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Image is everything: Undergraduate students' contributions towards a better understanding and improvement of public attitudes and perceptions of agricultural engineering

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ABSTRACT: Tertiary institutions, research organisations and professional agricultural engineering societies in developed countries have been restructuring their programmes in response to declining student enrolments and continuing reductions in research income from traditional sources. This study was carried out as part of an ongoing research programme in order to obtain students' input towards improving the appeal of future agricultural engineering (AE) academic programmes to more students, as well as to improve public perceptions regarding the image of agricultural engineering. The author has reported elsewhere on students' perspectives on their career prospects, critical skills for success and discipline name change. The present article presents a discussion of students' perceptions on the meaning of agricultural engineering, its past and future role in society, the image and profile of AE in the wider community, and the counter measures that could contribute towards a greater appeal of AE to young school leavers. Other feedback provided by students during a focused group discussion on the future of AE is also presented.

INTRODUCTION

It is widely perceived among professional agricultural engineers and students that both the discipline and profession have a poor image and appeal among school leavers and the general public. This is despite the overwhelming contributions of engineering and technological innovations in improving agricultural productivity, profitability and general human well-being during the past century.

In addition to the author's own personal experiences as a young undergraduate student pursuing a degree in agricultural engineering in a faculty of engineering about 21 years ago, many colleagues and current students have often raised the issue of the meaning and scope of agricultural engineering (AE). Furthermore, they have queried the reasons for its poor perceptions among students and the wider community as a *dirty* and *rural* profession, which educates young people to return back to farming when most of them aspire to the university to be able to get off the land [1]. This unhelpful perception among school leavers and the community about AE has continued to contribute to low enrolments in academic programmes, and it is a common view in many institutions that the majority of their students have chosen AE as a last resort so as to remain in the university, particularly those who could not get into the more traditional engineering programmes. Even where job opportunities exist in the rural sector, it is conceivable that most young fresh graduates would rather take up a job in or near the big cities for several personal reasons; this includes proximity to major facilities and services.

There are several key elements that may help to explain the poor image and low appeal of AE among students and the public. It appears that the situation with AE is exacerbated by the synergy of its close association with agriculture on the one hand, and engineering on the other.

Despite the fundamental importance of agriculture in the human food system, the industry continues to be dominated by low value commodities compared with other industries, such as machinery, construction and telecommunications. Even with the considerable advances achieved in the mechanisation of on-farm and post-harvest operations, and the overwhelming importance of agriculture in assuring food security and peace, agriculture continues to be perceived as a backward and poor profession [2]. The low factor productivity of agriculture and the low value-to-volume ratio of agricultural products have prompted some agricultural economists to suggest the end of agriculture in the American portfolio, presumably on the basis that the country could afford to rely on its neighbouring countries for sufficient cheap commodity imports [3].

In a way, the several problems facing education in science and engineering also affect education in agricultural engineering [4]. According to Göl et al, there is widespread ignorance and apathy in contemporary society concerning the role of engineering, science and technology, despite society's critical dependence on technology in almost every aspect of people's daily lives [5]. Those authors and many others have therefore discussed several proactive measures for the purpose of informing, affecting and shaping community attitudes towards engineering.

With respect to agricultural engineering, one could argue that the profession has become a victim of its own success in improving agricultural productivity [6][7]. For instance, in the 1980s, a group of farm workers and families who owned small farms in the USA brought a lawsuit against the University of California for spending public research funds to develop labour-saving machinery, including the tomato harvester [8]. They argued that mechanisation displaces farm workers and drives small farmers out of business.

In another article, the author explored the factors that have influenced students' choice of the AE major, their perceptions on employment prospects and the critical success skills in the workplace, as well as their attitudes towards changing the name of the degree programme and profession [9]. The objectives of the present article are to present and discuss students' perceptions and their understanding of the meaning and role of agricultural engineering, and to discus their views on the problems of the discipline's poor image and perception. Possible applications of these findings towards developing proactive measures in order to affect and shape the attitudes of future students' and community are also discussed.

METHODOLOGY

The research methodology has already been described elsewhere [9]. In brief, the study was carried out during the 2001 final semester with five (out of the total six) final year students enrolled in the Agricultural Engineering major at Massey University, New Zealand. A focused group discussion was held with students to assess their understanding of the meaning of agricultural engineering (AE), and to obtain their views on the magnitude of the image problem affecting AE among students and the wider public.

This was complemented with a pen and paper questionnaire in which students were asked to respond to several questions, such as their rating of the overall public understanding of AE and its role in the economy, the overall image/profile of AE in comparison with other engineering disciplines, and the relative contributions of agriculture and engineering to the image problem affecting AE.

