FIGURE S1. Locations of the New Zealand Pinot noir Ideotype Vine study vineyards in Wairarapa, Marlborough and Otago.

TABLE S1. Location, weather station and soil information for the New Zealand Pinot noir Ideotype Vine study network.

<table>
<thead>
<tr>
<th>Vineyard ID</th>
<th>Region</th>
<th>Sub region</th>
<th>Local Weather Station</th>
<th>Soil Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>OA</td>
<td>Otago</td>
<td>Manuherikia</td>
<td>Bannockburn</td>
<td>Sib 1</td>
</tr>
<tr>
<td>OB</td>
<td>Otago</td>
<td>Waengaf</td>
<td>Bannockburn</td>
<td>Sib 4</td>
</tr>
<tr>
<td>OC</td>
<td>Otago</td>
<td>Ranfurly</td>
<td>Bannockburn</td>
<td>Sib 1</td>
</tr>
<tr>
<td>OD</td>
<td>Otago</td>
<td>Ardgour</td>
<td>Bannockburn</td>
<td>Sib 9</td>
</tr>
<tr>
<td>MA</td>
<td>Marlborough</td>
<td>Ranfurly</td>
<td>VCSN</td>
<td>Sib 1</td>
</tr>
<tr>
<td>MB</td>
<td>Marlborough</td>
<td>Waipapa</td>
<td>VCSN</td>
<td>Sib 1</td>
</tr>
<tr>
<td>MC</td>
<td>Marlborough</td>
<td>Waipapa</td>
<td>VCSN</td>
<td>Sib 1</td>
</tr>
<tr>
<td>MD</td>
<td>Marlborough</td>
<td>Waipapa</td>
<td>VCSN</td>
<td>Sib 1</td>
</tr>
<tr>
<td>WA</td>
<td>Wairarapa</td>
<td>Waimakirri</td>
<td>Martinborough</td>
<td>Sib 22</td>
</tr>
<tr>
<td>WB</td>
<td>Wairarapa</td>
<td>Barrhalff</td>
<td>Martinborough</td>
<td>Sib 22</td>
</tr>
<tr>
<td>WC</td>
<td>Wairarapa</td>
<td>Lowcliff</td>
<td>Martinborough</td>
<td>Sib 5</td>
</tr>
<tr>
<td>WD</td>
<td>Wairarapa</td>
<td>Lowcliff</td>
<td>Martinborough</td>
<td>Sib 5</td>
</tr>
</tbody>
</table>

Soil order information supplied by Landcare Research https://smap.landcareresearch.co.nz/. Abbreviation VCSN = Virtual Climate Station Network http://data.niwa.co.nz/
TABLE S2. Vineyard block details for the New Zealand Pinot noir Ideotype Vine study network. All vineyard blocks planted with Pinot noir Abel Clone on 3309C rootstock.

