

Re-Cultivating Agricultural Science

or

What I've Learned in 40 Years of Professional Life

(John) Lindsay Falvey
2011

Institute for International Development, Adelaide

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About this Book

This book owes its origins to a collation of some of my publications for which a higher doctorate (Doctor of Agricultural Science) was awarded by the University of Melbourne in 2004. In that guise it was titled:

Integrating Reductionist Research into International Agricultural Development: Re-conceiving Agricultural Research for Development; Technical Support for Development; Thai Agriculture; International Agriculture; Agricultural Education.

It was thus an attempt to seek continuity across my research and development activities around various countries up until that time and to distill from it some conclusions that might inform future directions for international agricultural research and development.

The citation from the higher doctorate read:

'to John Lindsay Falvey who, from 30 years' research combining technical, social, environmental, policy and historical research in the developing world, challenged the simple importing of agricultural technology. He demonstrated that indigenous knowledge and culture is critical to sustainability, food security and human development, thereby potentially benefitting millions of persons participating in international development projects.'

The citation is both an exaggeration and an understatement. It may or may not have assisted millions of persons – how can anyone know. But in another sense, the work revealed the lost element of wholeness that once characterized good science, good lives and wisdom. The information presented here is snippets from papers and books that strive to make that revelation explicit. Its partial prototype benefitted in presentation and explication from my colleagues who formed the panel for the higher doctorate deliberations, Professors David Chapman, Adrian Egan and Robert White.

The original D.Agr.Sc. compilation ran to about 1,400 pages derived from 53 selected publications. I had judged the many publications excluded from the collation to be repetitive, less relevant to the theme being developed, or just not of a quality worth including. That collation was completed in the early 2000s. Since then my thoughts have continued to develop along the same directions and to further inform deeper conclusions. Those more developed thoughts are also included here in the form of extracts from two more recent books.

The product might be seen as a vanity publication since I am only using my own work. Be that as it may, the purpose of the original publications remains and is contextualized by my later work. The D.Agr.Sc. collation pointed out that much of third-world research is a mirror image of Western research, irrespective of different cultural and worldviews. Such ignorance of the roles of culture and tradition, let alone different values, has negated much effort by very bright persons – many of whom I have had the privilege to work with. My later work indicates that a failure to see life in its integrated whole produces chaotic results, in agricultural science as in all human endeavours. This too may be regarded as self-righteous vanity. I don't think it is.

And lest less informed readers mistake authorship for self-citing, it may be worth noting that the publications included herein contain some 2,750 references to other papers as is the nature of all intellectual pursuit. We do nothing alone; no one ever has a truly original thought. Whether or not it is a vanity publication, it may assist in conveying what seems to be a difficult concept for many modern scientists to grasp. That is: depth in scientific understanding must partner breadth or else the parts that are assumed to make up the whole will in fact undermine holism. The latter publications of this book present this in a cultural context, simply because that is my training and

experience; there are also many other ways to express this but the essence is the same. It is a pertinent message in an era that rewards technology over scientific understanding and then mistakes technical advice for holistic understanding.

As the first collation followed tradition in being dedicated to my family and those with whom I had worked through those decades, this book may now be dedicated to a different group. I hereby dedicate it to the farmers of the world, all of them, small more than large for they feed more of us. It is farmers, by using technology, that created the leisure that supports civilization with its complex structure and opportunities. As writing is one of the great legacies of civilization, it is only fitting that writing should repay its debt to agriculture by correcting misconceptions about food production today. I say this to counter modern bourgeois conceit, such as assumptions that food will always be available. That is why this book notes, as I now see after 40 years of observation and reflection, that neglect of food production always leads to societies failing.

The book may be summarized by a paraphrase of the earlier collation, as follows. *Forty years of research and development reveals means by which the efficiency of international aid may be increased, which is by integration of common reductionist approaches of agricultural science into the multi-disciplinary context of international agricultural development. Thus integration of technical, social, environmental, policy and historical research in the poorer countries of the world and in particular Southeast Asia generates new knowledge simply as a product of that integration. This reveals that routine practices of extending agricultural aid and research for development are self-defeating if they are based only on transplanting of research approaches from more-developed countries. Specific research in Thailand is used to relate across disciplines and finds a common base with traditional worldviews of integrated life. From the interaction between technological research and religion (for want of a better word to describe worldviews and beliefs that guide life among*

most peoples) a polemic emerges that highlights ineffectual and hypocritical approaches. While long debased, such single-focus approaches continue to consume excessive resources in international development for little benefit and oftentimes much harm.

Jonathan Swift captured part of the story when he gave his opinion of the agricultural scientist – be he farmer, government official or private sector employee – in the words: *that whosoever could make two ears of corn or two blades of grass to grow upon a spot of ground where only one grew before, would deserve better of mankind, and do more essential service to his country, than the whole race of politicians put together.*

To ‘politicians’ one might add today ‘uninformed administrators’, for much that is known is not being applied, and by not applying it unnecessary deaths and suffering are caused. I have learned that, in international development, securing basic food for survival comes first. In doing that, agricultural science remains the noblest of the arts.

The storyline of this book might be said to be the awakening of a scientist, or even the beginning of wisdom. It opens with technological research, some quite simple, and moves on to gradually accommodate wider contextual factors and then integrates them into the research itself. I can now see that such learning did not occur from the routine linear processes of modern science degrees. Rather it is a product of an integrative approach to agricultural science as a foundation on which time for reflection allowed personal understanding to develop – surely one of the most appealing of the many rewards of well-learned agricultural science. Reflection for me was initially restricted not by time as many may claim, but by my limited experience. With gradual expansion of geographical and socio-cultural experience, I eventually was able to consciously bring together apparently unrelated aspects of my eclectic life

by considering non-rational thought and spiritual insight in the same reflections about agriculture and science.

One result is this book. The process can be traced through its Chapters. What the words cannot portray is that the process is also a personal discovery of the purpose of life. This is alluded to in another document about my life - *an Open letter to Lindsay at 60* - where I also observe that my biochemical training provided a means of discovering the complex interrelationships of life and its purpose. As I consider the papers and books that make up this volume, I see them saying the same thing in a different language - one spoken by an even smaller group, many of whom I know have similar experiences. It has been a great privilege to work in the field of agriculture, to mix with highly intelligent minds often unfettered by conventional education, to be able to enjoy the essential best of the city and the country in dozens of countries, and to now be able to discern a thread throughout my professional life as if it was a sutra. Thus this work may be seen as:

a sutra from my professional life.

