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
For Achieved, the student needs to demonstrate understanding of how a life process is managed in a primary production system, and understanding of a Māori value in the context of how the life process is managed in the primary production system. This involves describing a life process that is managed in a primary production system and a relevant management practice that influences it, using supporting evidence. The student has described the digestion process and the management practice of feeding chicory with relevant detail, and demonstrated an understanding of manaakitanga in this context. For Merit, the student could explain how feeding chicory to deer would benefit the digestive system of the deer.

Deer

Achieved

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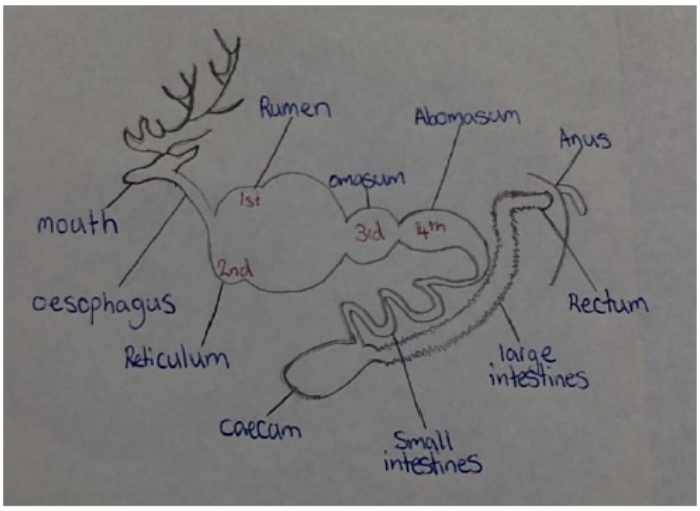
Animal – Deer

Life Process – Digestion

Management Practice – Feeding Chicory Pasture

Diagram – Describe the life process



Describe the life process – Digestion is the process of breaking down feed and absorbing nutrients. Deer are ruminant animals which means they have four stomach chambers, and breakdown/digest feed chemically. Once the deer has ingested the chicory/feed and it has moved down the oesophagus, it then enters the rumen which is the first of the four stomachs. This stomach is important for the survival of the deer as it's the largest of all four stomachs. This is where microbial digestion starts to take place. Microbial digestion is the process in which microorganisms break down cellulose which occurs through fermentation. It is also the stomach that has the small finger-like projections that are called papillae that help increase the surface area of the rumen in order to absorb some of the nutrients into the bloodstream.

The feed then continues through to the second stomach, another important stomach called the reticulum, which has the honeycomb structure which filters/collects large undigested feed into a small ball (cud) for regurgitation. This stomach also contains microbes for microbial breakdown/digestion.

The feed then moves through the last two stomachs, the omasum and the abomasum, before entering the small intestines, where enzymes continue to chemically break down the feed. The small intestine is also where the feed is absorbed through structures on the wall lining called villi.

These are the most important parts of microbial digestion for a ruminant animal because microbial digestion is needed for the breakdown of cellulose. Cellulose is broken down into VFAs (volatile fatty acids) which are absorbed into the bloodstream by the papillae which results in nutrients absorption. VFAs provide energy and energy is used for movement and growth.

Describe the management practice – My chosen management is feeding chicory crop to deer. This involves cultivating a standard pasture paddock and sowing a chicory seed crop. Chicory is a short-lived leafy herb with a high feed/protein value. Chicory can be incorporated into a rotational grazing system through its active growing months. It has good summer yield but limited cooler season growth. Grown from seed, chicory takes around 75-90 days (about three months) to be at its full potential ready for grazing. Once at its full potential, it is ready to be put into a rotational grazing system through the summer, autumn and spring months. Feeding chicory enhances a deer's digestion because chicory contains 20-26% protein, which is very high. This results in a higher rate of muscle and bone growth and a high rate of MJME (mega joules of metabolizable energy) for movement and growth. This ultimately results in a big, healthy animal ready for slaughter, returning more profit to the farmer.

