of the standard. It assists teachers to make assessment judgements at the grade.

New Zealand Qualifications Authority

To support internal assessment

| Grade: Achieved |
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| For Achieved, the student needs to demonstrate understanding of how a life process is managed in a primary production system.<br><br>This involves describing a life process that is managed in a primary production system and a relevant management practice that influences the life process, using supporting evidence. The understanding of a Māori concept in the context of how a life process is managed must be shown.<br><br>The student has described the life process of photosynthesis. The management practice of pruning kiwifruit has been described, with a captioned photograph referred to in the text as supporting evidence. A reference in the text to the pruning diagram shows further use of supporting evidence. The student shows an understanding of tiakitanga, although only refers to 'kaitiakitanga'.<br><br>For Merit, the student could explain how pruning the kiwifruit vine would influence the photosynthesis of the vine especially in the leaves. |

Achieved

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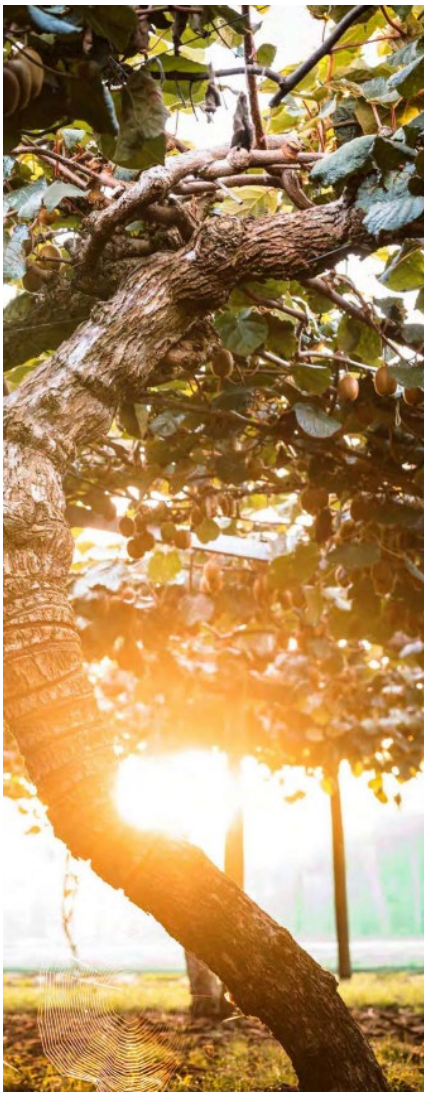
## Life process of photosynthesis in Kiwifruit

Photosynthesis generates energy, this energy is captured through light and converting the light to chemical energy. Energy in the sugars is used for growth.
The leaves of kiwifruit contain chlorophyll, this creates the green color in the kiwifruit. Chlorophyll absorbs the light energy. This energy and carbon dioxide is taken in through the kiwifruit leaf pores and the water is taken in through the roots, this combines to make glucose sugar and water. So, photosynthesis occurs in the leaves of the kiwifruit, these sugars need to be moved up to the stem, stalks, flowers and other leaves by the phloem. Water moves from the roots up to the rest of the kiwi plant (especially leaves) through the xylem.

Considering this, the word equation for photosynthesis that proves all these products are put together to create energy from photosynthesis are Carbon dioxide + water + glucose + oxygen gas. The carbon dioxide is a reactant along with water, and the glucose and oxygen gas are the products.

All this is needed to continue the life process of photosynthesis within the Kiwifruit Plant to maintain quality kiwifruit. The kiwifruit crop relies on this (photosynthesis) to develop successfully towards a purposeful harvest for the market.



## Pruning

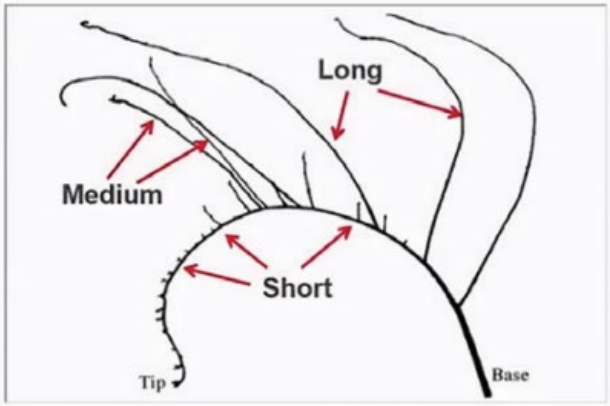
Pruning is a management practice that provides more light to the fruit (photosynthesis). This practice ensure the fruit ripen. With more light from pruning more kiwifruit shoots will occur from the photosynthesis – light entering in. The kiwifruit need this sunlight to promote healthier growth as the kiwifruit plant originated from ample sun exposure so lots of shadowing on the plants will negatively impact the kiwis.