Lindsay Falvey
2011

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As in the earlier collation: *I am pleased to acknowledge my debt to many organizations and persons for their support of, and advice on, the research presented in this collation. The early work in the Northern Territory of Australia was supported by the Northern Territory Administration, which at that time was part of the national Australian Government. The research conducted in Thailand from 1976 to 1980 was supported by the Australian Development Assistance Agency and the Royal Thai Department of Public Welfare in conjunction with Chiang Mai University; it was also supported intellectually through the University of Sydney and the University of Queensland. The research associated with specific non-technical studies in Thailand was supported in different ways by the University of Melbourne, Kasetsart University, Cornell University, Stanford University, MPW Australia and the Royal Siam Society. Subsequent research on global policy issues was variously supported by projects that were ultimately funded through United Nations and aid sources. Agricultural education research was supported by the Rural Industries Research and Development Council, the Victorian Education Foundation, and one of my residencies at the Rockefeller Foundation at Bellagio, and the contextual studies were supported in part by the International Development Fund of the Institute for International Development. My research has benefited from diverse and generous funding over a sustained period and this has been a significant factor in its successful completion.'* The two more recent books were supported by Clare Hall at the University of Cambridge, the University of Melbourne, the Rockefeller Foundation and Thaksin University. And in the tradition of past scientists, I have also supported my own work when others would not. Where my research was conducted in collaboration with others, I have mentioned this in the appropriate text. Rather than falling into false modesty by naming names for inspiration, let me simply say that I do not consider that I, or any other person, is unique. As the work herein reveals, everything is affected by every other thing, which includes our thoughts. If there is merit in these papers and books, it belongs to everyone whom I have ever met, or read or heard about.

JLF

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The Ten Chapters of this Work are interrelated in terms of approach and thematic continuity. In terms of approach, the work presented in each chapter has focused on knowledge gaps in a development situation as a basis for either designing an experimental device to generate that knowledge, or for researching other disciplines for contributions to agricultural science. In terms of thematic continuity, the thesis that we need a different concept of agricultural research for development, as introduced in Chapter 2, unites the collation tested in the elements of the succeeding sections; the technical research of Chapter 3 links to that concerning Thai agriculture in Chapter 4 through geographical application of research approaches developed in the earlier Australian work; this in turn forms a detailed subset of the topics considered in Chapter 5 in the framework of international agriculture. Both of these latter themes informed research into the origins, objectives, activities and deficiencies of agricultural education as examined in the work that forms Chapter 6, particularly in terms of its narrow perspective in the face of international issues and the realities of international exchange of information, technologies and commodities. The discussion of Chapter 7 addresses the thesis of Chapter 2 through papers that embrace hitherto neglected factors of agricultural science, especially intangible human value systems by using agricultural sustainability as a subject for examination. Chapter 8 considers sustainability in terms of Religion and Agriculture by tracing the origins of agricultural metaphor in spiritual development and non-rational insights derived from spiritual experience. This widened approach is then applied in an international development example in Chapter 9 in describing how Small Farmers Secure Food. Following this unusual path through agricultural science produces insights that are summarized in Chapter 10.

Chapter 1

Introduction

The research and discussion that follows has been conducted over 40 years around related themes. Rather than present it as a chronological log that leads the reader through each experiment and argument towards a narrow conclusion, the context is here presented first. In so doing it also refers to some more recent work. From this construct, work from different periods is then presented as either a demonstration of, or a challenge to, many institutional approaches to international development and research.

The compilation is inter-disciplinary, and while centred on the essence of agricultural science understanding, it is difficult to explicate within historical definitions of disciplines. This may apply even to emerging cross-disciplinary fields such as systems research. Nevertheless, it is an area that engages many persons who started in the technical integrative sciences of agriculture. Such persons have until recently been engaged variously in universities, international development agencies and non-government organizations. This point is introduced here in order that the reader may discern the intention to trace a personal developmental theme through a career. For it is clear that the 21 year old who initiated niche technical research projects in tropical Australia knew little of what the 61 year old writes today.

This book includes contributions to the five general themes that formed the D.Agr.Sc. collation for work over 30-odd years; these themes were:

- interdisciplinary considerations including non-tangible human values,

- the agricultural production environment,
- agriculture in Thailand,
- international agriculture, and
- agricultural education.

The themes are inter-related, as explained in the introductions to each section, and are presented under the umbrella of the contextual summary and are developed in the light of the work in the concluding chapter, which is the culmination of the discovery process. Notwithstanding this comment, each chapter includes contributions to agricultural science at the time it was conducted. Added to these are two chapters that unite these thoughts in more cohesive ways, which are the themes of:

- man's overall nature in relation to food production as contained in the book *Religion and Agriculture*, and
- a polemical concern about the marginal roles allocated to ensuring real food security and to nurturing small farmers, as presented in the book *Small Farmers Secure Food*.

Thus the ten chapters include the original seven (Chapters 1 to 7) followed by these last two and a conclusion. The original chapters are enhanced by the addition of reflective sections to link to the final chapter. They may be introduced as follows:

Chapter 1 is this introductory overview.

Chapter 2 is a scene-setting summary in which the overall context is defined for a broader understanding of agricultural science knowledge. In essence this is as follows. Inefficiencies in the conduct of field research and development are the result of inadequate cross-disciplinary considerations, from conception to execution of field activities, particularly in Asia, but also in more-developed countries. It is postulated that social science should be more comprehensively emphasized than is common within agricultural science. While this may seem akin to

farming-systems research approaches, it takes an even wider perspective to include non-tangible human-environmental interactions and ancient value systems. The thesis that international agricultural development has been less effective than predicted, and in some cases detrimental to poor rural communities, has emerged from technical, historical, social, environmental, political and educational research. The evolution from routine technical work through integrative understanding is rounded-off with a broad consideration of human-ness expressed through traditions including religion to inform reasons for some institutionally entrenched erroneous views and actions.

Chapter 3 presents conventional approaches to field agricultural science as developed in Western cultures. Sometimes employing innovative techniques, this group of research activities provides examples of defining an environment, its constraints and means of measuring improvements in agricultural production, usually using grazing animals as the indicator. This work, which was conducted in the Northern Territory of Australia and in northern Thailand, demonstrated the value of such approaches in general. It also highlighted the greater acceptability of technical research with minimal sociological consideration to the Australian than to the Thai situation. Beginning as an observation that was then tested in the field, this led to challenging the approach of conducting technical field research in isolation from each particular human environment. Notwithstanding this crucial drawback, contributions to technical knowledge resulting from this research included; range management research techniques, identification of nutrient deficiencies and demonstration of the superior potential of indigenous domestic Asian animals within the physical and human environment.

Chapter 4 develops the important result that definition of the overall context in which agriculture is practiced provides the

real basis for research and development. It further tests the thesis through a large-scale review of existing knowledge concerning agriculture in Thailand. This was collated in the book, *Thai Agriculture: Golden Cradle of Millennia*, a 460 page book resulting from examination of nearly 1,000 references in both Thai and English languages. This book was considered the leading document on the subject and stimulated learned discussion. Proceeding on the thesis that the historical origins which have shaped the Thai agricultural culture may allow apparently conflicting actions to be explained, the research linked historical, political, economic, social, technical, and cultural factors to ultimately reveal a form of agriculture that differed from that derived from the assumptions of the agricultural research and development approaches of Western-influenced persons. The latter included the worldviews of Thai scientists educated in Western approaches. These findings challenged mainstream approaches to research, particularly with respect to small farmers. My evolving understanding informed further consideration of these issues in international agricultural fora.

