FOOD & FIBRE CoVE
Learner-Focused, Industry-Led, Government-Enabled

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Evaluation | Analytics | Insights

October 2025

Training for profitability

A modelling approach to estimate the impact of training on business profitability

Introduction

This document provides an overview of a modelling approach to provide an indication[1] of the impact of training (or other interventions that build human capability) on business profitability. The aim is to build a model that can demonstrate the impact of funding training to learners, employers, industry bodies and government. One potential use of this information is to prioritise what training is funded within the food and fibre sector.

A modelling approach offers an alternative to using training / qualifications data to try to associate business profitability with directly[2]. The approach aims to decompose the top-level question 'what impact does training have on business profits?' into a set of more tractable questions for which data exists to answers and / or which lend themselves to being answered by expert judgement.

In this document we focus on people and businesses in the food and fibre sector in New Zealand, but the same logic could be extended to other industries.

1. A loose aspiration is that the model should indicate a 'half-order-of-magnitude' range. For example, error bars on the model output should span a range like 20-50 or 300-1,000.
2. If good quality data was available on business profitability and the level of qualifications of those businesses' team members it might be possible to show a correlation (but not causality) between qualification levels and profitability. In practice, the most readily available data i.e. that from the IDI, is likely to be too noisy to draw robust conclusions.

Introduction (continued)

It is intended that the model will be implemented in at least two ways:

1. As an overlay to Muka Tangata's skills forecasting model. This allows the impact of training on industry profitability to be estimated at the level of an individual worker / learner. This provides for a high degree of flexibility and detail in the modelling approach.
2. As a part of the investment tool developed for the Raising Aspirations project. Here the model is used to evaluate the impact of different training programmes on business profits.

Overall framing

Overall framing

An overview of the model logic at the top level.

Before we get started…

- The maxim *all models are wrong, some models are useful* should be kept front of mind for this work! We are trying to describe a complex system in a mathematical model. It is necessary to simplify at almost every stage and it will be easy to find flaws with the approach. However, this does not necessarily stop the model being useful.
- In particular, we think the model can be useful (without being right) if it can help us compare:
  - One training option with another
  - Change in business profitability, due to change in training inputs, over time

  In both of these cases, imperfections in the model should apply roughly equally to both sides of the comparison.
- With some exceptions, empirical data to calibrate the model do not exist in a useful form. However, we can use human judgement to tune the model – especially if we are careful in how we frame the questions about the inputs that we need.
- This model is a starting point and can be refined and improved over time. We include some ideas for future improvement in this document.

The theory of change

We want to characterise the chain of causality from training to the impact on business productivity. The theory of change that we use to describe this chain is similar to those from other descriptive frameworks for the impact of capability building[1].

Build individual capability through training → Build team capability → Improve workplace practice → Increase productivity

[1] For example, The Kirkpatrick Model or Bennett's Hierarchy.

Profitability as outcome measure

Build individual capability through training → Build team capability → Improve workplace practice → Increase productivity

We use business profitability as our measure of productivity as the outcome of interest because is it easier to define and collect data on.

The framework could be extended to cover other outcomes, such as environmental of social outcomes.

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Workplace practices drive profitability

Build individual capability through training

Build team capability

Improve workplace practice

Increase productivity

We assume that variation in workplace practices are an importance cause of variation in profitability (see later slide on how we treat other influences). By improving workplace practices we will increase profitability.

Team capability drives workplace practices

Build individual capability through training → Build team capability → Improve workplace practice → Increase productivity

Changes in workplace practices (i.e. changing behaviour) – could come about through changes in[1]:

- Capability
- Opportunities
- [Extrinsic] motivations

We only consider changes in *capability* in this model. That is, we assume that all businesses in a sector have similar *opportunities* (e.g. markets to sell to, regulatory constraints) and *extrinsic motivations* (e.g. market prices)[2].

1. There are many frameworks that describe behaviour change and its causes. Here we have referenced the COM-B framework.
2. Future iterations of this model could relax this assumption to estimate how important these factors are relative to changes in capability.

Training builds team capability

Build individual capability through training → Build team capability → Improve workplace practice → Increase productivity

We assume that training contributes to individual capability (along with experience and innate ability). Individual capability then contributes to team capability.

Parts of the modelling framework

Build individual capability through training → Build team capability → Improve workplace practice → Increase productivity

1

A model of individual capability that combines experience, innate ability and training

2 + 3

A model of team capability + a generalisation to all industries

4

A model of the impact that team capability has on business profitability for a reference industry (dairy farming)

The modelling framework analyses this chain of causality in four sub-models. In this document we will work through these sub-models in 'reverse order'.

Future improvement ideas – overall model

- **Consider other measures of productivity / profitability –** For example, consider the impact of training on GDP rather than business profitability.
- **Consider other influences on behaviour change –** Future iterations of this model could consider how important changes in opportunities and extrinsic motivations are relative to changes in capability at influencing farm practice.
- **Validate model using business profitability data** – We noted on an earlier slide that IDI data on business profitability and individual's qualification levels are likely to be too noisy to draw robust conclusions on the correlation between these attributes. However, this could be checked.

Summary of inputs and assumptions

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Impact of team capability on business profits

A sub-model to estimate the impact of changing team capability on business profitability. We use dairy farming as a reference as we have good data for this industry.

Overview – team capability to profitability sub-model

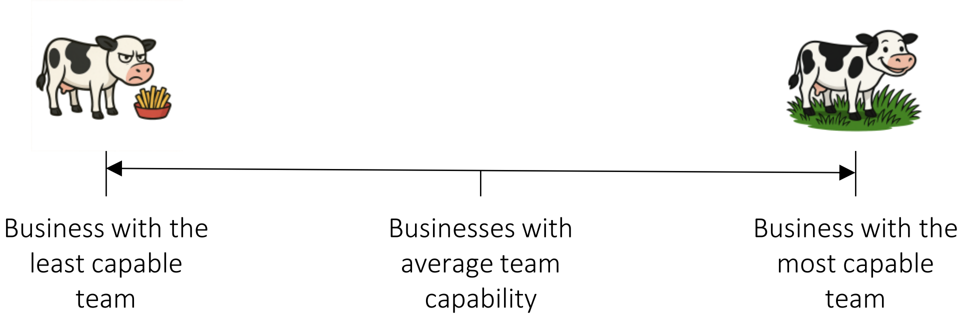
Goal

The goal of this sub-model is to equate variation in team capability across an industry with variation in profitably. This provides a way to equate *changes* in team capability with *changes* in business profitability.

Approach

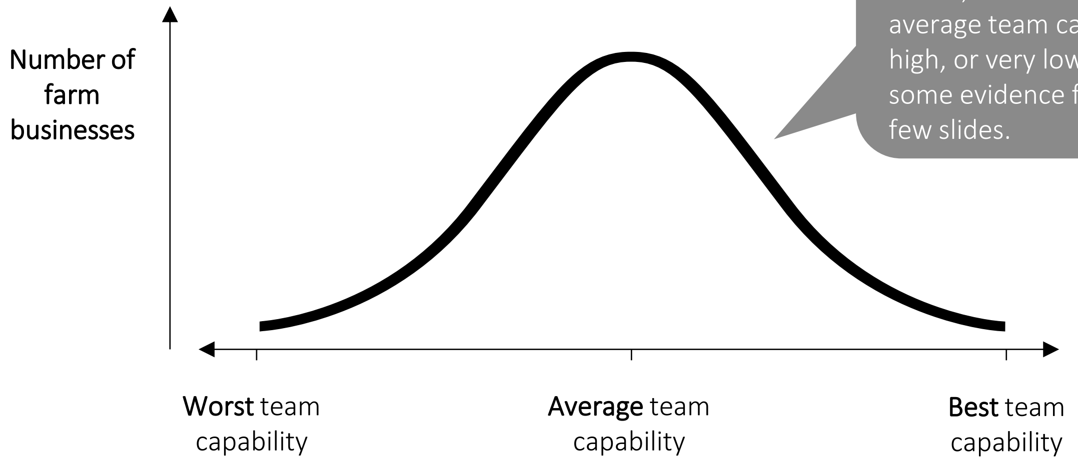
- The **team capability to business profitability** sub-model introduces three attributes of a business:
  - Team capability
  - Quality of workplace practice
  - Profitability
- Each of these attributes is assumed to vary across the industry with a roughly normal distribution.
- One measure of a business' team capability is where they sit within the industry distribution of team capability (how many standard deviations above or below the average they are).
- By equating this scale of team capability with observed data on the distribution of business profitability we arrive at a way to achieve the goal above.
- We use dairy farming as a reference industry because we have access to good quality data on the distribution of farm profitability across dairy farms. Later in this document we extend the framework to cover other industries.