By pruning the kiwi plants, it allows sunlight. Sunlight helps the process photosynthesis through the sunlight giving cells carbon dioxide and energy. This energy increases the kiwifruit sugar levels.

We carried out the management practice pruning, by trimming the kiwi canes, spurs and average amount of required leaves to reduce the canopy. If we didn't do this, the canopy will get overgrown and not allow sunlight to peek though to the fruit to ripen in time for the market – they will lose value.

The bottom photo, shows the required lengths to have the canes, spur, and number of leaves after pruning to ensure light reaches the fruit so photosynthesis can occur.

The above photo shows what our kiwifruit looks like after we prune. As you can see there is plenty of space for the kiwifruit to grow and light to enter.

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|---|---|---|---|
| **Short** | Terminated, short internodes (spurs) | 8 cm long, | 5 leaves |
| **Medium** | Terminated, long internodes | 56 cm long, | 14 leaves |
| **Long** | Non-terminated, often pruned | 187 cm long | , 40 leaves |

## Mātauranga Māori concept

The Maori concept I am choosing is Kaitiakitanga this is a New Zealand Maori term that means guardianship for the sky, sea and land. The kaitiaki is guardian and the process and management practices within protecting our land and environments, this is referred to as Kaitiakitanga. This maori concept, Kaitiakitanga relates to the management practice, pruning, by allowing photosynthesis into our kiwifruit. This is by caring for our kiwifruit - guardianship of land.

To carry out this process we pruned in early winter months to have a healthy, good-sized kiwifruit for the market and pruning at the right time to protect the plant from sap. We cared for the kiwi plant by doing this as if we did it later there would be less quality fruit (bud numbers) and cause the canes to sap which weakens the vines.

To the right shows the photo of pruning the canes correctly to ensure we produce quality kiwifruit for the market. This is our process along with many other practices (like girdling) to care for our land – Kaitiakitanga - that ensures we have a successful yield for fellow NZ citizens to buy from their local supermarkets.

We are also protecting the environment around us as if we left excess fruit rotting on the ground after an unsuccessful harvest from not carrying out our management practices, we would attract pests to eat them instead of helping citizens live healthier lives through our orchard providing great nutrition with high standards of fruit quality for the market.

The above photo shows sap dripping from the pruned end of the kiwifruit this happens when you prune too late.

| Grade: Merit |
| --- |
| For Merit, the student needs to explain how a life process is managed in a primary production system. This involves explaining how the life process is influenced by the management practice.<br><br>The student has described growth and drenching of lambs. They have referred to captioned photographs as supporting evidence to illustrate the steps of drenching. The influence of drenching on lamb growth has been explained. There is good understanding of the Māori concept of manaakitanga, evidenced with detail.<br><br>For Excellence, the student could evaluate how the life process (growth of lambs) is influenced by drenching or not drenching. This would involve making a judgement regarding which practice is best to improve production. |

Merit



## 1.Growth Processes in Lambs

- Lamb growth is when a lamb puts on mass or size throughout its lifetime.
- The target weight for a lamb at birth from an 80kg ewe is from 3.5kg-6kg depending on a single lamb, twins, or triplets.
- Farmers will aim to grow lambs to 40kg before sending them to the freezing works. This will make sure that the carcase weight of the lamb is above 15kg. If the carcase weight is below 15kg farmers will get marked down.
- The growth rate of a lamb changes from farm to farm. 150 grams a day is a good target for farmers. 400 grams a day can be done by using a high-quality feed for lambs.
- Lambs switch from milk to hard/grass feed at around 12 weeks of age. By eating grass lamb gain essential protein, energy, vitamins, and minerals which is essential for lamb growth.
- For lambs to grow they break down cellulose and protein to release amino acids and sugars that the lamb uses to put on muscle mass which increases the lambs' weight.

