SQUARE PEGS AND ROUND HOLES: CAN BUSINESS SCHOOLS DO AGRIBUSINESS AND FARM MANAGEMENT?

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Abstract

Globally, tertiary institutions are struggling with how best to respond to the growing industry demand for Agribusiness graduates. Mainstream 'business colleges and schools' are potential candidates to deliver agribusiness programs. Firstly, we describe what agribusiness scholarship is, then what type of curricula and teachers underpin good scholarship. Historically, more successful agribusiness programs, evolved from agricultural colleges and land grant universities. Based on literature review, case study and personal experience, we consider prospects for delivery of agribusiness programs by mainstream business colleges and schools. In identifying and discussing sixteen (16) factors, we conclude that, except in all but a very few isolated instances, business schools have poorer understanding of the complexity of agribusiness and farm management scholarship. Furthermore, business schools are often ill equipped in the underpinning philosophical requirements for agribusiness education and training. We suggest a major change in philosophy, built around inductive multidisciplinary delivery capacity is essential for most mainstream business colleges and schools to be appropriate vehicles for agribusiness and farm management scholarship.

Keywords:" agribusiness scholarship, farm management, agricultural economics, agribusiness teachers, teaching of agribusiness and farm management

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1 Introduction

Tertiary institutions are struggling with how best to respond to the growing industry demand for Agribusiness graduates. After briefly discussing the heritage of the agribusiness discipline and its idiosyncrasies, we discuss the philosophy and competencies of agribusiness scholarship. We examine the inherent differences between agribusiness and mainstream business scholarship, finishing with discussion of the fit of agribusiness in mainstream business schools.

1.1 What is agribusiness?

Drawing upon its original roots in farm management (Boland and Crespi, 2010) and agricultural economics (Malcolm, 1990), we would argue that Agribusiness today has evolved to one now encompassing multiple complex business activity clusters, interfaces, and interactions spanning the whole value chain from genetics to the consumer. These activity clusters are based upon numerous disciplines including business, social, applied, and fundamental sciences