Chapter 5 follows this awakening by considering some major issues within international agriculture. It examines them for consistency with an emerging conviction that current approaches, while technically sound, contained elements of their own ineffectiveness. With long hindsight, this might perhaps be better labeled as the ‘self-limiting conclusions of technical research’. The work reported in this Chapter included hundreds of reports for development agencies that are not included in this collation, and also papers derived from that work that were ultimately published. It includes country-specific analyses in situations where no previous data existed, sections from a book (*Smallholder Dairying in the Tropics*) jointly edited with friend and colleague Charan Chantalakhana that challenged a widespread policy concerning dairying in less-developed countries, and an important paper that linked

historical elements to agricultural development knowledge across Asia. When considered in conjunction with the knowledge developed in the previous two Chapters, this research may be seen to have contributed to agricultural science in the developing world. This was in the form of a heightened awareness of the role of extant practices being at odds with policies for international agricultural research copied from more-developed cultures.

Chapter 6 expands the observation that the inapplicability of the standard Western development model to less-developed countries extended to many elite agricultural scientists from those countries who had been trained in the West. This led to a widening of research into agricultural education. Seen as being of declining efficiency in meeting even the needs of the more-developed countries, agricultural education was examined in terms of its origins, current trends and scope for modification in both more- and less-developed countries. This work included surveys, historical research and global data collection that culminated in some of the papers included here, and in particular, the book *Food Environment Education: Agricultural Education in Natural Resource Management*. The research concluded that agricultural education and research could not be considered separate from natural resource management concepts, and in fact was a subset of that under-developed disciplinary grouping. This work was conducted before that reported in Chapters 4 and 5, and consequently did not develop the theme of wider human values beyond a contextual consideration in the book. In confirming the benefits of integrative agricultural education and research, the work also challenged institutional dogma that poor country agriculture was inefficient, and showed its effectiveness when properly analyzed in socioeconomic terms.

Chapter 7 widens consideration of such neglected aspects of agricultural development as sustainable subsistence farming or

smallholder self-sufficiency as a national policy, and religious traditions related to agriculture. This links to the applied agricultural ethics introduced for the case of Thailand. Using the popular notion of ‘sustainability’ its elusive quality is developed from extracts from the book *Sustainability - Elusive or Illusion: Wise Environmental Intervention*. Further research sought to relate modern technological approaches to ancient wisdom within an Asian paradigm, and concluded that while agriculture originated with and probably was causal to the refinement of two forms of knowledge, the rational deductive form has since been pursued in earnest in most science, while experiential knowledge had been neglected. However, the very fact that such a conclusion arises within the agricultural science tradition suggests that, over time, the applied science paradigm may yet account for diverse human values. The Chapter concludes with a discussion of the apparent conflict between science and traditional value systems, and contrary to popular opinion, finds the continuing evolution of applied science as probably the best basis for continued sustainable development, provided it continually challenges its underlying assumptions, and surmounts its enchantment with technology.

Chapter 8, which was not in the original collation, develops the theme of unacknowledged motivations in science as in other aspects of life, by considering sustainability in non-conventional terms. Using extracts from the book, *Religion and Agriculture: Sustainability in Christianity and Buddhism*, notions of sustainability are traced to underlying human fear of death. Popular ascriptions of religious teachings to sustainability are similarly challenged, together with the Western-derived assertion that Buddhism is more environmentally aware than Christianity. The book also dealt with spiritual aspects of religion and life and as such provided a development of the theme of knowledge both by modern empirical means as well as traditional experiential approaches by persons who dedicate themselves to understanding and calming their minds. From

such an approach, though largely rejected by the current dominant culture, a wider knowledge base arises that offers insights often precluded from routine institutional actions.

Chapter 9 similarly postdates the original collation and continues the theme of responsible agricultural science in the international arena. It is based on extracts from a book *Small Farmers Secure Food: Survival Food Security, the World's Kitchen & the Crucial Role of Small Farmers*, which dwells on two subjects that, with the benefit of experience and mental distance, may be seen as critical to the future of material human wellbeing. The first is real food security, which is defined as having enough food to survive. This is a primary responsibility of good governance. It is contrasted with institutional definitions that are confused with other social engineering and environmental objectives that may be useful in their own right but compromise real food security. The second subject is the critical role of small (a hectare or two each) farmers in world food production and their precarious survival in the face of prevailing development agency attitudes. Both policies to reduce the number of small farmers and the contingent effects of other policies and actions belie a separation of funding agency personnel from the reality that small farmers feed up to half the world and usually at levels of efficiency higher than possible from broadacre production systems. The book foresees aspects of the future for global food production and highlights issues already confronting humanity.

Chapter 10 brings these disparate stands together under the overall theme of the limitations of technical research and the self-creation of unnecessary problems in food for the world. It concludes that the earlier applied technical research produced some financially beneficial outcomes, albeit of varying sustainability. More satisfying however, is the progression in understanding that traditional agricultural systems seem to be sustainable in proportion to their sensitivity of the natural

environment. This widened vision reveals that international agricultural research, education and development largely ignore such knowledge despite their sometimes spectacular short term successes. These conclusions arose within the context that insight into our understanding of the world and ourselves guides real development. Science and non-rational understanding both serve such development although both are often compromised in technology-dominated development practice.

An Appendix then presents a more complete list of books and other publications, most of which are not mentioned in the discussions in this book.

The work covers the breadth of agricultural science, including the complexity of systems that necessarily involve human dimensions. As a consequence, the chronology of the presented work also reflects the emergence of an understanding with experience, as the early technical papers gradually gave way to social and economic considerations, which in turn generated an interest in global and philosophical approaches to agricultural science. The work presented has made specific contributions to knowledge in its application in the tropics of Australia and Thailand, and in educational and international policy. However, its greater contribution is to international agricultural research and development where incorporation of understanding of local cultures, traditions and belief systems allows a large potential increase in effectiveness. Even more significant is that the evolution of this work has guided a development of understanding far beyond conventional agricultural science. It has made 'unscientific' approaches, ranging from Permaculture to Steiner's biodynamic legacy, interesting without compromising that gem of the human mind – the scientific method and its assumption that we cannot trust our own senses and logic. It is the same outcome in the wisdom

of sages from various cultures and traditions, expressed millennia ago.

The following selections from the diverse work represent the thesis discussed above. As most of the early work has been oriented to development in the tropics and less-developed countries, the range of journals available for publication has been restricted; nevertheless, where possible, acceptable journals were found. A consolidated list of publications included herein is presented below; a more comprehensive list of publications is included as an appendix.

