Attracting Youth into Agriculture

Developing a strategic framework to encourage young people to pursue a career in agriculture

A model for Tasmania

A report for

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Executive Summary

Youth are the cohort that will provide solutions for future challenges facing agriculture, but youth are generally unaware of the diverse career opportunities offered by the industry.

Dr Hlami Ngwenya of South Africa, coined the acronym PERFECT opportunities to highlight the full breadth of careers from creating agricultural policies to designing technologies for agricultural uses. Lower than required numbers of youth pursuing post-16 studies in agriculture is an international concern.

In response, in the United Kingdom, Professor Louise Archer and her team researched, analysed and then created the conceptual framework of Science Capital. This framework identified eight key dimensions relative to what science the youth cohort knows, how they think about science (their attitudes and dispositions), who they know (e.g. if their parents are very interested in science) and what sort of everyday engagement they have with science. This Nuffield report seeks to apply this framework to achieve the same result in attracting youth into agriculture.

Tasmania could be used as the pilot study state. It is economically dependent on the agricultural industry and currently has a strong foundation of suitable programs/activities into which international examples could be integrated or altered to suit. The ultimate aim being to increase the number of young people entering the agricultural industry to build capacity and resolve current and future issues.

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Foreword

Figure 1. Clare Peltzer (Terry, 2019)

As a secondary agriculture and science teacher and prime lamb farmer, I recognise that I am in a unique position to determine the reasons that attract youth to a career in agriculture. I understand the challenges within the education system, as well as the barriers to entry into a career in agriculture. Building social capacity is a pillar for many Australian primary industry bodies; however, there is not a well-organised or recognised pathway for an excited 12-year-old or post-16-year old undergoing vocational or technical education into a career in agriculture. To explore different pathways into agriculture, I travelled to Belgium, Bulgaria, Canada, Czech Republic, England, Germany, Ireland, Italy, Kenya, Netherlands, New Zealand, Qatar, Romania and the United States of America.

My unique position

As a teacher

Schools are institutions where young people learn about the complex interactions that occur in everyday life post-16 years. It provides them with the foundations for becoming an active member of the community and the skills to thrive in their surrounding environment. From the age of five, youth interact with peers, teaching staff and information where they decide to agree, disagree or be indifferent to ideas posed. This is where the 'teachable moments' come about. They create their identity through these years and build an understanding of a possible career path. Hence, the school system is a perfect environment to expose students to an understanding of global and local food and fibre production systems.

When I was a child, my aunt suggested that I would be a good teacher, as I had an interest in passing on knowledge to my younger family members. At 18, I worked at a summer camp in Canada with 6 – 12-year old girls and then altered my Primary Education degree to a Combined Secondary Education and Science degree at the University of Sydney. After five years of studying and six years of teaching in two different schools (from a low socio-economic public

school in New South Wales to a private independent school in Tasmania), I found my niche in teaching agriculture to 13-18-year-old students.

The syllabus for any course is the written document that is open to interpretation and scope for personalisation. The 'what' you teach is outlined, but the 'how' you teach it is where a teacher can play a vital role in the student's engagement with the content. Timing and ratio of theoretical knowledge to practical application is also a source of personal preference by the individual teacher. Furthermore, the academic rigour of the course can be inherently altered by the expectations from the leading teacher. Therefore, the teacher is fundamental when looking at the pathways pursued by youth post-16 years.

As a farmer

I have recognised youth as a crucial collection of people within the farming community. They bring an energy and vibrancy to the sector, they are generally the first ones to adopt new technologies, implement new ideas and apply the latest research into their practices. Youth can be a more flexible portion of the labour force where they generally do not have dependents, so are available for late-night harvesting, early-morning milking and regional, seasonal work picking fruit. They are a highly motivated and cost effective for certain labour requirements, such as at tailing. Although requiring more guidance, time and resources during the teaching phase, they are an asset to every farming team.

However, youth need to be nurtured with:

- Further education as a mandatory inclusion to their daily work – either through extra vocational or technical training.
- Close monitoring, and mentoring if required, of their first employer who can significantly influence their views on the whole industry and interest in continuing in the industry (Pangborn, 2019).
- Knowledge of their rights and responsibilities in the business, while being fully supported by the employer (Daw, 2019).
- Recognition of their strengths, and support through any weaknesses.
- Regular appraisal to correct any misinformation early before bad habits are formed.

This nurturing phase is critical for all employers as the youth's continuation in the industry will help alter their perception towards a more supportive and open career option. As Richard Branson aptly stated, "*train people well enough so they can leave, treat them well enough they don't want to*" (2014).

As a member of a large industry body

Figure 2. Clare Peltzer (far right) with 17-18 year old Agricultural Science students in a crop of hemp, Tasmania (Peltzer, 2018).

Building human capacity is commonly a pillar of large industry bodies as they recognise the need to actively attract and retain a workforce. This can either be achieved by people swapping careers or introducing youth into the sector; these two viable options require different methodologies and strategies. Youth is a hugely significant asset to an industry offering diverse views and a skill set that can help solve current issues. For instance, Meat and Livestock Australia sponsor a scholar every year to explore, learn and disseminate information to help all in the industry.

In summary

- This report aims to provide a unique perspective on the current international issue of how to attract youth into agricultural careers.
- As a teacher, the opportunities and limitations of the schooling system are identified, and improvements suggested.
- As a farmer, the strengths and weaknesses that exist as the primary employer of these youth are explored.
- There needs to be an alignment of all industry bodies to ensure a united and singular approach to attracting youth into agriculture.
- A conceptual framework is introduced that aligns with these perspectives and amalgamates them into a common goal of attracting youth into pursing agriculture in their post-16 studies.

Acknowledgments

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Nuffield Australia recognised my passion for the overlap between my careers in agriculture and education to award me this scholarship.

Meat and Livestock Australia for funding my travels to some fascinating countries to learn about many different aspects of the agricultural sector.

To everyone I contacted, interviewed or questioned regarding the challenge of attracting youth into a career in agriculture. Your passion for your industry and patience in sharing your knowledge is commendable.

My incredible network of friends and family who have helped in many ways. I've had a wonderful year learning that 'you don't know what you don't know', so I will continue to ask questions, listen to myself and others and think about how I do what I do, better.