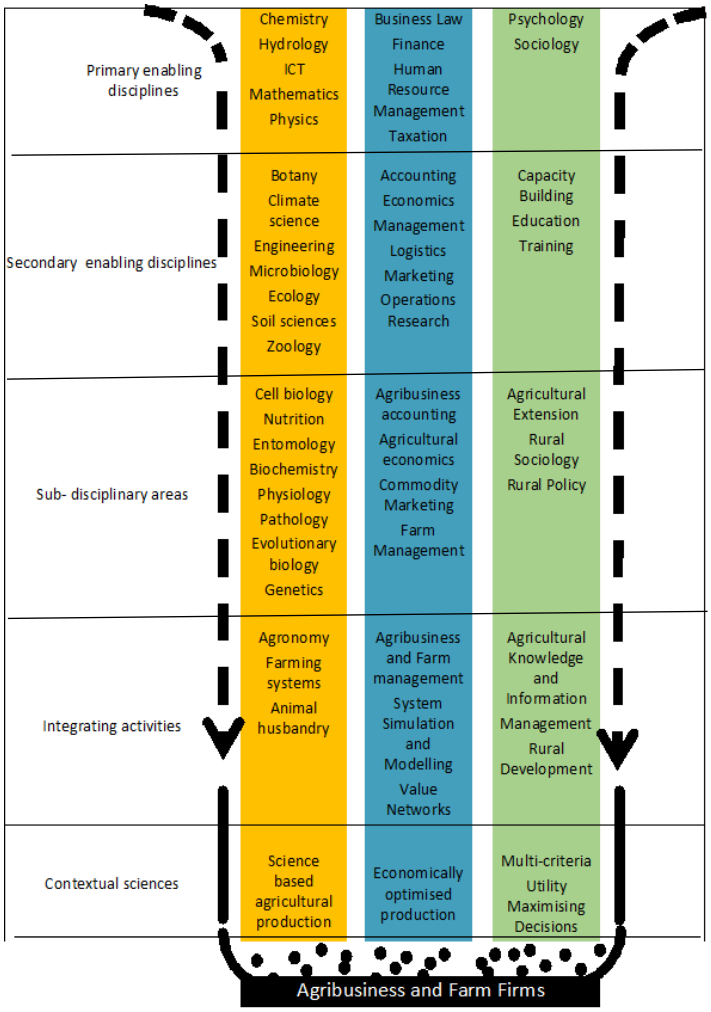

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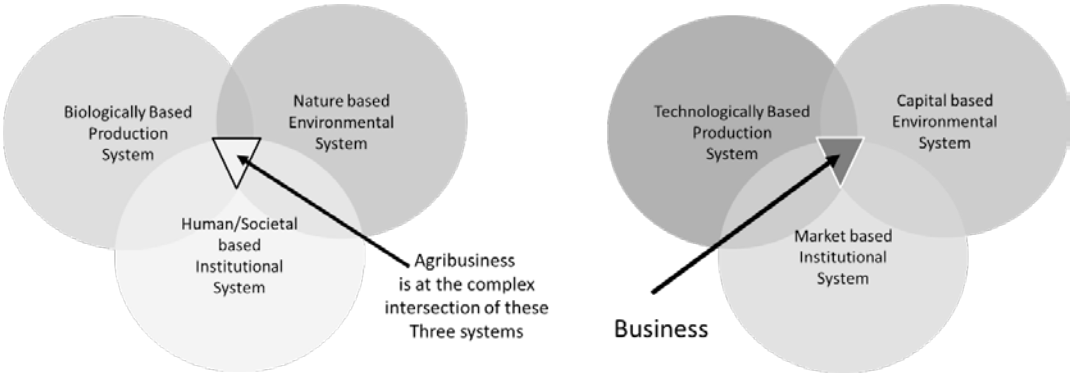
Figure 1: The Agriculture and Agribusiness Crucible.
Adopted from Australian Academy of Sciences (2017).

Figure 1 provides insights into the 'complexity' (King, 2012b) and 'open' nature (Malcolm, 2011) of the interconnectedness of agricultural systems, the agribusiness and farm management environment and a 'crucible' in which an 'composite' of integrated discipline knowledge mixes. Management within this complex and interconnected set of activity clusters requires managers to possess not only strong knowledge of each individual discipline but also a holistic and integrated systems perspective of how everything interacts (Bawden, 1992, Boyd and Folke, 2011).

Figure 2 demonstrates our view of the complexity and fundamental differences between agribusiness and business 'ecosystems'.

Figure 2: The Agribusiness ecosystem Vs the business ecosystem.



2 Agribusiness scholarship

2.1 What is agribusiness scholarship?

Distinction between agriculture, business, and agribusiness scholarship is important. Over the past 100 years Agribusiness (King et al., 2010) has developed fundamentally different epistemologies, ontologies and practices to those of Agricultural Science, Fundamental Science, or Business (Boland and Akridge, 2004, Boland and Crespi, 2010, Boland and Akridge, 2008b, King et al., 2010).

We will argue, as a generality, business school academics teach and research within their strong, deep, and often narrow, discipline silos. In contrast, agribusiness academics are almost universally required to operate as systems integrators, spanning and integrating sub-system boundaries in a multidisciplinary environment; often with a requirement to develop discipline specializations in two or more areas.

Agribusiness academics often exhibit deeper and broader appreciation of interdependency and confounding factors within and across the agri(business) system The perspective has moved from the reductionist and mechanistic approach of 'scientific thinking' (Dillon, 1976), which has served agriculture well for over 150 years (Bawden, 1991), towards more adaptive and inductive approaches. Agribusiness academics are almost universally required to operate as systems integrators (Bawden, 1992), spanning sub-system boundaries (Rickert et al., 2004) in a multidisciplinary environment; often possessing a broader set of competencies with one or two deeper areas. BS academics are generally, but not universally, 'I' shaped (atemporal, linear, reductionist and static) and operating in silos, whereas agribusiness academics are 'T' shaped (temporal, systemic, inductive and dynamic) having core disciplines , the 'I' part of the 'T', having to understand business systems and the underlying biological and social systems (Figures 1 & 2), the cross of the 'T'.