A continuum of team capability



We start the description of this sub-model by considering a continuum of team capability that ranges from a business with the least capable team in the sector to one with the most capable team.

Distribution of team capability



We assume that a (roughly) normal distribution applies for team capability – that is, there are more businesses with average team capability than with very high, or very low, capability. We will see some evidence for this assumption in a few slides.

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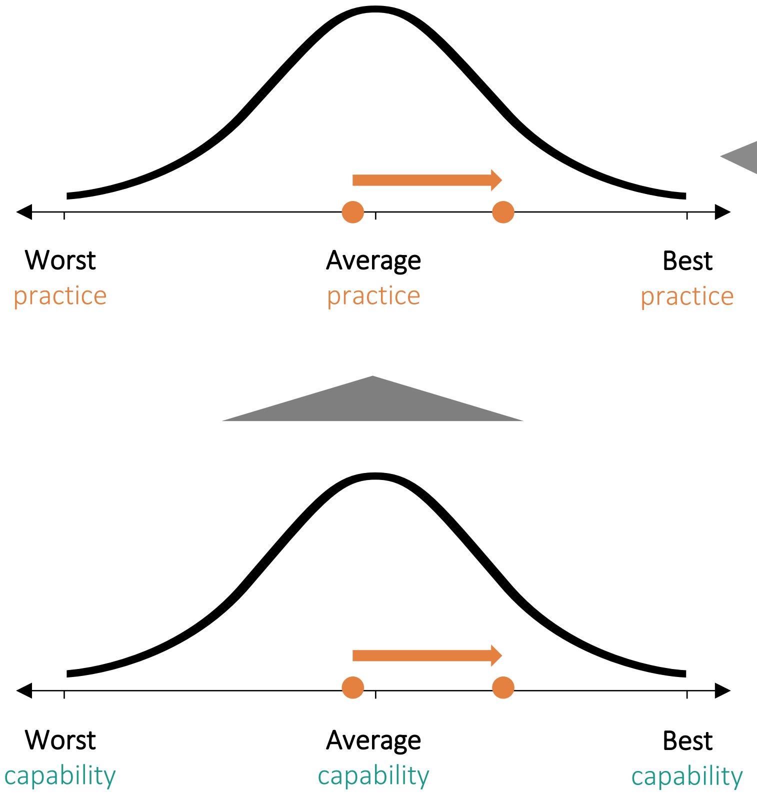
Equivalence of capability and workplace practice shifts



Because of our earlier assumption (see slide 10) that the main variation in workplace practices is variation in team capability, we will assume that a similar continuum and distribution exists for workplace practices as for team capability.

We also assume that moving a business from one point to another along the capability continuum will (in time) also move the business along the workplace practice continuum by the same amount.

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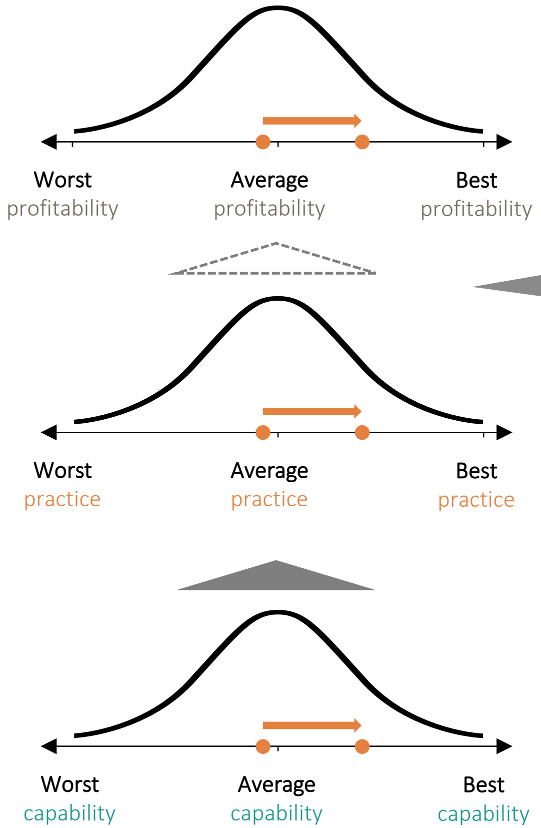
Equivalence of capability and profitability



If we can also estimate the impact that changing a management practice has on a continuum of profitability, then we have a way of equating changes in team capability with changes in profitability.

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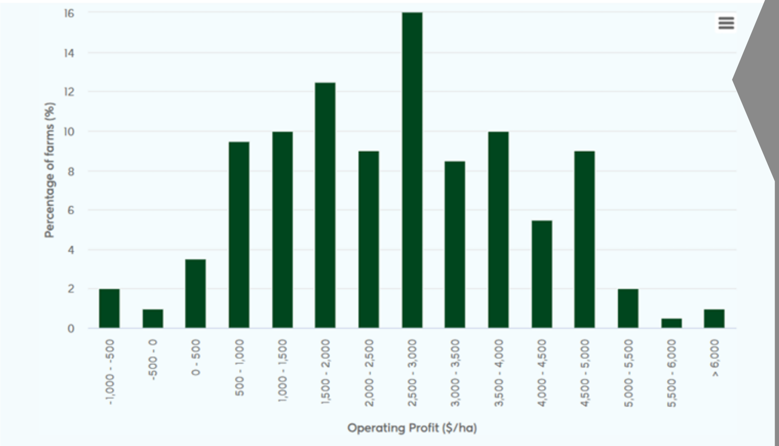
Variation in profitability – data from dairy farming

Graph 5.4: Distribution of Owner-operators Profit ($/hectare) in 2023-24



We have good (DairyNZ) data on the variation in profitability for dairy farms. This gives us an upper bound for how much variation in team capability (and therefore variation in farm practices) could cause profits to vary.

That is, if we assume that variation in team capability is the only factor driving variation in profitability, the impact of changing capability from industry average to industry best would be about $3,000 per hectare. Mathematically, we could say that, for dairy farming:

- 3 standard deviations (3σ) is ~$3,000 per ha,
- 1 standard deviation (σ) is ~$1,000 per ha,
- Variance (σ^2) is ~1,000,000 $\$^2 /ha^2$

However, as other factors also contribute to the variation in profitability we see here, the actual opportunity is less than this.

Note that the (roughly) normal distribution of profitability we observe here provides some justification for the assumption about this distribution of team capability that we made earlier.

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Source: DairyNZ Economic Survey 2023-24

Causes of variation in profitability

Human capital - Variation in the capability of the people working in the business, and hence variation in the quality of workplace practices from farm to farm.

Physical capital - Variation in:

- *Physical features* of the business such as soil, terrain, climate
- *Financial investment* in equipment, stock etc.

Differences in capability / practices (human capital) are not the only thing that explains the differences in profitability we observed in the previous slide.