Abbreviations

ACARA – Australian Curriculum, Assessment and Reporting Authority

BERA - British Educational Research Association

CASE – Curriculum for Agricultural Science Education

DPIPWE – Department of Primary Industries, Parks, Water and Environment

DPIRD – Department of Primary Industries and Regional Development

GAP – Global Agricultural Productivity

LEAF – Linking Environment and Farming, United Kingdom

NFU – National Farmers Union, United Kingdom

PERFECT – Policies, Education and training, Research, Farming and Finance, Extension and rural advisory, Communication, Technology and Trade

UK – United Kingdom

Objectives

- Highlighting the imperative need to attract youth into a career in agriculture internationally and within Australia.
- Broadening the perceived definition of agriculture by applying Dr Hlami Ngwenya's PERFECT opportunities acronym.
- Recognise the strength of Science Capital as a strategic framework.
- Adapting and applying the Science Capital framework to agriculture.
- Analysing international programs that could be implemented into the Tasmanian system to fill the 'Ag Bag'.

Chapter 1: Introduction

The imperative need to attract youth into a career in agriculture

Our food and agriculture systems face profound challenges in the 21st century. Consumers need more nutritious food that is affordable and safe; producers seek innovation to help them tackle climate change and natural resource constraints; and the entire agri-food value chain must rapidly adopt new practices and tools that contribute to a healthy, sustainable world (2019 Global Agricultural Productivity Report, 2019). With a growing population that will possibly peak at 9.7 billion by 2050, the common dialogue has been around the 'how' to produce more food from less land and distribute it. This report concentrates on the 'who' is needed to assist in meeting this goal. "*One key to success in tackling this global challenge is to engage young agricultural leaders and equip them with the knowledge, resources and access to markets needed to produce and distribute food to feed the world*" (International Agri-Food Network, 2018). The rate of innovation and implementation of new technologies needs to be exponential in order to meet these targets, so youth are a crucial piece of this puzzle.

Having visited 16 countries in 2019 alone, it is difficult to pinpoint the exact reason why youth are not choosing a career in agriculture. For example, Ireland have strong numbers studying a university degree in agriculture but have limited numbers of youth interested in farming. On a similar note, Kenya has a high proportion of well-educated youth studying a degree in agriculture; however, they are limited by the job opportunities available post-university (Figure 3). The analogy given was "*too many pilots, not enough planes*" (Barden, 2019). Alternatively, Australia is limited in overall graduate numbers which has led to an excess of graduate positions not being filled (Pratley & Archer, 2017).

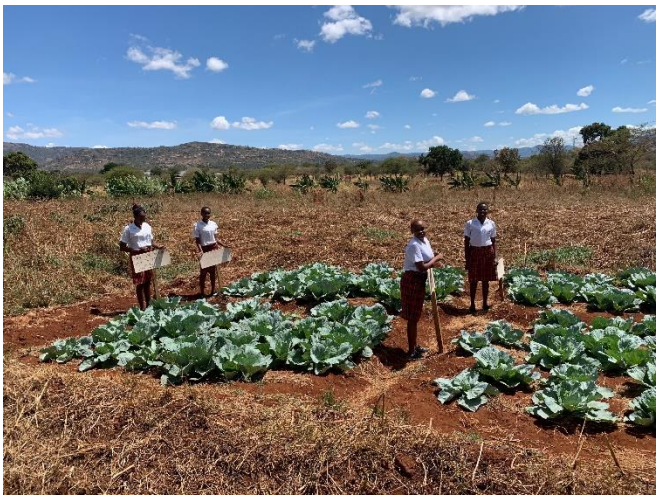

Figure 3. Kenyan students studying agriculture at secondary school (Peltzer, 2019).

To simplify the numbers to ensure they are accurate, this report concentrates on the university graduate numbers from agricultural degrees within Australia. The graduate supply does not include the students who choose to study internationally or students completing certificates

from vocational training courses. Despite this movement, the industry saw a grave decline in graduate numbers which ranged from around 1,300 in 2001 to around 550 in 2014 (Pratley, 2017). In his 2017 paper, Pratley noted that there is a '*glimmer of hope'* as the trends are showing more positive numbers due to having 1,500 enrolments in 2016, based on the latest unofficial data from the universities. It will be interesting to learn the number of graduates from this cohort graduating in 2020 after completing their four-year course. This positive trend is reassuring for the industry; however, the industry must not become complacent with these facts. Does this increase in enrolments reflect a notable change within the method to attract these students or is it just a coincidence?

The Australian tertiary education sector relies heavily on the secondary sector to supply suitable candidates into the pipeline for agricultural degrees. Therefore, it is important to recognise that there has been a downward trend in students enrolling in secondary agricultural courses as 17-18-year old's over the past 30 years. Within New South Wales alone, only 1,392 students completed a secondary agricultural science or equivalent course in 2018 compared to approximately 2,500 in 1991 (Randall, 2019). During this same year, only 2,451 students within Australia completed a course in agriculture. These historically low numbers can be explained by the decrease in courses available throughout the whole schooling system. It is not a compulsory course within the Australian Curriculum, Assessment and Reporting Authority; therefore, it is up to the individual school to include a course into their already tight curriculum.

If a school chooses to include an agricultural course into their curriculum, it needs to clearly aim for either agricultural literacy (education about agriculture) or technical/vocational agriculture (education in agriculture). Agricultural literacy provides students with the general knowledge about food and fibre production so they can become well-informed consumers, while technical/vocational agriculture prepares students for a career in agriculture post-16 years old. This report concentrates on highlighting the strengths and limitations in the education system for youth to pursue a career in agriculture. In addition, youth from both farming and non-farming backgrounds should be equally targeted to pursue a career in agriculture post-16 years old. Although some may say it is best to concentrate on youth from a farming background, this report recognises the opportunity to encourage non-farming background youth into agriculture. The current cohort of agriculture enrolments at the University of Tasmania has approximately 60% from a non-farming background (Jones, 2019).

Furthermore, non-farming background students come with a different, but easily transferable, set of skills that are required for this current change in agriculture.

However, if a school chooses not to include an agricultural course into their curriculum, has it limited the career opportunities into agriculture for its students?