<table>
<thead>
<tr>
<th>Vineyard ID</th>
<th>Year planted</th>
<th>Row spacing (m)</th>
<th>Vine spacing (m)</th>
<th>Vine density</th>
<th>Block area (ha)</th>
<th>Vine number</th>
<th>linear row length (m)</th>
<th>trial zone area (ha)</th>
<th>% of block in trial zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>OA</td>
<td>2000</td>
<td>2.2</td>
<td>1.1</td>
<td>4,132</td>
<td>0.30</td>
<td>1,241</td>
<td>1,365</td>
<td>0.2</td>
<td>76%</td>
</tr>
<tr>
<td>OB</td>
<td>2008</td>
<td>1.6</td>
<td>0.9</td>
<td>6,944</td>
<td>0.13</td>
<td>917</td>
<td>825</td>
<td>0.1</td>
<td>64%</td>
</tr>
<tr>
<td>OC</td>
<td>1996</td>
<td>1.5</td>
<td>0.9</td>
<td>7,407</td>
<td>0.50</td>
<td>3,667</td>
<td>3,300</td>
<td>0.1</td>
<td>14%</td>
</tr>
<tr>
<td>OD</td>
<td>2008</td>
<td>2.4</td>
<td>1.5</td>
<td>2,778</td>
<td>1.56</td>
<td>4,333</td>
<td>6,500</td>
<td>0.4</td>
<td>23%</td>
</tr>
<tr>
<td>MA</td>
<td>1993</td>
<td>1.5</td>
<td>1.3</td>
<td>5,333</td>
<td>0.08</td>
<td>400</td>
<td>500</td>
<td>0.1</td>
<td>100%</td>
</tr>
<tr>
<td>MB</td>
<td>2006</td>
<td>3.0</td>
<td>1.4</td>
<td>2,381</td>
<td>0.72</td>
<td>1,714</td>
<td>2,400</td>
<td>0.1</td>
<td>19%</td>
</tr>
<tr>
<td>MC</td>
<td>2013</td>
<td>1.6</td>
<td>1.3</td>
<td>5,000</td>
<td>4.62</td>
<td>23,107</td>
<td>28,884</td>
<td>0.1</td>
<td>3%</td>
</tr>
<tr>
<td>MD</td>
<td>2005</td>
<td>1.8</td>
<td>1.2</td>
<td>4,831</td>
<td>0.75</td>
<td>3,637</td>
<td>4,182</td>
<td>0.1</td>
<td>15%</td>
</tr>
<tr>
<td>WA</td>
<td>2003</td>
<td>2.0</td>
<td>1.2</td>
<td>4,167</td>
<td>0.28</td>
<td>1,148</td>
<td>1,378</td>
<td>0.2</td>
<td>62%</td>
</tr>
<tr>
<td>WB</td>
<td>2009</td>
<td>2.4</td>
<td>1.4</td>
<td>2,976</td>
<td>0.67</td>
<td>1,982</td>
<td>2,775</td>
<td>0.2</td>
<td>27%</td>
</tr>
<tr>
<td>WC</td>
<td>1998</td>
<td>2.4</td>
<td>1.3</td>
<td>3,333</td>
<td>0.30</td>
<td>1,016</td>
<td>1,270</td>
<td>0.2</td>
<td>60%</td>
</tr>
<tr>
<td>WD</td>
<td>1999</td>
<td>1.6</td>
<td>1.2</td>
<td>5,208</td>
<td>0.95</td>
<td>4,954</td>
<td>5,945</td>
<td>0.2</td>
<td>20%</td>
</tr>
</tbody>
</table>

TABLE S3. Vineyard production and wine type details for the New Zealand Pinot noir Ideotype Vine study network.

<table>
<thead>
<tr>
<th>Vineyard ID</th>
<th>Typical product type</th>
<th>Approx. bottle price (SNZ)</th>
<th>Pruning system</th>
<th>Training system</th>
<th>Target yield (kg/m)</th>
<th>Shoot thinning</th>
<th>Crop thinning</th>
<th>Production philosophy</th>
</tr>
</thead>
<tbody>
<tr>
<td>OA</td>
<td>Icon Single Vineyard</td>
<td>$ 76</td>
<td>2-cane</td>
<td>VSP</td>
<td>1.3</td>
<td>Intensive</td>
<td>Intensive</td>
<td>organic/bio</td>
</tr>
<tr>
<td>OB</td>
<td>Icon Single Block</td>
<td>$ 102</td>
<td>2-cane</td>
<td>VSP</td>
<td>1.1</td>
<td>Intensive</td>
<td>Intensive</td>
<td>organic/bio</td>
</tr>
<tr>
<td>OC</td>
<td>Single Vineyard</td>
<td>$ 79</td>
<td>2-cane</td>
<td>VSP</td>
<td>1.1</td>
<td>Intensive</td>
<td>Intensive</td>
<td>organic/bio</td>
</tr>
<tr>
<td>OD</td>
<td>Multi-vineyard Blend</td>
<td>$ 28</td>
<td>10-spur</td>
<td>VSP</td>
<td>2.3</td>
<td>Light</td>
<td>Moderate</td>
<td>conventional</td>
</tr>
<tr>
<td>MA</td>
<td>Icon Single Vineyard</td>
<td>$ 63</td>
<td>2-cane</td>
<td>VSP</td>
<td>1.0</td>
<td>Intensive</td>
<td>Intensive</td>
<td>organic/bio</td>
</tr>
<tr>
<td>MB</td>
<td>Multi-vineyard Blend</td>
<td>$ 15</td>
<td>2-cane</td>
<td>VSP</td>
<td>2.5</td>
<td>Light</td>
<td>Light</td>
<td>conventional</td>
</tr>
<tr>
<td>MC</td>
<td>Single Vineyard</td>
<td>$ 20</td>
<td>2-cane</td>
<td>VSP</td>
<td>2.0</td>
<td>Light</td>
<td>Light</td>
<td>conventional</td>
</tr>
<tr>
<td>MD</td>
<td>Single Vineyard</td>
<td>$ 44</td>
<td>2-cane</td>
<td>VSP</td>
<td>1.1</td>
<td>Intensive</td>
<td>Intensive</td>
<td>organic/bio</td>
</tr>
<tr>
<td>WA</td>
<td>Icon Single Block</td>
<td>$ 80</td>
<td>2-cane</td>
<td>VSP</td>
<td>1.0</td>
<td>Intensive</td>
<td>Intensive</td>
<td>organic/bio</td>
</tr>
<tr>
<td>WB</td>
<td>Multi-vineyard Blend</td>
<td>$ 26</td>
<td>2-cane</td>
<td>VSP</td>
<td>1.8</td>
<td>Light</td>
<td>Light</td>
<td>conventional</td>
</tr>
<tr>
<td>WC</td>
<td>Single Vineyard</td>
<td>$ 52</td>
<td>2-cane</td>
<td>VSP</td>
<td>1.6</td>
<td>Light</td>
<td>Light</td>
<td>organic/bio</td>
</tr>
<tr>
<td>WD</td>
<td>Icon Single Vineyard</td>
<td>$ 140</td>
<td>2-cane</td>
<td>VSP</td>
<td>1.0</td>
<td>Intensive</td>
<td>Intensive</td>
<td>organic/bio</td>
</tr>
</tbody>
</table>
DETAILED VINEYARD INFORMATION

