Review of Perceptions of Agriculture in Primary School Students and opportunities for developments

A report for

NUFFIELD IRELAND

Farming Scholarships

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2018 Nuffield Scholar

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1 Executive Summary

More people live in urban centres rather than rural areas, and this will increase to 2/3rds of the world's population by 2050. This contributes to an ever-growing disconnect between primary producers of agricultural products and its consumers.

The challenge for agriculture is to engage the population to facilitate a better understanding of what it does, and help it to feed a growing population, while protecting biodiversity and reducing agricultures effects on climate change.

To change perceptions, positive experiences must be introduced from a young age and repeated regularly. The school system offers the best opportunity to reach a wide audience of young people. There is the opportunity to incorporate agricultural examples into the teaching of other subjects.

Using creativity and new technologies can ensure engagement and a positive perception of agriculture in children's minds, while also facilitating the development of critical thinking from a young age.

The key **objectives of this study** were to examine:

1. How are perceptions formed and how can they be positively influenced?
2. Where are the links between agriculture and the current primary curriculum?
3. New technologies that can be used to enable children to learn about agriculture in an interesting and meaningful manner.
4. Who is best positioned to lead this in Ireland?

Summary of Findings

1. There is a growing divide between people involved in agriculture and those who are not.

2. There are negative perceptions of agriculture and a poor understanding of the wide variety of careers associated with it. Agriculture must change this.

3. There are tangible links between Science, Technology, Engineering and Maths (STEM) and agriculture. This convergence must be exploited as a means of enabling children to learn about modern agriculture and its interactions with the environment and nutrition.

4. Children can be introduced to the complexities of climate change, food waste, nutrition, soil health, water quality and the other myriad of issues farmers face every day. The best and brightest must be engaged to ensure these challenges are met.

5. In a number of countries, a large amount of resources are being used to educate children about farming, a lot of these efforts are fragmented by sector promoting their specific product, rather than the education about what agriculture actually is. Better results will be realised if all agricultural industries work together and produce one message.

6. Attendance at the Committee on World Food Security (CFS) in Rome made clear to the author that how we farm into the future will be guided by the UN Sustainable Development Goals (SDG's).

7. The voices of primary producers must be heard at events such as the CFS so that decisions that directly affect farmers are not just left to big corporations, government representatives and Non-Governmental Organisations (NGO's).

Main Recommendations:

1. Leverage the opportunity to use agriculture in teaching STEM in schools. Agricultural examples should be made accessible for teachers and fully aligned with the curriculum. Consider doing this through one point for all agriculture in Ireland. UN SDG 4 "Quality Education".

2. Continuous Professional Development (CPD) courses on the use of this resource should be provided. Avail of opportunities such as teacher union conferences and principal conferences to present on this CPD and the benefits to the teacher and the students of using it.

3. Rollout Facetime/Skype a Farmer countrywide. A pilot of this initiative was run in Ireland in 2018 with excellent feedback from students, teachers and farmers. Sponsorship could fund its rollout.

4. It should be highlighted how exciting a career in agriculture can be. Farm visits are the gold standard in introducing children to agriculture, if a farm visit is happening ensure maximum benefit is derived from this with lead up and follow up initiatives such as FarmLink in the UK provide.

5. Immersive technologies such as VR, AR and 360 videoing can be utilised, allowing children to experience what farming is like through these mediums it will spark children's interest in agriculture and the environment it operates in. This recommendation ties in with SDG 8 "Decent work and economic growth".

6. This should be done under one coherent umbrella, with one central point where resources can be easily accessible by teachers/children, rather than multitude sites to navigate.

7. Agricultural representation must insist that it is involved in all national initiatives around health, nutrition and the environment and be willing to debate in an open and meaningful manner. Agriculture should be part of the solution and work with, and not against, public sentiment.

8. Farmers have a role in portraying a positive image of primary agriculture, put on a happy face and tell the positives.

Agriculture can be the tree upon which children can learn and become critical thinkers, facilitated by immersive technologies.

Contents

2 Abbreviations

CSO	Central Statistics Office
CAP	Common Agricultural Policy
CFS	Committee on World Food Security
CPD	Continuous Professional Development
FAO	Food and Agriculture Organisation of the United Nations
GMO	Genetically Modified Organism
LEAF	Linking Environment and Farming
NDC	National Dairy Council
NFU	National Farmers Union
NGO's	Non-Governmental Organisations
PIEFA	Primary Industries Education Foundation Australia
SESE	Social, Environmental and Scientific Education
STEM	Science, Technology, Engineering and Maths
UN	United Nations
UN SDG's	United Nations Sustainable Development Goals

3 Personal Introduction

I grew up on a suckler farm in North Kerry. As a young boy I spent as much time as possible with my Father and Grandfather on the farm. I loved the outdoors, being around the animals, and of course using the machinery.

I decided at the age of 16 that this was the life for me. I left school and went to work on the farm full time.

As time went on it became clear that that this was not a viable option in the long term, as the farm had tight margins and not enough income to support two households.

With this in mind, and yearning for a challenge, I returned to education, completing my Leaving Certificate and moving on to university in Cork, graduating in 2004 with a 1st class Honours Degree in Business Studies.

This led me to Dublin to work with Bank of Ireland, qualifying as a Chartered Accountant and working in Finance, Regulatory and Tax roles.

In 2007 I met Caroline and we married in 2010. We had discussed having a family and agreed that we wanted to get out of the city and raise children in the countryside. We moved back to Kerry after our honeymoon and I took over the family farm, (which was then a beef farm) while also working in Fexco as the company Tax Manager. In 2011, I qualified as a Chartered Tax Consultant and we welcomed our son Tommy into the world.

Even though I found my role in Fexco very interesting and it had a lot of career prospects, living in Kerry and being back on the farm reignited my love of agriculture.

I took the decision to leave my job in Fexco and return to farming full time. However, due to its size, the only realistic way I could return to farming and support our growing family was to leave beef farming behind and convert to dairy.

In late March 2013 we welcomed our daughter Emily, and the first calves were born on the farm and so the dairy odyssey began. Each year the number of cows milked has increased and the farm is now fully stocked milking just over 100 Holstein cows.

Therefore, it was time to find the next challenge and that search is what has led me to this Nuffield journey.

4 Rationale for my Topic

As I became more involved in farming over the past number of years, the thing that has really caught my attention is the amount of challenging narratives that farmers face about what they do, especially on social media.

Farmers produce food to feed other people, while trying to make a living to support their families. When I look at other farmers, the vast majority are trying to do this in a manner that looks after the environment.

Because Farmers know it is the natural environment that gives them the raw materials to produce, so if they are willing to protect the environment, it will provide for them.

I have undertaken this Nuffield journey with the objective of seeing how this growing negativity can be changed. There is an ever-growing gap between those who grow food and most consumers, so direct physical access to farmers is not a realistic option.

Being awarded a Nuffield scholarship has enabled me to explore how perceptions can be improved, and to significantly broaden my knowledge of how agriculture is incorporated into the education sector both nationally and internationally.

The people I have met, both abroad and in Ireland, have helped me develop an understanding of the breadth of challenges and possibilities of integrating agriculture into the school curriculum.

My Nuffield study tour has taken me to the Netherlands for the Nuffield Contemporary Scholars Conference, to Singapore, the Philippines, Japan, Israel, back to the Netherlands and the United States on my Global Focus Program, and my personal travel has seen me visit England, Belgium, United States, Canada, Kenya, Italy, Australia and of course all over Ireland.

I have experienced so much that I could write multiple reports on the area of young people and agriculture. All the countries I visited and the people I met have influenced my thoughts on this subject, some in a profound manner and some more subtly.

This report is focused on how to positively influence perceptions of agriculture in primary school students in Ireland.

5 Objectives

There were 4 main objectives in preparing this report.

1. How are perceptions formed and how can they be positively influenced.

2. Where are the links between agriculture and current primary curriculum.

3. New technologies that can be used to enable children to learn about agriculture in an interesting and meaningful manner.

4. Who is best positioned to lead this in Ireland?

6 Introduction

"Never … was so much owed by so many to so few"[1] This famous line was spoken by Winston Churchill in reference to the RAF during the battle of Britain in 1940. Some may believe this is an apt statement for farmers in today's world, where for example in the US, according to the Farm Bureau, one farmer currently feeds 166 people.[2]

The UN forecasts that demand for food will increase by between 60% and 98% by 2050 as compared to today. In the next 30 to 40 years humans we will have to produce as much food as has been produced in the last 10,000 years. To do this all means available, be it through science, technology, innovation, along with the very best of organic, GMO, gene editing, reduced food waste, plant-based proteins and livestock genetics will have to be utilised.

While the demand for food is growing the numbers involved in agriculture are falling. In the 2016 census agriculture accounted for 4.6% of employment in Ireland, in 1966 it accounted for 31.3% of total employment[3]. This aligned with the fact that less than 5% of farm holders were under the age of 35 per the CSO (Central Statistics office) in 2016 point to a continuing decline in the numbers involved in agriculture into the future.