This report will highlight the need to broaden the perceived definition of agriculture to ensure that youth is aware of the career opportunities. It uses the small island state of Tasmania to discuss the alternative pathways that exist to encourage youth into post-16 careers in agriculture. It highlights the necessity of a strategic conceptual framework that ensures 12 to 16-year old's experience timely exposure to agriculture, with the aim of both farming and non-farming background youth ultimately pursuing a career in agriculture. Fortunately, a team in the United Kingdom (UK) created a conceptual framework for identifying the reasons how and why a student chooses to pursue a career in science. This framework can be altered and applied to current programs/activities in agriculture and suggests examples of alternative program/activities that are successful in other countries. The aim is to increase employee numbers within the whole of agriculture in Tasmania.

Chapter 2: Broadening the perceived definition of agriculture

Anecdotally, the majority of interviewees across multiple countries stated that it is imperative to "*reframe agriculture as a business choice that is intellectually, socially and financially rewarding, as well as one in which young people can have an incredible impact on issues such as climate change, hunger, displacement, poverty and more*" (International Agri-Food Network, 2018). In order to reframe agriculture, there is a dire need to be more inclusive of all sectors of agriculture under the one umbrella. Currently, agriculture is perceived by youth as 'just farming' which is the largest and most influential limiting factor to attracting more into the industry. As perception equals reality, the industry needs to change the language used and allow a broader range of career options to fall under the agricultural banner. Within the agricultural industry, it is common knowledge that farming is an important, but not the only sector to be considered, while others outside the industry do not have a grasp on the full extent of jobs available.

The need to sell the full breadth of career options within agriculture is a concept explored by South African, Dr Hlami Ngwenya, where she identified the PERFECT opportunities available in agriculture as an acronym for all sectors and their associated career paths (Table 1). She created it to challenge people to broaden their view to seek alternative pathways to attract brilliant and innovative youth, including those out of the mainstream agricultural field (2019).

Table 1. Dr Hlami Ngwenya's PERFECT opportunities in agriculture (2019).

	Career Opportunities
P	Policies
E	Education and training
R	Research
F	Finance and Farming
E	Extension and advisory services
C	Communication
T	Technologies and Trade

All career options under the PERFECT banner, at all levels (local, state, national and global), need to incorporate the term agriculture into their dialogue to increase the proportion of the population involved in agriculture. This will lead to a higher probability that youth will interact with someone involved in agriculture on a daily, weekly or annual basis. Furthermore, parents, family and close friends may find themselves under the agricultural banner which creates a more powerful dialogue with the interested youth.

Chapter 3: Conceptual Framework of Science Capital

3.1. Why a framework is needed

If youth, from 12-16 years old, is presented with a rigorous, well-resourced agricultural course at a school led by a knowledgeable and inspirational teacher, then it may be assumed that they were provided with ample opportunities to pursue their studies in agriculture post-16. However, this idealistic situation does not exist in enough schools throughout Australia; therefore, we need to use an organised and tested method to attract them into a career in agriculture rather than relying on a chance interaction.

There are some high quality and successful programs that already exist and are seamlessly implemented into a mainstream science topic, but they are currently occurring in isolation for the individual youth. Some are not receiving the quality and/or quantity of interactions at pivotal times between the age of 12-16 that encourage them to pursue a career in agriculture post-16. Luckily, a chance discussion with Jennie Devine at the National Farmers Union (NFU) in the UK where she mentioned that she used the conceptual framework of Science Capital to design and deliver agricultural classroom lessons to primary school aged students (Figure 4). Although this framework was designed for the teaching of science, its adaption into agriculture teaching should be an easy translation.

Figure 4. Discussing Science Capital framework with Jennie Devine, NFU (Peltzer, 2019).

3.2. Definition of Science Capital

Science Capital is a conceptual tool for measuring an individual's exposure and knowledge of science. It is used to help to understand why some people participate in post-16 science and others do not. It is a term coined by Professor Louise Archer and her team in the UK, based on work conducted by the sociologist Pierre Bourdieu's concept of capital (referring to economic, cultural and social resources) – in short, Bourdieu proposed that the more you have of the 'right sort' of capital, the better you are able to 'get on' in life (Archer et al., 2015). They applied Pierre Bourdieu's model with an aim of finding out how to develop a teaching approach to

improve science engagement and understand what produces unequal patterns in science participation.

3.3. Methodology of the research conducted

The impact of Professor Louise Archer and her team's Science Capital work draws from two research projects; ASPIRES/ ASPIRES 2 and Enterprising Science. ASPIRES/ ASPIRES 2 constitute a ten-year longitudinal study, tracking a student cohort from age 10-19 to understand the influences of family, school, careers education, social identities and inequalities on science and career aspirations. They surveyed 40,000 students in the UK and conducted over 650 in-depth interviews with young people and parents (British Educational Research Association, 2019). The results were statistically analysed to identify the eight key dimensions of Science Capital. These dimensions are the aspects of Science Capital which are most closely related to post-16 participation and for fostering a sense of science is 'for me'. That is, the more a young person has, the more likely they are to plan to continue with science in the future (Archer et al., 2015).

The concept of Science Capital can be imagined like a 'holdall', or bag, containing all the science-related knowledge, attitudes, experiences and resources that an individual acquires through life. Figure 5 represents the bag that includes what science they know, how they think about science (their attitudes and disposition), who they know (e.g. if their parents are very interested in science) and what sort of everyday engagement they have with science (Archer et al., 2015).

Figure 5. A cartoon to represent the bag of science capital an individual acquires (Archer et al., 2016).

3.4. Current application of the Science Capital framework

The research conducted by Professor Louise Archer and her team has dramatically changed science education policy and practice both in the UK and internationally, shifting understanding, policy and practice across government departments, national institutions, museums, science centres, and major science and engineering professional societies. It has been integrated into professional training and new practice networks of teachers and added

as a criterion in national awards schemes, including the primary science quality mark which reaches 240,000 children and 9,000 teachers annually.

The Science Capital concept has not been integrated into science teaching here in Australia to date. Being based on strong empirical research from the UK, it may be reasonable to expect that the findings are applicable to the Australian schooling system. Furthermore, due to its success and the close relationship between science and agriculture, it can be translated to suit agriculture, and then used as a framework to analyse and redirect the current system in Tasmania.