Vineyard “OA” was planted in 2000 with Pinot noir Abel clone grafted on 3309C rootstock. The rows are oriented slightly West of North-South with a spacing of 2.2 m and a within-row vine spacing of 1.13 m, to give a planting density of 4,023 vines per hectare. The vines are pruned to a two-cane vertical shoot positioned (VSP) trellis with fruiting wire height of approximately 0.9 m and two sets of movable foliage wires that hold a 1.0-m tall canopy. Target yields for the vineyard are between 1.0 and 2.0 kg per vine. The vineyard soil type is classified as Manuherikiaf (Laminar Argillic Semiarid Soil) moderately deep, well drained, loam over sandy loam. Vineyard management practices are certified Bio Dynamic by Demeter New Zealand.

Vineyard “OB” was planted in 2008 with Pinot noir Abel clone grafted on 3309C rootstock. The rows are oriented North-South with a spacing of 1.6 m and a within-row vine spacing of 0.9 m, to give a planting density of 6,944 vines per hectare. The vines are pruned to a two-cane vertical shoot positioned (VSP) trellis with fruiting wire height of approximately 0.9 m and two sets of movable foliage wires that hold a 1.0-m tall canopy. Target yield for the vineyard is approximately 1.0 kg per vine per vine. The vineyard soil type is classified as Waenga(Typic Argillic Semiarid Soil) shallow, moderately well drained, loam. Vineyard management practices are certified Bio Dynamic by Demeter New Zealand.

Vineyard “OC” was planted in 1996 with Pinot noir Abel clone grafted on 3309C rootstock. The rows are oriented North-South with a spacing of 1.5 m and a within-row vine spacing of 0.9 m, to give a planting density of 7,407 vines per hectare. The vines are pruned to a single-cane vertical shoot positioned (VSP) trellis with fruiting wire height of approximately 0.7 m and two sets of movable foliage wires that hold a 1.0-m tall canopy. Target yield for the vineyard is approximately 1.0 kg per vine per vine. The vineyard soils have zones of Ranfurlyf (Typic Immature Semiarid Soil) shallow, well drained, loam and Manuherikiaf (Laminar Argillic Semiarid Soil) moderately deep, well drained, loam over sandy loam. Vineyard management practices are certified Bio Dynamic by Demeter New Zealand.

Vineyard “OD” was planted in 2008 with Pinot noir Abel clone grafted on 3309C rootstock. The rows are oriented NE-SW with a spacing of 2.4 m and a within-row vine spacing of 1.5 m, to give a planting density of 2,778 vines per hectare. The vines are spur pruned to a vertical shoot positioned (VSP) trellis with a fruiting wire height of approximately 0.9 m and three sets of movable foliage wires that hold a 1.2-m tall canopy. Target yields for the vineyard are between 3.0 and 3.5 kg per vine. The vineyard soils are classified as Ardgouf Typic Aged-argillic Semiarid Soil shallow, well drained, loam. Vineyard management practices are accredited by Sustainable Winegrowing New Zealand®.

Vineyard “MA” was planted in 1993 with Pinot noir Abel clone grafted on 3309C rootstock. The rows are oriented North-South with a spacing of 1.50 m and a within-row vine spacing of 1.25 m, to give a planting density of 5,333 vines per hectare. The vines are pruned to a two-cane vertical shoot positioned (VSP) trellis with fruiting wire height of approximately 0.6 m and two pairs of movable foliage wires that hold a 1.0-m tall canopy. Target yields for the vineyard are between 1.0 and 1.5 kg per vine. The vineyard soil type is classified as Renwickf (Immature Orthic Brown Soil) shallow, well drained, loam. Vineyard management practices are certified Organic by BioGro® New Zealand.