The current trend worldwide is of population migration from rural to urban areas. In Figure 1 below it can be seen that in 2008 for the first time in human history more people lived in urban than rural areas. The UN Population Fund states that this shift will continue into the future "*While the world's urban population grew very rapidly (from 220 million to 2.8 billion) over the 20th century, the next few decades will see an unprecedented scale of urban growth in the developing world. This will be particularly notable in Africa and Asia where the urban population will double between 2000 and 2030".*[4]

[1] https://www.parliament.uk/about/living-heritage/transformingsociety/private-lives/yourcountry/collections/churchillexhibition/churchill-the-orator/human-conflict/
[2] https://www.fb.org/newsroom/fast-facts
[3] CSO, 2016, Summary Results 2016, P.32 https://www.cso.ie/en/media/csoie/newsevents/documents/census2016summaryresultspart2/Census_2016_Summary_Results_%E2%80%93_Part_2.pdf
[4] United Nations Population Fund, State of World Population 2007 https://www.unfpa.org/publications/state-world-population-2007

In 2018 4.2bn people or 55% of the world population lived in urban areas and this is forecast to grow to 68% of the population by 2050 per the UN 2018 revision of world urbanization prospects report[5].

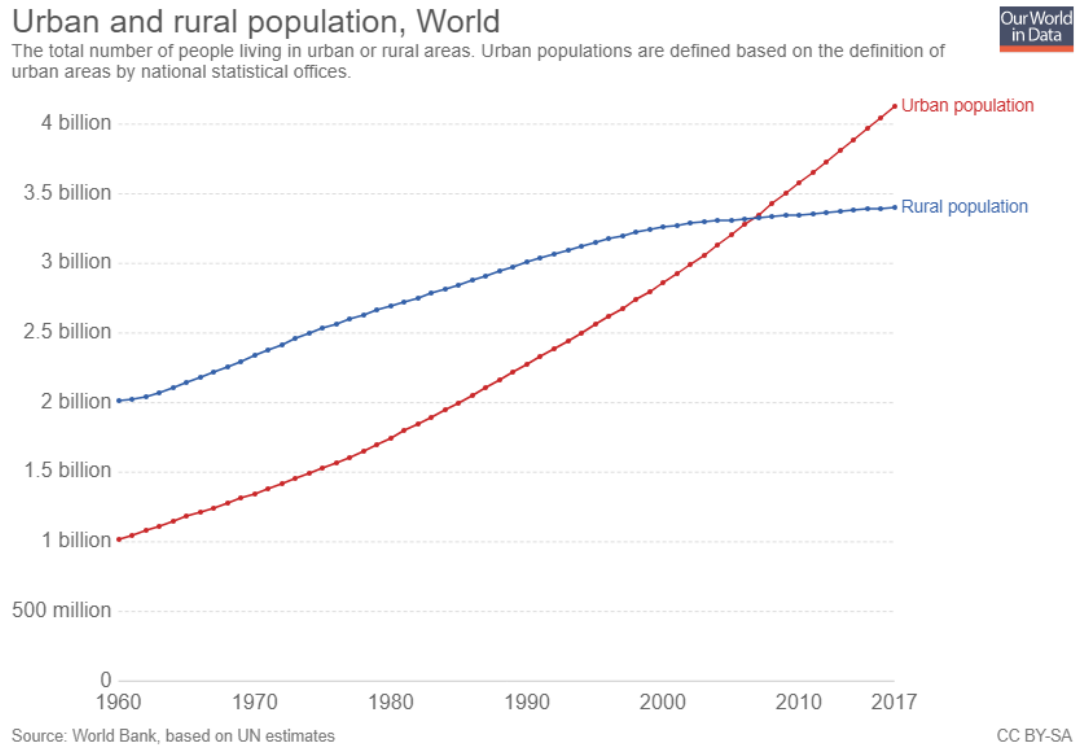

Figure 1: *Urban and Rural population, Our World in Data (2018)*

In Ireland this movement can also be seen, as per World Bank figures for 2016 rural dwellers made up 36.5% of Irelands population, this has shown a 3% fall from 2006[6].
If other EU countries are looked at the rural population in Ireland is still high, with an EU average of 27% and only 12% in Britain living in rural areas[7]. From this we can infer that the movement in Ireland's population to urban areas will continue.

What is relevant to this report is the fact that this movement from rural to urban areas can lead to a disconnect between agriculture and the consumers of its products. Of course, just because one lives in an urban area does not mean that one understands less about agriculture than a rural non farming dweller, but in general urban dwellers will have less chance to see and interact with agricultural production on a regular basis.

This growing disconnect will need be overcome if the population is to gain a better understanding of where their food, fibre and increasingly energy comes from. Professor of Public Health at UCD (University College Dublin) Patrick Wall recently told a Smart Farming

[5] United Nations, 2018 Revision of World Urbanization Prospects
https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html
[6] World Bank/Trending Economics, Ireland rural population as percentage of the total population 2016
https://tradingeconomics.com/ireland/rural-population-percent-of-total-population-wb-data.html
[7] McMahon A., (2016), "Irelands population one of the most rural in European Union," *Irish Times*
https://www.irishtimes.com/news/health/ireland-s-population-one-of-most-rural-in-european-union-1.2667855

Seminar that *"We have to be aware that there's a big disconnect between consumers and us."* The "us" referred to in this instance being farmers.

A 2011 survey in the United States by US Farmers & Ranchers[8] where under 20% of the population live in rural areas worryingly showed that 72% of consumers knew nothing or very little about farming or ranching. The conclusion reached by the survey was that: "…*the populace thinks little about the source of their food: ranching and farming. Perceptions could very well have strong impact on the future direction of agriculture".*

The results of a recent survey of Australian school children between the ages of 10 and 14 by PIEFA (Primary Industries Educational Foundation Australia) is shown in Figure 2 below;

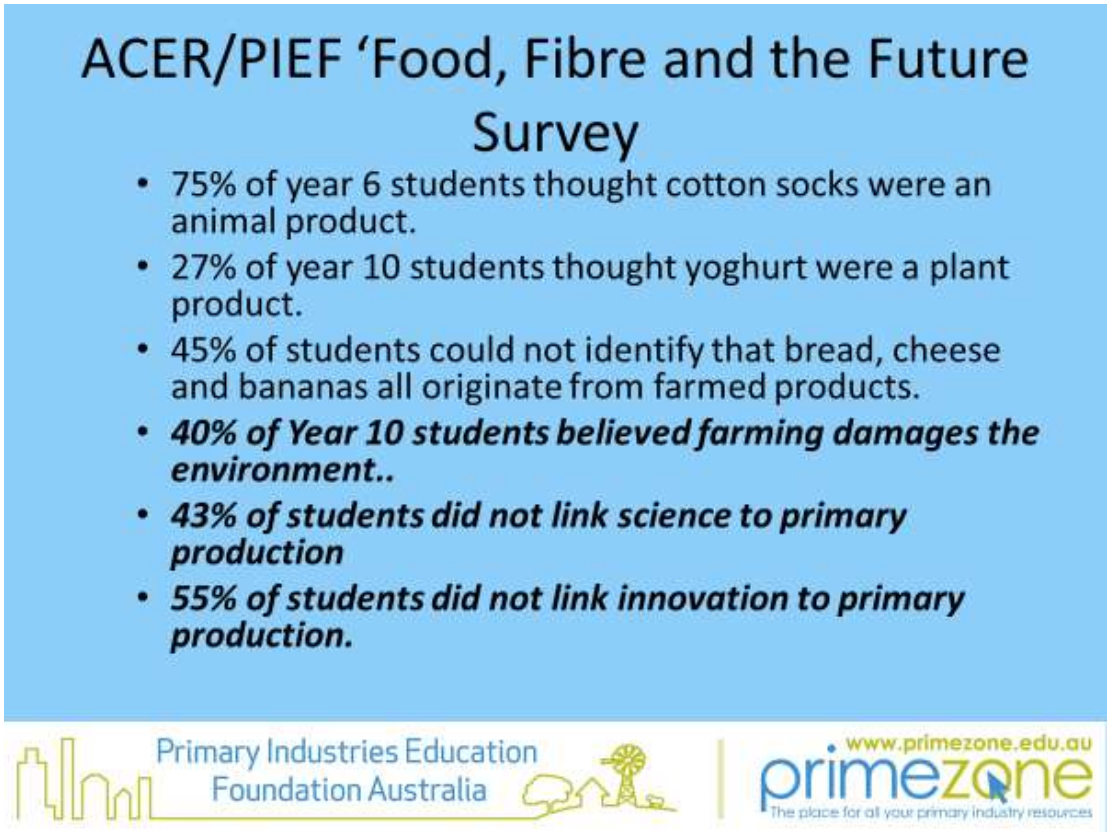

Figure 2: *Food, Fibre and the Future Survey, ACER/PIEFA (2019)*

Figure 2: "Food, Fibre and the Future Survey" ACER/PIEFA (2019)

From this survey not only can it be seen that a large proportion of young people do not know where their food comes from but also see agriculture as harming the environment and not technologically advanced.