We need to estimate how importance variation in human capital is relative to variation in other influences

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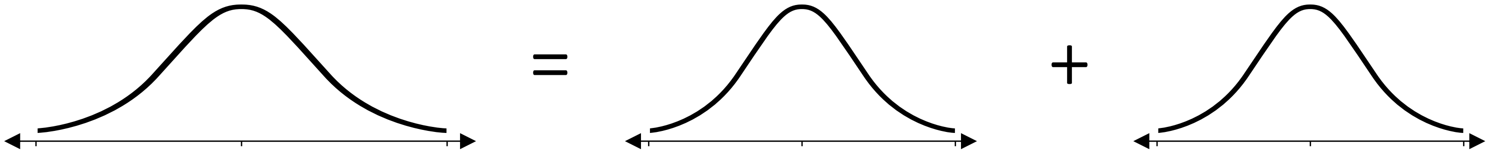
Decomposing variance in profitability

Total variance in profitability = Variance in profitability due to variance in team capability + Variance in profitability due to all other factors



Total variance in profitability: σ^2 = ~1,000,000 $\$^2/ha^2$; σ = ~1,000 \$/ha

Variance in profitability due to variance in team capability: σ^2 = ~500,000 $\$^2/ha^2$; σ = ~707 \$/ha

Variance in profitability due to all other factors: σ^2 = ~500,000 $\$^2/ha^2$; σ = ~707 \$/ha

If we assume that variation in team capability (and therefore workplace practices) is not correlated to variation in physical capital, we can 'decompose' the bell curve into two parts.

As an input to the model, we need the split of the variance. When we have 'crowd-sourced' estimates of this in the past we typically find that the variances get about the same weight.

In this way we arrive at a way to characterise the continuum of team capability among dairy farms with units of \$/ha. That is, shifting team capability by one standard deviation will have an impact on dairy farm profitability of about \$700 per hectare per year.

Scaling to farm business level

- On the previous slide we arrived at a statement that *shifting team capability by one standard deviation will have an impact on dairy farm profitability of about **$700 per hectare per year***.
- An average dairy farm is approximately **150 hectares.**
- We use this value to reframe the statement to say that *shifting one dairy farm's team capability by one standard deviation in will have an impact on dairy farm industry profitability of about **$105,000 per year.***

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Summary of inputs and assumptions

Assumption / input

- The influence of team capability and physical capital on business profitability are independent of each other. That is good teams can be found on poor farms, and poor teams can be found on good farms[1].
- The variance of distribution of dairy farm profitability is due equally to variation of team capability and variation of physical capital[2].
- Size of an average dairy farm is approximately 150 hectares.

1. Support for this assumption can be seen in data on dairy farm profitability by region. The spread of profitability within regions is much larger than the differences in average profitability between comparatively low productivity regions, such as Northland or the West Coast, and comparatively high productivity regions, such as Taranaki or Canterbury – Source DairyNZ.
2. A related data point is that the labour income share of net domestic income is around 55-60% - Source (see Fig 1).

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Future improvement ideas – team capability to profit

- **Add other outcomes –** The approach that we've described above could be extended to other outcomes (such as environmental performance) provided that it is possible to described a distribution in each outcome analogous to the distribution in profitably that we have used here.
- **Consider the impact of competing away variation in profitability** – Consider how the differences in competitiveness between sectors matters. For example, large capital cushions in many sheep and beef farms may allow them to operate in ways that are cashflow positive but not covering cost of capital. This wouldn't be viable in a less capital-intensive sector.
- **Consider the role of 'accounting noise'** – An additional factor contributing to the distribution of observed industry profitability is likely to be 'accounting noise'. For example, the extent to which inventory levels (imported feed, pasture cover) are accurately reflected in tax accounts will vary from accountant to accountant. This effect could be estimated.
- **Consider the role of business performance on training implementation** – How much does business performance impact the ability to implement the impact of training on profit.

Team capability

A sub-model to characterise team capability as a combination of different roles and different areas-of-farm-practice

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Overview – team capability sub-model

Goal

The goal of this sub-model is to allocate the team capability measure developed in the previous section to individual roles and to areas-of-farm-practice. This provides a way to estimate the impact of changing an individual's skills within a given area-of-farm-practice on business (end hence industry) profitability.

Approach

- The **team capability sub-model** creates a framework to characterise team capability as a function of capability by area-of-farm-practice and by team role.
- We define areas-of-farm-practice – domains of farm practice / capability that have an influence on business performance, and we estimate the relative influence that variation in these capability within these areas-of-farm-practice has over variation in farm profits.
- We define four role levels within the farm team.
- We estimate the relative influence of each role at each area-of-farm-practice .

Areas-of-farm-practice

Area-of-farm-practice (dairy farming)
Feed and pasture management
Animal management
Milking management
Equipment and infrastructure management
Financial management
People management
Environmental management
Business planning

We introduce the concept of areas-of-farm-practice – industry specific domains of workplace practices (or equivalently team capability) – that have an influence over business profitability.

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Hierarchy of areas-of-farm-practice

Level 1	Level 2	Level 3
Production management	Feed and pasture management	Pasture management
		Imported feed
		…
	Animal management	Animal health
		Animal husbandry
	Milking management	
	Equipment and infrastructure management	
Business management	Financial management	
	People management	
	Environmental management	
	Business planning	

Areas-of-farm-practice could be shown as a hierarchy with varying levels of aggregation.

In the current version of the model we will use only the highest level of aggregation but it may still be useful to develop a detailed hierarchy for each industry in order to calibrate the weights assigned to different areas-of-farm-practice (see next slide).

Weighting areas-of-farm-practice

Level 1	Level 2	Level 3	Weight
Production management (55%)	Feed and pasture management (30%)	Pasture management	15%
		Imported feed	10%
		…	5%
	Animal mgt (10%)	Animal health	5%
		Animal husbandry	5%
	Milking mgt	…	10%
	Equipment mgt	…	5%
Business management (45%)	Financial mgt	…	15%
	People mgt	…	10%
	Env. mgt	…	0%
	Business planning	…	20%
			100%

For each area-of-farm-practice we assign an input (weight) to characterise the relative importance that the different areas have on business profitability.

The interpretation of these weights is loosely 'what proportion of the variance in overall team capability (and therefore business profitability) is due to variance in this particular area-of-farm-practice[1].

1. This assumes that every farm team has some base level of capability within every area-of-farm-practice. We are interested in how much varying capability at each area-of-farm-practice contributes towards the variation in farm profits that we observe from industry data.

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Role ratio

Role	Number of people	Proportion of workforce	# per average-sized dairy farm
Strategic manager	16,000	40%	1.2
Manager	4,000	10%	0.3
Semi-autonomous	4,000	10%	0.3
Managed	16,000	40%	1.2
	40,000	**100%**	3.0

The next input needed is a breakdown of the number of people in each industry workforce by role.

We assume that all workers can classified into four role levels.

Role definitions

- **Managed workers** are those who work under supervision.
  - On a dairy farm, a **farm assistant** would be a **managed worker**.
- **Semi-autonomous workers** work independently, but within a management structure.
  - On a dairy farm, a **herd manager** would be a **semi-autonomous worker**.
- **Managers** and **strategic managers** manage the other two groups, with strategic managers representing those who are more involved in the executive management of the company.
  - On a dairy farm, an employed **farm manager,** or a self-employed **contract milker** would be a **manager**.
  - On a dairy farm, a **farm owner,** or an employee overseeing a groups of farms, would be a **strategic manager**.

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Top level areas-of-farm-practice and roles

- **Business management** refers to the skills not directly related to production, relating to administrative or strategic practice. For example: Financial management, people management, environmental management, or business planning. These skills are typically only highly relevant in manager and strategic manager positions. In semi-autonomous roles, these skills have a marginal effect on profitability, and in managed roles, these skills have no effect on profitability.
- **Production management** refers to practices directly related to producing the product. For example: Milking, animal health, feed and pasture management, or equipment and infrastructure management. These skills are used across all role levels, though have more impact in management, or in more autonomous roles.

Role influence weights

	Owner / strategic manager	Manager	Semi-autonomous	Managed
Production management	8	4	2	1
Business management	10	3	1	0

Next we estimate the relative influence of a person in each role for each area-of-farm-practice.