## 2.Drenching Managment Practice

**Drenching Steps:**

1. Thoroughly wash the drenching equipment and check equipment for operational efficiency.
2. Weigh a sample of lambs to find a sample of weights. Make sure you drench to the heaviest lamb to prevent drench resistance from under dossing heaver lambs.
3. Calibrate the drench gun by setting it to the heaviest lamb. To find how much drench the heaviest lamb needs, read the back of the drench packet to find out. Using water, set the drench gun to the correct amount of ml and squirt it into a measuring cylinder 10 times then divide total volume by 10. If it is not the correct amount of liquid adjust the drench gun until the right amount comes out.
4. Screw the drench gun onto the drench drum and prime the drench gun by making sure there are no air bubbles in the tube or drench gun.
5. Put the lambs into a race and go through with the drench gun making sure to drench every lamb to prevent internal parasites such as worms.
6. One you drench a lamb record the date drenched, animal ID, type of drench, dose rate, weight of animal, batch number, and the expiry date of the drench.

**Dos and Don'ts of drenching**

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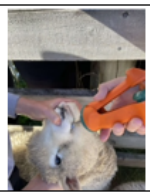
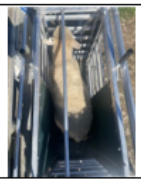
|  |  |
| DON'T hold the lambs head up too high or drench will go into the lungs which can lead to death. | DON'T hold the lambs' moth closed or it could break its teeth. |
|  |  |
| DO calibrate the drench gun, making sure you drench to the heaviest weight. | Do weigh the lambs before drenching so you can drench to the highest weight. |

## 3. Manakitanga

Manakitanga is shown when a farmer drenches their lambs to get rid of the sicknesses and make the animals feel better. By doing this the lambs will provide the farmer with more, high quality meat. This happens because the farmer has helped the lamb by drenching it and killing the internal parasites, so the lamb is helping out the farmer because it healthy and providing more meat output for the farmer to sell.

**4.How drenching effects lamb growth**

By drenching lambs, you kill the internal parasites which take up the lamb's nutrients that they get from the grass. Without the parasites lambs grow a lot faster because they are not fighting the parasites to get their energy. Farmers will use several types of drenches such as a dual drench or triple drench to kill the several types of parasites within the lambs. To find out what parasite the lambs have farmers will do a faecal egg count on the lamb's faeces. The four main types of internal parasites are tape worm, hook worm, round worm and whip worm, these parasites can infect vital organs within the lamb such as the gastrointestinal tract, liver, and the lungs. Parasites can stop the lambs from putting on weight because of nutrients loss which effects the lamb's health. Decreased feed efficiency is a result of internal parasites because the parasites compete with the lamb for nutrients, so the lamb needs more feed to thrive. The Barbers pole worm is a blood sucking worm that can cause anemia in lambs. Anemia is caused by loss of blood from the parasites leading to lamb weakness and lethargy. This results in decreased growth as energy is required to replace the lost blood.

**5.Drenching Evaluation**

There are good and bad things about drenching for farmers. The benefits on drenching are: the drench kills the internal parasites, such as worms so that the lambs can get all the nutrients they need, Drench can give a higher survival rate in lambs which can lead to a higher profit, more productive lambs, and less labour from dealing with sick sheep. The down sides of drenching are cost of drench (It can cost anywhere from $500 - $800 per 15L of drench), drench resistance caused by the wrong drench or under drenching. Drench resistance can lead to worms staying in the lambs and causing health problems such as reduced nutrients intake. More cons to drenching are cost of labour for drenching and time to drench depending on the amount of lambs. In my opinion the pros outweigh the cons so I think the farmer should drench because of increased meat quality and production.

**Bibliography**


- OneNote
- Growing great lambs - Growing Great Lambs | VetSouth
- Worm wise - wormwise-resource-book.pdf (beeflambnz.com)
- Correct drenching technique video - Listerine Total Care 5X More Cleaning Power 2024 - NZ 6s (youtube.com)
- Managing sheep worm's video - Managing sheep worms (youtube.com)

| Grade: Excellence |
| --- |
| For Excellence, the student needs to evaluate how a life process is managed in primary production system. This involves evaluating how the life process is influenced by the management practice to improve production.<br><br>The student has evaluated the impact of different types of irrigation systems, and the impact of too much or too little water on photosynthesis and strawberry production. Supporting evidence has been used, with the reference in the text to the photograph of drip irrigation. A basic understanding of manaakitanga and growing healthy strawberries has been provided. |