If agriculture wants to attract future generations then it has to compete with all the noise, false information, those with an agenda and "experts" on social media in order to show a true picture of the industry.

[8] US Farmers and Ranchers Alliance, 2011 Consumer Survey https://www.prnewswire.com/news-releases/nationwide-surveys-reveal-disconnect-between-americans-and-their-food-130336143.html

As studies such as "The Enterprising Science Project"[9] from Kings College London show, people's perceptions and beliefs are engrained by the early teenage years; the main focus of this report then is about equipping people with the ability to cut through the noise around primary food production and disseminate the facts from a young age.

[9] Archer, L., Dawson, E., DeWitt, J., Godec, S., King, H., Mau, A., Nomikou, E. & Seakins, A. (2016). *Science Capital Made Clear.* London: King's College London. https://www.kcl.ac.uk/ecs/research/research-centres/cppr/research/currentpro/enterprising-science

7 Perceptions

"If the doors of perception were cleansed everything would appear to man as it is, Infinite. For man has closed himself up, till he sees all things thro' narrow chinks of his cavern"[10]*. – William Blake*

7.1 What are perceptions?

In the Cambridge English dictionary perception is defined as "a belief or opinion, often held by many people and based on how things seem". Belief is defined as "the feeling of being certain that something exists or is true" and an opinion is "a thought or belief about something or someone". So, perception is really a thought or feeling of being certain something exists or is true, that is often held by many people, based on how things seem.

Dealing with intangibles such as thoughts and feelings based on how thing appear mean a perception is difficult to change. People use mental shortcuts in making innumerable decisions every day. This happens because there is simply not enough time to think in detail on every decision we make.

Some of these mental shortcuts include "confirmation bias" we look for information that is consistent with our beliefs and we avoid or discount information that is not consistent with our beliefs. This error leads the individual to stop gathering information when the evidence gathered so far confirms the views or prejudices one would like to be true.

Availability Heuristics is another mental shortcut used. This is what information comes to mind when you hear a word. People make decisions based on what they remember. They assume their memories are a representative sample of reality, and discount events that are outside of their immediate recollection. If you can quickly think of multiple examples of something you will believe that is quite common. In Thinking Fast and Slow, Daniel Kahneman writes: *"People tend to assess the relative importance of issues by the ease with which they are retrieved from memory—and this is largely determined by the extent of coverage in the media"*[11].

7.2 When do perceptions form

In "How children come to understand false beliefs: A shared intentionality account" Michael Tomasello[12] outlines that children come to understand beliefs, including false beliefs, at about 4–5 years of age. Michael also investigates why humans are the only species that operate with the concept of "false beliefs". He proposes that the main reason for the development of false beliefs is due to the fact that humans are ultra-cooperative, which creates the possibility of taking a perspective on a situation which may not be truthful due to the fact that it's the perspective social partners have taken.

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[10] Blake, W. (1790). *The Marriage of Heaven and Hell*, United Kingdom

[11] Kahneman, D. (2012). *Thinking Fast and Slow*, London: Penguin Books Ltd.

[12] Tomasello, M. (2018). How children come to understand false beliefs: A shared intentionality account, *Proceedings of the National Academy of Sciences of the United States of America* https://www.pnas.org/content/115/34/8491#sec-5

7.3 How to influence perceptions

It is generally agreed that there are 3 stages in the perception process which happen sequentially: selection of stimuli in the environment, organization of that information, and interpretation of those stimuli. To influence perceptions, it is the third "interpretation of those stimuli" that must be looked at.

Lumen Learning, "*boundless psychology, introduction to perceptions"*[13] states that *"Cultural values, needs, beliefs, experiences, expectations, involvement, self-concept, and other personal influences all have tremendous bearing on how stimuli are interpret in our environment."*

Therefore, to change perceptions or to positively influence them, taking into consideration when perceptions form, positive experiences must be introduced from a young age.

To change a belief, which is what a perception basically is, does not happen immediately. It requires repetition to positively influence or change a belief. One positive experience will not change a perception. It will take many positive experiences to change a negative or false belief. As Dr. Robert B. Cialdini states *"Often we don't realize that our attitude toward something has been influenced by the number of times we have been exposed to it in the past".*[14]

7.4 Where to influence perceptions

If the best way to positively influence perceptions is through positive experiences in children, then the school system should be considered, as it presents the opportunity to reach many at once. In most developed nations, Ireland included, the chances of getting a mandatory standalone agricultural subject into primary school is very remote. Therefore, other means of enabling children to learn about agriculture and the environment must be created.

Some of the most important subjects' children learn in school are the STEM subjects. When considering STEM subjects, immediately anybody involved in agriculture will see a close synergy between these and agriculture. Just about everything that happens in agriculture can be covered in STEM.

Neil A Knoblock states that *"Elementary (Primary) students need authentic learning experiences with community-based topics to motivate them, help develop inquiry skills, apply academic content, and connect their learning beyond the context of the classroom. In particular, the study of food, agriculture, and natural resources in elementary (primary) classrooms can bring learning to life".*[15] The philosophical base underpinning the need for agricultural awareness in elementary (primary) classrooms is based on Dewey's (1938) philosophy of education. Dewey stated that *"anything which can be called a study, whether arithmetic, history, geography, or one of the natural sciences, must be derived from materials which at the outset fall within the scope of ordinary life experience"*[16] this is discussed by

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[13] McIntosh M. (2018). *boundless psychology, introduction to perceptions,* Portland, Lumen Learning. https://courses.lumenlearning.com/boundless-psychology/chapter/introduction-to-perception

[14] Cialdini, R. B. Ph.D. (1984). *Influence "The Psychology of Persuasion",* New York, Harper Collins.

[15] Knoblock N. (2008). Factors of teacher beliefs related to integrating agriculture into elementary school classrooms, *ResearchGate.* https://www.researchgate.net/publication/226923894_Factors_of_teacher_beliefs_related_to_integrating_agriculture_into_elementary_school_classrooms

[16] Knoblock N,. Martin R. (2000). Agricultural Awareness Activities and their Integration into the Curriculum as perceived by Elementary Teachers. *Journal of Agricultural Education, Vol. 41 Issue 4 p.17*

Knoblock & Martin in their paper Agricultural Awareness Activities and their Integration into the Curriculum as perceived by Elementary Teachers.

https://www.researchgate.net/publication/234682383_Agricultural_Awareness_Activities_And_Their_Integration_Into_The_Curriculum_As_Perceived_By_Elementary_Teachers

8 STEM and Agriculture

8.1 Links in education

The science curriculum in Ireland for primary schools is part of SESE which is Social, Environmental and Science Education, it consists of 3 subjects, Geography, History and Science. Within these subjects' areas covered include;

- Living Things
- Energy and Forces
- Materials
- Natural Environments
- Environmental Awareness and Care

For technology in Irish primary schools the main teaching is around Information and Communications Technology, Engineering is covered above in the science module and of course Maths is its own standalone subject.

The STEM Education Review Group published the "STEM Education in the Irish School System[17]" report in November 2016 of which some of the main proposed actions are;

- *Develop extensive curricular materials for teachers that **operationalise learning outcomes** in STEM subjects at primary and post-primary levels.*
- *Promote real engagement with fundamental science concepts and principles through application to **real-life** situations and practical work*
- *STEM curriculum and assessment should be linked to wider ethical, legal, and societal issues, such as STEM's role in addressing global challenges (**food, water**, and energy security; **biodiversity loss**; etc.).*
- *An **inquiry-based approach** offers one potential way to increase engagement in STEM*"
- *Blended learning, **or a mix of online and face-to-face**, is what many teachers seem to find most comfortable, but there are issues around the lack of time, resources and confidence to implement it. Teachers need more support in this area. Increasing engagement STEM subjects need to be visible and accessible for students, and students who have the capacity to get ahead in these subjects need to be challenged and kept engaged."*

Agriculture can help implement all these actions, be it from using agriculture in teaching in an inquiry-based manner, to showing real world examples of STEM and the using of both online and face to face teaching method.