Sonka and Hudson (1989) identified five factors (Table 1) separating agribusiness from other industries. Malcolm (1990) then mapped farm management into the social sciences of psychology and sociology. King et al. (2010) further demonstrated the complexity of agribusiness differentiating it from other business scholarship.

Table 1: Five factors separating agribusiness from other industries.

	Factors separating agribusiness from other industries
1	Unique cultural, institutional, and political elements
2	Uncertainty arising from the underlying biologic basis
3	Wide ranging and alternative business goals and forms of political intervention
4	Institutional arrangements placing portions of technology development in the public sector
5	Differing competitive structures existing within and among the agribusiness subsectors

Adapted from Sonka and Hudson (1989)

Scholars unfamiliar with agribusiness and agriculture are often challenged to grasp its complexity

Table 2: Keys to success for agribusiness teaching.

	Foundation factor
1	A requirement for recognition that agriculture students are unique, with backgrounds, value systems, preferred learning styles, expectations of faculty and the educational system, and career goals which may be different from other students.
2	Interpretation of employers' expectations and needs into curricula, activities and programs. Students need to be informed about knowledge bases, skills, behaviors and experience that employers desire and expect from new graduates. Courses and programs must offer students opportunities to prepare to meet these expectations.
3	Agribusiness faculty must be more than disciplinary specialists.
4	Educational structures that are different if graduate and other adult learner programs are offered or linked.

Adapted from Wallace and Smith (1994)

and subsequent implications (Peterson, 2011).

The interweaving complexity of mixing disciplines fosters 'grounded theory' (Locke, 2000) to be a major underpinning of agribusiness scholarship (Peterson, 2011). The assertions of Wallace and Smith (1994) (Table 2), for successful agribusiness teaching remain relevant today.

Further, analysis of current offerings at our own and other institutions indicates that there is a fundamental difference in how agribusiness and business is taught. Business focuses on highly bounded silos of known and certain discipline knowledge, whereas agribusiness takes on a complex systems approach drawing upon topics such as:

- agency theory
- commodity trading
- decision science
- diminishing margin return
- economies of size and scale
- inventory management
- production economics
- resource economics and the 'tragedy of the commons'
- partial budgeting and enterprise gross margin analysis
- rotational and Year-in Year-Out budgeting
- Opportunity cost of resource allocations and shadow pricing
- uncertainty
- utility theory

2.2 Philosophical underpinnings of agribusiness scholarship

Peterson (2011) argues that agribusiness scholars face philosophical challenges with " a significant tension between the research demands of their applied industry peers and theoretical academic peers (Peterson, 2011, 11)."

In teaching agribusiness, it is important to understand the lens through which research is conducted. Darnhofer et al. (2010) present agricultural research through a contemporary, complex adaptive systems setting, comparing the lens of the engineer to a historic farming systems lens. We extrapolate the model to include business disciplines (Table 3), thus providing insights into the comparatively complexity of agribusiness scholarship.

2.3 Student characteristics

Enabling a teaching environment that delivers to student and employers expectations is critical. Additionally, it has been found that agribusiness students "the preferred learning style is "hands on" (Skaggs, 1992, 351)."

Table 3: Key characteristics of the three broad approaches to researching farms and farming systems.