Chapter 4: Agricultural Capital

4.1. Applying Science Capital framework to agriculture

4.1.1. Why the Science Capital framework can be used

Similarities exist between the challenges of attracting youth into post-16 studies in both science and agriculture. Although science is the basis of many aspects of agriculture, there are other parallels to be drawn between the two, allowing the Science Capital framework to be successfully applied for the same purpose in agriculture. For example, both careers are perceived with stereotypical older, white males working hard in low-paying jobs. Although this perception is generally incorrect, it is difficult for both industries to alter these views to attract more youth into pursing post-16 studies in either field.

4.1.2. Differences between science and agriculture

Although there are several obvious similarities, there are still some differences that need to be identified to allow for the application of this model while knowing its limitations.

Table 2. Differences between science and agriculture as subjects delivered at secondary schools in Tasmania

	Science	**Agriculture**
Enrolment	Every school has science courses available and due to it being compulsory for most of those years with strong enrolments.	The number of viable programs is declining, consequently the number of students served by the program are declining too.
Availability	Available in every school from lower primary to upper secondary. Compulsory for majority of those years.	Generally, it is up to the individual school to choose to include it into their curriculum.
Current curriculum	Updated as often as the other core courses. The concepts taught in science are generally static, but the applications adapt to the current climate.	Some of the content taught has failed to keep up with modern agriculture, i.e. the recent Irish agricultural curriculum had not been updated for the past 30 years.
Uneven quality	The quality is carefully monitored by teachers from consecutive years as content is cumulative.	Due to a low number of available courses, measures are not in place to ensure even quality of courses.
Academic rigour	Carefully monitored by adjustments made in the curriculum, within assessments and remains high through feedback from tertiary providers.	Generally lower than other sciences.
Cohort of students	Science is compulsory for Year 7-10, then a choice for Year 11-12. A prerequisite for many university degrees.	Routine processes are required to evaluate the curriculum content to ensure it continues to attract a cross-section of

		students in terms of academic ability and tertiary education aspirations.
Access to Continuous Professional Development (CPD)	Higher number of courses available which theoretically reduces the distances to travel to the CPD.	Limited number of courses, which leads to larger distances to be travelled. Online courses could be a successful method to connect teachers.
Teacher support in school	As it is compulsory in every school, generally, there is a team of science teachers who can provide and receive support with their content, pedagogy or assessment tasks.	As an option in some schools, generally, there is a limited number of agriculture teachers so lack of timely support with their content, pedagogy or assessment tasks.
Teacher education	Many science and specialised science teaching degrees at tertiary providers.	Very limited number of specialised agriculture teaching degrees at tertiary providers.

4.2. Agricultural capital

The Science Capital 'carry all' can be further dissected into eight key dimensions identified as reasons why students pursue science in their post-16 studies. These have been adapted to an agricultural setting as seen in Table 3. The definitions will ensure that the dimensions are correctly interpreted and can be applied to a range of different programs/activities both in and out of school to ensure targets are being reached.

Table 3. Agricultural capital with definitions and examples of the eight key dimensions

Agricultural capital dimension number	**Agricultural capital defined as:**
1 – Knowledge of agriculture	A young person's knowledge and understanding about agriculture and how agriculture works. This also includes their confidence in feeling that they know about agriculture.
2 – Agriculture related attitudes, values and dispositions	The extent to which a young person sees agriculture as relevant to their everyday life (for instance, the view that agriculture is 'everywhere').
3 – Knowledge about the transferability of agricultural skills	Understanding the utility and broad application of agricultural skills, knowledge and qualifications (e.g. that these can lead to a wide range of jobs beyond, not just in, agricultural fields).
4 – Consumption of agriculture-related media	The extent to which a person, engages with agriculture-related media including television, books, magazines and internet content.
5 – Participation in out-of-school learning activities	How often a young person participates in informal agricultural learning contexts, such as agricultural museums, farming and country shows.
6 – Family agriculture skills, knowledge and qualifications	The extent to which a young person's family have agricultural-related skills, qualifications, jobs and interests.
7 – Knowing people in an agriculture related job/role	The people a young person knows (in a meaningful way) among their wider family, friends, peers, and community circles who work in agricultural-related roles.

8 – Talking to others about agriculture in everyday life	How often a young person talks about agriculture with key people in their lives (friends, siblings, parents, neighbours, community members) and the extent to which a young person is encouraged to continue with agriculture by key people in their lives.

4.2.1. Monitoring and re-filling the Ag Bag

Professor Louise Archer and her team coined the term, a 'carry all' as an analogy (depicted in Figure 5) where students collect information, experiences and a feeling during their time learning about science, both in and out of school. To bring the analogy into agriculture, it can be termed the 'Ag Bag' as it can be filled with information, experiences and feelings about agriculture acquired over time. The contents of the bag come from interactions with the eight key dimensions that can be accrued through personal experiences with friends and family, in school, through community events and from interactions with society.

The quality of these interactions can vary with different experiences at pivotal times. The individual can fill their Ag Bag with differing amounts from the same experience depending on their personal background and previous experiences. Some programs will meet multiple dimensions at once, while others will just meet one dimension at a time.

The contents of the Ag Bag are dynamic, and potentially decreases over time unless replaced with new information, experiences or feelings on a timely basis up until the student is 16 years old. For example, an experience at 12 years old will need to be updated and increased if it is going to be of any value post-16. The value of the contents will also change over time too. For example, a high-quality experience at 13 years old will hold a different value compared to a similar experience at 16 years old.

Therefore, the quality, quantity, and timing of interactions with agriculture needs to be closely monitored for an individual. The aim of this framework is to ensure that the agricultural programs/activities align to meet the eight key dimensions at strategic times for the 12-16-year old individual. In order to fully demonstrate the usability of the framework, it will be applied to the highly agriculture-dependent state of Tasmania. The following chapter highlights the ways in which this framework aligns the existing programs/activities for maximum number of youth pursing agriculture post-16. In addition, it introduces new programs/activities from other nations that fill the holes identified by the framework and have the potential to succeed in Tasmania.