Internationally many studies have been compiled highlighting the benefits of students being taught STEM using agricultural examples:

Per Ridgeway 2016 "*educators in Maryland developed hands-on activities around animals, plant sciences and nutrition, while linking station-specific activities back to STEM standards.*

[17] STEM Education Review Group (2016). *STEM Education in the Irish School System.* Dublin, Ireland. https://www.education.ie/en/Publications/Education-Reports/STEM-Education-in-the-Irish-School-System.pdf

Pretests and posttests show a statistically significant change in STEM-related knowledge by students, while feedback from teachers demonstrates the educational value of the program"[18]

In a recent article in educationworld.com, Navindra Persaud outlines how agriculture and STEM go hand in hand "*whether it's the science behind farming itself, engineering and programming new technology to increase the efficiency of farming, or developing the mathematical concepts necessary to help engineer the new technology, it's clear that agriculture has a heavy involvement with STEM"*[19]

Penn State's Tracy Hoover, associate dean for Undergraduate Education, and Jean Lonie director of Student Recruitment and Activities state: *"In some ways, agriculture is an umbrella that all the STEM fields fall under. The study of agriculture, food, and natural resources involves biology and genetics, engineering, physics, chemistry, math, geology/hydrology, and other scientific fields."*[20]

Dr. Kristopher Elliott, Director of STEM for Metropolitan Nashville Public Schools states in a 2016 agfoundation article that *"Teaching science and math with a silo approach does not reflect the real world, and often falls short of giving students the ability to problem solve as critical thinkers"* he goes on to say that *"it can seem like a no brainer to move toward more purposeful STEM instruction, but this is easier said than done"* he further states that *"One thing is for certain, in order to survive, your students need food, fiber, and shelter - all of which are provided by agriculture. Surprisingly though, most students don't seem to make that connection, and furthermore, many teachers don't recognize how agriculture can be a useful context to teach STEM."*[21]

However, this is all not a simple answer to the teaching of STEM with Dr Elliott posing the question; *"But without an agricultural background, how do teachers use this context as a teaching tool? How does an urban educator connect students with agriculture when many of them are generations removed from the farm and live far from production areas?"* The issue of giving teachers the resources to incorporate agriculture in the teaching of STEM must also be considered.

8.1.1 Critical Thinking

Critical thinking is reading and thinking with a questioning and open mind; it is not accepting material at face value but looking behind the material. It allows you to openly ask about the subject area. It will open discussion on the subject matter and is a major step in the journey to becoming an independent thinker.

Critical thinking was first recorded in the writings by Plato on the teachings of Socrates. Socrates established the fact that one cannot depend upon those in "authority" to have sound

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[18] Ridgway B., Brown V., (2018). AgVenture: Establishing the Link between STEM and Agriculture, *Journal of Youth Development*, Vol. 13 No 4
https://jyd.pitt.edu/ojs/jyd/article/view/18-13-04-PA-06

[19] Persaud N. (2018). Boosting K-12 Agriculture Education & Its Relation to STEM, *education world*
https://www.educationworld.com/a_news/boosting-k-12-agriculture-education-its-relation-stem-1654916265

[20] Manning L. (2016). Agriculture: Putting the Steam in STEM Degrees at US Universities, *AgFunder News*, December 2016 https://agfundernews.com/agriculture-putting-steam-stem-studies-university.html

[21] Elliott, K. Dr., (2016). Is Ag the Answer to STEM?, *American Farm bureau Foundation for Agriculture*, August 2016. https://www.agfoundation.org/news/is-ag-the-answer-to-stem

knowledge and insight. He demonstrated that persons may have power and high position and yet be deeply confused and irrational. He established the importance of asking deep questions that probe profoundly into thinking before we accept ideas as worthy of belief.

He established the importance of seeking evidence, closely examining reasoning and assumptions, analysing basic concepts, and tracing out implications not only of what is said but of what is done as well.

Figure 3: *Why Kids Need To Develop Critical Thinking Skills, Carol Miller, medium.com, (2017).*

To truly grow as a society, we need to develop students as critical thinkers, how can issues such as climate change be solved without new thinking and questioning of all we currently do. STEM can be brought to life in the classroom by the use of animals, plants and the natural environment that exist in agriculture. By teaching STEM through agriculture there is the possibility of introducing critical thinking to young minds.

8.2 What is being done in this area?

A number of organisations around the world have recognised the link between agriculture and STEM and have set about putting programs in place to get teachers and school children interested in this link. In the design of such initiatives a common thread is to make it interesting for the children and easy for the teachers to implement. The use of competitions to gain initial traction is also widespread. As part of the authors personal travels some of these organisations were visited with highlights outlined below:

8.2.1 UK

The NFU (National Farmers Union) launched an initiative in Autumn 2018 called **Farmvention,** this is a competition for primary schools linking STEM and agriculture. The

author attended the launch at the Thinktank Science museum in Birmingham. There were 3 strands to the competition for 2018/2019 year;

1. creating "a truly British snack" using any combination from the ingredients milk, beef, beetroot or oats.
2. "happy, healthy hens" where the children must design an environment for a flock of 100 laying hens, and
3. design the "tractor of the future".

The children were judged on four criteria in each category:

I. How well they've solved the problem,
II. creativity and innovation,
III. the environmental impact of the design and
IV. the benefits the design will have for farmers and food producers.

The author Karol Kissane with NFU President Minnette Batters at the launch of Farmvention in Birmingham, September 2018

At the launch Minette Batters - NFU president, stated how "*One in eight in the UK work in the food industry"*, and how "*STEM is a crucial part of farming"*. She outlined to the children present that "*it's not just about what farmers do; it is about all your food and where it comes from".*

The winners of the competition were announced in January 2019 and each got to attend the House of Commons during British Science week. Subsequent to the end of the competition Josh Payne, Educational Manager, NFU outlined to the author how 2,000 children from 115

schools submitted a total of 1,025 entries, He is hoping to see the number of entries for the 2019/2020 competition double.

A survey of 50 teachers whose classes took part in the project showed:

- 78% agreed or strongly agreed that their children's understanding of issues affecting farmers and growers has improved.
- 90% agreed or strongly agreed that the project provided an engaging context for STEM learning.
- 84% agreed or strongly agreed that the children's STEM knowledge and skills have improved.
- 100% are planning or considering planning to enter the competition in 2019.

Josh said, "*in terms of benefits it's been pretty great for both STEM learning as well as learning about farming, we've actually had feedback that they want more farming knowledge, it is a massive bonus so we're factoring in that for the next set of resources*".

Another initiative the NFU provide is Farming **STEMterprise** projects for children aged 7 to 11. These take children through each stage of setting up a farm shop business such as:

- considering seasonality when deciding which crop to grow,
- growing their own ingredients,
- considering nutrition when designing their recipes,
- using market research to test their ideas out with potential consumers,
- working within a budget when buying additional ingredients,
- calculating expected profit,
- designing responsible packaging, and much more.

Practical Science and Design & Technology lessons, closely tailored to each year group's programme of study, are incorporated throughout the projects and opportunities for applying maths skills to engaging, real life problems are embedded at each stage. The projects have been designed to be easy to use and enable teachers to deliver key content from the national curriculum whilst embedding important messages about financial literacy and food provenance.

The NFU are encountering huge demand from teachers to be trained on what they offer. They have attended such conferences as the Science Foundation Conference and other primary science teacher conferences presenting their resources for teaching STEM, over 225 teachers have been trained between January and April 2019.

8.2.2 US

The American Farm Bureau have an initiative called "Purple Plow". This is a website that links STEM and agriculture. The website has challenges, puzzles and resources to help teachers and students to understand the science and technology involved in agriculture.

Figure 4: *Screen shot of Purple Plough by American Farm Bureau Foundation for Agriculture (purpleplow.org)*

Julia Recko, Director, Education Outreach, Farm Bureau, outlined to the author how the Farm Bureau also consider what does it mean to be agricultural literate, she said that they "*use a lot of social media content marketing and get others to share it, write blogs for institutions to share about agriculture being STEM, for example universities and colleges, get the message linking the two out there, get people to talk of the link between the two"*. They also attend teacher conferences to highlight to new teachers the link and resources available.

8.2.3 Kenya

Young Scientists Kenya (YSK) is a unique platform in East Africa aimed at encouraging school students to demonstrate their innovation and showcase their scientific talents and STEM pathways. Modelled on the internationally acclaimed BT Young Scientists and Technology Exhibition (BTYSTE) in Ireland and local science fairs such as Kenya Science and Engineering Fair, YSK hopes to popularize science and technology amongst young people and encourage them to develop projects that seek practical solutions to the everyday problems Kenyans face within society, environment and their economy.

When meeting Eric Nyamwaro, YSK National Programmes & Partnerships Director, he outlined how he believes STEM should be thought in a practical not a theoretical manner. The idea is to encourage students to do basic research on practical problems they see in Kenya. The main premise of the competition is to build a critical mass of young scientists in Kenya. There is very low take up of science in Kenya, especially in agriculture and Eric sees the linking of STEM and agriculture as one area where real tangible benefits can be seen relatively quickly.

8.2.4 Australia

PIEFA (Primary Industries Education Foundation Australia) mission is to engage and inform students, teachers and the broader community about the role and importance of primary industries in the Australian economy, environment and wider community. It provides leadership and coordination of initiatives to encourage primary industries education in schools through a partnership between industry, government and educators.

Industry bodies such as Meat & Livestock Australia, Cotton Australia, Forest & Wood Products Australia, Royal Agricultural Society of New South Wales, Cotton Australia and many others

are members of PIEFA and its board is representative of its members. PIEFA is a non-profit organisation funded through members fees, amounts received from industry or government for specific projects and grants. Recently PIEFA was awarded a Google ad words grant of AUD$100,000 to promote its Primezone resource.