Characteristic	Accounting and Business	Engineering	Farming systems	Complex adaptive (farming) systems
Underlying theory	Positivism	Positivism, reductionism	General systems theory, 'simple systems', system dynamics,	Co-evolution, complex systems, adaptive systems, stochastic optimization (under change and chance) , normative ethics
Systems view	Mechanistic systems	Mechanistic systems, Newtonian science	Systemic view: system is made of parts that interact, focus on the parts,	Hierarchically nested systems, various temporal and spatial scales, properties of complex adaptive systems: emergence, hysteresis, etc., focus on interactions of parts
Time	Time is a variable (Equity & Macro-economics excluded)	Atemporal: time not taken into consideration	Atemporal but some linear projection into the future; no change in the dynamics of a system	Time is a key variable: 'history matters', path dependency, irreversibility
Dynamics considered	Static approach, steady-state	Static approach, steady-state, equilibrium view	Static approach, equilibrium view, relationship between elements does not change	Perpetual disequilibrium, non-linear dynamics, adaptability: the dynamics change over time, co-evolution
Context	Irrelevant ('one size fits all')	Irrelevant ('one size fits all'), allows for technological blueprints	Context matters: differences between locations is important, farmer perception needs to be taken into account, focus on agricultural sector	Context is constantly changing, change can be unexpected in strength, timing and direction, due to interactions need to include all sectors, not just agriculture
Inclusion of social sciences	Mostly single discipline-driven	Mostly single discipline-driven, some inclusion of neoclassical economics	Interdisciplinary: inclusion of sociology to address farmer perception, farmer participation, economics include some behavioural notions (e.g., agents are boundedly rational), learning and policy (politics)	Interdisciplinary, inclusion of insights from psychology such as mental 'traps' and bias typical to information processing by humans, learning as an on-going and interactive process

Adapted from Darnhofer et al. (2010, 547)

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Data collected at Curtin since 2014 indicates 80-90% of agribusiness students are kinesthetic and visual learners versus 40-60% in other discipline cohorts, a finding consistent with those of others (Greenway, 2012, Wallace and Smith, 1994).

Myers Brigg analysis by Strachan (2011) finds that agriculturalists are over represented in the 'Sensing Judging' type, Nicholson et al. (2015) identify such types as being important in framing training about 'agribusiness risk', all of which is consistent with our observations of agribusiness students and amplifies the need for andragogic 'hands-on' leaning environments. These students prefer to learn through networks rather than single sources (Kilpatrick and Johns, 2003).

3 Differentiating factors – Agribusiness Vs Business

The sixteen factors characterize the comparative differences between Business Schools (BS) and Schools of Agriculture and Agribusiness (AG).

3.1 Philosophy - Epistemology, Ontology and Axioms

Mainstream BS are often structured differently to AG faculties and schools.

Peterson (2011) argues agribusiness scholars are misunderstood and marginalised by academics from other disciplines with an associated tension. Such tension is created by the difference in how the two sets of peers 'know what they know', a difference of practical knowledge versus positivistic knowledge. Peterson (2011) explores the epistemologies of practice and positivism, and proposes a third epistemology, grounded theory (Locke, 2000), allowing agribusiness scholars to produce rigorous research acceptable and relevant to both sets of peers. Poor comprehension of agribusiness by mainstream economics and finance academics is well recognised by Malcolm (1990) (2011). A growing need to address 'wicked problems' (King, 2012b) pushes agribusiness scholars even further toward an epistemology of engaged scholarship and grounded theory.

Business schools are more focused on reductive activities that 'tease things apart' (reductionism), whereas agribusiness and agriculture is more about 'systems thinking' (Bawden, 1991, Dillon, 1992) and concepts inductively shaping the curricula from its outset.

Design led approaches to problem definition and solution is likely to be at the forefront of driving innovation in agribusiness in the next decade (King, 2012b) to create new axioms. Increasing evidence points to the use of 'design led' thinking for new solutions in

agriculture (Prost et al., 2018, Salembier et al., 2018, Berthet et al., 2018, Berthet and Hickey, 2018).

3.2 Disciplines Vs Multidisciplinary

Business Schools work in discipline silos: Accounting, Economics, Finance, Management, and Marketing. Often university incentives drive these disciplines to focus on a 'teacher directed' instruction models with large classes.

Whereas agribusiness is taught and learned through 'adult centred' or andragogic methods (Knowles et al, 1998). Figures 1 and 2 illustrate how agribusiness draws upon the core business disciplines, together with the agricultural sciences and other applied sciences (technologies) through an 'integrated systems perspective' (Packham, 2011) and importantly consider the impact of externalities.

Our rudimentary analysis of core first year BS units in accounting, economics, management and marketing (the 'foundation four'), at our institutions indicates less than one-third to one-fifth of content is contextually relevant to agribusiness students.