Numbered List of Papers Included in this Collation

1. Falvey, L., (1974) Effect of mowing frequency and height on Townsville Stylo (Stylosanthes humilis) pastures on cleared on Blain soil. *Tropical Agric.* 2:143-147.
2. Falvey, L., and Bainbridge, M.H. (1975) The effect of anthelmintic treatment on the liveweight Brahman-Shorthorn cross steers in the Northern Territory in Australia. *Tropical Grasslands* 9:83-91.
3. Falvey, L., and Woolley Anne. (1974) Losses from cattle faeces during chemical analysis. *Australian J. of Experimental Agriculture & Anim. Husb.* 14:716-719.
4. Falvey, L. (1976) Field losses of nitrogen from cattle faeces. *Australian Journal of Experimental Agriculture and Animal Husbandry* 16:808-809.
5. Falvey, L. (1976) The effect of Leucaena leucocephala on cattle in the Northern Territory. *Australian Veterinary Journal* 50:243.
6. Falvey, L. and Ross, A.J. (1980) Leucaena leucocephala as a protein supplement. *Journal of the Australian Institute of Agricultural Science* 46:196.
7. Falvey, L. (1976) Productivity of Leucaena leucocephala in the Daly Basin, Northern Territory. *Tropical Grasslands* 10:117-122.)
8. Falvey, J.L. (1977) Dry season re-growth of six forage species following wild fire. *Journal of Range Management* 30:37-39.
9. Falvey, L. (1977) Response of steers to dry seasons supplementation on improved pastures. *Australian J. of Experimental Agriculture & Anim. Husb.* 17:724-727.
10. Falvey, L. (1979) Establishment of two Stylosanthes species in a Urochloa mosambicensis dominant sward in the Daly River Basin. *Journal of the Australian Institute of Agricultural Science* 45:69-71.
11. Falvey, L. (1979) Crude protein percentage of the diet and liveweight changes of steers on improved pastures. *J. of Aust. Institute of Agricultural Science* 45:267-268.
12. Falvey, L. and Andrews, A. (1979) Improved pastures in the Thai highlands. *Tropical Grasslands* 13:154-156.
13. Falvey, J.L. and Hengmichai, P. (1979) Invasion of Imperata cylindrica (L.) Beauv. by Eupatorium species in Northern Thailand. *J. Range Management* 32 (5):340-344.
14. Falvey, J.L. (1981) Imperata cylindrica and animal production in South East Asia: A Review. *Tropical Grasslands* 15: 52-56.
15. Falvey, J.L. (1985) Thai highland cattle nutrition studies. *World Animal Review* 54:42-46.

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17. Falvey, J.L. and Andrews, A.C. (1982) Studies on improved pastures in the Northern Thai Highlands. *Tropical Grasslands* 16:83-86.
18. Falvey, J.L. (1982) *Gliricidia maculata* - A review. *The International Tree Crops Journal*. 2:1-14.
19. Falvey, J.L. (1982) The effect of infrequent administration of urea on rumen ammonia and serum urea levels of cattle consuming rice straw. *Tropical Animal Production* 7: 209-212.
20. Falvey, J.L. (1981) Research on native pigs in Thailand. *World Animal Review* 38:16-22.
21. Falvey, J.L. (1979) Sacrifices involving large livestock in the northern Thailand highlands. *The Journal of Developing Areas* 13:275-282.
22. Falvey, L. (1982) Some economic aspects of the livestock industry in the highlands of north Thailand. *The Journal of Tropical Geography* 49:11-18.
23. Falvey, L. (2000) Thai Livestock Industries: Assuring Quality. Proceedings of the Scientific Program of the 2nd Northern Agricultural Fair in Honour of His Majesty the King's Sixth Cycle, held December 1999 at Chiang Mai University, Thailand.
24. Falvey, L. (2000) The Role of Smallholders in Thai Agricultural Development. *Kasetsart Journal of Social Science* 21: 199-213.
25. Falvey, L. (2000) Early Origins of Agriculture in Thailand. *Asian Agri-History Journal* 5: 23-28.
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29. Falvey, L. (2001) Sustainable Technologies in Thai Agriculture. *Academy of Technological Sciences and Engineering, Focus* 115: 2-5.
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32. Falvey, J.L. (1992) Livestock Development Assistance: Australia's Experience. Paper presented to the Sixth Congress of the Asian-Australasian Association of Animal Production, held in Bangkok, November 1992.
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38. Falvey, L. (2001) Global Development Forces on Agriculture and the Environment. Keynote Presentation at the Regional Science-Policy Conference 'Global Change and Sustainable Development in Southeast Asia', Chiang Mai, Thailand, February.
39. Falvey, L. (2001) Re-conceiving Food Security and Environmental Protection. Keynote Lecture, Asian Agriculture Congress Organised by the Combined 9th Congress of the Soc. for the Advancement of Breeding Researchers in Asia and Oceania, the 4th Conference of the Asian Crop Science Association, and the 16th Conference of the Federation of Crop Science Societies of the Philippines, Westin Philippine Plaza, Manila, 24-27 April. Re-presented at SEARCA Conference 'Food Security and Environmental Protection for the 21st Century', Los Banos, April 26.
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44. Falvey, L. (1997) Food and Environmental Science. *Australian Science Teachers Journal* 43(3): 7-14.
45. Falvey, L. and Matthews, B. (1999) Stakeholder Views on Agricultural Education in Australia. *Journal of International Agricultural and Extension Education* 6 (1): 23-35
46. Matthews, B. and Falvey, L. (1999) Year 10 Student Perceptions of Agricultural Careers. *Journal of International Agricultural and Extension Education* 6 (1): 55-67.
47. Falvey, L. (1998) Are Faculties of Agriculture Still Necessary? *Australian Academy of Technological Sciences and Engineering, Focus* 103:2-8
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52. Falvey, L. (2003) Agri-History and Sustainable Agriculture: A Consideration of Technology and Ancient Wisdom. *Asian Agri-History Journal* 7(4): 279-294
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56. Falvey, L. (2005) Religion and Agriculture: Sustainability in Christianity and Buddhism. 350pp. Institute for International Development, Adelaide.
57. Falvey, L. (2010) *Small Farmers Secure Food: Survival Food Security, the World's Kitchen & the Crucial Role of Small Farmers*. 232pp. TSU Press, Songkhla.

Chapter 2

A Different Concept of Agricultural Research for Development: Contextual Summary

This Chapter describes a different conception of agricultural research and development as it has arisen from the work itself. That conception provides the framework for a continuity of revelation in the presentation of this research, even though individual pieces of research also produced their own specific results. The conception includes aspects of human knowledge that are usually omitted in reductionist research approaches that seek technical innovations for a modern society unconnected to agriculture. That wider conception opens a window on agriculture in societies where agriculture is integrated with everyday life for the majority of a population – a window that remains shuttered to narrow rational and technical approaches. It is now past time, according to this conception of the profession, to move beyond the quick financial benefits of technological and social engineering orientations as is still practiced in major agencies providing international development assistance.

The usually unquestioned thesis – that conventional Western approaches of agricultural research and development must apply in less-developed countries – is tested in the following Chapters and is found to be invalid. This does not mean that the manifold technical innovations do not produce potential financial results. They do. Rather it means that the worldviews of different individuals introduce different values to the outcomes of innovation. The social and environmental interrelationships of the small farmer form a worldview more integrated than a technologist from the middle-class West, and

the small farmer's agriculture fulfils a role distinctly different from that in more-developed countries.

Cultural and religious beliefs are sometimes used to explain this difference, which has become apparent with the experience of international development. The work presented here includes not only such beliefs, but also psychological elements that may well be that described in spiritual terms by others (Chapter 8 concerns this idea). From this approach, a conventional conclusion might be that there are benefits in cross-disciplinary research in international agricultural development, which is undoubtedly true. However, there is much more of value than that somewhat conventional interpretation, including insights into re-emerging values in Western culture on land and place, and personal integrity in its real sense. With such a perspective, what are often considered to be unproductive elements in farming be they aboriginal spirituality, psychological health or landscape values find a place that makes economics in its full guise workable.