Vineyard “MB” was planted in 2006 with Pinot noir Abel clone grafted on 3309C rootstock. The rows are oriented North-South with a spacing of 3.00 m and a within-row vine spacing of 1.4 m, to give a
planting density of 2,381 vines per hectare. The vines are pruned to a two-cane vertical shoot positioned (VSP) trellis with fruiting wire height of approximately 0.9 m and three sets of movable foliage wires plus a fixed wire that hold a 1.2-m tall canopy. Target yields for the vineyard are between 3.0 and 3.5 kg per vine. The vineyard soil type is classified as Renwickf (Immature Orthic Brown Soil) shallow, well drained, loam https://smap.landcareresearch.co.nz/. Vineyard management practices are accredited by Sustainable Winegrowing New Zealand®.

Vineyard “MC” was planted in 2013 with Pinot noir Abel clone grafted on 3309C rootstock. The rows are oriented North-South with a spacing of 1.60 m and a within-row vine spacing of 1.25 m, to give a planting density of 5,000 vines per hectare. The vines are pruned to a two-cane vertical shoot positioned (VSP) trellis with fruiting wire height of approximately 0.7 m and two sets of movable foliage wires that hold a 1.1-m tall canopy. Target yields for the vineyard are between 2.0 and 2.5 kg per vine. The vineyard soil type is classified as Renwickf (Immature Orthic Brown Soil) shallow, well drained, loam https://smap.landcareresearch.co.nz/. Vineyard management practices are accredited by Sustainable Winegrowing New Zealand®.

Vineyard “MD” was planted in 2005 with Pinot noir Abel clone grafted on 3309C rootstock. The rows are oriented North-South with a spacing of 1.80 m and a within-row vine spacing of 1.15 m, to give a planting density of 4,831 vines per hectare. The vines are pruned to a two-cane vertical shoot positioned (VSP) trellis with fruiting wire height of approximately 0.7 m and two sets of movable foliage wires that hold a 1.1-m tall canopy. Target yields for the vineyard are between 1.0 and 2.0 kg per vine. The vineyard soil type is classified as Renwickf (Immature Orthic Brown Soil) shallow, well drained, loam https://smap.landcareresearch.co.nz/. Vineyard management practices are certified Organic by BioGro® New Zealand.

Vineyard “WA” was planted in 2003 with Pinot noir Abel clone grafted on 3309C rootstock. The rows are oriented NE-SW with a spacing of 2.0 m and a within-row vine spacing of 1.2 m, to give a planting density of 4,167 vines per hectare. The vines are pruned to a single-cane vertical shoot positioned (VSP) trellis with fruiting wire height of approximately 0.7 m and two sets of movable foliage wires that hold a 1.0-m tall canopy. Target yields for the vineyard are between 1.0 and 1.5 kg per vine. The vineyard soils are classified as Barrhillf (Typic Immature Pallic Soil) moderately deep, well drained, silty loam https://smap.landcareresearch.co.nz/. Vineyard management practices are accredited by Sustainable Winegrowing New Zealand®.

Vineyard “WB” was planted in 2009 with Pinot noir Abel clone grafted on 3309C rootstock. The rows are oriented North-South with a spacing of 2.4 m and a within-row vine spacing of 1.4 m, to give a planting density of 2,976 vines per hectare. The vines are pruned to a two-cane vertical shoot positioned (VSP) trellis with a fruiting wire height of approximately 0.9 m and three sets of movable foliage wires that hold a 1.2-m tall canopy. Target yields for the vineyard are between 2.0 and 3.0 kg per vine. The vineyard soils have zones of Waimakaririf (Weathered Fluvial Recent Soil) deep, moderately well drained, silty loam over clay and Taitapuf (Typic Recurrent Gley Soil) deep, poorly drained, loam over clay https://smap.landcareresearch.co.nz/. Vineyard management practices are accredited by Sustainable Winegrowing New Zealand®.