Students were also asked to recommend practical actions that could be undertaken in order to enhance the image and public understanding of AE, as well its appeal among school leavers.

RESULTS AND DISCUSSION

Meaning and Role of Agricultural Engineering

All of the students expressed difficulty in defining agricultural engineering, as they were not certain about its correct meaning and scope. Most definitions offered by the students made reference to the words *machines* or *mechanical*. One student defined AE as the *design and practical(s) involved in agricultural processes*, while another referred to it as the *physical (solid) side of farming*.

This uncertainty about the meaning and scope of agricultural engineering among students was also echoed during the focus group discussion. This was particularly evident when one of the students asked: *Could someone write down what ag engineering means and does, and give it to us so that we can use it to explain to others when they ask us?* All of the students admitted that, on several occasions, their peers or family members have asked them about the meaning of agricultural engineering. These comments confirm that the very limited understanding of the meaning and scope of AE among undergraduate students extends also to students enrolled in the AE major.

When students were asked in the questionnaire to select two words (from the list: tractorisation, mechanisation, power and machinery, irrigation and drainage, post-harvest, processing, and any other terminology) that would best describe the past (historical) role of engineering and technology in the agricultural sector, *tractorisation* or *mechanisation* was chosen by all students. This response corroborated the majority of students' earlier responses that they chose to study agricultural engineering because of their interest in the mechanical aspects of agriculture.

However, when the students were asked which two of the following best describes the future (opportunities) role of engineering and technologies in agriculture (from the list: machinery design and management, environmental management, precision agriculture, sustainable energy, post-harvest technology, processing, agsystems integration and management, and any other), the most commonly selected areas were *sustainable energy* and *agsystem integration and management*. Only one student selected, respectively, *precision agriculture*, *waste management*, and *machinery design and management*.

It was interesting to note the considerable difference between students' original interest in agricultural machinery, which attracted them to the discipline, and the areas of sustainable energy and agricultural system management that they consider as having the future potentials for the discipline.

It should be noted that these responses may mirror, in part, the subject areas that the students had already been exposed to during their period of study, and this view might change when they join the workforce. They also reflect the dynamic changes that have been occurring in the evolution and scope of the agricultural engineering discipline, particularly in response to societal demands.

Public Understanding and Image of Agricultural Engineering

Students perceived a poor to fairly good overall public understanding of agricultural engineering and its role in the economy in comparison to other engineering disciplines, with an average rating of 28-47% from a scale of 0-20 (very poor), 21-40 (poor), 41-60 (fairly good), 61-80 (very good) and 81-100% (excellent).

Using the same rating scale, students also perceived the overall public image/profile of agricultural engineering as a discipline to be poor or fairly good compared to other engineering disciplines. In general, the students noted that there was a need for efforts to improve the low image and understanding of agricultural engineering among the general public and potential future students.

Sources of the Poor Image and Perception of Agricultural Engineering

In order to gain more insight into the factors that contribute to the poor image and profile of agricultural engineering among the public and its low appeal among school leavers, the students were asked to identify what proportion of the problem was attributable to the public perception of agriculture and engineering, respectively.

Overall, students attributed 62% of the problem to the image of agriculture and 38% to engineering. The feeling among the students about inadequate public understanding and poor image about the role of engineering in agriculture was summarised by

one student who wrote down in the questionnaire, *When I tell people* [that] *I am studying Ag Eng, they think it is a welding/engineering course where I am learning to build machinery*. Students particularly observed that the link often made by their peers and family members between agricultural engineering and working on the farm was a major contributing factor to the poor image and low appeal of the discipline among students.

The feeling among the students about the poor image and low profile of AE among the public was encapsulated in the following question posed by one student during the focus group discussion: *Is there some database or Website that has a list of influential ag engineers anywhere?* This issue was explored further in the questionnaire where students were asked to identify the names of some agricultural engineers (excluding university staff) in influential positions (eg politics, agriculture and other industries) in New Zealand. Three students responded that they knew someone but they could not remember their names. Only *one* student named someone who owns a major engineering firm, which provides a range of agricultural services and sells agricultural equipment.

Enhancing Public Understanding, Image and Appeal of Agricultural Engineering among School Leavers

The practical steps and actions, which could be undertaken to enhance public understanding and the image/profile of agricultural engineering as well as improve its appeal among school leavers, were then explored. The students strongly recommended the use of television advertising campaigns to reach high school students and the general public.