Feedback from students who were required to take the foundation four during a course realignment of Curtin's agribusiness degree reflected such a view. The foundation four were subsequent dropped.

A qualitative study of Australian accountants found "the present financial reports provided to farmers are of little decision-making value (Halabi and Carroll, 2015, 227)", a European study finds "caution should be taken when generalizing the current knowledge on the use of management accounting practices in other organizational forms to farming entities. (Ndemewah et al., 2018, 1)"

The relevance of more holistic courses from BS that can be offered to agribusiness students are under question. For example, in the area of strategic management and planning Bell et al. (2018) report "Strategic management courses today are criticized for being repositories of multiple frameworks that are not tightly integrated and are aging rapidly while concerns have been voiced about the lack of effectiveness of strategic management education." Strategic management is increasingly important in agribusiness and often the focus of capstone units in agribusiness management (Boland and Akridge, 2008a).

3.3 Endogenous Vs Exogenous focus

Business Schools are largely focused on establishing endogenous factors, internal control of the firm and the production system, the management of the physical, financial, human and capital functions, with social capital often a distant fourth.

Agribusiness is more focused on the previous factors in dealing with exogenous shocks (Darnhofer et al., 2010) from the natural environment, resulting in recurrent turbulence and perturbation in agricultural production (Rickert et al., 2004).

3.4 Simplicity Vs Complexity

Business Schools tend to teach and research about the production of 'widgets' where the inputs and outputs are highly specified, engineered, and controlled. The production or transformation process is often viewed through controllable sets of steps and processes resulting in the prospect of low variability product or services.

Instead agribusiness often deals with highly complex, random, stochastic and variable biological production processes embedded within a natural environment with a high variability, volatility and uncertainty (Darnhofer et al., 2010); repeatedly and unexpectedly presenting 'messes' (Ackoff, 1973) and 'wicked problems' (Batie, 2008) requiring more nuanced management (Ritchey, 2011, King, 2012a) that can have catastrophic impacts if mishandled.

3.5 Risk and Uncertainty

Business Schools rarely factor 'risk' into the core of the curriculum. At best, they focus on 'financial risk'. Many BSs offer elective units in risk with a narrower focus, often as postgraduate offering in MBA courses or specialised Master's programs in extractive industries such as mining and oil and gas, or commodities / derivatives.

Whereas risk is fundamental to, and fully integrated into, all agribusiness courses and programs (Chavas et al., 2010, Hardaker et al., 2015). There is a range of factors identified or charactered with respect to a 'risk complex' in agribusiness, usually having associated sets of interacting tools used to reduce the risk/s.

More often, the 'risk complex' is often only found in the BS curricula at a postgraduate level. The risk complex is at the core of all agribusiness curricula.

3.6 Information symmetry

Business Schools generally teach to the tenant of a bounded more certain operating environment with information symmetry as a relative given.

Agribusiness is about understanding and managing uncertainty (Ghadim et al., 2005, Marra et al., 2003), often with information asymmetry and unboundedness.

3.7 Profit maximisation Vs Profit optimisation

Business Schools teach to the tenant of the survival of the individual profit maximizing firm (‘dog eat dog’).

For nearly two decades, agribusiness has focused on value creation, value chains, clusters and networks (Lazzarini et al., 2001), where optimisation of profit amongst the network and chain participants is a driver of the business model.

3.8 Price setting Vs Price taking

Business Schools often focus on firms as ‘price setters’ (Mauldon and Schaper, 1974), where they have control over the cost of production, and often set the wholesale or retail price.

In all but a few instances, agribusinesses are ‘price takers’ operating in seasonal markets characterised by various associated risks and uncertainties, such as market manipulation activities of “hoarding” and “dumping” (Williams, 2012, 14) that affect prices.

3.9 Secondary Vs Primary information and data sourcing

Business Schools rely on secondary data sources and creation of ‘meta’ data as research enablers, which often is available at relatively low cost.

Agribusiness is highly dependent on primary data collection and analysis, as there are few reliable, relevant or representative sources of secondary data. Farmers and agribusinesses often ‘play’ with surveys to derive benefits or subvert the survey instrument, such motivations are discussed by Seligman (2018).