Chapter 5: Future strategies for Tasmania's agricultural education system

As one of the seven states and territories of Australia, Tasmania currently has a population of ~500,000 people and a land mass comparable in size to the Republic of Ireland. The agricultural sector is a key pillar of Tasmania's economy, contributing 5.6% of Gross State Product and sustaining jobs and economic activity in the rural and regional areas (Department of Primary Industries, Parks, Water and Environment, 2017). The Deputy Premier and Minister for Primary Industries and Water at the time, Jeremy Rockcliff, stated that the Tasmanian Government has an ambitious goal to increase the annual value of the agricultural sector to $10 billion by 2050. To reach $10 billion, the sector will need to grow at more than double the growth rate experienced over the past 20 years (DPIPWE, 2017). With a dominance of agriculture economically and throughout the landscape, it would be expected that a continuous stream of youth, graduates and apprentices would be entering all aspects of PERFECT agriculture. On the contrary, the continuum is weak and generally disorganised and therefore Tasmania is a suitable candidate for the application of the Agricultural Capital framework in order to fill the Ag Bag of the youth of Tasmania.

5.1 Perceptions of the agricultural industry and career options

Perception is a very powerful concept that can attract or repel youth into pursuing a career in agriculture. Unfortunately, agriculture has a stereotype created by TV, movies, cartoons, news and limited personal experiences. A job in agriculture requires hard, manual labour, is only about farming, tractors and paddocks, and unprofitable based on perceptions from 512 school students (16-18 years old) from Western Australia (Department of Primary Industries and Regional Development, 2017). The benefits for agricultural graduates, such as job security, high salaries and constantly evolving industry, are not well-understood by youth. They also highlighted their misunderstandings by providing the following reasons against considering an agricultural career, including:

- Not being from a farming family/background.
- Cannot afford a farm.
- Do not want to move to the country/a regional area.
- Do not know what jobs are involved in the agricultural industry.

- No jobs available for ‘people like me’.
- Can earn more money in a different industry.
- Lacks technology/innovation.

It can be assumed that 16-18-year old students from Tasmania hold similar perceptions of agriculture as their Western Australian counterparts. In 2014, Turner and Hawkins conducted research with older students currently attending the University of Tasmania and found that it is essential to recognise that for the average Tasmanian young person, the initial, or default expected outcomes for choosing agricultural science as a career are generally negative. This is largely due to the background environmental influences of negative public perceptions and learning experience, and subsequent assumptions that a low level of ability is required to pursue this career path (Turner & Hawkins, 2014). Throughout the interviews, the students consistently referred to a career in agriculture being viewed as 'just' or 'only' farming within their spheres of influence, reflecting not only a lack of awareness of the many career options available but also a lack of value placed on farming and the wider agricultural industry in Tasmania (Turner & Hawkins, 2014).

Therefore, both school-aged students and current university students do not see the vast opportunities available within PERFECT agriculture. These views are detrimental to building capacity, but many other industries have misconceptions too, so it is important to be aware of these and actively realign them when given the opportunity. Everyone within the whole of PERFECT agriculture has a role to play in this respect.

5.2 Current school system

The agricultural education system in Tasmania has a broad spectrum of practice. It ranges from high quality, well-implemented programs to weakly funded and fragile programs. As presented in Table 2, if it is even an option offered at the school, then it may come with its own challenges. Therefore, the workforce required in agriculture should not solely depend on the school system, but alternatives outside of school should be assessed, modified and supported.

5.3 Applying the Agricultural Capital Framework to Tasmania

The Agricultural Capital Framework will work well within the Tasmanian system as it is a small island with a high concentration and economic dependency on agriculture. With short

distances to a wide range of agricultural enterprises and examples of PERFECT agriculture, interactions of youth with agriculture has the potential to be more accessible compared to other states of Australia. Additionally, the large discrepancy between the quality and quantity of schools teaching agriculture, there is a need to include non-school based methods to attract youth into agriculture.

The strengths of this framework in Tasmania are:

- The number of highly professional businesses within suitable distances of the major metropolitan areas – Hobart, Launceston and Devonport.
- The high number of stakeholders from government positions through to business owners interested in having a strategic approach to attracting youth into the industry.
- Well-resourced, funded and successful programs currently exist.

Despite the strengths with this framework, limitations within this state include:

- Accessibility to willing people within all aspects of PERFECT.
- True collaborations between PERFECT agriculture for a common goal.
- The need for annual reassessments of this framework to be modified and adapted to suit changes within the forward-moving agricultural sector.
- Remaining as a non-political framework.
- The difficulty of ascertaining its success as a numerical piece of data to compare its success year-on-year.

Addition of an independent body

The introduction of an intermediary group to bridge the gap between producers and consumers is necessary to help connect and communicate questions and concerns about agriculture. Ireland has a charitable trust, Agri Aware, created to improve the image and understanding of agriculture, farming and the food industry among the general public (Jaghoe, 2019). Tasmania would benefit from having a politically independent body to meet the same goals as improved communication will help in promoting the following programs and activities.

Suitable programs/activities for Tasmania

There are several programs/activities that currently exist within the Tasmanian landscape and calendar. Further suggestions from international examples to improve these current programs/activities are mentioned and mapped to the eight key dimensions in the Agricultural Capital framework (Table 4).

Table 4. Demonstrating matching the eight key dimensions with suitable programs/activities in Tasmania

	1 – Knowledge of agriculture	2 – Agriculture related attitudes, values & dispositions	3 – Knowledge about the transferability of agricultural skills	4 – Consumption of agriculture related media	5 – Participation in out-of-school learning activities	6 – Family agricultural skills, knowledge and qualifications	7 – Knowing people in an agriculture related job/role	8 – Talking to others about agriculture in everyday life
Large community agricultural events	x	x	x	x	x			x
Farm open days	x		x		x		x	x
Option of a gap year	x	x	x		x		x	x
Utilising social media	x			x	x		x	
Young Farmer Clubs	x	x	x	x	x	x		x
Bringing agriculture to the school	x		x				x	x

Large community agricultural events

Historically, country shows attracted families from urban, regional and rural areas to showcase all aspects of farm life in the heart of the community. Some of these shows no longer exist or fail to attract the numbers previously achieved for future sustainability. Alternatively, Tasmania hosts a very successful three-day agricultural and machinery field-day event, Agfest, that has been operating for 37 years, attracting 63,383 patrons and 728 exhibitors in 2019. Ireland's Ploughing Championships is a similar concept but draws a crowd of 300,000 people. However, does this one-day interaction make the most of this perfect opportunity to excite and connect with the 12-16-year-old people entering the gates? Can the interaction be strengthened by including side-events or post-events aimed at these youth? With an

abundance of resources (physical and people) and a captive audience, it would be a relatively simple time and place to capitalise on this opportunity.