For example, the inputs shown here assume that, for production management, a strategic manager is 2x more influential than a manager, and 8x more influential than a managed employee.

For business management, managed staff are assumed to have no influence at all.

Weighted team role contribution

	Owner / strategic manager	Manager	Semi-autonomous	Managed	Total
Number of roles per business	**1.2**	**0.3**	**0.3**	**1.2**	**3.0**
Production management	41.9%	5.2%	2.6%	5.2%	55.0%
Business management	40.9%	3.1%	1.0%	0.0%	45.0%
Total	**82.8%**	**8.3%**	**3.6%**	**5.2%**	**100.0%**

Multiplying:

- Area-of-farm-practice weight
- Relative role influence
- Role numbers per team

Gives the proportion that each role x area-of-farm-practice pair makes to overall team capability

Relative influence of 1 FTE by role x area-of-farm-practice

	Owner / strategic manager	Manager	Semi-autonomous	Managed
Production management	34.9%	17.5%	8.7%	4.4%
Business management	34.1%	10.2%	3.4%	0.0%

The previous result can be rescaled to arrive at the relative influence of 1.0 FTE in each role

Relative influence of 1 FTE by role x area-of-farm-practice

	Owner / strategic manager	Manager	Semi-autonomous	Managed
Production management	34.9%	17.5%	8.7%	4.4%
Business management	34.1%	10.2%	3.4%	0.0%

+

“shifting one dairy farm’s team capability by one standard deviation in will have an impact on dairy farm industry profitability of about $105,000 per year.”

These values can be combined with the value of shifting team capability derived in the previous section to arrive at an estimate of the impact of shifting individual capability. For example ->

*shifting a **strategic manager’s capability at production management** by an amount one standard deviation of the variation of all **strategic managers’ capability at production management** will have an impact on dairy farm industry profitability of about **$37,000** (34.9% x $105,000) per year.*

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Summary of assumptions and inputs needed

Assumption

- Team capability can be 'decomposed' into the contributions made by individuals in different roles and by areas-of-farm-practice. This is an idealisation (see next slide) but is inherently self-correcting in that over-allocating weight to a role or practice area means under-allocating somewhere else.

Inputs

- A breakdown of areas-of-farm-practice and their associated weights – see slide 30
- The split of roles in the workforce – see slide 31
- For each area-of-farm-practice, the ratio of the relative influence of a person in each role – see slide 34

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Future improvement ideas – team capability model

- **Use more detailed area-of-farm-practice tables –** A refinement would be to use more detailed area-of-farm-practice in the model. However, this would also require more detailed mapping of training programmes to these areas-of-farm-practice later in the modelling process. An alternative, refinement would be to structure the model to create the option to drill down on specific areas-of-farm-practice, the associated mapping of training programmes, but not require that all areas-of-farm-practice are modelled to the same detail.
- **Use role level x employment types –** Instead of having just four role levels, roles could be specified by role type and by employment type. For example, an employed farm manager would be modelled differently to a contract milker reflecting the different levels of influence they are likely to have in business management.
- **Understand the correlation of team manager capability –** Good managers are likely to be on the same team and good employees. While this correlation should not distort the model much it might be worth estimating the effect that this has more accurately.

Extending to other industries

An approach to generalising the analysis above from dairy farming to other food and fibre industries

Overview – extension to other industries sub-model

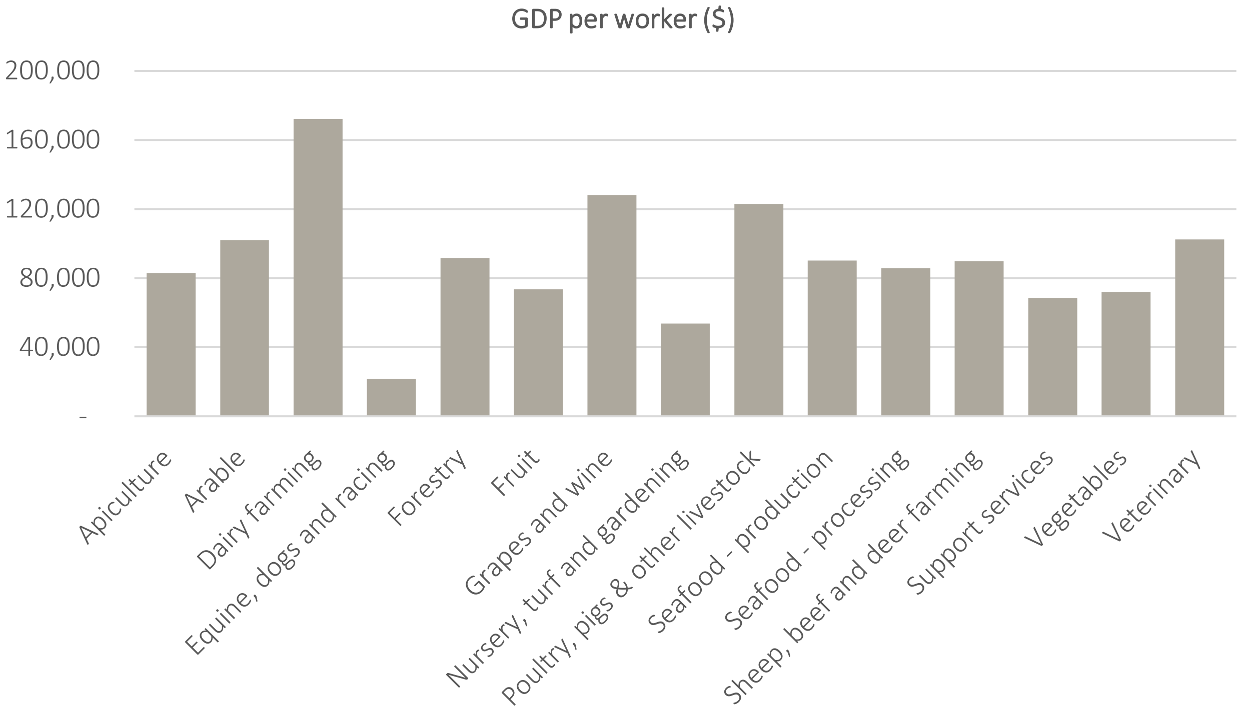
Goal

The goal of this sub-model is to generalise the results for dairy farming from the previous two sub-models to other industries.

Approach

- Assume that the impact of human capability on profitability varies by industry depending on the relative importance of human vs financial and physical capital. In industries that have high investment of financial and physical capital, skills should matter more because they are 'geared' by the financial and physical investment.
- We use data on GDP per worker to make an estimate of this gearing. Our reference industry (dairy farming) has a high GDP per worker. We use the ratio of GDP per worker (industry) / GDP per worker (dairy farming) to scale the result from the previous sub-model.

GDP per worker by industry



[1] Source: Muka Tangata GDP forecasting model.

Future improvement ideas – extension to other industries

- **Refine the GDP model –** There are some suspicious data points in the GDP forecasting model that could be refined e.g. equine, dogs and racing.
- **Use other industry data** – We could check the approach proposed in this sub-model vs replicating the approach taken for dairy farming if we have data on the distribution of profitability for other industries. The only other food and fibre industry where good data is readily available is sheep and beef farming (through the B+LNZ Economic Service). However, it might be possible to estimate / model the distribution of profitability for other industries, such as horticulture.

Individual capability

A sub-model to characterise individual capability as a combination of experience, innate ability and training; and to characterise the impact of indivdual training programmes.

Overview - individual capability sub-model

Goal

The goal of this sub-model is to characterise how capable an individual is at a given area-of-farm-practice given their experience, innate ability and training. This allows us to estimate the relative importance of training and therefore how much training can move individual capability.