3.10 Homogenous Vs Heterogeneous teaching

In BS, teaching staff often follow a 'homogenous route' from undergraduate to postgraduate training via the same discipline in which they teach. BS teachers invariably 'pay less attention' to curricula or courses in other BS disciplines.

Agribusiness courses require diverse or heterogeneous teachers, who are multidisciplinary in nature, who integrate their teaching via a fuller working knowledge of other curricula elements and their contextual integration.

3.11 Text book Vs Case study

Often BS courses hinge around generic multinational textbooks, with a reliance on secondary and meta-data sets for research as previously described. In some instances there are secondary references to agribusiness case studies, e.g. the Australian dairy cooperative Bega Cheese in Cengage's text *Strategic management: competitiveness and globalisation* (Hanson, 2014).

Agribusiness courses rely heavily on primary data and local case studies drawn from a range of sources for teaching and research, with few introductory and comprehensive textbooks. The local biological, environmental, economic and social systems greatly affect how farms and agribusinesses operate. Understanding of localized systems is critical to the success of agribusiness graduates, hence dictating the use of localised teaching resources.

3.12 Low cost - high throughput Vs High cost - low throughput

Business Schools almost universally have three-year undergraduate programs with a suite of core first year introductory courses, including the foundation four. Almost universally, these courses have high student numbers in terms of Full Time Student Equivalents (FTEs), usually with lower per FTE costs.

Instead first year agribusiness courses are generally a mix of foundation applied sciences integrated with specialised agribusiness accounting, agribusiness management, food marketing, production, and similar courses. It is common to find lower FTEs, with higher costs. With four-year agribusiness courses, the opportunity to integrate mainstream business units becomes more feasible.

BS students often attract less external or public funding per capita beyond the tuition fees payable. Due to either an inherent or a perceived intrinsic value, external funders provide higher levels of support for agribusiness students. For example, in Australia, government funded undergraduate agriculture and agribusiness 'places' are funded similarly to medicine places, up to three times that of BS students.

3.13 Experiential learning and field study

'Field' trips and immersive experiential learning opportunities are infrequent in BS with industry engagement and interaction generally limited to guest speakers and multimedia content.

Whereas field trips, experiential learning, and industry participation are core to agribusiness courses.

3.14 Mass-market Vs Intimate experience.

Frequently BS courses have a high throughput of students with higher dropout rates. Agribusiness courses are frequently much smaller in student numbers often with higher retention and completion rates.

3.15 Course length, content and articulation

Internationally, undergraduate degrees in Agribusiness are almost universally four years in duration. Whereas business and commerce degrees are usually three. Extrapolating from Boland et al. (2001), Boland and Akridge (2008a), Boland and Akridge (2008b), less than 5% of US undergraduate agribusiness degrees offer substantive BS courses.

3.15.1 Three year undergraduate ‘I’ shaped business / commerce courses

Most undergraduate BS courses are based on a three year program in which the core field or discipline is sometimes complemented by one other first year core and limited electives. The essence of the program, in most instances, is to deliver a higher level of competency in a single discipline, except perhaps for entrepreneurial programs engendering multidisciplinary skills or linkage into double degrees.

3.15.2 Three year undergraduate ‘T’ shaped agribusiness courses

Predominantly, three year undergraduate agribusiness programs aim to produce multidisciplinary generalists, often with limited opportunity for specialisation due to the constraints of a three-year program. Almost universally, these programs cover multidisciplinary units in agribusiness, production agriculture and farming systems; and are well suited to case study methods to scaffold the primary and secondary enabling disciplines (Figure 1) such as biology (Bonney, 2015). These programs general link to an associated honours or masters program that provides specialization.

3.15.3 Four year undergraduate ‘T’ agribusiness courses

Four year undergraduate programs enable broader offerings with elective courses and the possibility for double majors, such as agronomy and farm management. Four year

programs also allow students to take specialist BS units, such as accounting or finance (Wallace and Smith, 1994).

3.16 Market forces and government policy.

Business schools have limited focus on government policy, international trade, and market impacts; if included, it is often as an elective.