There is no intention to denigrate the great contributions of agricultural science, which remain extremely significant in practical spheres as a function of the profession's biologically-integrative understanding of the natural environment including all life forms. This has to varying extents ensured a link to the social sciences, although sometimes tenuously and often restricted to applied aspects of economics and sociology. In recent decades, one advance from the conventional biologically-integrated approach of agricultural science has been farming-systems research as a discipline. This is a very productive approach, and one that has fed current enthusiasm for modeling, which is itself again an illustration of the proclivity of the conventional approach to defining technical components of a system to the exclusion of intangibles. By contrast, the work presented here takes a much wider approach comprising non-

tangible human-environmental interactions including ancient value systems as they apply at policy level.

Policies related to agriculture are usually influenced by international actions and plans concerning such matters as food aid, improved protection of the natural environment, and adherence to a particular concept of agricultural sustainability. Consideration of such policy matters can be illustrated by example; the value systems in Thailand as presented in Chapter 4 suggest that Western-influenced policies for agricultural development lead to conflict with Asian self-sufficiency approaches. Yet those local approaches, in some cases enshrined with religious authority, have demonstrated millennia-long sustainability.

So it is not possible to simply slot conclusions from the work presented in these pages into the great body of work detailing technical advancement. It provides a distinctly different understanding of agricultural development to that experienced in Western countries, which is often the basis of international development policy. An incidental product of this wider approach may be the highlighting of deficiencies in claims about agricultural sustainability, many of which appear to have been informed by politics more than research or policy.

Realists accept the overriding interests of politics for civilized living, but the skewing of research interpretations to claim sustainable outcomes to meet political fashions is anathema to science. The need for integrity is even greater when it is considered that political forces govern funding for much agricultural research related to everyday food basics for most of the world. A broader perspective of agriculture cannot fail to reveal it as a human manipulation of an ecosystem that is inherently unstable and ipso facto unsustainable except by continuous human intervention with its diverse concomitant effects on the wider environment. The continual human

intervention of modern agriculture is informed by agricultural research, such that – as quipped in one of the papers referred to herein – the only thing sustained in the approach is research itself. This is not necessarily a negative statement. All species impact on their environment and this is the way that humans do, although sometimes to excess. Where long-held cultural values are abandoned and no guide for ethical action exists, redefinition of such concepts as sustainability emerge. Thus the work in traditional communities informs the overall approach of agricultural science. That is why replacing an agricultural system that had sustained a medium density population for centuries with one reliant on continuous agricultural research to address each unforeseen problem as it arises can actually reduce social and/or environmental sustainability. And that cannot be seen as ‘sustainable agriculture’.

The common incidental dismissal of the traditional values that are part of extant sustainable systems forms the crux of this book. As the succeeding Chapters reveal this work leads to the suggestion that our agricultural research and development approaches have omitted essential human values that are critical to sustainable agriculture. Examination of technological approaches and ancient wisdom within an Asian paradigm, as is presented in more detail in Chapters 7 and 8, indicates that while agriculture originated with and probably, was causal to, the refinement of human knowledge in both its experiential and rational forms, the former has been made subservient to the latter. This leads to an ever-narrowing perspective on nature, the environment, the cosmos or whatever universal term is invoked. This theme is revisited in Chapter 9, which shows how partial economic analyses used to justify politically expedient programs can work to the detriment of those ostensibly being helped. It is not indulging in hyperbole to say that some development assistance may have increased starvation, substituted sustainable with unsustainable food production systems and accelerated environmental decline. That conclusion

does not mean accepting scientism or claiming ‘green’ superiority without a sound educational and scientific background, or seeking to reinstate the imaginary noble peasant. The difference is that the conclusions here are derived from the practice of and reflection on science, a tested faith in the scientific method as a means of overcoming our imperfect powers of deduction and induction and an openness to other learning across the ages. Thus this book contains spiritual and technical insights side by side – as they should be for an integrated understanding of humans, humanness and essentials of life, like food.

Some persons seem to find it difficult to reconcile such diverse considerations. Perhaps they might find it beneficial not to consider the issues raised in this collation as a criticism of agricultural science *per se*, but as a failure to adhere to the scientific method, to speak out against uninformed policy and to look outside one’s technical field, one’s niche within a culture and one’s assumptions of spiritual insights.

Within this contextual overview, the next Chapter begins consideration of specific papers from the early 1970s with a focus on conventional agricultural research following its usual technological approach.

Chapter 3

Technological Support to Development

Overview

The primarily reductionist approach of agricultural research is considered in this section by using examples selected from research in Australia and Thailand. The research includes innovative research techniques and produced its own minor contributions to agricultural science. However, its main contribution was to stimulate a wider perspective on the dynamics of agricultural systems. Two specific contributions to knowledge at that time were the development of field collection techniques for approximation of cattle protein intake under extensive rangeland conditions, and proving the viability of broad-scale improved pastures including tree legumes as protein supplements in tropical Australia. In transferring this research approach to a remote region of Thailand, where it seemed clear that traditional reliance on indigenous vegetation would continue for the future then foreseeable, research was oriented to improving cattle productivity from this feed base. The ensuing research culminated in the discovery of sodium deficiency in some areas, remediation of which provided a larger increase in productivity than other interventions. It was also shown that apparently wasteful traditional practices including animal sacrifice, contributed a higher value to the tribal production systems than would have sale of the animals concerned.

Numbered list of papers included in Chapter 3

1. Falvey, L., (1974) Effect of mowing frequency and height on Townsville Stylo (*Stylosanthes humilis*) pastures on cleared on Blain soil. Tropical Agriculture 2:143-147.

2. Falvey, L., and Bainbridge, M.H. (1975) The effect of anthelmintic treatment on the liveweight Brahman-Shorthorn cross steers in the Northern Territory in Australia. *Tropical Anim. Health & Prod.* 7:124.
3. Falvey, L., and Woolley Anne. (1974) Losses from cattle faeces during chemical analysis. *Australian Journal of Experimental Agriculture and Animal Husbandry* 14:716-719.
4. Falvey, L. (1976) Field losses of nitrogen from cattle faeces. *Australian Journal of Experimental Agriculture and Animal Husbandry* 16:808-809.
5. Falvey, L. (1976) The effect of Leucaena leucocephala on cattle in the Northern Territory. *Australian Veterinary Journal* 50:243.
6. Falvey, L. and Ross, A.J. (1980) Leucaena leucocephala as a protein supplement. *J. of the Australian Institute of Agricultural Science* 46:196.
7. Falvey, L. (1976) Productivity of Leucaena leucocephala in the Daly Basin, Northern Territory. *Tropical Grasslands* 10:117-122.
8. Falvey, J.L. (1977) Dry season re-growth of six forage species following wild fire. *Journal of Range Management* 30:37-39.
9. Falvey, L. (1977) Response of steers to dry seasons supplementation on improved pastures. *Australian Journal of Experimental Agriculture and Animal Husbandry* 17:724-727.
10. Falvey, L. (1979) Establishment of two Stylosanthes species in a Urochloa mosambicensis dominant Sward in the Daly River Basin. *Journal of the Australian Institute of Agricultural Science* 45:69-71.
11. Falvey, L. (1979) Crude protein percentage of the diet and liveweight changes of steers on improved pastures. *Journal of the Australian Institute of Agricultural Science* 45:267-268.
12. Falvey, L. and Andrews, A. (1979) Improved pastures in the Thai highlands. *Tropical Grasslands* 13:154-156.
13. Falvey, J.L. and Hengmichai, P. (1979) Invasion of Imperata cylindrica (L.) Beauv. by Eupatorium species in Northern Thailand. *Journal of Range Management* 32 (5):340-344.
14. Falvey, J.L. (1981) Imperata cylindrica and animal production in South East Asia: A Review. *Tropical Grasslands* 15: 52-56.
15. Falvey, J.L. (1985) Thai highland cattle nutrition studies. *World Animal Review* 54:42-46.
16. Falvey, J.L., Gibson, T.A. and Andrews, A.C. (1981) Animal production from improved pastures in the Thai Highlands. *World Animal Review* 49: 13-18.
17. Falvey, J.L. and Andrews, A.C. (1982) Studies on improved pastures in the Northern Thai Highlands. *Tropical Grasslands* 16:83-86.
18. Falvey, J.L. (1982) Gliciridia maculata - A review. *The International Tree Crops Journal.* 2:1-14.
19. Falvey, J.L. (1982) The effect of infrequent administration of urea on rumen ammonia and serum urea levels of cattle consuming rice straw. *Tropical Animal Production* 7:209-212.