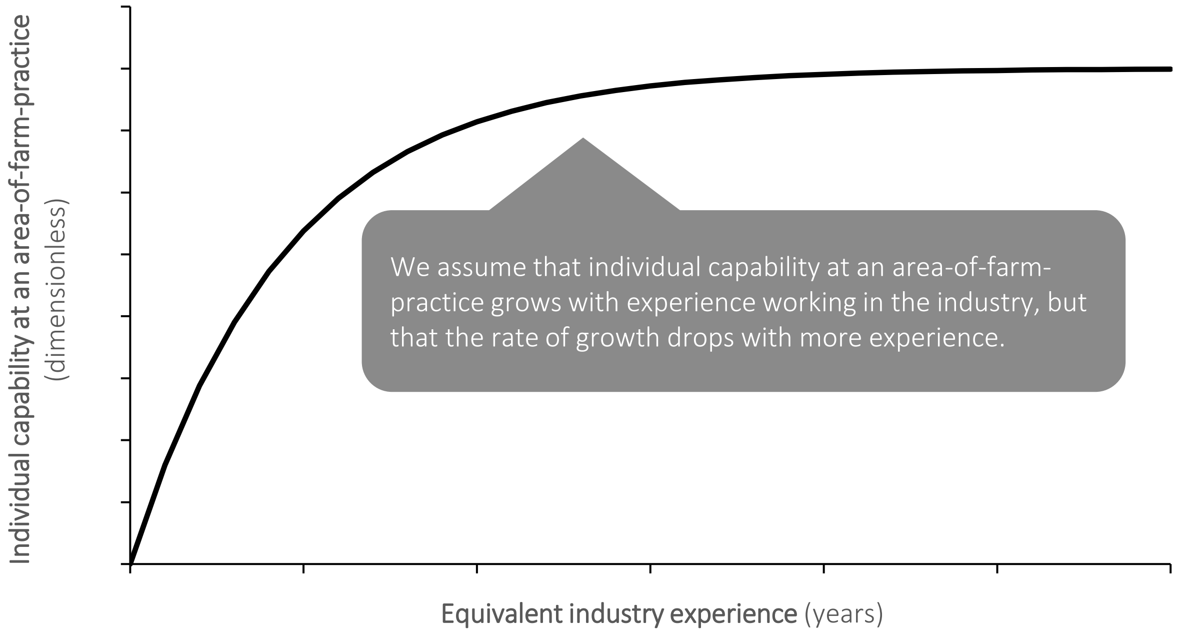
Approach

- The sub-model characterises how each of *industry experience*, *innate ability* and *training history* influence *individual capability*.
  - Gaining *industry experience* is assumed to result in a gain in *individual capability*, until a plateau is reached after a given number of years. Work experience prior to entering a specific food and fibre industry counts towards *industry experience* but at a discounted rate.
  - *Innate ability* is used as catch-all term to characterise all attributes that contribute to *individual capability* other than tertiary training and industry experience. This includes, for example, intellectual capability, intrinsic motivation and educational attainment at secondary school. *Innate ability* is modelled as a normally-distributed variable that adds, or subtracts, from the *individual capability* gained through *industry experience*.
  - To characterise *training history* we start by defining a reference training programme against which all other training programmes are compared.

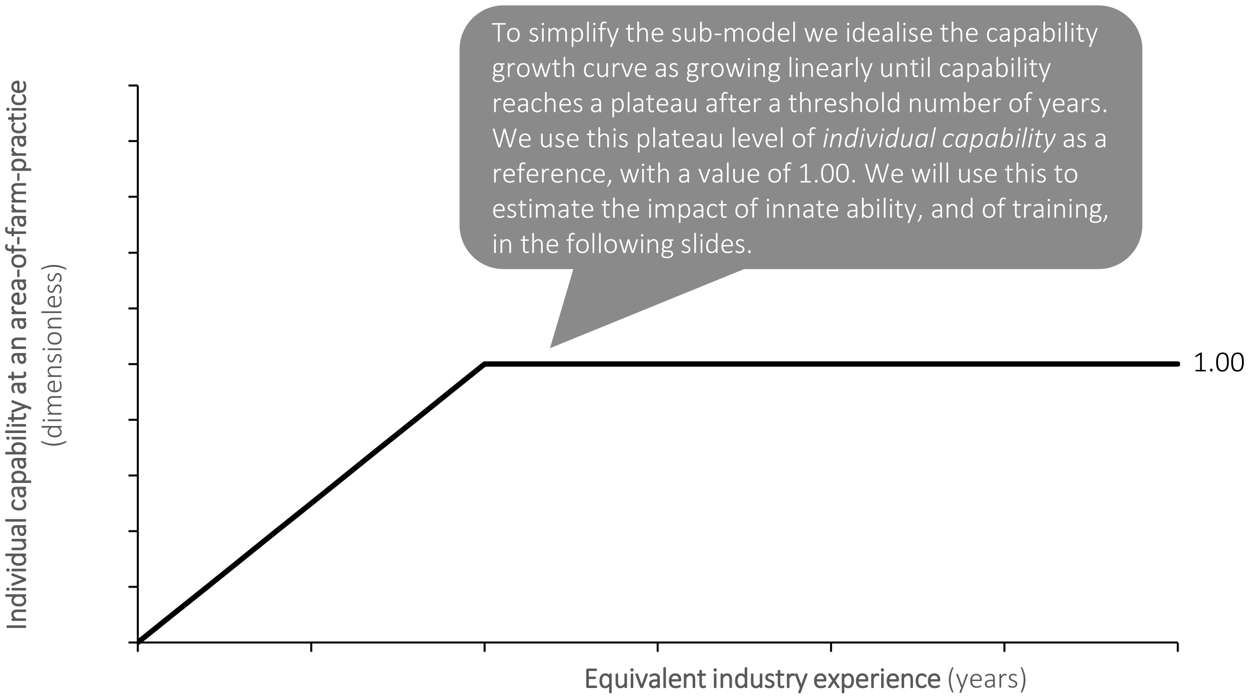
Overview - individual capability sub-model (continued)

- This sub-model has three types of inputs / calibrations:
  - Judgements about the relative importance of *innate ability*, *industry experience*, and the reference training programme relative to one another. For this first calibration step the measure of individual capability is dimensionless.
  - Mapping the distribution of innate ability to the distribution of team capability implied by the distribution in industry profitability. This assumes that innate ability is the dominant cause of variation in individual capability. This step maps the dimensionless measure of individual capability to one that is measured in dollar terms.
  - A series of modifiers / factors that compare any given training programme to the reference training programme – see next point.
- There are a range of attributes that determine how much impact a training programme has on individual capability such as number of learning hours, NZQF level and relevance to role. We model eight such training programme attributes. For each attribute we calculate a modifier that is applied to the reference training programme.

Impact of experience on capability



Impact of experience on individual capability - simplified



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Value of non-industry experience

Discount on experience working in other industries	Other food and fibre industry	Non- food and fibre industry
Production management	40%	20%
Business management	60%	40%

Experience working outside of the industry is counted towards *equivalent industry experience* – but at a discounted rate.

For example, a dairy farmer with 5 year of experience in dairy farming, and 10 years prior experience in horticulture, is assumed to have 11 years of *equivalent industry experience* at the business management area-of-farm-practice (5 years + 60% x 10 years = 11 years).

Threshold of experience until capability plateaus

Industry	Production management	Business management
Apiculture	15	25
Arable	15	25
Dairy farming	15	25
Equine, dogs and racing	15	25
Forestry	15	25
Fruit	15	25
Grapes and wine	15	25
Nursery, turf and gardening	15	25
Poultry, pigs and other livestock farming	15	25
Seafood - production	15	25
Seafood - processing	15	25
Sheep, beef and deer farming	15	25
Support services	15	25
Vegetables	15	25
Veterinary	15	25

We assume that capability at production management plateaus after 15 years and at business management after 25 years.

Impact of innate ability

- *Innate ability* is treated as an attribute of each individual worker that shifts the capability growth curve vertically up or down.
- *Innate ability* for all people in the industry is a normally distributed variable. We will equate the standard deviation of this attribute with the standard deviation of the team capability to translate individual capability scores into equivalent team capability scores.
- *Innate ability* is calibrated (using human judgment) by comparing the increase in individual capability due to experience to the standard deviation of innate ability.
- As a starting input we assume that one standard deviation of *innate ability* corresponds to 0.25 units of capability.
- It is possible for a person with low *innate ability* to have negative individual capability. That is, a person with low experience and innate ability can actually impair team capability.