Figure 5: *Screenshot of Primezone, A resource developed by PIEFA linking agriculture and education (primezone.edu.au)*

Primezone is a website that provides teachers with a single-point access to a range of agricultural education resources. In 2018 there were 21,089 unique users on the site with 297,361 resource downloads. It provides resources which are all linked directly to the curriculum using worksheets, videos and the website.

The author attended the 2018 PIEFA AGM at which PIEFA Chairman, Dr. Cameron Archer stated that "*No matter which way you look at primary industries education, it will always have a STEM theme.* CEO Ben Stockwin outlined that PIEFA "*are sincere about not resting until every student in Australia is undertaking a significant learning experience related to food and fibre production in every year of their schooling."*

9 A new generation

9.1 How does Agriculture engage?

"*There is nothing permanent except change."* These immortal words were uttered almost 2,500 years ago by the Greek historian Herodotus. They apply today the same as they have throughout history. Human history is a story of constant change. When looking at the marvel of modern agriculture and how much can be produced to feed (if evenly shared) a population of over 7 billion, a person could be forgiven for thinking that this is the best means of producing food that could ever exist. But if you were to go back through history, change and improvements have always taken place and there is nothing to indicate this will not continue. In recent history there has been the Moldboard plough in the 18th century, Mendels' plant breeding in the 19th century, the discovery of nitrogen fixation in the early 20th century, the green revolution in the mid-20th century and now we have advances in genetic engineering, genome editing, robotics and data driven agriculture.

But despite all these advances the latest UN figures show there are more than 820 million people living in hunger[22]. Enough food is currently produced to feed everyone, but it is not getting to everybody. With the population forecasted to grow by nearly 2 billion in the next 30 years this problem does not currently look like being solved. Add to this the huge issues facing the world of climate change and biodiversity loss and it becomes apparent that new thinking will need to be applied at a global level to help solve these 3 problems of feeding a growing population, while protecting biodiversity and reducing agricultures effects on climate change.

9.2 Generation Z

Current school children are known as Generation Z (Gen Z), Centennials or iGeneration. In an article by the worldwide consulting firm Northhighland it is stated that when interacting with this generation one must: "*Communicate more frequently and in shorter bursts of bite-sized content. Don't just tell them; build a relationship with them. Interact with them, teach them, listen to them, and learn from them."*[23] Studies are showing that Gen Z is a values-driven cohort, identifying with causes and supporting organisations that embrace them. Graham Kramer, the founder and CEO of Artemis Venture Capital states that "*For Gen Z'ers, social content has to resonate on a level deeper than "what's trending." This is a generation we've seen protest gun control in front of the White House, and say things much older generations have been hesitant to say. They are empowered by their beliefs and aren't afraid to fight for them"*.[24]

While young people growing up today have probably never been further from the primary producer of their food, they are engaged with the issues mentioned above around hunger, climate and biodiversity. Agriculture must appeal to the best and brightest of Gen Z to ensure that this engagement is harnessed and leveraged in the pursuit of answers to these questions.

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[22] United Nations FAO, (2019) The State of Food Security and Nutrition in the World http://www.fao.org/state-of-food-security-nutrition/en/

[23] True North, (2016). Centennials why they are the way they are (and why you should care), *Northhighland*, May 2016. http://blog.northhighland.com/centennials-why-they-are-the-way-they-are-and-why-you-should-care/

[24] Olenski, S. (2018). 5 Ways Brands Can Engage Gen Z On Social Media, *Forbes*, July 2018. https://www.forbes.com/sites/steveolenski/2018/07/28/5-ways-brands-can-engage-gen-z-on-social-media/#feb75f661297

Through getting students engaged and understanding agriculture at a young age they will identify that they can make a positive contribution to the world through agriculture. In a recent article by Deep Patel states "*This is a pragmatic generation — they care about making a difference, but are ultimately motivated by ensuring they have a secure life outside of work"*.[25]

9.3 Case Study – University of Melbourne

In Australia the author met Dr. Stuart Barber, Veterinary Lecture at University of Melbourne. A huge problem Stuart is encountering is of students in his classes not knowing about agriculture. A large amount of his students are from non-agricultural backgrounds, they primarily wish to becomes Veterinarians to look after small domestic animals, but to teach the subject the student must also learn about farm animals.

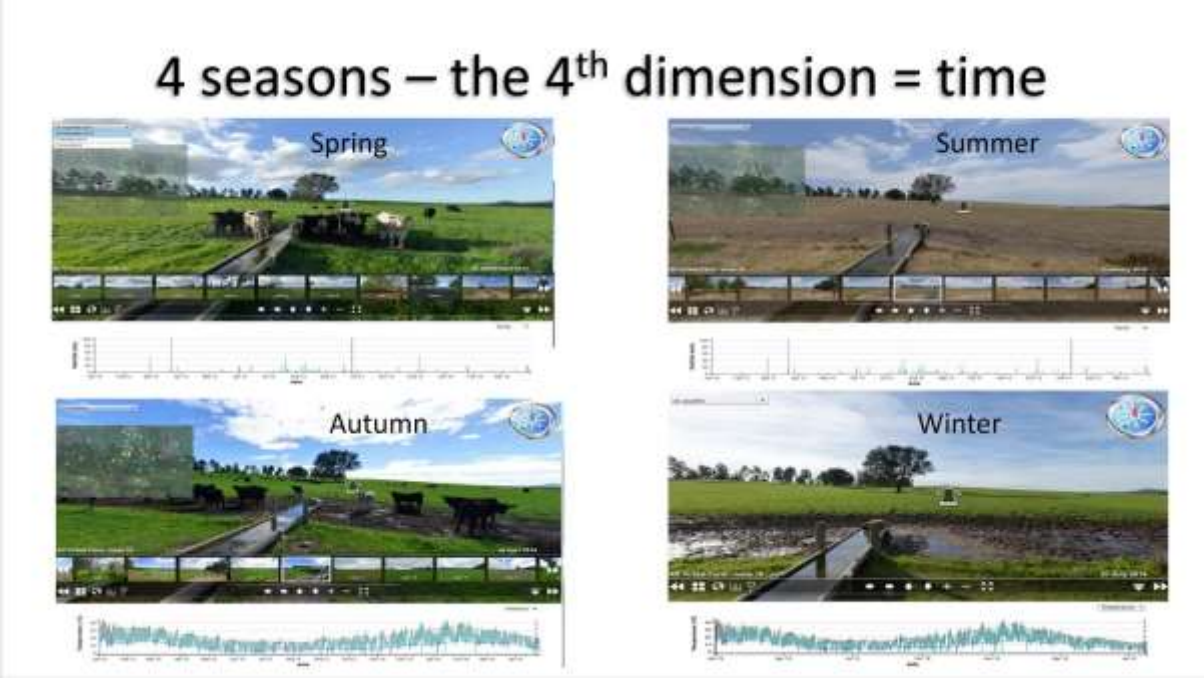

Figure 6: *Screenshot of "Dookie VR" created by Dr Stuart Barber, users can move around the farm to see what is happening in each season and data such as rainfall and temperature also included.*

Stuart outlined how standard video and pictures were not getting the message through, so he decided to develop a Virtual Farm for the classroom. Currently there are 11 farms across Australia where 360 videos are taken throughout the year, these images are linked with data such as rainfall and temperature on each farm to show the seasonal effects on the landscape and the animals. From this Stuart says he may ask questions like *"what do you do when facing a drought?"* He outlined he may get an answer *"irrigate the grass"*. He may follow on with *"where is the water going to come from? The main source of water for possible irrigation might be a few thousand miles away. How can this work? What will the cost be?* All this engages the student to think about and understand agriculture better.

[25] Patel, D. (2017). 8 Ways Generation Z Will Differ From Millennials In The Workplace, *Forbes*, September 2017 https://www.forbes.com/sites/deeppatel/2017/09/21/8-ways-generation-z-will-differ-from-millennials-in-the-workplace/#35edb8876e5e

Stuart believes in the need to keep engaging children with information on a topic if you want them to really learn about it. He is working with schools around Melbourne to see how Dookie VR may benefit learning, engagement and impact. On the question on how to get teachers interested in this Stuart states that "*if you can get children to look at and interact with the 360 videos they will pick it up rapidly, this then will help teachers realise the benefits*".

He is also developing 360 sheep for teaching in veterinary school. Through VR the students will be miniaturized and can go through the veins and arteries, down the throat to the stomach and through the whole body of the sheep. This should make the learning process much more interactive and hopefully memorable from the students' perspective.

9.4 Case Study 'Facetime a Farmer'

As part of my visit to the UK I met with Tom Martin, a tillage and livestock farmer in Cambridgeshire. Tom worked off farm for a number of years. After returning to farm, one of his friends, who is a teacher was speaking to him about the huge disconnect between school children and agriculture. It was from this discussion that he came up with the idea of Facetime a Farmer.

Facetime a Farmer sees a farmer speaking via Facetime or Skype with a school for 15 minutes every two weeks from his/her farm. The discussion should be tied into the curriculum and what the children are currently learning about to make it more relevant and engaging for the children. This tie in is achieved by the farmer and teacher communicating in advance of each call, whereby the teacher can outline what is currently been thought in class and then the farmer can come up with something on the farm that is linked and relevant to this.