20. Falvey, J.L. (1981) Research on native pigs in Thailand. *World Animal Review* 38:16-22.
21. Falvey, J.L. (1979) Sacrifices involving large livestock in the northern Thailand highlands. *The Journal of Developing Areas* 13:275-282.
22. Falvey, L. (1982) Some economic aspects of the livestock industry in the highlands of north Thailand. *The Journal of Tropical Geography* 49:11-18.

Discussion

The research conducted in the ‘Top End’ of the Australia’s Northern Territory and the highlands of northern Thailand shared a common approach, representing the norms of agricultural research and development in that era. At the time the work was conducted in the Northern Territory, research in tropical Australia was developing its approaches mainly through work conducted in Queensland. The applicability of these approaches to the different soils, demography and stage of development of the more remote Northern Territory required the adaptation of existing, and development of new, research techniques. Hence some of the early work in the Northern Territory, as also became the case in Thailand, first focused on defining the local production system and developing tools to further understand variations in field-based experiments involving cattle and pasture in extensive situations.

Each paper contains its own discussion and conclusions, which are not repeated here. Summaries, mainly taken directly from the publications themselves are presented as footnotes for more detailed information about the research. Footnotes are used to allow the flow of the main text to develop the book’s theme, which relies more on hindsight than extant conclusions. Thus an evolution in thought may be traced concerning both research approaches and personal understanding of nature.

The work in northern Australia was mainly conducted on silty and silty-clay loam soils at the Douglas Daly Experiment

Station, a remote 10,000 acre site at the junction of the Douglas and Daly rivers about a 100km from the coast, with distinct wet and dry seasons. The northern Thailand research work was largely conducted in the tropical montain climate of the highlands forming the border regions with Burma (Myanmar) on granite derived soils supporting shifting agriculturists whose activities were transforming the primary forested areas into fire-dominant grasslands and secondary forests or bamboo.

When the research began in the Northern Territory, the legume *Stylosanthes humilis* had already been introduced as an improved pasture species for cattle but there was little understanding of its management requirements. Observations of its growth in paddocks of tens of square kilometers were confounded by site, management and other variations, and by variable health constraints including helminth infestation. In addition, tools that could rapidly provide an indication of the likely primary protein deficiency in cattle diets were tedious. Accordingly the first work sought to provide an indication of the effect of grazing frequency and height on Townsville Stylo (*Stylosanthes humilis*) pastures using a simple mowing technique on plots (Publication 1).¹ Other confounding variations in the field grazing situation looked at, in conjunction with Mike Bainbridge, the effect of anthelmintic treatment on the liveweight of the common Brahman-Shorthorn cross steers in

¹ Abstract from the Original Paper: *A Townsville stylo (TS) pasture infested by annual grass species was subjected to mowing treatments for different periods at two cutting heights during the 1971/72 wet season and all to same treatment in during the 1972/73 wet season. Mowing to a height of 10 cm during the early and mid-wet season was the superior treatment with respect to TS content of the pasture both for the dry season following and the wet season of the next year. The effect of grass control seems to be related to reduced competition during the early stages of growth of TS rather than to grass seed control. The growth habits of the most important invading grass species are discussed.* Falvey, L. (1974). Effect of mowing frequency and height on Townsville Stylo (*Stylosanthes humilis*) pastures on cleared on Blain soil. *Tropical Agriculture* 2:143-147.

the region (Publication 2).² Development of a tool that could provide a reliable indication of the relative protein intake of cattle under the prevailing extensive conditions led to work with Dr Anne Woolley to determine losses from cattle faeces during chemical analysis (Publication 3).³ This developed into an applied tool for local conditions (Publication 4)⁴ that suited extensive properties of the region, and subsequently generated

² Summary from Published Research Note: *Sixty-four steers grazed on improved pastures in the Top End of the Northern Territory were subjected to one dose of tetramisole and half of them to additional 16 monthly doses. While significant weight gain differences were recorded, the intensive treatment with anthelmintics was concluded to be uneconomic.* Falvey, L., and Bainbridge, M.H. (1975). The effect of anthelmintic treatment on the liveweight of Brahman-Shorthorn cross steers in the Northern Territory in Australia. *Tropical Animal Health and Production* 7:124.

³ Abstract from the Original Paper: *The effects of drying temperature and method of sample digestion on the determination of nitrogen and dry matter in the faeces of cattle grazing pastures of two different nitrogen contents were examined. Nitrogen loss varied from 8 to 20 percent depending on the temperatures and associated length of drying time. The variation in the loss between samples from animals grazing the two pastures was small, tending to be higher for the samples taken from animals grazing a higher nitrogen pasture. Sample digestion by the H₂SO₄ - H₂O₂ method was found to be as satisfactory as the micro-Kjeldahl method. Drying at 100°C for 24 hours gave the least loss of nitrogen. This procedure in conjunction with the H₂SO₄ - H₂O₂ digestion is proposed as a routine method for determination of nitrogen in faecal material.* Falvey, L. and Woolley A. (1974). Losses from cattle faeces during chemical analysis. *Australian Journal of Experimental Agriculture and Animal Husbandry* 14:716-719.

⁴ Abstract from the Original Paper: *Nitrogen analysis of cattle faeces collected after various periods of exposure to sun and air in the field showed a decrease in nitrogen content followed by an increase. The relationship between the change in nitrogen content and time of exposure was found to be quadratic with a correlation coefficient of 0.413. The collection of faeces from the paddock for analysis is much less precise than collection direct from the animal and is not recommended.* Falvey, L. (1976). Field losses of nitrogen from cattle faeces. *Australian Journal of Experimental Agriculture and Animal Husbandry* 16:808-809.

first level information for the planning of more detailed pasture and cattle grazing experiments.