Farm open days

A prominent constraint on the industry to date is that it has failed to inform interested consumers about what happens in agriculture currently. Now, more than ever, the sector needs to open 'gates' to all interested parties to allow for two-way communication. This can be achieved through allowing individuals, families and special interest groups into businesses so they can gain perspective into the current issues faced by all those working in agriculture.

The Irish agri-food sector semi-state authority, Teagasc, were astounded when 10,000 people attending their Moorepark '19 National Dairy Open Day event in July (Kelly, 2019). All dairy farmers, dairy industry stakeholders and other interested people are invited to this event which concentrates on the theme of 'growing sustainably'. The event was further promoted through Twitter, with over one million hits. Farmers were asked to add the hashtag #ThisIsDairying on family-orientated dairying photos to share the positive attributes of the dairy sector.

Linking Environment and Farming (LEAF) in the UK have *Open Farm Sunday* as an annual event for the public. While these one-off days are beneficial, increased frequency of these interactions is more powerful.

Also, in Ireland, *Family Farm*, will open their doors in summer 2020 as a shared place for consumers and producers to interact. Developed by Agri Aware and the Dublin Zoo, it is an acre of land with cows, sheep, goats and pigs close to Dublin providing an interactive day for families and school groups, where they will learn how to milk a cow, make butter and grow vegetables. By simulating a working farm in a safe and exciting way, the real messages are not being lost. To take this model a step further, it would be advantageous to identify a suitable month or season where an example of a PERFECT Tasmanian agricultural business was open every Sunday. Each business would only need to open for one day during the period, but it would allow more people/families with the opportunity to attend at least one day. The variety showcased would ensure that individuals learn about more than just one aspect of agriculture as there will be an opportunity to interact with 4 – 12 businesses within the year. There would be three separate programs run near the metropolises in the South, North and North-Western part of Tasmania. It would be promoted by all industry bodies and communities involved. It

encourages individuals and families to move into the regional or rural parts of the state and individuals will be able to ask pertinent questions to the farmers/business owners and other industry members.

Option of a gap year

With insight from the Australian Farm Institute that Australian agriculture faces an immediate labour shortfall in excess of 101,000 full time equivalent works in 2030, the National Farmers' Federation 2030 Roadmap highlights the opportunity to increase the labour force in agriculture through establishing an 'Ag Gap Year' program to get young Australians to try their hand at agriculture (2018). Chief Executive Officer Tony Mahar noted that this program has not currently been progressed but it is an option being considered in the next few years (2019).

Many schools in Tasmania offer work experience programs for 16-year-old students for a working week. Although this is a great opportunity, five days may not allow them enough experience to gain the feeling of 'it's for me' and pursue a different career path. Alternatively, the Irish offer an optional one-year school programme, 'Transition Year', that can be undertaken by students at the age of 16, prior to completing their Leaving Certificate. It is an opportunity for a non-academic year of learning life skills and sports, where working in agriculture is a viable option. The strength of this program is that it is recognised as a credible option before completing the final two years of compulsory schooling, and students would be able to try out different aspects of PERFECT agriculture for a true sense of the career opportunities available. Post-secondary schooling, Cotton Australia (the peak body for Australia's cotton producers), offer a 'Cotton Gap' program to connect cotton farmers with keen operational youth who are interested in either a long-term career in the cotton industry or 12 months employment in the form of a 'gap year'. As with any 'gap year', it needs to be well-structured, with suitable employers and recognition by industry and the education sector as being a credible alternative to continuing with academic learning. Furthermore, it could be a suitable model for people within career breaks or sabbaticals for career movement into agriculture.

Utilising Social Media

The role and power of media is a relatively untapped source of marketing by the agricultural sector for building capacity. Julie Neale, the Education Programme Coordinator at LEAF in the UK, conducted research into gaining a greater understanding of the way in which 12-18 years old view food and farming (2019). They questioned over 1,000 teenagers across the UK in June

2018 and found that 86% of teenagers would search online or take to social media to find out more about farming with Snapchat, followed by YouTube, as their preferred channels. Nearly 89% say social media is either very important or important to them and they use it several times a day (63%) or once a day (25%) (LEAF, 2018). A short (30-second) video is teenagers' preferred format of online content. With these insights, the industry knows how and where the captive audience is and can provide them with engaging and informative content.

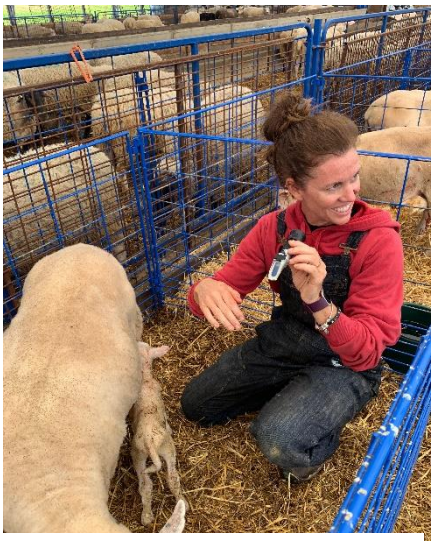

Figure 6. Sandi Brock uses social media to share information about sheep farming (Peltzer, 2018).

Generally, communication within agricultural spheres is consistent and informative; however, the industry does not communicate adequately with others outside these seemingly closed groups. This role can, and should, be conducted by both individuals, industry groups and large corporations. Sandi Brock, Sheepishly Me, is an indoor prime lamb producer from Ontario, Canada, and has 83,000 subscribers to her YouTube Channel with up to 290,000 views of a 17-minute video within six weeks of being produced (Figure 6). She is a sensation to farming and non-farming individuals and families of a wide age range from around the world. Her videos inform and educate others about the strengths and challenges of sheep farming. "*It is a time-consuming interest, but the followers thoroughly enjoy it. Not every farmer is suited to this type of media, but those who are should be telling our story*" (Brock, 2019). Depending on the platform used, there are different requirements in terms of video length and frequency of adding new content. Tasmanian farmers would require training and mentoring to maximise their impact, but it is a cheap and viable option for attracting youth into agriculture.