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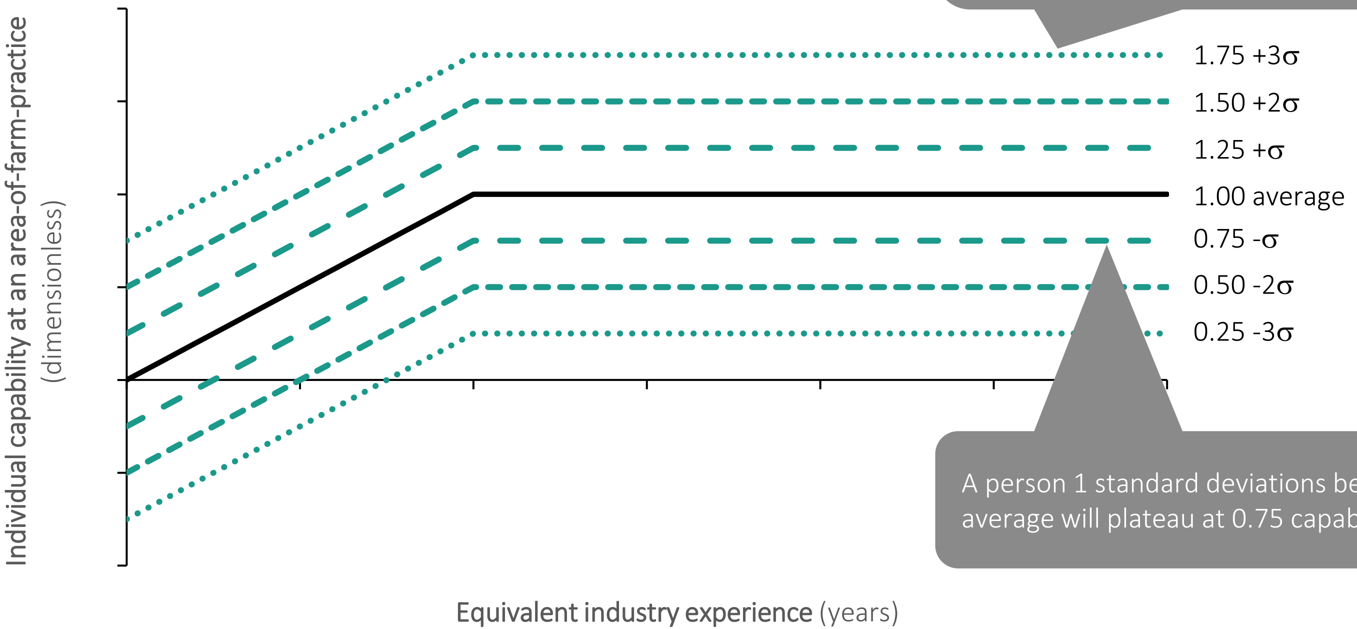
Impact of innate ability

A person 3 standard deviations above the average (which will only be about 15 people in a workforce of 10,000 people) will plateau at 1.75 capability units.



A person 1 standard deviations below the average will plateau at 0.75 capability units.

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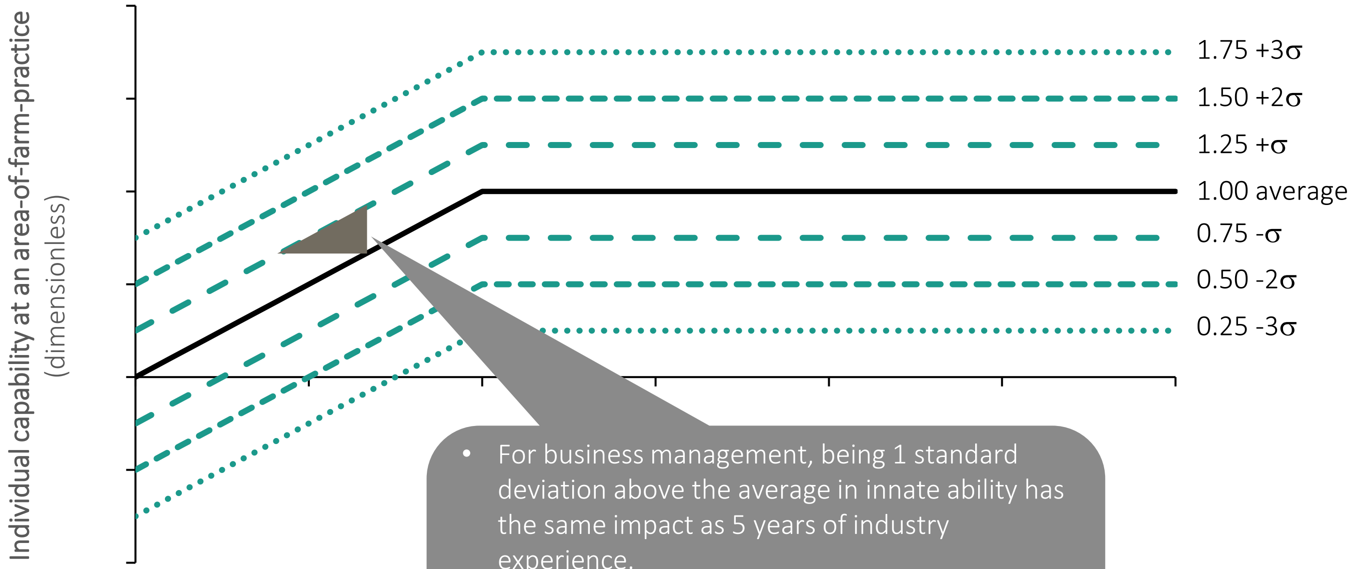
Testing the intuition of the experience – innate trade-off



- For business management, being 1 standard deviation above the average in innate ability has the same impact as 5 years of industry experience.
- For production management, being 1 standard deviation above the average in innate ability has the same impact as 3 years of industry experience.

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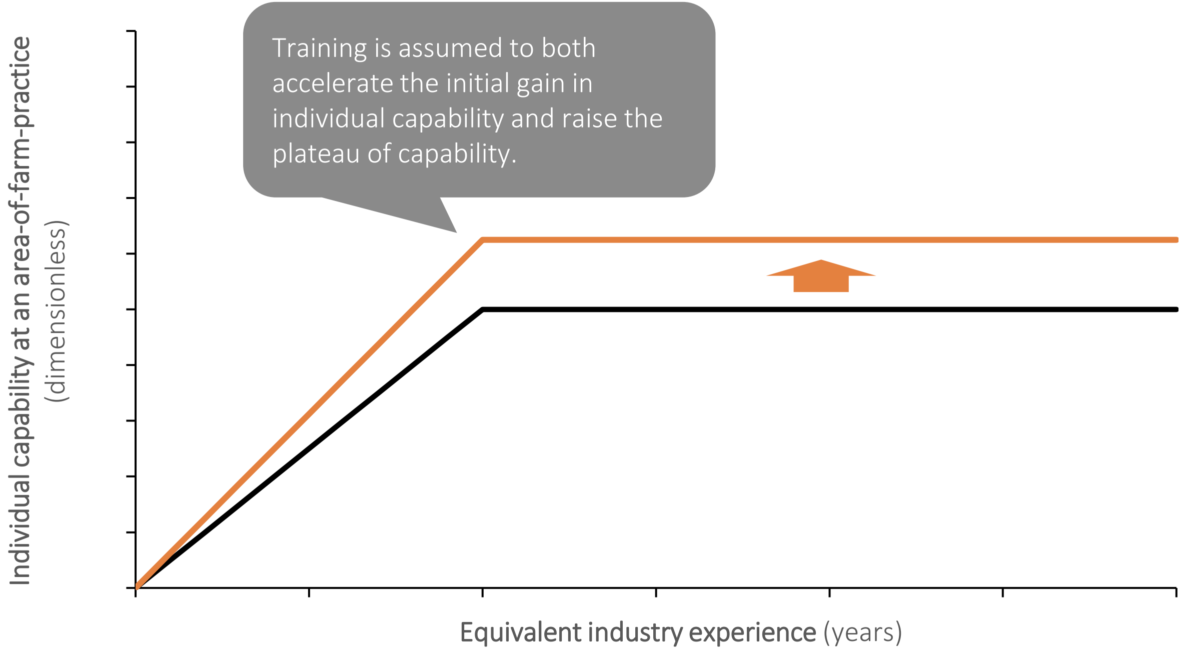
Impact of training history