Vineyard “WC” was planted in 1998 with Pinot noir Abel clone grafted on 3309C rootstock. The rows are oriented North-South with a spacing of 2.4 m and a within-row vine spacing of 1.25 m, to give a planting density of 3,333 vines per hectare. The vines are pruned to a two-cane vertical shoot positioned (VSP) trellis with a fruiting wire height of approximately 0.7 m and two sets of movable foliage wires...
that hold a 1.0-m tall canopy. Target yields for the vineyard are between 1.0 and 2.0 kg per vine. The vineyard soils have zones of Lowcliffe (Mottled Argillic Pallic Soil) shallow, imperfectly drained, silty loam and Pahauf (Mottled Argillic Pallic Soil) moderately deep, imperfectly drained, silty loam https://smap.landcareresearch.co.nz/. Vineyard management practices are accredited by Sustainable Winegrowing New Zealand®.

Vineyard “WD” was planted in 1999 with Pinot noir Abel clone grafted on 3309C rootstock. The rows are oriented North-South with a spacing of 1.6 m and a within-row vine spacing of 1.2 m, to give a planting density of 5,208 vines per hectare. The vines are pruned to a two-cane vertical shoot positioned (VSP) trellis with a fruiting wire height of approximately 0.8 m and three sets of movable foliage wires that hold a 1.1-m tall canopy. Target yields for the vineyard are between 1.0 and 1.5 kg per vine. The vineyard soils are classified as Lowcliffe (Mottled Argillic Pallic Soil) shallow, imperfectly drained, silty loam https://smap.landcareresearch.co.nz/. Vineyard management practices are accredited by Sustainable Winegrowing New Zealand®.

**TABLE S4. Summary climate information for the three New Zealand study regions.**

<table>
<thead>
<tr>
<th></th>
<th>Growing season (1 September to 30 April) climate summaries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tmax (ºC)</td>
</tr>
<tr>
<td><strong>Otago</strong></td>
<td></td>
</tr>
<tr>
<td>LTA</td>
<td>20.6</td>
</tr>
<tr>
<td>2017/18</td>
<td>22.8</td>
</tr>
<tr>
<td>2018/19</td>
<td>21.6</td>
</tr>
<tr>
<td>2019/20</td>
<td>20.3</td>
</tr>
</tbody>
</table>

| **Marlborough** |           |           |           |          |         |           |         |
| LTA      | 20.4      | 9.8       | 15.1      | 1,263    | 10.5    | 393       | 854     |
| 2017/18  | 21.3      | 11.2      | 16.2      | 1,519    | 10.2    | 488       | 907     |
| 2018/19  | 21.2      | 10.7      | 16.0      | 1,465    | 10.5    | 373       | 899     |
| 2019/20  | 20.9      | 9.9       | 15.4      | 1,344    | 11.1    | 269       | 928     |

| **Wairarapa** |           |           |           |          |         |           |         |
| LTA      | 20.2      | 9.5       | 14.9      | 1,192    | 10.8    | 461       | 882     |
| 2017/18  | 21.0      | 10.6      | 15.3      | 1,423    | 10.3    | 492       | 874     |
| 2018/19  | 20.9      | 10.3      | 15.6      | 1,382    | 10.7    | 462       | 826     |
| 2019/20  | 21.0      | 9.8       | 15.4      | 1,350    | 11.1    | 360       | 910     |

Abbreviations LTA = Long Term Average; Tmax = mean maximum air temperature; Tmin = mean minimum air temperature; Tmean = mean air temperature; GDD = accumulated Growing Degree Days (base 10ºC); DV = Diurnal Variation; ET = Evapotranspiration.
FIGURE S2. Seasonal deviations from Long term average (LTA) of Growing degree days (GDD), Seasonal water balance (SWB) and Diurnal variation (DV) in three September to April growing seasons from 2017/18 to 2019/20 in Otago (top), Marlborough (centre) and Wairarapa (bottom).
FIGURE S3. Example of the dormant canopy vine photography taken on New Zealand Pinot noir Ideotype Vine Marlborough vineyard “MD” on vine “05”.
Photograph was taken on 4 July 2019 using a Nikon® D70s without flash; F-stop = f8; speed = 1/250 sec.; focal length = 16 mm
Vintage by vine interactions most strongly influence Pinot noir grape composition in New Zealand.

FIGURE S4. Within-vineyard relationships between yield (kg/m) and berry Total Soluble Solids (TSS) of the New Zealand Pinot noir Ideotype Vine study network in 2018.
FIGURE S5. Within-vineyard relationships between yield (kg/m) and berry Total Soluble Solids (TSS) of the New Zealand Pinot noir Ideotype Vine study network in 2019.
SUPPLEMENTARY DATA

OENO One, 54(4). https://doi.org/10.20870/oeno-one.2020.54.4.4021

FIGURE S6. Within-vineyard relationships between yield (kg/m) and berry Total Soluble Solids (TSS) of the New Zealand Pinot noir Ideotype Vine study network in 2020.