When discussing the role of the John Deere brand in attracting youth into agriculture, Dr Lane Arthur, Director Digital Solutions, JD Precision Agriculture stated that "*labour will be the pinch point – not just steering the combine, but fully understanding it*" (2019). It was suggested that their promotional videos could act as a powerful motivator in fulfilling their capacity requirements. Nine months after such discussions, the advertisement 'We're for ground-breakers' has circulated the internet highlighting the need for creative, courageous and gumptious people to change the world. It is a positive step towards creating space for youth

to enter the industry, and other companies using visual media in advertising should aim to meet this requirement.

Young Farmer Clubs

Youth community-based clubs, independent of a school, exist in most countries visited. Generally, these clubs are for 16-30 year-old, farming background, likeminded youths where the older members usually hold key positions to organise events. For example, the Young Farmer Club in New Zealand run regional and national competitions and were fortunate to have them televised nationally during primetime TV in 2018. Unfortunately, due to poor funding choices, this opportunity has been revoked (Campbell, 2019). As these clubs are heavily reliant on volunteers, it can be difficult to attract and retain passionate members into key positions to ensure that all intended outcomes are met annually.

Alternatively, some clubs are sustainably funded and fully immersed into the community. An example of this is the 4-H program that exists in many countries around the world. In Delaware in the United States of America, the 4-H program is open to all children between the ages of five to 19 and is sponsored by the University of Delaware, where a portion of the extension agent's salary is allocated towards organising the local and state clubs (Figure 7; Garey, 2019). This ensures funding requirements are met, adult mentorship is conducted, and resources are available.

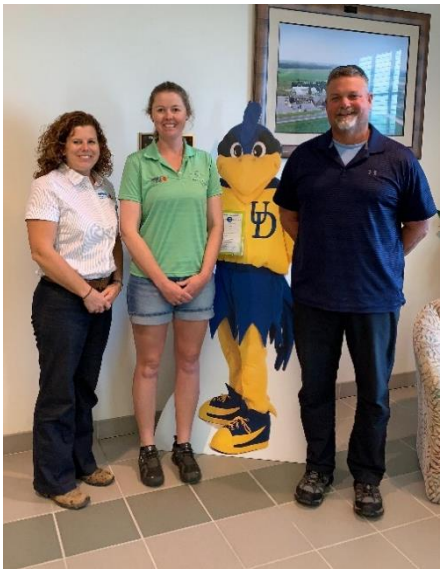

Figure 7. Learning about 4-H with Susan Garey and Mark Isaacs, University of Delaware, Delaware (Peltzer, 2019).

Tasmania has numerous Rural Youth clubs throughout the state. Strengthening their connection with the University of Tasmania would also create a cyclic opportunity to attract these youth into further education within their state. Furthermore, lowering the age bracket of members down to five-years old would bring in whole families and not necessarily just those from farming backgrounds.

Bringing agriculture to schools

Undoubtedly, school is the ideal setting for teaching youth about agriculture. If an explicit course is not included into the curriculum, there are still alternatives to incorporate

agricultural content into other subjects or days. Once the school has defined their timeframe, outcomes and resources available, they can determine their limiting factors to find a suitable program/activity. Limiting factors include:

- Inadequate content knowledge of teachers.
- Lack of hands-on authentic experiences at school.
- Interactions with a professional in agriculture.

Inadequate content knowledge of teacher

Many industry bodies pride themselves on developing units with age suitable content, delivery suggestions and mapped to the curriculum of multiple subjects. For example, Lisette van der Kallen of ZuivelNL, the Dutch dairy industry body, shared the physical and digital resources developed for 4-18-year-old students (2019). The concept is similar to Dairy Australia's education resources and those developed by the NFU in the UK. However, the national government subsidises the implementation of these programs in schools under their Jong Leven Eten (young learn eat) initiative which will continue until 2025 to address the current funding issues that exist in schools. Furthermore, 46 states of the United States of America implement the Curriculum for Agricultural Science Education (CASE) model into their school. It supports teachers with curriculum, professional development, assessment and certification which ensures that teachers are properly equipped and trained to optimise student learning. With nearly 78,000 students being taught with CASE in the 2019-2020 school year, it is a successful model for Tasmania to aspire towards (CASE, 2019).

To support teachers with content and connections to farmers, the UK Government funds nine positions that are geographically spread throughout the UK. These 'Recs' are ex-teachers who work for the department for 1.5 days per week helping schools develop and analyse their agricultural programs. They help strengthen connections between schools and the agricultural sector. This model would be successful in Tasmania with face-to-face interactions with current and past teachers.

Lack of hands-on authentic experiences at school

Access to authentic hands-on agricultural experiences is difficult for both urban and regional schools. It is usually expensive and time-consuming to go on class excursions to a working farm. However, in New South Wales, Australia, Steve Mansur and Kate Zlotkowski designed a mobile farm unit known as iFarm trailers to teach students about farming, use of water, waste management and solar energy. Although aimed at city primary schools, the concept could be feasible for sharing resources between schools in Tasmania.

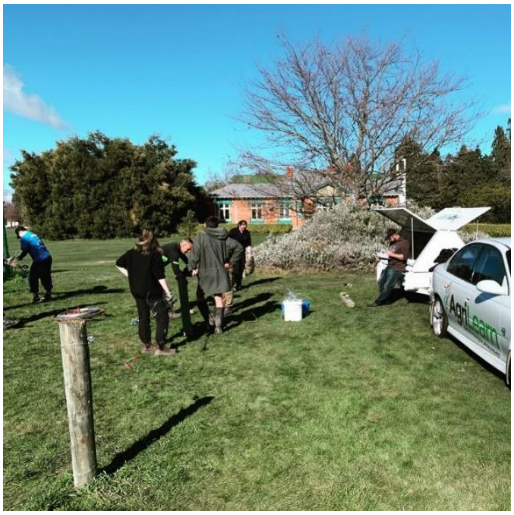

Figure 8. AgriLearn teaching and assessing students with agricultural skills at Mt Hutt, New Zealand (Pelltzer, 2019).