Having confirmed the primary economic nutrient deficiency for cattle to be protein, a range of potential legume pasture species were tested in the region, one of which was the tree *Leucaena leucocephala*. Pasture species research conducted to that time in the non-coastal regions of the Northern Territory had been based mainly on casual observation of small plant introduction plots. The work discussed here allowed the planting of large areas of the tree legume under a range of management systems. It facilitated measurement of; its effect on cattle in terms of hair loss from the mimosine protein component (Publication 5),⁵ its potential as a protein supplement (Publication 6)⁶ as determined from controlled metabolism trials conducted in conjunction with Tony Ross, and its contribution in an extensive and controlled field situation (Publication 7).⁷

⁵ Summary from Published Research Note: *Two comparable groups of Brahman X Shorthorn heifers, one allowed access to Leucaena leucocephala and the other not, over a period of 2.5 years were compared for behavioural and physical differences, including reproduction and thyroxin levels. It was concluded that behavioural effects associated with Leucaena may limit its utility in extensive grazing situations.* Falvey, L. (1976). The effect of Leucaena leucocephala on cattle in the Northern Territory. Australian Veterinary Journal 50:243.

⁶ Overview of the Paper: *Air-dried leaves of Leucaena were fed twice daily to steers in metabolism cages and the results confirmed other nutritional studies and suggested that with appropriate management approaches the species could provide a valuable protein source to the deficient diets of Top End cattle in the NT.* Falvey, L. and Ross, A.J. (1980). Leucaena leucocephala as a protein supplement. Journal of the Australian Institute of Agricultural Science 46:196.

⁷ Abstract from the Original Paper: *Two experiments with Leucaena at Douglas-Daly Experiment Station are reported. Grazing Leucaena under a set-stocking regime gave a slight but significant liveweight advantage over a Green Panic-Townsville Stylo pasture and a Buffel grass-Townsville Stylo pasture. Weaner heifers rotationally grazing Leucaena on 50 percent of the area in conjunction with a Townsville Stylo-grass pasture gained 16 kg more*

Although providing large production increases, the knowledge generated from the research about extensive planting of tree legumes was tempered by risk of their loss in the annual uncontrolled wildfires of the Top End. The work resurfaces periodically. Observing the critical role of fire in the environment, it seemed appropriate to also examine the dry season re-growth of forage species following wildfire (Publication 8)⁸ for reliable cattle diets post-fire as well as the alternative of providing supplementary protein, even to cattle grazing improved pastures (Publication 9).⁹ From this research

over the dry season than heifers grazing a Townsville Stylo-grass pasture only. No compensatory gain was recorded over the following wet season. This response to Leucaena was only recorded when the legume proportion of the basal pasture was low. Falvey, L. (1976). Productivity of Leucaena leucocephala in the Daly Basin, Northern Territory. Tropical Grasslands 10:117-122.

⁸ Abstract from the Original Paper: *The regrowth of three introduced perennial grasses, Buffelgrass, Pangolagrass and Sabigrass; one native perennial grass, Sehima; and two perennial legumes, Caribbean Stylo and Leucaena, after a dry season wildfire was studied in northern Australia. The native grass produced similar quantities of dry matter during the dry season but was of lower digestibility and crude protein content than all other species. Crude protein yield per hectare was highest for Sabigrass during the dry season. After the onset of the wet season the native grass produced significantly more dry matter and crude protein per hectare than all other species. Neither of the legumes provided large amounts of feed during the dry season. It is suggested that introduced grasses may be of greater value after a fire while native grasses may be superior after rains have begun.* Falvey, J.L. (1977). Dry season re-growth of six forage species following wild fire. *Journal of Range Management* 30:37-39.

⁹ Abstract from the Original Paper: *A dry season meat-and-bone supplement fed to steers grazing improved legume-based pastures in northern Australia provided a significant liveweight advantage in three out of four dry seasons. An apparent negative response was attributed to a shortage of dry matter. Analyses of blood, bone and pasture samples and correlations of liveweight change with blood and bone measurements indicated the primary response to the supplement was probably due to nitrogen. Feeding the supplement did not reduce the total time spent grazing but it did increase water consumption.*

developed a need to better understand the ease and success of the establishment of two promising *Stylosanthes* species in an improved grass (*Urochloa mosambicensis*) dominant sward (Publication 10),¹⁰ and at the same time to measure protein in the diet of cattle on these pastures (Publication 11).¹¹ This research proved applicable to commercial conditions.

The approach to defining techniques suited to that undeveloped region of northern Australia was applied five years later in northern Thailand. Some improved pasture observations that had already been made by Dr Trevor Gibson were analyzed jointly with fellow researcher Dr Alan Andrews in order to establish a basis for further work (Publication 12).¹²

The potential benefit of a protein supplement on improved pasture is discussed. Falvey, L. (1977). Response of steers to dry seasons supplementation on improved pastures. Australian Journal of Experimental Agriculture and Animal Husbandry 17:724-727.

¹⁰ Overview of the Paper: *A multi-factoral experiment of legumes in grass swards across seasons demonstrated that it is possible to do so for a Urochloa pasture in the absence of grazing although later sowing after cultivation and use of untreated legume seed produced the best results for two Stylosanthes species.* Falvey, L. (1979). Establishment of two Stylosanthes species in a Urochloa mosambicensis dominant Sward in the Daly River Basin. Journal of the Aust. Insti. of Agric. Science 45:69-71.

¹¹ Overview of the Paper: *The experiment examined the relationship between liveweight changes and the protein intake of cattle grazing two types of improved tropical pastures, with some of the cattle receiving a meat-and-bone supplement during the dry season.* Falvey, L. (1979). Crude protein percentage of the diet and liveweight changes of steers on improved pastures. Journal of the Australian Institute of Agricultural Science 45:267-268.

¹² Abstract from the Original Paper: *Improved pastures in the highlands of north Thailand were studied under grazing for more than two years. Dry matter on offer decreased with time and the most productive legumes were Desmodium intortum initially and later Macrotyloma axillare. Liveweight gains for cattle were higher than those recorded for cattle grazing native pastures. Sown grasses failed to persist and there was marked weed invasion. Some suggestions for future research are presented.* Falvey, L. and Andrews, A. (1979). Improved pastures in the Thai highlands. Tropical Grasslands 13:154-156.

It was evident that the grazing base for the local adapted cattle was the grass *Imperata cylindrica*, which was less-aggressive in this environment than the weed-oriented scientific literature concerning the grass in Australia indicated. The research began by considering invasion of *Imperata* by *Eupatorium* species (Publication 13)¹³ and proceeded to compare the role of *Imperata* as a feed-base rather than as a weed in the South East Asian region (Publication 14).¹⁴ This innovative approach challenged conventional thought on the grass, which assumed that its replacement or control should be the primary research focus.