Mannakitunga – Is the process of showing respect, generosity and care. If the farmer is feeding his deer high-quality feed, like chicory, that is getting them to their full potential faster and healthier, they produce a higher amount of venison. This then results in increased profit for the farmer. This is a great reflection of mannakitunga as it shows a relationship between the farmer and the animal because the farmer produced the good quality feed, and the deer produced the venison. This management practice shows care for the animal and respecting it by feeding it well.

Evaluation – A strength of this management practice relates to the speed that it fattens the deer. Although chicory costs more than standard pasture, it fattens the deer up faster. This results in a quicker turnover of deer on-farm, thus more profit for the farmer. However, there are a couple of weaknesses of this management practice. Although rare, chicory has the potential to bloat deer if too much is digested too quickly, so the volume consumed needs to be monitored. Also, as mentioned above, chicory is not an all-year round crop as its peak growth time is during the summer, spring and autumn months. Therefore, during winter it would not be the best choice of feed for the deer. So overall, feeding chicory to deer is more beneficial for the deer than if the farmer was to feed them a ryegrass pasture, as chicory has higher protein and energy rates, producing more venison and more profit for the farmer.

[redacted]

Grade: Merit
For Merit, the student needs to explain how a life process is managed in a primary production system, and demonstrate understanding of a Māori value in the context of how the life process is managed in the primary production system. This involves explaining how the life process is influenced by the management practice. The student has described photosynthesis and pruning of apple trees with detailed supporting evidence. They have explained how pruning of apple trees influences photosynthesis. An understanding of tiakitanga has been demonstrated in this context. For Excellence, the student could compare how two methods of apple tree pruning influence photosynthesis, e.g. central leader vs open vase shape.

Merit

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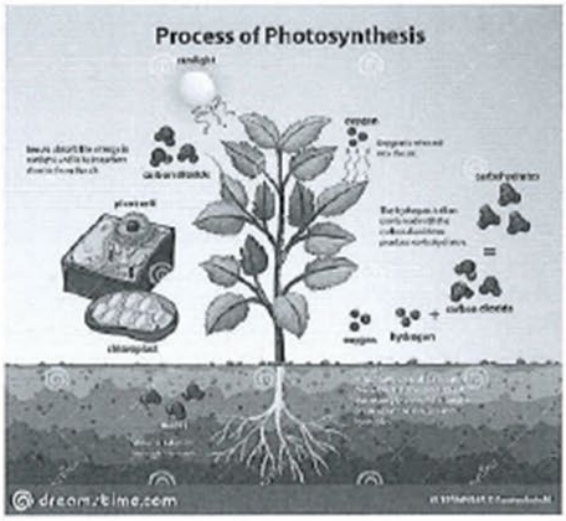
Photosynthesis:

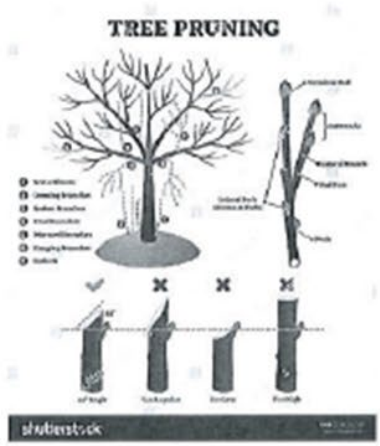
Photosynthesis is the process by which the plant uses the sunlight , water and carbon dioxide to create oxygen and energy in the form of sugar that occurs in the chloroplast.This performs during the day hours because this reaction needs sunlight. During the process of photosynthesis the plant is taking in carbon dioxide (co2) and water (H2O) from the air and soil. This is transforming the water into oxygen and the carbon dioxide into glucose (C6,H12,O6 = Glucose).. Then the plant releases the oxygen back into the air and stores the energy with the glucose molecules. Water comes from the soil via the xylem. Carbon dioxide is entering the plant from the air with the sunlight hitting the plant and Chlorophyll (the active ingredient) which makes the plant look green and also absorbs energy from the sunlight.The glucose that the plant has made ,the plant now uses this to help it grow and may be transported to the roots, seeds ,stalks or the fruits for storage. Starch is the storage for the plant that is stored in the seeds and roots. The plant sortes this away so that when the plant needs it to grow it is available for the plant.