It is a constant link for school children with a farmer, it allows the children to see the many different roles a farmer performs, from looking after animals, crops, hedgerows, nature habitats, concerns for the environment etc. Tom says he does *"not believe a farmer should do it with a local school but with a school in another area. This means it is a great opportunity for the farming community to show children in large urban areas where their food comes from and what modern agriculture is all about, and it allows children from the countryside to see and understand what farmers in another area do and they can contrast their local farms, land type, animals on the farm etc with the farm from another area."*

Tom has linked with LEAF (Linking Environment and Farming) to get a wider rollout in the UK of Facetime a Farmer. LEAF have all relevant information now on their website where both farmers and teachers can sign up, all administration is done by LEAF with a person dedicate to looking after Facetime a Farmer now employed by LEAF. There is no charge to a school for participating and no payment to the farmer (he/she can surely give up 15 minutes every two weeks for this!). A number of sponsors are now involved in the project in the UK and these funds are used to pay the person looking after the program in LEAF.

The author Karol Kissane on a Facetime a Farmer call with St John of God Girls Primary School, Artane, Dublin.

Subsequent to meeting with Tom and LEAF permission was granted to the author to run a pilot of Facetime a Farmer in Ireland. Three schools and three farmers were involved in this pilot and some feedback from students, teachers and farmers involved in included in Appendix 15.1. It is hoped that a nationwide rollout can happen once a partner in Ireland is obtained.

9.5 4-H Canada & Nutrien Ltd

4-H is one of the most highly respected youth development organisations in Canada, they believe in nourishing responsible, caring and contributing leaders who are concerned with positively impacting their communities. Meeting with Lindsay Bebbington, Program Coordinator 4-H Ontario she outlined how 4-H are "*all about trying to get children hands-on involved in experiencing agriculture and thinking for themselves, all 4-H does is linked to STEM and tell the children it is STEM and not frightening."*

One initiative 4-H use to appeal to children from non-agricultural backgrounds is the online game and app called Journey 2050 which was developed by Nutrien Ltd. This game takes students on a virtual farm simulation that explores world food sustainability. Using an inquiry-based approach the program encourages students to make decisions and adjust them as they see their impact on society, the environment and the economy at a local and global scale. The students hear from farmers across the globe. As the student interacts with each family, they

learn the role of best management practices in feeding the world, reducing environmental impacts and in improving social performance through greater access to education, medical care and community infrastructure. This simulator is built in line with the UN SDG's (Sustainable Development Goals).

Figure 7: *Screenshot of the online game Journey 2050, (www.journey2050.com)*

Lindsey Verhaeghe, Proud Community Partner with Nutrien Ltd says that Nutrien Ltd "*have developed over 20 online agricultural games and a VR game called nutrients for life. Everything is licensed for free, there are teacher notes, pre and post activity learning and teacher tool kits. They collaborate with ag in the classroom (*ag in the classroom engage students and teachers to enhance their knowledge and appreciation of agriculture and food) *as ag in the classroom have the resources linked to the curriculum so no point trying to copy what they have.*" Currently, this game is on based on 3 real life farms, one in Canada, one in India and one in Kenya. Lindsey said that Nutrien Ltd are open to adding more countries to the game in the near future and believed Ireland would fit in very well.

10 The Irish Perspective

A number of organisations are working on improving children's understanding of agriculture in Ireland. I met with a number of these and discussed the current programs they have on offer and plans they have for the future;

10.1 Agri Aware
https://www.agriaware.ie/

Agri Aware's mission is "to improve the image and understanding of agriculture, farming and the food industry among the general public"

They have several programs for encouraging learning of agriculture and food such as;

- "Incredible Edibles" which is a healthy eating initiative for primary school pupils. It encourages schools across the country to get busy growing carrots, lettuce, potatoes, strawberries, chives, spinach, and turnips. Schools are supplied with grow packs containing everything they need to grow a veritable feast of healthy foods.

  The Department of Education and Skills and the Department of Healthy and Children, through the Healthy Ireland framework, have joined Agri Aware's Incredible Edibles patrons along with the Department of Agriculture, Food and Marine, Bord Bia and the horticulture industry to support this programme.

- "Dig In" which enables learning about life on the farm and countryside is an interactive agricultural curriculum designed for primary school students. Broken down into comprehensive topics, Dig In covers all different aspects of farming. These topics range from the Irish farmer, farm animals, healthy eating, food products and farm safety, to earth science, sustainability, food security and the European Common Agricultural Policy (CAP)

Dig In is divided into four modules according to levels of ability. Each module contains 20 read-to-go lesson plans and corresponding activities, and each lesson plan is linked to strands of the English, Math, Art, Drama, Science, Geography and SPHE curricula.

Deirdre O Shea Executive Director, Agri Aware outlined how Agri Aware have all the material in place to enable STEM to be thought using examples from agriculture and the environment. The main issue they face is how to get it out to schools in a more widespread manner and how they can get teachers to pick up and use the material.

10.2 National Dairy Council
https://ndc.ie/

The mission of the NDC is to champion the role of quality pasture-based dairy and its nutrition benefits in supporting healthier, more active living.

The NDC have been involved with schools for many years through the School Milk Scheme. This is EU-subsidised and provides a carton of milk at a very low price to every child registered in participating schools – Preschool, National and Secondary schools alike. The programme is valuable for Irish children, helping to count towards one of their recommended servings from

the 'milk, yogurt and cheese' food group and, as the milk is delivered by local dairies, participation also supports local jobs.

"Moo Crew" is an initiative of the NDC, it is a fun, exciting and educational way for pupils from Junior Infants up to 6th class to learn all about healthy eating and nutrition, the importance of exercise and exploring where our dairy foods come from. A hard copy of this pack is sent out to primary schools at the beginning of each school year.

Speaking with Zoe Kavanagh she outlined how the NDC are spending a lot of time thinking about the current perceptions of dairy in the marketplace and how to keep dairy products relevant and defend their positions. A question she has is "*How can we get the positives of dairy across to primary school kids*? *How can we dispel the myths around dairy*?" Again, like Agri Aware the NDC have prepared a curriculum linked resource for primary schools but many schools are not utilising this.

10.3 Dairy Sustainability Ireland

https://www.dairyindustryireland.com/dairy-sustainability

Dairy Sustainability Ireland is a collaborative project with Bord Bia, the Department of Agriculture, Food and the Marine and a number of Irelands dairy processors and comes under the umbrella of Dairy Industry Ireland. It has been established to help farmers meet environmental targets, improve profitability and to copper fasten Ireland's reputation as a world leader in grass-fed dairy production. It is a global first 'whole of sector/whole of government' approach to addressing the challenges of the dairy industry. Fundamental to that work is the principle that environmental protection and economic competitiveness are equal and complementary: one will not be achieved at the expense of the other.

Meeting with Conor Mulvihill, Director, Dairy Industry Ireland he outlined that while he represents the processors he recognises farmers and processors are all part of the one ecosystem, processors need farmers to produce the milk for them to process, farmers need processors to purchase and market their milk. His view is that from the processors perspective a positive image of all facets of the industry from primary producer through to processors needs to be put out there. Members of Dairy Industry Ireland are also concerned about the perceptions of their industry. Agriculture in its totality is what drives the rural economy.

On the sustainability question Conor says "*we need to highlight the positives of Irish agriculture but also pose the question on how we can improve, it is not a static situation. Further initiatives on the environmental, soil, water, habitats and general biodiversity must be put in place to ensure we as an industry are part of the solution."*

11 Conclusions

This scholarship has been hugely beneficial in enabling me to gain a global picture of how agriculture is presented to young people in the 21st century, and this perspective has given me an appreciation of the clear requirement for greater sector collaboration at home, particularly in the area of ensuring children grow up knowing what modern, cutting edge careers are available in agriculture and thus change the perception of agriculture to one where the best aspire to have a career within it. The following is a summary of my conclusions;

1. There is an ever-growing divide between people involved in agriculture and those that are not. It is no longer a simple rural urban divide, as most people living in rural areas who are not involved in agriculture are just as detached from understanding modern agriculture as people living in urban areas. This issue is worldwide.

2. Overall there is a challenging perception of agriculture and a lack of understanding of the careers associated with it by people who are not involved in the industry, agriculture must strive to change this, there are limitless opportunities to follow just about any type of career in agriculture (eg technology, communications, education, management etc).

3. There are very tangible links between STEM and agriculture, this convergence must be exploited as a means of enabling children to learn about modern agriculture and its interactions with the environment and nutrition. At the same time, it can mean an easier understanding of STEM for children by using agricultural examples. In technologically advanced economies it will not be possible to get agriculture included as a standalone subject in primary schools, however through the avenue of integrating agriculture into the wider curriculum there is the opportunity to make a substantial and lasting influence on the perception of agriculture in young people's minds.

