

**Assessment Schedule – 2016****Agricultural and Horticultural Science: Demonstrate understanding of land use for primary production in New Zealand (91297)****Assessment Criteria****Question ONE: Horticultural production**

<b>Achievement</b>	<b>Achievement with Merit</b>	<b>Achievement with Excellence</b>
<b>Explains</b> , using two factors, what may have determined the change in land use; OR <b>Explains</b> , using two factors, how future land use may be affected.	<b>Explains in detail</b> , using two factors, what may have determined the change in land use; OR <b>Explains in detail</b> , using two factors, how future land use may be affected.	<b>Justifies</b> , using two factors, how this information will affect future land use.

<b>N1</b>	Some writing, but does not explain TWO factors that determine the change in land use OR how future land use will be affected.
<b>N2</b>	Partial or insufficient explanation of TWO factors that determine the change in land use OR how future land use will be affected.
<b>A3</b>	Explains TWO factors that determine the change in land use OR how future land use will be affected.
<b>A4</b>	Explains TWO factors that determine the change in land use OR how future land use will be affected. Both require supporting information.
<b>M5</b>	Explains in detail, using TWO factors, what may have determined the change in land use; OR how future land use may be affected. One factor explained in detail, the other factor explained.
<b>M6</b>	Explains in detail, using TWO factors, what may have determined the change in land use; OR how future land use may be affected. Both factors explained in detail.
<b>E7</b>	Justifies, using TWO factors, how this information will affect future land use. Comprehensive evidence given for ONE factor, with another factor well supported.
<b>E8</b>	Justifies, using TWO factors, how this information will affect future land use. Comprehensive supporting evidence given for both factors.

N0 = No response; no relevant evidence.

Q1	Sample Evidence
(a)	<p><b><u>Explains</u></b>, using two factors, what may have determined the change in land use.</p> <p><i>Economic</i></p> <p>Apple production area has decreased due to greater competition in the market from other fruit, such as grapes.</p> <p>Oversupply of apples in the market led to lower prices paid to the grower.</p> <p>Other countries have produced apples at cheaper prices than here in New Zealand.</p> <p><i>Technological</i></p> <p>Apple production area has decreased due to increased mechanisation of orchards.</p> <p>Increased productivity from new varieties of apple trees.</p> <p>Increased productivity due to better management practices, increasing yields of existing trees.</p> <p><b><u>Explains in detail</u></b>, using two factors, what may have determined the change in land use.</p> <p><i>Economic</i></p> <p>The main growing areas for apples are Hawke's Bay and Nelson. Other regions producing small volumes of apples are Central Otago, Gisborne, South Auckland, Wairarapa, Marlborough, and Canterbury. Over the past 20 years, the number of hectares used to produce apples has declined. If we look at the number of hectares used to grow grapes, we can see the land area has increased. This is likely to be mainly concentrated around Marlborough and Hawke's Bay. It suggests that traditional apple-growing areas are being converted or replaced by grape or dairy production, due to higher returns for growers.</p> <p><i>Technological</i></p> <p>Despite the area being planted for apples decreasing, there are now more varieties and higher production per hectare. New Zealand has been rated the most productive region in the world, at 63 tonnes per hectare. This is due to technological advances in the development of new varieties, plant management practices, and productivity, leading to higher production per hectare. Growers no longer need vast areas of land to grow apples.</p>
(b)	<p><b><u>Explains</u></b>, using two factors, how future land use may be affected.</p> <p><i>Economic</i></p> <p>Kiwifruit production has remained constant, due to consistent market demand and prices.</p> <p>Grape production has increased, due to increasing price and demand for New Zealand wine.</p> <p><i>Social</i></p> <p>Grape production has attracted a trained workforce – keeping the vineyard in the family.</p> <p>More possibility of a tourist trade, as vineyards can operate cellar door ventures.</p>

*Technological*

Newer PSA-resistant kiwifruit varieties are being developed and introduced.