Another transferable concept is AgriLearn, an independent business in Timaru, New Zealand, that works with secondary schools to deliver skills-based training to complement the practical portion of their agricultural education. For example, Fiona Jessep of Mount Hutt College, uses AgriLearn to teach and assess her students with their fencing skills for their technical agricultural course (Figure 8). Furthermore, Australia's Tim Gentle and his team at Think Digital, are using Virtual and Augmented Reality (VR and AR) to teach, connect and excite students about agriculture without attending farm-based school excursions (2018) which can teach students to safely operate a tractor from the classroom.

Interactions with a professional in agriculture

Teachers may choose to include a professional within agriculture to complement the content being taught. Tom Martin, UK, created a concept to connect the school classroom with the farm by harnessing the power of digital communications to inspire, engage and educate young people with 'FaceTime a Farmer'. The LEAF Global Impact Report 2019 showed how 300 UK farmers have been paired with 9,000 children for an average of 18-minute 'real-time' sessions every fortnight (LEAF, 2019). LEAF organise the logistics of initially connecting the farmers with the schoolteachers and from there, the teacher and farmer will create connections between the current content in the curriculum and what is happening on the farm. The impact of these frequent and high-quality interactions is relatively easy to obtain where time, content and internet reception are the only considerations. This idea is a feasible option in a primary school setting but will be harder to achieve in the 12-16-year-old classes where the curriculum is

more focused on content rather than social development. Alternatively, the older students may benefit from an agricultural professional talking to them in whole school assemblies about current issues facing international food and fibre production. For example, these students are retrieving information from social media sources about pertinent issues such as decreasing red meat consumption to mitigate climate change, where the alternative perspective needs to be delivered too. NFU members in the UK are currently being trained for these Q&A type sessions with secondary school students under a new program called 'Speakers for Schools'.

5.4 Business as a result of a Nuffield Scholarship

On returning to Tasmania with a wealth of knowledge acquired through extensive travelling, the opportunity to develop and organise Educational Agri Tours of this unique island state was created to benefit both the educational and agricultural sectors. With a change in soil, climate and terrain in relatively short distances, a wide variety of high-quality produce is available. This business brings school students to Tasmania for an immersive experience where they will interact with professionals working in all aspects of the agricultural industry. It demonstrates the full breadth of career opportunities available while strengthening networks within agriculture. Connections will be formed and maintained through a social media presence.

Conclusion

Youth is a crucial piece of the puzzle for determining solutions to the current challenges in international agriculture. However, they are not entering the workforce at the rates required to solve these issues. It is a complex matter as there are multiple independent factors at play, such as the perception of agriculture, career opportunities available, and the timing of interactions with agricultural programs/activities. These have a negative effect on attracting youth into agriculture.

This project concentrates on providing 12-16-year-old students with multiple opportunities to encourage them to consider pursuing agriculture in their post-16 studies. In order to meet this goal, a well-researched framework for this purpose in science has been modified and applied to agriculture. The framework can be used to identify deficiencies in the interface between a 12-16-year-old person and agriculture. Each of the eight key dimensions of the framework needs to be 'hit' with a quality program/activity, at a high rate of incidence and in a timely manner in order to fill their 'Ag Bag'. Furthermore, the framework can be used as a tool to assess the success of current programs/activities. For example, the Science Museum Group, UK, uses the eight key dimensions of the Science Capital framework to identify practical considerations which they can apply to their practice and be used as guiding principles to inform the design and outcomes of their varied experiences and resources (Hawkins, 2016).

Therefore, the Agricultural Capital framework can be used in a similar way to ensure that all efforts into attracting youth into a career in agriculture is due to strategic interactions, rather than leaving it up to chance. The state of Tasmania can act as the pilot study for this framework due to its dependency on agriculture and ease in adapting or introducing programs into the current space.

Recommendations

- Industry wide acceptance and use of Dr Hlami Ngwenya's acronym PERFECT opportunities in agriculture (refer to p.14).
- All within PERFECT agriculture to help address any misperceptions about a career in agriculture (refer to p.14).
- Apply the Agricultural Capital framework to the current system in Tasmania to attract youth into pursuing agriculture in post-16 studies (refer to p. 19).
- Find successful programs/activities from other countries to integrate into the Tasmanian Agricultural Capital framework for further use (refer to p. 23).
- Potential to apply the Agricultural Capital framework to other states or countries.

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Plain English Compendium Summary

Project Title:	**Attracting youth into agriculture** **Developing a strategic framework to encourage young people to pursue a career in agriculture. A model for Tasmania**

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Objectives

- Highlighting the imperative need to attract youth into a career in agriculture internationally and within Australia.
- Broadening the perceived definition of agriculture by applying Dr Hlami Ngwenya's PERFECT opportunities acronym.
- Recognise the strength of Science Capital as a strategic framework.
- Adapting and applying the Science Capital framework to agriculture.
- Analysing international programs that could be implemented into the Tasmanian system to fill the 'Ag Bag'.

Background

In Australia, the continuum of youth entering a career in agriculture is lower than required to meet the current challenges facing food and fibre production systems. The full spectrum of career prospects available in agriculture are not well understood and therefore not pursued. An interest in agriculture can be sparked through interactions both in school and through outside school programs/activities.

Research

School, universities and agricultural industry advocates were interviewed across six countries to determine suitable programs/activities to be integrated into the Tasmanian system using a suitable framework to encourage youth to pursue post-16 studies in agriculture.

Outcomes

The study revealed the need for a strategic framework to ensure a high number of quality interactions are acquired by individual youth both in school and through outside school activities/programs in order to fill their 'Ag Bag'. Professor Louise Archer and her team in the UK researched and analysed reasons why youth pursue post-16 studies in science. This framework was adapted for agriculture and applied to the current Tasmanian system with international suggestions for strengthening existing activities/programs. The aim is to increase to number of youth entering the agricultural industry.

Implications

Youth will interact with agriculture at pivotal times through accessing quality programs/activities that will lead to an increase in youth pursuing post-16 studies in agriculture. This framework will be a common document used by schools, industry bodies and other stakeholders in Tasmania where the aim will be to ensure the youth's 'Ag Bag' will be filled and remain full so they pursue post-16 studies in agriculture. The framework can be adopted by other regions, states or countries.