$6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$

Pruning:

Apple trees should have a conical / pyramidal shape with shorter branches at the top , so more light can be let in to reach the lower branches.Pruning is the practice of removing certain branches , such as verticals because apples are unable to grow upwards , diseased branches , we remove these because the tree is using all of its energy up on branches that have a disease or are dead and the tree is trying to heal the branch when it is already dead, so we remove these branches to prevent the tree from using up its energy. We also want to be removing the crossed over branches because it creates more shade and it slows down the photosynthesis process. Because having crossed over branches they are preventing the sunlight from entering in and being able to reach down towards the branches underneath. The sunlight is one of the most important things towards the process of photosynthesis ,so this is why we are removing these branches so that there is less shade and more sun and energy for the tree to be able to grow strong and for the tree to be able to create a good apple yield for when they are ready.

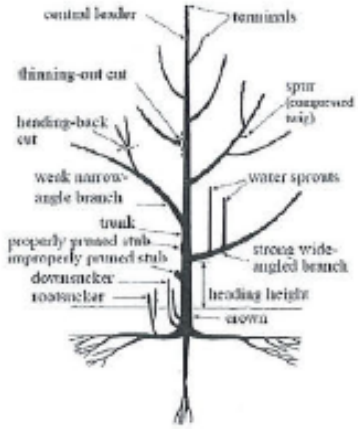


Small branches are also necessary to be removed (mainly size of a pencil) because they also take up to much energy with the growing process, they won't be able to produce apples until the next year (next yield) .So therefore it is pointless to have those branches and keep that energy for those branches that are already producing the apples.When we go to prune the tree we want to be leaving the horizontal branches and the mature spurs. This is because the apples will be growing from the spurs. When you go to cut off a branch you have to make sure that you cut on a diagonal line so that when it rains the rain is able to run off the branch but at the same time the branch is able to gather the water that is needed without being drowned. The equipment that you used must be cleaned and sanitised so that we don't spread bugs and we want to be sure that the equipment is

sharp so we have a clean cut. The equipment that is used must be suitable for the job of what you are cutting. Pruning shears from the little branches , loppers for the bigger, thicker branches and a hand saw for the massive branches that are unable to be cut with the loppers.

Tiakitanga

Tiakitanga means guardianship and to care and protect people ,land and environment.To allow for intergenerational sustainability in future.



We are showing Tiakitanga by caring for our apple trees via pruning them to improve their growth and being able to have a better chance with photosynthesis and being able to produce a good yield. This is related to our photosynthesis for apple trees because we are trying to improve the photosynthesis of apple trees by removing the diseased branches , crisscross and the small branches to be able to help the tree improve the growth and a better apple yield. This is helping the environment by not letting the diseases spread and being able to have the tree string for the rest of the year and it is helping the people with being able to have a good yield of apples to be able to sell to make money and even have something healthy and organic for a snack and creating a sustainable future for the next people.

Grade: Excellence
For Excellence, the student needs to evaluate how a life process is managed in a primary production system. The student also needs to demonstrate understanding of a Māori value in the context of how the life process is managed in a primary production system. This involves evaluating how the life process is influenced by the management practice to improve production. This student has evaluated the process of reproduction and the management practice of artificial insemination with relevant detail, and demonstrated an understanding of manaakitanga in this context.

Excellence

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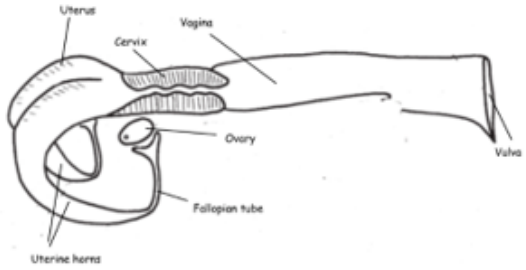
Reproduction is an essential life process in life to increase the numbers of offspring either through asexual or in the case of deer through sexual reproduction. The importance of reproduction in deer is that it ensures the genetics, so the farmer has replacement stock for breeding or selling for venison for meat, velvet for traditional medicine, and antlers for export. Proper management of deer reproduction can help to reduce inbreeding, maintain genetic diversity, and minimize the risk of disease transmission within the herd. Manaakitanga refers to the practice of caring for and respecting others, and in return, they will reciprocate. Manaakitanga is linked to reproduction and the management practice of AI by emphasizing the importance of caring for the deer, and ensuring their well-being, allowing farmers to improve the breeding process so the deer will provide quality products in return. This is especially important during the reproduction process, as it can be a stressful and challenging time. By providing proper care and attention to the deer ensures a successful breeding process and improve the overall health of their animals.