New varieties are being developed with attributes that meet consumers' needs.

Increasing urbanisation means the workforce lives closer to rural areas.

**Explains in detail**, using two factors, how future land use may be affected.*Economic*

Strong international demand for New Zealand wine was the main driving force behind the increase in the grape-growing area, along with more international competition in apple production. As recently as the 1960s, government viticulturists advised that the South Island was unsuitable for growing wine grapes. In the 1970s and 1980s, some people chose to ignore this advice. They planted the right grape varieties for their sites, and went on to produce award-winning wines. This has caused many others to plant grapes in areas traditionally thought of as unsuitable for grape production. This is in contrast to the traditional land use of Marlborough, which was mixed cropping, pastoral farming, and orchards. Grape growers also produce table grapes for export, mainly in greenhouses in northern New Zealand. Around 20 tonnes are air-freighted to Japan each year, where they are mostly sold as gifts. The most common varieties are Muscat of Italia (a green grape) and Black Beauty. This seems to be an industry which is viable for the future.

*Technological*

The area of land in kiwifruit production has remained consistent over the last 20 years, thanks to the establishment of ZESPRI and the introduction of new varieties such as Gold kiwifruit and successful responses to PSA. Land use has remained consistent due to the marketability of kiwifruit. New, sustainable practices such as KIWI green and organic growing have resulted in New Zealand kiwifruit being of high quality and still in demand for export.

**Justifies**, using two factors, how this information will affect future land use.

Future land use will probably see an increase in grape production until its natural limit has been reached. This could encourage a change of land use in other untried areas such as Kapiti. If this is successful, with suitable climatic factors and a workforce that's attracted to the area, then this could see an increase in land use for grape production. However, if the quality is low or if the market becomes saturated, then we may see a decrease in grape production as production is reduced to maintain demand.

Kiwifruit production is likely to remain consistent, with increasing methods of control for PSA and continued marketing by ZESPRI. New Zealand's biggest producer of kiwifruit estimated the world market is only at half saturation, so production could double by 2020. The introduction of increasingly PSA-resistant varieties and new varieties such as the red-tinted fruit could lead to higher demand and production. This means the land is being utilised in a productive manner. The ease of irrigation in the planting areas, as well as the natural rainfall in production areas, allow for intensive, profitable production. However, the increasing amount of fruit production in both areas could put pressure on waterways, with increased leaching of nitrogen and phosphorus – which in turn cause excessive growth of weeds and algae, choking water systems. This could limit production as councils implement the Resource Management Act and limit water use. Kiwifruit production may be limited to areas with sufficient rainfall. However, ZESPRI has excellent protocols in place to reduce this threat.

Despite the area planted for apples decreasing, there are now more varieties and more production per hectare. New Zealand has been rated the most productive

	region in the world, at 63 tonnes per hectare. It is likely that areas used for apple production will remain stable, with technological advances leading to higher production per hectare rather than expanding production areas.
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**Question TWO: Land use conflicts**

Achievement	Achievement with Merit	Achievement with Excellence
<b>Explains</b> , using TWO land use factors, why there is conflict between horticultural land use and residential areas.	<b>Explains in detail</b> , using TWO land use factors, how traditional land use has influenced the tension seen in current land use.	<b>Compares and contrasts</b> , using TWO land use factors, the implications if a council does not take into consideration the highly productive land when changing horticultural land use to residential land use.