For campaigns aimed at the general public, the students suggested the inclusion of the following elements:

- Promote local ag engineering business and their services (eg *see your local Ag Engineer for* …)
- Provide information on the importance of agriculture to the economy and the role of engineering and technological innovations in bringing about current progress.
- Show specific data that links improved efficiencies and profits to the adoption of engineering and technological tools in agriculture.
- Demonstrate the important interrelationships between agricultural engineering and other well known agricultural professions in the rural sector, such as farm management.
- Promote the technological aspects of the degree programme.

The recommendation by students to promote the technological components of the academic programme (presumably to de-emphasise the agricultural image) was considered contradictory, especially given the students' earlier preference for closer alignment of their programme towards agriculture than engineering and technology [9].

On the one hand, the students reported their poor background in mathematics and physics and their preference for an emphasis on agriculture. On the other hand, they would also like to be considered as engineers after graduation and recommended that promotional activities should emphasise the technological components of the degree programme and discipline. This contradiction underlies some of the difficulties and challenges facing agricultural engineering in attracting young school leavers, particularly in the 21st Century.

When the students were asked to outline some specific actions and information that could be provided in order to make agricultural engineering more appealing to school leavers during promotional campaigns, their responses included the following:

- Judgement on the issue of money (income), which should be comparable to graduates from other related disciplines.
- Demonstration of the opportunities for personal achievement and job satisfaction.
- Indication of the worldwide opportunities that exist and the prospects for travel (ie graduates with *portable* degrees for an increasingly global job market).
- Evidence of good job opportunities and the demand for graduates with agricultural engineering qualifications.
- The ability to pursue a wide range of careers.
- A good lifestyle for those who may choose to work in the rural sector.

The ability to pursue a wide range of careers in agriculture, engineering and, indeed, other industries after graduation was strongly emphasised by the students as an important tool to promote agricultural engineering among students. This view is supported by the fact that the meaningful test of quality and relevance of agricultural engineering programmes (and any others) is the placement of graduates and their performance in the world of engineering and technology.

Evidence from research on the careers of graduates from other disciplines supports the recommendation made by the students, because it is increasingly known that only a small proportion of graduates in a discipline area go to work in the conventional industries serviced by the discipline. For instance, Prausnitz reported that at the University of California, Berkely, USA, only 20% of their recent chemical engineering graduates work in the conventional chemical and petroleum industries [10]. Most recent graduates found employment in industries that either did not exist 10 or 20 years ago, or did not, until recently, discover the usefulness and relevance of chemical engineers in their operations.

CONCLUSIONS

This study utilised a combination of focus group discussion and a pen-and-paper questionnaire in order to evaluate students' understanding of the meaning and role of agricultural engineering in the economy, and to assess their perceptions of the extent of the poor image and public perception of the discipline. The findings are summarised below.

When asked about the meaning (or definition) of agricultural engineering, most students associated it with the *mechanical* or *physical* aspects of agriculture, and generally expressed the view that it was hard to define. One student posited that it was *probably best described as a mixture of engineering with an agricultural flavour*. Overall, most students reported that they were frequently asked by their peers and family but were not sure about the correct meaning of AE. The students desired a standard definition that they could use to explain to other people.

Students used the words *mechanisation* and *tractorisation* to describe the historical (past) role of engineering in the agricultural sector. However, they considered future opportunities to lie in *sustainable energy*, *agsystem integration*, *precision agriculture* and *waste management*.

Students rated the overall public understanding of agricultural engineering and its role in the economy to be low. Similarly, students' rating of the public image/profile of agricultural engineering as a discipline in comparison to other engineering disciplines was also low.

Students were of the opinion that the low public perception about agriculture accounted for over 62% (and 38% for engineering) of the overall problem of the poor image/profile that faces agricultural engineering.

In order to enhance public understanding and image/profile of agricultural engineering, students recommended television adverts. These adverts would publicise local agricultural engineering firms, link increased productivity and profits to the adoption of engineering technology in agriculture, and demonstrate the link between AE and other successful careers, such as farm management. Highlighting the technological aspects of the degree programme was also recommended.

So as to increase the appeal of agricultural engineering to more school leavers, students suggested the use of television adverts and other media to demonstrate that opportunities exist for a wide range of career options and good job opportunities.

It was also found that agricultural engineering programmes must equip future graduates with a *portable* degree that can provide opportunities for travel in an increasingly globalised job market.

Students also identified that evidence of a good income and a good lifestyle was important information that needed to be shown and demonstrated during such promotional campaigns. This required studies on the work placement and incomes of graduates and those in other industries.

It was also perceived by the students polled that using *famous* and *influential* agricultural engineers to lead television campaigns would enhance the positive impact on young school leavers.

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