4. For children to be responsible global citizens they should develop the ability to think critically. Critical thinking will enable them to make informed choices throughout life. Agriculture can help this development by being included in an engaging and challenging manner across the curriculum. Children should be introduced to the complexities of climate change, food waste, nutrition, how to ensure soil health, water quality and the other myriad of issues farmers face every day along with understanding the societal and economic impacts of agriculture in a country. In the next 30 to 40 years we will have to produce as much food as we have produced in the last 10,000 years of civilisation. The best and brightest should be engaged at a young age to ensure success in solving these issues.

5. In a number of countries, a large amount of resources are being used to educate children about farming, a lot of these efforts are fragmented along lines such as the type of farming (Dairy, Tillage, Poultry etc). They look more at promoting the consumption of their product rather than the education of what agriculture actually is. In Ireland we have an opportunity to ensure this does not happen. Better results will be obtained if all agriculture works together to produce one message. It is not just about promoting your product, give the children the information on the how's and why's of your industry and let them make up their own minds about what they want to consume.

6. Throughout this journey and specifically during attendance at the Committee on World Food Security (CFS) in Rome in October 2018 it is apparent that how we farm into the future

will be guided by the UN Sustainable Development Goals (SDG's). There are 17 SDG's which were adopted by all UN Member States in 2015. These are an urgent call for action by all countries - developed and developing - in a global partnership. They recognise that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests. All global agricultural policies in the future will be guided by the SDG's so we as primary producers must learn about and embrace these into our daily lives as farmers.

It is imperative that the voices of primary producers are heard at events such as the CFS and that decisions that directly affect farmers are not just left to big corporations, government representatives and NGO's. All opportunities to attend and contribute to such forums must be availed of.

12 Recommendations

1. Leverage the opportunity presented of using agriculture in the teaching of STEM in schools. Have a resource in place whereby agricultural examples are easily accessible for teachers and fully aligned with the curriculum. Do this for all agriculture in Ireland through one point. UN SDG 4 "Quality Education"

2. CPD courses on the use of this resource should be developed and provided. Take opportunities such as INTO conference, principal conferences etc to present on this CPD and the benefits to the teacher and the students of using it. Make new teachers aware of the opportunity to use agriculture in the teaching of STEM, if these new teachers can see the benefits, they will take it out into schools with them and other teachers within the school they teach, will then also see the opportunity.

In the *STEM Education in the Irish School System* report one of the proposed actions recommended was to "*Develop CPD programmes for primary teachers to expand their knowledge in STEM subjects in order to build capacity in schools for the role of 'STEM Champions*'" Let agriculture lead the development of "STEM Champions" in schools by providing STEM through Agriculture CPD for teachers.

3. Rollout Facetime/Skype a Farmer countrywide. A pilot of this initiative was run by the author in Ireland in 2018 with excellent feedback from students, teachers and farmers (Appendix 15.1). A sponsor will need to be identified to fund the rollout in the Republic of Ireland with Sainsburys sponsoring this in England and The Royal Highland Educational Trust sponsoring it in Scotland.

4. Highlight how exciting and rewarding a career in agriculture can be. Farm visits are the gold standard in introducing children to agriculture, take note of the Farmlink model (Appendix 15.2), if a farm visit is happening ensure maximum benefit is derived from this with lead up and follow up initiatives. Visits must be easy to organise from the teacher and the farmer perspective; a set of Standard Operating Procedures should be developed to ensure this, and the question of insurance should be one of the first issues standardised. This recommendation ties in with SDG 8 "Decent work and economic growth"

5. Immersive technologies such as VR, AR and 360 videoing can be utilised. By allowing children experience what farming is like through these mediums it will spark children's interest in agriculture and the environment it operates in. Children must want to see and experience agriculture, it needs to be entertaining. The use of such technologies must be done correctly, the content is the most important thing, it cannot just be technology for technology sake. The message must be strong and fully linked to the curriculum, the new technology is only a medium to transmit this message.

A resource to be set up whereby schools can log on and ask question about what is happening in agriculture. At set intervals a farmer will do a video (on his/her phone) answering these questions and showing some practical examples of the answers from his/her farm. Each video will then build up into a catalogue whereby eventually when a teacher/student has a question on agriculture they can go to this resource and the answer will be available. For this to work several farmers with different farming systems, land types etc will need to be signed up, so the most relevant farmer for each question, can answer that question.

There are several free farm/environmental educational simulator games in other countries, it is not recommended to develop a separate game for Ireland due to the cost, but links should be developed with providers of such games.

6. This should be done under one coherent umbrella; it does not mean one group needs to provide everything but there would be one central point where all resources available can be easily found by teachers/children and not a multitude of different sites to navigate.

7. Agricultural representation should be involved in any national initiatives around health, nutrition and the environment and be willing to debate in an open and meaningful manner. Agriculture should be part of the solution to issues in these areas and not part of the problem. The population is our consumer, work with and not against public sentiment. This recommendation ties in with SDG 2 "Zero Hunger", SDG 13 "Climate Change", SDG 14 "Life below Water" & SDG 15 "Life on Land"

8. Farmers have a role in portraying a positive image of primary agriculture, put on a happy face and tell the positives, even go as far as talking about farming no longer being "old McDonald has a farm" but rather "young McDonald has a drone"! Don't be afraid to share stories about what you do. A large portion of the population is now detached from agricultural production, so do not assume that what you do is known by all. People can derive incorrect perceptions of what is happening in agriculture if the story is left to be told by groups with ulterior or unknown motives**.**

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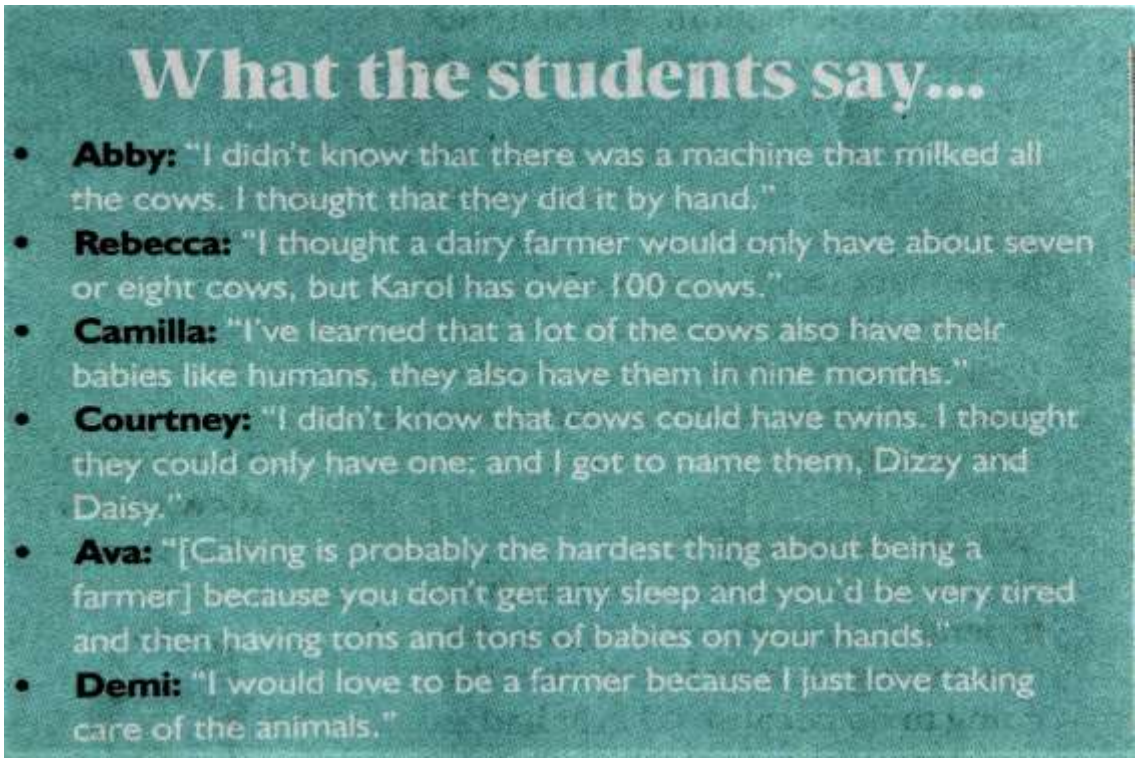
Zoe Kavanagh, CEO, National Dairy Council (Interview)