<b>N1</b>	Some writing, but does not explain TWO land use factors that determine why there is conflict between horticultural land use and residential areas.
<b>N2</b>	Partial or insufficient explanation of TWO land use factors that determine why there is conflict between horticultural land use and residential areas.
<b>A3</b>	Explains, using TWO land use factors, why there is conflict between horticultural land use and residential areas.
<b>A4</b>	Explains, using TWO land use factors, why there is conflict between horticultural land use and residential areas. Both require supporting information.
<b>M5</b>	Explains in detail, using TWO land use factors, how traditional land use has influenced the tension seen in current land use. One factor explained in detail, the other factor explained.
<b>M6</b>	Explains in detail, using TWO land use factors, how traditional land use has influenced the tension seen in current land use. Both factors explained in detail.
<b>E7</b>	Compares and contrasts, using TWO land use factors, the implications if a council does not take into consideration the highly productive land when changing horticultural land use to residential land use. Comprehensive evidence given for ONE factor, with another factor well supported.
<b>E8</b>	Compares and contrasts, using TWO land use factors, the implications if a council does not take into consideration the highly productive land when changing horticultural land use to residential land use. Comprehensive supporting evidence given for TWO factors.

N0 = No response; no relevant evidence.

Q2	Sample Evidence
	<p><b><u>Explains</u></b>, using two land use factors, why there is conflict between horticultural land use and residential areas.</p> <p><i>Economic</i>  Residential areas want fertile soils for good garden and lawn growth. Saves them spending money trucking in topsoil. Placing a house on prime horticultural soil is seen by horticulturists as a waste of a precious resource that should be used for food production. Once lost to a residential area, it will not be used for food production. This means that less productive soil areas will be utilised, increasing the cost of production. Horticulturalists would like residential areas to be placed on less productive soils, as they are not useful for food production.  Ease of supply of building materials to the area is useful for both parties to reduce costs.  Both parties like to be close to good, existing infrastructure so that transport costs are reduced and they can have ready access to a labour supply.</p> <p><i>Social</i>  Community builds up around productive areas, due to the ease of travelling, so residential areas grow, causing conflict between productive and residential areas. North-facing land is desirable for residential areas; however these are usually the most productive areas, so horticulturists want them as well.</p> <p><i>Workforce considerations</i>  Production land needs a good, reliable, workforce, so likes to be close to major towns and cities.</p> <p><i>Environmental</i>  Plant growth requirements are similar to population growth requirements, such as the allocation of water quantity and issues surrounding fresh-water quality degradation.</p> <p><b><u>Explains</u></b>, in detail, using two land use factors, how traditional land use has influenced the tension seen in current land use.</p> <p><i>Economic</i>  Land supply is affected by changes to the rural urban boundary and land fragmentation. Access to land is paramount for the horticultural sector, as it is losing the best of a finite resource, including north-facing and frost-free high-production land, to urbanisation. If this continues, production levels could decline, leading to a decrease in economic viability. Due to these areas being sought after, prices for land rise, causing tension between these two groups of people, as it becomes too expensive for horticultural use.</p> <p><i>Social</i>  Land is used for horticultural activities because it is free-draining, north-facing, and flat, with good, productive soil. However, these are also the areas that people want to live in for similar reasons, therefore causing a tension between land users.</p> <p><i>Workforce considerations</i></p>

As horticultural production areas grow and develop, so too does the size of the workforce needed to tend it. Much of this workforce is unwilling to travel long distances, and therefore requires housing nearby. This increases urbanisation and places a conflict on land use when rural activities expand. In addition to this, production areas are often set up at what seems to be a long distance from urban areas, but as urbanisation expands, these areas unintentionally become urbanised.

#### *Environmental*

People in urban areas compete for the same resources needed for plant growth and production. There is a tension with water management, including the allocation of water quality and quantity parameters that are key matters for the horticultural sector. Without water, prime land cannot support high-value rural production. There are also risks to the rural sector from fresh-water quality degradation as a result of urban activities (storm run-off and aquifer contamination). In the past, horticultural production didn't need to deal with this degradation, as issues were not as pronounced.

**Compares and contrasts**, using TWO land use factors, the implications if a council does not take into consideration the highly productive land when changing horticultural land use to residential land use.