A management practice that effects reproduction is artificial insemination (AI). AI involves the collection of semen from a male deer and the insertion of that semen into a female deer's reproductive tract to achieve fertilization as shown in the diagram. The first step of AI is heat detection, this is the process the farmer does to determine whether the hind is ovulating. A deer farmer only gets a small window of ovulation to inseminate the hind. If this opportunity is missed the farmer will have to wait for the next cycle. Next is to sterilize and prepare the equipment, this is to ensure no bacteria gets dragged into the reproductive tract. Thawing semen straws makes the sperm ready for fertilization. The next step is to wipe the vulva and insert the AI rod into the vagina at a 45-degree angle. This is to protect the internal structure of the vagina. An arm is then placed into the rectum to locate the cervix. This is so the rod does not damage the cervix and is not inserted too far. The semen is deposited into the body of the uterus to increase the chance of pregnancy.



AI enables farmers to pick stags with favorable genetic traits and utilize their semen to inseminate hinds. This can result in offspring with better genetics, like faster antler growth rates, higher venison or velvet quality, or other desired traits. Farmers will increase the production efficiency of their mobs by selecting superior genetics using semen from high-quality stags, even if those stags are not physically present on the farm, increasing the number of offspring that can be generated from a single stag, resulting in more efficient utilization of resources. In natural mating, a single stag will generally mate with 8-12 hinds, this is a large contrast from AI where a much larger number of hinds can become pregnant. AI influences the reproductive life cycle of deer by allowing for better regulated breeding and the selection of superior genetics which increases farmer revenue by increasing productivity and profitability. If hinds do not breed in a timely manner or produce too few offspring, it can delay the age at which the animals reach optimal harvest weight and size. AI can provide better regulated breeding by allowing farmers to control the timing by selecting when to inseminate hinds to have greater control over the timing of fawning. This is useful for farmers who wish to time their births for certain times during the season or meet market demands. AI can lower the chance of animal injury or stress during breeding, which enhances animal welfare.

AI is a management practice that has both strengths and weaknesses for deer farms in NZ.

Strengths:

- AI allows deer farmers to use semen from stags that are not physically present on the farm to introduce new genetics, increasing genetic diversity in the herd.
- By selecting superior genetics, farmers can produce offspring with desirable traits such as improved growth rates, meat quality, or antler production.

- AI allows farmers to have greater control over the timing of breeding and can reduce the risk of injury or stress to animals that can occur during natural breeding.
- AI can increase the number of offspring that can be produced from a single stag, which can lead to more efficient use of resources, increasing profits.

Weaknesses:

- AI can be expensive, as it requires specialized equipment and expertise.
- AI requires specialized skills and knowledge required by a vet.
- Conception rates for AI in deer are lower than those for natural breeding, which can reduce the effectiveness of the technology.

The reproductive life process of deer can have a significant effect on meat and velvet production on deer farms in NZ. The manipulation of reproduction is critical in determining the productivity and profitability of deer mobs. Hinds must be bred each year to produce fawns for meat or velvet. The reproductive efficiency of the herd can have a direct impact on the number of offspring produced and the timing of their growth. AI is an important management practice for deer farmers in NZ as it improves genetic quality and productivity of their herds, resulting in a higher quality and yield of venison or velvet, increasing income and reducing the risk of injury to animals. By using AI, farmers can ensure that the offspring are of consistent quality, which can be important for buyers who are looking for high-quality products or animals. Overall, AI can have a positive effect on meat and velvet production by allowing farmers to select superior genetics, time breeding for specific market demands, and increase efficiency. However, it is important to weigh the potential benefits against the costs and skill requirements of implementing AI on the farm against the potential benefits of improved genetics, increased efficiency, and controlled breeding.