15 Appendices

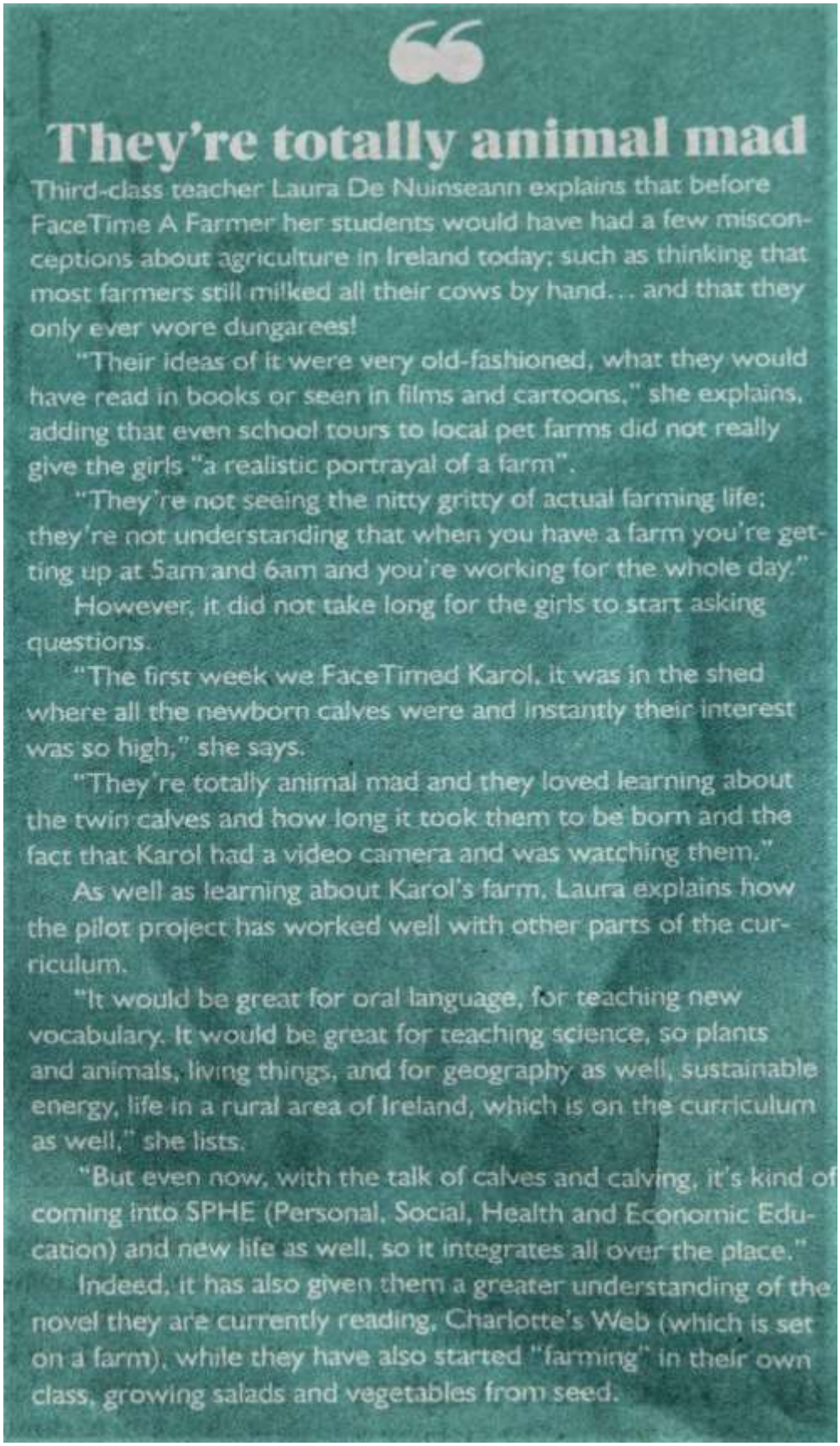
15.1 Facetime a Farmer – feedback



What the students say...

- **Abby:** "I didn't know that there was a machine that milked all the cows. I thought that they did it by hand."
- **Rebecca:** "I thought a dairy farmer would only have about seven or eight cows, but Karol has over 100 cows."
- **Camilla:** "I've learned that a lot of the cows also have their babies like humans, they also have them in nine months."
- **Courtney:** "I didn't know that cows could have twins. I thought they could only have one: and I got to name them, Dizzy and Daisy."
- **Ava:** "[Calving is probably the hardest thing about being a farmer] because you don't get any sleep and you'd be very tired and then having tons and tons of babies on your hands."
- **Demi:** "I would love to be a farmer because I just love taking care of the animals."

Taken from article in Irish Country Living 15 June 2019 https://www.farmersjournal.ie/connecting-kids-with-agriculture-through-facetime-a-farmer-463572



They're totally animal mad

Third-class teacher Laura De Nuinseann explains that before FaceTime A Farmer her students would have had a few misconceptions about agriculture in Ireland today; such as thinking that most farmers still milked all their cows by hand… and that they only ever wore dungarees!

"Their ideas of it were very old-fashioned, what they would have read in books or seen in films and cartoons," she explains, adding that even school tours to local pet farms did not really give the girls "a realistic portrayal of a farm".

"They're not seeing the nitty gritty of actual farming life; they're not understanding that when you have a farm you're getting up at 5am and 6am and you're working for the whole day."

However, it did not take long for the girls to start asking questions.

"The first week we FaceTimed Karol, it was in the shed where all the newborn calves were and instantly their interest was so high," she says.

"They're totally animal mad and they loved learning about the twin calves and how long it took them to be born and the fact that Karol had a video camera and was watching them."

As well as learning about Karol's farm, Laura explains how the pilot project has worked well with other parts of the curriculum.

"It would be great for oral language, for teaching new vocabulary. It would be great for teaching science, so plants and animals, living things, and for geography as well, sustainable energy, life in a rural area of Ireland, which is on the curriculum as well," she lists.

"But even now, with the talk of calves and calving, it's kind of coming into SPHE (Personal, Social, Health and Economic Education) and new life as well, so it integrates all over the place."

Indeed, it has also given them a greater understanding of the novel they are currently reading, Charlotte's Web (which is set on a farm), while they have also started "farming" in their own class, growing salads and vegetables from seed.

Taken from article in Irish Country Living 15 June 2019 https://www.farmersjournal.ie/connecting-kids-with-agriculture-through-facetime-a-farmer-463572

"*Your project was wonderful and had such a beneficial impact on the children. The children were fascinated with the live coverage you provided and this real-life experience of farming that they would never have gotten in a million years otherwise! I'm so glad we said yes to this pilot. Hope you got what you were looking for from the girls for your research. We would be interested in continuing with this project next year if you would like?"* Aoife McNicholas, principal, St John of God Girls Primary School, Artane.

"For me Facetime a Farmer has been thoroughly enjoyable. It allowed me to share my passion, knowledge and experience of dairy farming with the children from St. Luke's Montenotte, Cork and it was very encouraging to hear and see their engagement, interest and enthusiasm. This experience I feel opened their eyes to the reality of farm life and challenge some of the misconceptions. It really reinforces for me the benefits of educating both children and the wider community about agriculture. I believe all schools would benefit greatly from such a program." Patrick O Hanlon, Dairy Farmer, Tarbert, Co. Kerry

15.2 FarmLink

Meeting Nuffield UK Scholars Nick Green, Farm Operations Director (2003) and John Alvis, Managing Director (1983) of Lye Cross Farm and Farmlink. A rather apt quote on the wall considering all they have achieved. http://www.farmlink.org.uk/

John is the founder of FarmLink and has been hosting farm visits since the 1980's.

FarmLink is a company limited by guarantee with charitable status and is dedicated to educating school children about farming, food production, healthier eating and the environment. This is accomplished by FarmLink visiting schools through the winter terms and then children visiting farms through the spring, summer and autumn terms while studying a subject of the teachers choice all linked to the National Curriculum. Farmlink currently organise farm visits for over 44,000 school children every year, it runs as a charitable trust and get funding mainly from a number of other trustees.

Farmlink will link in with the school curriculum for 4 weeks before the farm visit, usually during the winter where the children will learn about a topic. They will then see the practical side of what they have been learning about on the farm visit which usually happens in Spring, Summer or Autumn and spend a period afterwards writing up about the whole experience. It works like a project. First investigation, then visit and then a report.

Prior to a farm taking part the farm will be inspected by a FarmLink representative and the farmers will be vetted to ensure suitability of farm and farmer to deliver to school children. If suitable then training will be provided, this is to ensure the farmer stays on topic and to make sure they can deal with any problems that may arise. Farmlink will make sure that all overheads requirements are in place such as health and safety, child protection policies, insurance etc. If the Farmer has an NFU insurance policy, then they can be informed that this visit is going to happen, and it's just noted on the policy with no extra charge from the insurance company. The NFU insurance will have already inspector the farm as part of the yearly insurance renewal. A teacher will visit the farm also before the visit of the school children to see what's happening on the farm and to understand what is going to be spoken about on the visit.

Food that comes from what is farmed on the farm will be shown, an example from a dairy farm could be a cheese sandwich, cheese and butter comes from the dairy farm and a little bit on how both are made, that would cover what the cow eats right through to the making of the cheese and butter.

Currently costing £2.84 per pupil all in, that includes everything including the time, overheads, right down to toilet paper.

The biggest challenge that Nick and John outlined is how to roll this out countrywide? To attract more schools Farmlink will attend school conferences, giving a 15-minute presentation and then try and get teachers to sign up for a project. It's only been done in the local area where they have 44,000 children currently involved and probably 8,000 more in the wider area going to join in the next school year.