#### *Social and workforce considerations*

Both land uses require north-facing, frost-free land and good infrastructure; this means there is often competition for the same land. Horticultural activities attract people to an area as a workforce. As the workforce increases, so does the need for houses and services, and therefore the demand for land, which can impinge on the land available for the original activity. This means that our areas of high production can be eroded by other land uses. As urban areas spread and grow, the land becomes further eroded, and this will affect what is available for horticultural production. Urbanisation is in direct conflict with horticultural activities. Noise pollution from rural activities is another direct conflict. The horticulture industry is worth \$5 billion and employs over 50 000 people. Despite the industry growth, there are a number of threats to the viability of horticulture in New Zealand and to maintaining a sustained sector growth and the security of food supply. If highly productive land is changed to residential, businesses will close and this will have an impact on the types of jobs offered in the area. People may have to move away or retrain due to having horticultural skills that are no longer required.

#### *Economic*

The production value of the land is important to New Zealand's economic growth, so if it is used for residential homes then it cannot be used for production. If production is forced into less productive areas, more resources will need to be spent improving soils, which can affect profits and the quality of the product. Areas of high production should be protected and set aside for horticultural activities, and not wasted on housing and urbanisation. With such a small percentage of land in the high-production category, it is important to preserve it.

**Question Three: El Niño**

<b>Achievement</b>	<b>Achievement with Merit</b>	<b>Achievement with Excellence</b>
<b>Explains</b> , using two factors, how traditional land use in 1997–1998 may have been affected by the El Niño weather pattern; OR <b>Explains</b> , using two factors, how current land use may not be as significantly affected by El Niño.	<b>Explains in detail</b> , using two factors, how traditional land use would have been affected by the El Niño weather pattern; OR <b>Explains in detail</b> , using two factors how current land use may not be as significantly affected by El Niño.	<b>Justifies</b> , using two factors with reference to traditional and current land use, why NZIER may have made this statement.

<b>N1</b>	Some writing, but does not explain TWO factors that determine how traditional land use in 1997–1998 may have been affected by the El Niño weather pattern, OR how current land use may not be as significantly affected by El Niño.
<b>N2</b>	Partial or insufficient explanation of TWO factors that determine how traditional land use in 1997–1998 may have been affected by the El Niño weather pattern, OR how current land use may not be as significantly affected by El Niño.
<b>A3</b>	Explains, using TWO factors, how traditional land use in 1997–1998 may have been affected by the El Niño weather pattern, OR how current land use may not be as significantly affected by El Niño.
<b>A4</b>	Explains using TWO factors with supporting information, how traditional land use in 1997–1998 may have been affected by the El Niño weather pattern, OR how current land use may not be as significantly affected by El Niño.
<b>M5</b>	Explains in detail, using TWO factors, how traditional land use would have been affected by the El Niño weather pattern; OR how current land use may not be as significantly affected by El Niño. ONE factor explained in detail, the other factor explained.
<b>M6</b>	Explains in detail, using TWO factors, how traditional land use would have been affected by the El Niño weather pattern; OR how current land use may not be as significantly affected by El Niño. BOTH factors explained in detail.
<b>E7</b>	Justifies, using TWO factors with reference to traditional and current land use, why NZIER may have made this statement. Comprehensive evidence given for ONE factor, with the other factor well supported.
<b>E8</b>	Justifies, using TWO factors with reference to traditional and current land use, why NZIER may have made this statement. Comprehensive supporting evidence given for BOTH factors.

N0 = No response; no relevant evidence.