Excellence

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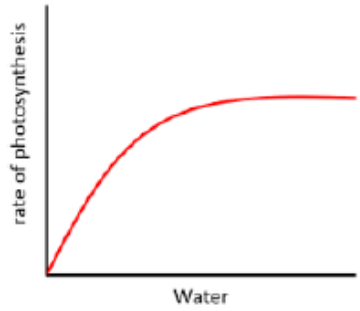
Crop: Strawberries (berry growing, outside- not hydroponics)
Life process: Photosynthesis
Management process: Irrigation

Photosynthesis is the process by which plants make their own food. Water is sucked up through the roots, carbon dioxide enters the leaves through the stomata and sunlight is absorbed through chlorophyll in the leaf which provides energy to the chloroplast. The chloroplast acts like a factory to break down molecules to then reconstruct them to produce glucose and oxygen. These outputs are used in respiration to make energy and excess sugars are stored as starch. Photosynthesis occurs in the day or at night if artificial light is used because that is when light levels are most sufficient. Factors that can affect photosynthesis in crops are the amount of carbon dioxide in the air, volume of water in the soil, amount of light available, environment's temperature and the amount of chlorophyll that is used to absorb light. In this report I will be investigating how irrigation affects photosynthesis in (field) strawberry plants.


Water is vital for a plant's survival because it is required for plant processes such as photosynthesis. The word equation pictured on the left demonstrates that water can become a limiting factor in photosynthesis so without it, the plant would be unable to produce sufficient amounts of glucose and oxygen which would result in either the plant producing bad fruit, a very sick plant or the plant dying because the plant is left with suboptimal levels of sugar stores therefore the ability to make energy but this is a part of the respiration process. Too much water is also bad because it doesn't let enough oxygen into the soil to get to the roots. This graph showing the rate of photosynthesis shows that photosynthesis will slow down if there is not enough water and at a certain point, water will stop increasing photosynthesis. Fortunately, plants can be monitored by growers so that the crop receives the right amount of water. Sometimes rain does not provide an adequate amount of water to the plant which is why many growers use a system called irrigation. Irrigation is needed for good plant growth so the grower does not have to rely on rainfall. There are two main systems of irrigation which are drip irrigation and sprinkler irrigation. Drip irrigation has tubes along the ground that slowly drips water into the soil for the plant. Less water is wasted in this system which means more money is saved and it gives weeds less opportunity to steal water from the plants. Disadvantages of this system are that it can be easily damaged by mowers, animals and the sun because of it being on the ground, and the holes can get blocked up by sediments in the water. Sprinkler irrigation has tubes under the ground with sprinkler heads above the ground that pumps water to the plants. This system can cover a large surface which is good for large crops and since the tubes are underground, they



are less likely to be damaged by animals, mowers and the sun. Sprinkler systems are less efficient at getting water to the plant's roots because water is lost to runoff and evaporation.

Irrigation is crucial when growing strawberries because they are very sensitive to both too much or too little amount of water. Over irrigation can cause their shallow roots to become more susceptible to root diseases. Drip irrigation (shown on the left) is the most efficient when growing strawberries because the water can enter the soil and get to the roots faster with less wastage of water that would occur with the sprinkler system. Sprinkler systems can also cause the flowers, fruit and leaves to rot because of the overhead watering which is also a reason why drip irrigation is more ideal. Without this extra water needed for photosynthesis, the crop will not be able to produce the best fruit and improve production because of water being a limiting factor.

Photosynthesis is affected by irrigation because plants need water, and rainfall usually doesn't provide enough of it so growers use irrigation to supply the plants with the right amount of water. Drip irrigation drips water into the soil which is sucked up by the roots and used along with carbon dioxide and sunlight to make glucose and oxygen. Photosynthesis is influenced by irrigation because it provides one of the main factors to help the plant produce its food. Irrigation doesn't just keep the plant alive but it also helps the plant produce better fruit which will end up being more beneficial to the grower. It is also important to consider that growers also have to manage the amount of carbon dioxide and sunlight that the plant is absorbing. If there is enough water and not enough carbon dioxide or sunlight then the plant will be unable to photosynthesise as efficiently as possible.

Irrigation in strawberry plants shows manaakitanga because it shows how the grower cares for the whenua and nurtures the plant to make sure it can produce an abundant amount of healthy fruit. The grower provides this fruit for people to enjoy which also shows manaakitanga by providing for others.

References

Crop Guide: Growing strawberry (Provided by teachers)

https://www.rivulis.com/crop/strawberries/ -information about types of irrigation

https://www.parkland.co.nz/growing-outstanding-strawberries-with-aquatraxx-drip-tape/ - drip tape photo used from this site