- *Training history* is an is a composite attribute of an individual worker derived from all the individual training programmes the individual worker has completed or partially completed.
- The impact of any given training programme on *training history* is calculated by comparing to a hypothetical reference training programme.
- The reference training programme has the attributes:
  - **Duration**: 1200 learning hours
  - **Programme type**: Diploma
  - **NZQF level**: L7
  - **Relevance to area-of-farm-practice:** 100% relevant
  - **Delivery mode**: Classroom (or other dedicated training location)
  - **Completion**: 100%
  - **Delivery quality**: Typical
  - **Workplace support**: Fully supported
- Having completed a reference training programme is assumed to have the impact of raising *individual capability* by **0.25**. That is, completing a reference training programme has the same impact as being 1 standard deviation of *innate ability* above average.

Impact of completing a reference training programme



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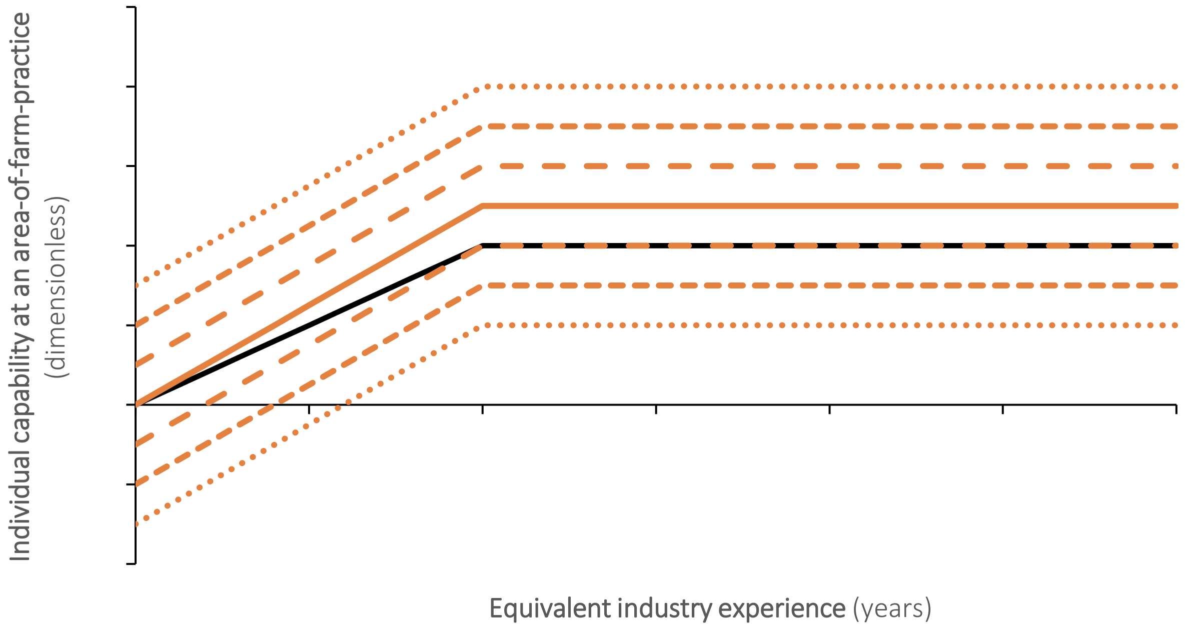
Combining experience, innate ability and training



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Impact of training non-reference training programmes

The effect of any given training programme is calculated as:

Impact_of_training_programme

= Impact_of_reference_training_programme

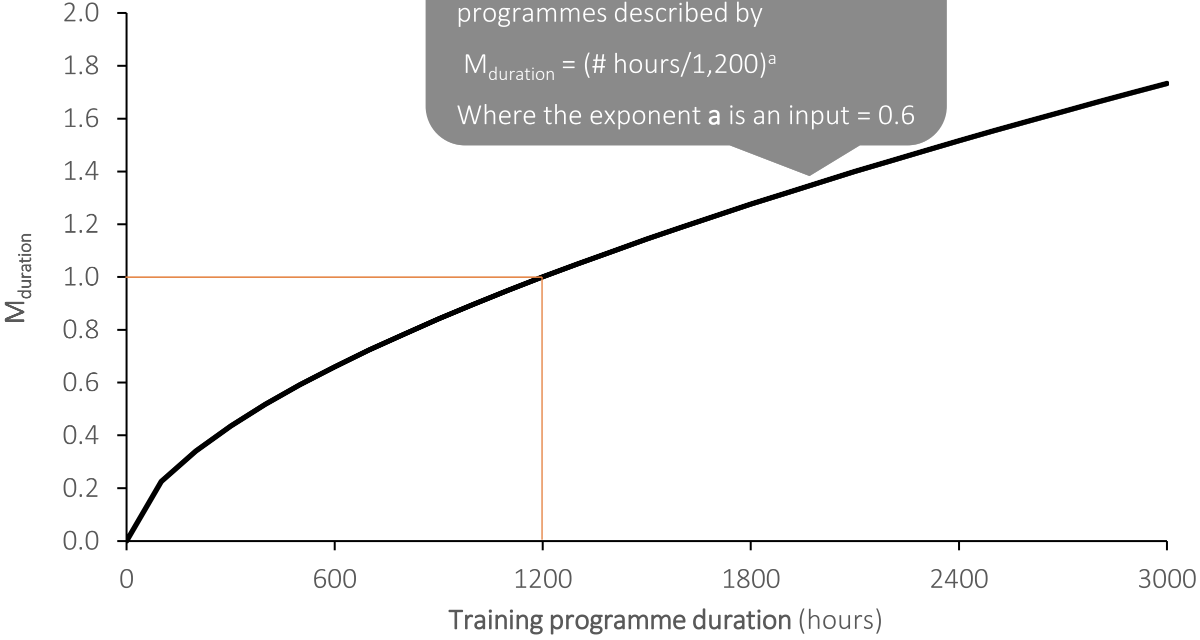
x $M_{duration}$	a modifier for the effect of programme direction (in learning hours)
x $M_{programme\_type}$	a modifier to differentiate assessed (formal) vs non-formal training
x $M_{NZQF\ level}$	a modifier to differentiate different NZQF training levels
x $M_{relevance}$	a modifier to account for the relevance of the training to the area-of-farm-practice
x $M_{delivery\ mode}$	a modifier to differentiate different modes of delivery
x $M_{completion}$	a modifier for incomplete training
x $M_{delivery\ quality}$	a modifier for the quality of delivery
x $M_{workplace\ support}$	a modifier to discount the impact of training if workplaces are not supportive of it

Calculating $M_{duration}$

We assume that there are diminishing returns for the duration of training programmes described by

$M_{duration}$ = (# hours/1,200)^{a}

Where the exponent **a** is an input = 0.6



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Calculating $M_{programme\_type}$

Programme type	$M_{programme\_type}$
Degree	1.0
Diploma	1.0
Certificate	1.0
Appenticeship	1.0
Micro-credential	1.0
Non-formal	0.5

The absence of assessment is assumed to make non-formal training 50% as effective as formal training all other things being equal.