Q3	Sample Evidence
	<p><b><u>Explains</u></b>, using two factors, how traditional land use in 1997–98 may have been affected by the El Niño weather pattern.  Traditional land use such as sheep and beef production.</p> <p><i>Environmental</i>  Lower rainfall decreases production.  Less irrigated land.  Land is marginal in terms of production, so impact is greater.</p> <p><i>Economic</i>  Production reduced.  More money used on irrigating land.  Animals culled, providing a short-term solution.  Loss of revenue during drought.</p> <p><b><u>Explains in detail</u></b>, using two factors, how traditional land use would have been affected by the El Niño weather pattern.</p> <p><i>Environmental</i>  Drought means that there is a lack of water over the driest period, decreasing plant production. Areas that would normally get enough rainfall, now do not, and the farmer does not have the infrastructure or land type to irrigate.</p> <p><i>Economic</i>  The traditional land use had higher stocking rates and more unirrigated, marginal land. This meant that a drought would cause substantial economic losses, due to reduced production, and the potential loss of breeding stock due to destocking, resulting in reduced income.</p> <p><b><u>Explains</u></b>, using two factors, how current land use may not be as significantly affected by El Niño.  Current land use such as dairy production.</p> <p><i>Technological</i>  Changes in irrigation technology, such as centre pivots, mean farmers are able to adequately irrigate their pastures to buffer the impact of drought.  Planting of drought-resistant crops as supplementary feed.  Those farmers still in sheep and beef production now benefit from improved genetic potential, which will help to buffer the impact.</p>



*Environmental*

Current land use is seeing 1.1 million hectares of land being used for dairying in the North Island and 0.6 million hectares in the South Island. Some of the growth is on marginal land, but the increase in land under irrigation was the greatest buffer to the impact of El Niño and drought.

**Explains** in detail, using two factors, how current land use may not be as significantly affected by El Niño.

*Technological*

Current land use sees better management practices and genetics, which lead to higher production per hectare. Better production per animal and improved irrigation systems buffer the impact of drought. Technology that has been developed in the past 20 years (e.g. improved irrigation methods like centre pivots) ensures that dairy production or orcharding can occur, as the land can be irrigated to produce large quantities of produce. If this new technology was not available, then drought would have a significant impact, as the land dries out in the summer, and fruit and grass growth and quality are restricted.

*Environmental*

Current land use means 1.1 million hectares of land is used for dairying in the North Island and 0.6 million hectares in the South Island. Some of the growth is on marginal land, but the increase in land under irrigation was the greatest buffer to the impact of El Niño and drought. This helped productivity under these drought conditions and helped maintain production levels.

**Justifies**, using two factors with reference to traditional and current land use, why NZIER may have made this statement.

*Economic*

El Niño may tip the country into drought but will not spark a recession, due to the changes we have seen in land use since the last significant El Niño event. Past El Niños have hit farmers and the economy hard, but as farming practices and land use have changed, the sector is more resilient to changes in weather patterns. Traditional land use in many parts of the East Coast, where drought would be the worst, have moved away from sheep and beef and are moving towards dairy. The Hawkes Bay and the East Cape were likely to experience the worst effects but with the lower dairy payout, stocking rates were already reduced, therefore it did not have a significant impact, enabling them to withstand a dry spell. Milk production has increased in most years since 1992 / 93, but dropped markedly due to the droughts in 1997 / 98, 2007 / 08 and 2012 / 13. Overall, in drought years, milk production decreases and meat production increases. In the post-drought years, milk production recovers and meat production falls. This means that the trend for more dairy farms will allow New Zealand to ride out the drought with minimum impact. If the event causes New Zealand's competitors to be adversely affected, then we could see prices increasing and further conversions taking place, influencing future land use.

*Technological*

Since 1990, the sheep flock has almost halved, but efficient farm management and genetics mean the tonnage of lamb for export is roughly flat, even though much prime sheep country is now used for dairying. The location of the dairy industry has shifted markedly over the past 25 years, driven by farm conversions in

Southland and Canterbury. With a change in agricultural practices and the shift away from traditional sheep and beef, farmers are able to be more creative in dealing with drought. They are often able to plan for it, due to more accurate weather predictions, and use alternative feed practices and shift stock around to reduce exposure to dry conditions. The trend towards dairying also enables culling to take place, to help manage drier conditions without a mass loss in productivity. This can balance available feed.

### Cut Scores

Not Achieved	Achieved	Achieved with Merit	Achieved with Excellence
0–6	7–12	13–18	19–24