All agribusiness courses have an explicit focus on government policy, markets and trade; in the US and EU more domestic markets, whereas the rest are more international.

4 Discussion and Implications

4.1 Do Business Schools get Agribusiness?

The sixteen influencing factors outlined provide the foundations for comparative analysis of the teaching of agribusiness and business within agricultural schools verses business schools.

Firstly, can the key disciplines from the sciences and business be taught independently or in a co-curricular manner and then fused through 'systemisation' (Ackoff, 1973) in a double degree agriculture plus business program? We believe there are few, if any, examples of this approach producing successful outcomes.

Attempts to integrate, service teach courses or integrate undergraduate programs in agribusiness into BSs have largely been unsuccessful; except for instances where the BS evolved out of 'agricultural colleges' in Australasia, Canada, Europe and the UK or a 'land grant university' background in the US.

The view of Davis and Goldberg that "food system needs to be viewed as an integrated system" (King et al., 2010, 554) in which agribusiness is central to the functional capacity of the system is instructive. It is important for agribusiness academics to understand the interconnectivity of the elements of the system and possess the multidisciplinary competences required for working within the food and agribusiness system. We reassert that it a working multidisciplinary understanding of 'the system' and the influencing elements is a fundamental core skill set of all agribusiness academics and students ; complemented by time spent in the field engaging with agribusiness practitioners (Boland and Crespi, 2010).

Employers often cite the multidisciplinary integrated and immersive nature of the training of the agribusiness graduates as key.

Can an ‘agricultural science’ or ‘business’ graduate ‘morph’ through a double major, double degree or postgraduate program in agribusiness? Yes! But, they require substantial contextual immersion to fill the chasm between the science and business disciplines. (Foran et al., 2014, Boyd and Folke, 2011)

The propositions of Wallace and Smith (1994) are as relevant now as they were in the 1990s. “It is not enough to construct a curriculum that has all the "proper" discrete components. Rather, the curriculum when completed must have presented insightful glimpses into the various aspects of the entire agricultural system, how economic values are ascribed to biological processes, and how the various components of the agricultural system are linked both by market-based systems and politically-based systems. The curriculum needs to be "started" in the foundation years”, well linked in the intermediate years, with “detailed analyses and activities during the” (final years) “and the process "closed" with a (relevant) capstone course (Wallace and Smith, 1994, 1002).”

4.2 What role for Business Management and Graduate schools in Agribusiness?

Graduate schools with executive MBAs and MBAs focusing on agribusiness, delivered outside of agriculture faculties, are rare outside of North America and Europe. Monash in Australia is one example. Outside of the ‘land grants’ in the United States, Harvard is widely considered as a preeminent program in agribusiness. Programs at Harvard, and other non land-grants, focus on corporate agribusiness (Boland and Akridge, 2008b). The programs are usually built from the ‘ground up’, not strung together with agribusiness add-ins to existing programs. However, they are in direct completion with executive programs at Land Grant universities.

A focus on ’supply’ chains and not ‘value’ chains, is often the focus in BSs. Sporleder and Boland (2011) highlight seven specific economic characteristics of agrifood value chains distinguishing them from other industrial manufacturing and service supply chains, thus requiring a ground up or deep integration of agribusiness philosophy into the program for it to be successful. As Boland et al. (1999, 79) conclude, there is “ a distinct trade-off between the integration of food and agricultural topics vis-a-vis a strong basis in general management courses” in MBAs, we find no change.

5 Conclusion

In our view, sixteen factors constrain the potential for mainstream business schools to grasp the fundaments and the nuances of agribusiness. However, where four year undergraduate

programs exist it is possible to leverage parts of the first year core and subsequent electives into the agribusiness degree. We find limited examples of desirable or impactful undergraduate teaching of agribusiness elsewhere in mainstream business education; however, we conclude a limited number of appropriate structured and quality programs do exist.

Business schools can provide agribusiness scholarship; but! We suggest a major change in philosophy and culture, built around inductive multidisciplinary delivery capacity, is essential for mainstream business schools to be successful vehicles for agribusiness scholarship.

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