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Calculating $M_{NZQF\ level}$

Role	NZQF level				
	1/2	3	4	5/6	7+
Strategic manager	0.2	0.4	0.6	0.8	**1.0**
Manager	0.4	0.6	0.8	**1.0**	1.1
Semi-autonomous	0.6	0.8	**1.0**	1.1	1.2
Managed	0.8	**1.0**	1.1	1.2	1.3

We assume that training programmes get their full benefit (i.e. $M_{NZQF\ level}$ = 1.0) when they are held by a person in an appropriate role.

Training at NZQF level below that appropriate for the role is discounted e.g. for a strategic manager, 10 credits of learning at L2 is worth only 20% as much as 10 credits of learning at L7.

Being 'over-qualified' offers a small benefit.

Calculating $M_{relevance}$ - Business management

NZSCED label	NZSCED code	Apiculture	Arable	Dairy farming	Equine, dogs and racing	Forestry	Fruit	Grapes and wine	Nursery, turf and gardenin	Poultry, pigs and other livestock farming	Seafood - processing	Seafood - production	Sheep, beef and deer farming	Support services	Vegetables	Veterinary
Other	9999	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Biological Sciences	0109	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
Other Natural and Physical Sciences	0199	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Manufacturing, Engineering and Technology	0301	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Process and Resources Engineering	0303	10%	10%	10%	10%	10%	10%	40%	10%	10%	40%	40%	10%	40%	10%	10%
Maritime Engineering and Technology	0317	10%	10%	10%	10%	10%	10%	10%	10%	10%	20%	80%	10%	10%	10%	10%
Agricultural Science	050101	20%	40%	100%	20%	40%	40%	40%	20%	60%	10%	20%	100%	100%	40%	20%
Wool and Fibre Science	050103	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	100%	20%	20%	20%
Beekeeping	050104	100%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Animal Husbandry	050105	20%	40%	100%	60%	20%	20%	20%	20%	100%	20%	20%	100%	40%	20%	60%
Crop production	050106	20%	100%	40%	20%	40%	100%	100%	40%	20%	20%	20%	40%	80%	100%	20%
Equine trades	050108	20%	20%	40%	100%	20%	20%	20%	20%	40%	20%	20%	40%	40%	20%	40%
Wool and fibre harvesting	050110	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	100%	40%	20%	20%
General Land Skills	050112	20%	20%	100%	20%	40%	100%	100%	60%	20%	20%	20%	100%	60%	100%	20%
Agriculture not elsewhere classified	050199	20%	20%	40%	20%	20%	20%	20%	20%	20%	20%	20%	40%	40%	20%	20%
Horticulture	050301	20%	60%	40%	20%	40%	100%	80%	80%	20%	20%	20%	40%	60%	80%	20%
Viticulture	050303	20%	40%	40%	20%	40%	80%	100%	60%	20%	20%	20%	40%	60%	80%	20%
Forestry Studies	050501	20%	40%	20%	20%	100%	40%	40%	40%	20%	20%	20%	20%	20%	40%	20%
Solid wood processing	050502	10%	10%	10%	10%	80%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Aquaculture	050701	20%	20%	20%	20%	20%	20%	20%	20%	20%	100%	100%	20%	20%	20%	20%
Seafood Harvesting (Fishing)	050702	20%	20%	20%	20%	20%	20%	20%	20%	20%	100%	100%	20%	20%	20%	20%
Fisheries studies not elsewhere classified	050799	20%	20%	20%	20%	20%	20%	20%	20%	20%	100%	100%	20%	20%	20%	20%
Land, parks and wildlife management	050901	20%	20%	20%	20%	20%	20%	20%	100%	20%	20%	20%	20%	60%	20%	20%
Environmental Sustainability	050902	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
Environmental Studies not elsewhere classified	050999	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
Pest and Weed Control	059901	20%	60%	40%	20%	30%	60%	60%	60%	20%	20%	20%	40%	40%	60%	20%
Agriculture, Environmental and Related Studies not elsewhere classified	059999	20%	20%	60%	20%	20%	20%	20%	20%	60%	20%	20%	60%	60%	20%	20%
Veterinary Studies	0611	40%	20%	60%	60%	20%	20%	20%	20%	60%	20%	40%	60%	20%	20%	100%
Public Health	0613	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Other Health	0699	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Business and Management	0803	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Sales and Marketing	0805	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Office Administration	0809	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Banking, Finance and Related Fields	0811	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%

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Calculating $M_{relevance}$ - Production management

NZSCED label	NZSCED code	Apiculture	Arable	Dairy farming	Equine, dogs and racing	Forestry	Fruit	Grapes and wine	Nursery, turf and gardenin	Poultry, pigs and other livestock farming	Seafood - processing	Seafood - production	Sheep, beef and deer farming	Support services	Vegetables	Veterinary
Other	9999	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Biological Sciences	0109	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Other Natural and Physical Sciences	0199	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Manufacturing, Engineering and Technology	0301	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Process and Resources Engineering	0303	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Maritime Engineering and Technology	0317	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Agricultural Science	050101	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Wool and Fibre Science	050103	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Beekeeping	050104	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Animal Husbandry	050105	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Crop production	050106	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Equine trades	050108	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Wool and fibre harvesting	050110	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
General Land Skills	050112	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Agriculture not elsewhere classified	050199	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Horticulture	050301	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Viticulture	050303	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Forestry Studies	050501	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Solid wood processing	050502	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Aquaculture	050701	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Seafood Harvesting (Fishing)	050702	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Fisheries studies not elsewhere classified	050799	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Land, parks and wildlife management	050901	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Environmental Sustainability	050902	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Environmental Studies not elsewhere classified	050999	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Pest and Weed Control	059901	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Agriculture, Environmental and Related Studies not elsewhere classified	059999	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Veterinary Studies	0611	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Public Health	0613	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Other Health	0699	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Business and Management	0803	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sales and Marketing	0805	60%	40%	40%	40%	40%	40%	60%	40%	40%	40%	40%	40%	60%	60%	80%
Office Administration	0809	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
Banking, Finance and Related Fields	0811	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%

Calculating $M_{delivery\ mode}$

Programme type	$M_{delivery\_mode}$
'Classroom' learning	1.0
Work-based learning	0.3
One-to-one coaching	2.0
Online (synchronous)	0.6
Online (asynchronous)	0.3
Self-directed learning	0.3

Calculating $M_{completion}$

Proportion of programme completed	$M_{completion}$
Fully complete	1.0
51% to 99%	0.5
20% to 50%	0.2
Less than 20%	0

Calculating $M_{delivery\ quality}$

Delivery quality	$M_{delivery\ quality}$
Excellent	2.0
Good	1.5
Typical	1.0
Not acceptable	0.5

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Calculating $M_{delivery\ mode}$

Programme type	$M_{delivery\_mode}$
'Classroom' learning	1.0
Work-based learning	0.3
One-to-one coaching	2.0
Online (synchronous)	0.6
Online (asynchronous)	0.3
Self-directed learning	0.3

Calculating $M_{workplace\ support}$

Proportion of programme completed	$M_{completion}$
Strategic manager	1.0
Manager	0.8
Semi-autonomous	0.7
Managed	0.6

Effect of multiple training programmes

- For each individual worker, calculate the impact of each training programme on each area-of-farm-practice
- For the training programme that provides the most benefit, assign the full benefit of the training
- For the second most beneficial programme, assign **a** x the benefit, where **a** is the exponent from the model used to calculate $M_{duration}$
- For the third most beneficial programme, assign $\mathbf{a}^2$ x the benefit
- For the fourth most beneficial programme, assign $\mathbf{a}^3$ x the benefit
- …

Summary of inputs and assumptions

Assumption

- xxx.

Inputs

- zzz

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Future improvement ideas – individual capability model

- **Consider the link between training and innate ability –** Training history and innate ability are likely to be correlated – people with high innate ability are more likely to be trained. This probably doesn't matter much here as the role of innate ability in the model is only to calibrate the impact of training. But it would be useful to consider any second order effects.
- **Xxx** – xxx.

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Turning research into action

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