Further and detailed research, which was not presented in the original collation, was conducted with Thai colleagues Dr

¹³ Abstract from the Original Paper: *The pattern of invasion of native Imperata cylindrica swards by Eupatorium in the highlands of northern Thailand was studied by the technique of comparing invasion at different sites of known history. Eupatorium ground cover decreased with increasing distance from the night camp of cattle. Variations in the curves between different villages was attributed to the number of years of sustained grazing each site had undergone. A more detailed study of one area showed a high correlation ($r = 0.887$) between the mean percentage of Eupatorium and the number of years of grazing, but not for average estimated stocking rate for each site. The correlation coefficient between percent Eupatorium and the product of the number of years grazing and estimated average stocking rate at each site was also high ($r = 0.894$). Some agronomic data for E. adenophorum in one area is also presented.* Falvey, J.L. and Hengmichai, P. (1979). Invasion of *Imperata cylindrica* (L.) Beauv. by *Eupatorium* species in Northern Thailand. *Journal of Range Management* 32 (5):340-344.

¹⁴ Abstract from the Original Paper: *The role of Imperata cylindrica in South East Asia is reviewed with particular respect to animal production. Imperata is a useful native species in Papua New Guinea, Indonesia, The Philippines and Thailand, where studies have indicated that it can support low levels of animal production with negligible inputs. Difference in nutritional values between countries are attributed to environmental differences and their implications for animal production are discussed. Imperata will continue to play a substantial role in South East Asian animal production despite small schemes to replace it with improved pastures.* Falvey, J.L. (1981). Imperata cylindrica and animal production in South East Asia: A Review. *Tropical Grasslands* 15: 52-56.

Choke Mikled, Khun Egachai Thanyaliptak and Khun Prakob Hengmichai and led to the discovery of a primary sodium deficiency in the diet of cattle across most of the granite-derived soils of the highlands of Thailand, Lao-PDR, Myanmar and Yunnan province of China. The research demonstrated means of producing substantial and sustained liveweight and reproductive rate gains in cattle grazing the *Imperata* dominant areas and developed these into simple practical management interventions (Publication 15).¹⁵ Through the same period, the option of introducing improved pastures was examined (Publications 16 and 17)^{16,17} by considering work conducted

¹⁵ Abstract from the Original Paper: *This article describes the results of five years research on the grazing of cattle on native pastures in the Thai highlands. Initial research showed that native cattle were capable of responding to improved nutrition and that supplementing the native grassland diet with minerals, energy and nitrogen could realize part of this potential. Research on sodium and phosphorus deficiencies was also undertaken. It was concluded that productivity can be improved by at least 30 percent through supplementation, and that grazing cattle only during day-time limits feed intake and productivity.* Falvey, J.L. (1985) Thai highland cattle nutrition studies. *World Animal Review* 54:42-46.

¹⁶ Introduction/Abstract from the Original Paper: *The highland regions of northern Thailand were the site of improved pasture research between 1972 and 1980 ... species evaluation to animal production to pasture development. The major agencies supporting this research ... [AIDAB and UN] ... have fulfilled their commitments and the time is opportune to review the results achieved.* Falvey, J.L., Gibson, T.A. and Andrews, A.C. (1981). Animal production from improved pastures in the Thai Highlands. *World Animal Review* 49: 13-18.

¹⁷ Abstract from the Original Paper: *Improved pastures in the Thai highlands were grazed at the pressures of 210 and 420 kg liveweight ha⁻¹. Half of the cattle at each grazing pressure received a monthly anthelmintic. Ingested herbage quality and quantity from oesophageal fistula samples indicated that low feed intakes may limit productivity more than low feed quality. Liveweight gains of cattle receiving anthelminic treatment and grazing at the low grazing pressure were significantly higher than those of other cattle during the wet season.* Falvey, J.L. and Andrews, A.C. (1982). Studies on improved pastures in the Northern Thai Highlands. *Tropical Grasslands* 16:83-86.

mainly by colleagues Drs Trevor Gibson and Alan Andrews. Among the opportunistic work conducted in parallel, the possibility of combining erosion control and cattle feed production by using the palatable legume tree, *Gliricidia maculata* (Publication 18)¹⁸ was considered – albeit through a review of literature more than experimentation on this occasion. The review indicates the approach: observations followed by an idea worth testing leading to information gathering through a review process before commencing experimentation.

The physiological effects of using urea as one of the possible supplements that could be offered to cattle under these conditions was found to be poorly understood in the Asian

¹⁸ Abstract from the Original [literature review] Paper: *Gliricidia maculata* (syn. *G. sepium*) is a fast-growing, leguminous, medium-sized, thornless tree which can substitute for *Leucaena leucocephala* as a source of fodder, fuelwood and green manure, in hedges and living fences, and as a shade tree in tea, coffee, and cocoa plantations. It grows in lowland areas of the tropics having mean annual temperatures of 22-30°C and rainfall of 800-1700mm, and is much easier to establish than *Leucaena*. The foliage has a crude protein content of 20-30 per cent, and recent research reviewed in this paper confirms the value of *Gliricidia* as a feed supplement for sheep and cattle. Feeding *Gliricidia* to ewes in Sri Lanka as 25 per cent of total feed led to increased voluntary intake, weight changes before lambing, percentage lambing, and survival of ewes and lambs compared with a diet consisting only of grass. Lamb growth rates were almost doubled. No further benefits were obtained by increasing *Gliricidia* to more than 25 per cent of total feed. No detrimental side effects were observed in these long term studies, even at *Gliricidia* levels of 80 per cent of total feed received over up to 2 breeding cycles. The milk production of cattle fed on *Gliricidia* was not significantly affected, although milk was tainted at *Gliricidia* levels above 50 per cent total feed. Trials in Thailand have shown that *Gliricidia* can substitute for *Leucaena* as a feed supplement with no significant differences in feed intake, and digestible dry matter, protein and fibre. Digestible energy is significantly lower, but the overall difference in feed value is small. *Gliricidia maculata* has considerable potential as a multi-purpose tree for agroforestry systems in the tropics. Falvey, J.L. (1982). *Gliricidia maculata* - A Review. The International Tree Crops Journal. 2:1-14.

environment, and two experiments (Publication 19)¹⁹ were conducted with the assistance of Khun Prakob Hengmichai and others to determine means of applying results from foreign rangeland situations to Southeast Asia, including the parts of the Thai highlands.

Using the same research approach, unquestioned ‘scientific’ opinion of the superiority of European breeds of pigs was similarly challenged. Technical research was extended to include the local fat pig breed (*Sus indicus*) as represented by Publication 20²⁰ which reviews several of the research projects conducted with Dean Ajan Theera Visitpanich to determine the distinct adaptive advantages of this breed over introduced breeds for the nutrition and management levels possible in the region at that time. This led to demonstrating practical means of

¹⁹ Abstract from the Original Paper: *Two experiments are reported in which urea was administered intrarumenally either once or twice daily to cattle consuming a diet of rice straw for 12 hours each day. Rumen fluid ammonia levels were above the suggested critical level for 5.6 and 8.3 hours in the two experiments following the single administration of urea and for a total of 8.1 hours following the split administration of urea. The benefit of urea fed as a supplement to cattle consuming low protein diets in Asia is discussed.* Falvey, J.L. (1982) The effect of infrequent administration of urea on rumen ammonia and serum urea levels of cattle consuming rice straw. *Tropical Animal Production* 7: 209-212.

²⁰ Outline of the paper: *Several experiments with the native black pig of the Asian highlands are discussed. Pigs were well adapted to their environment and were a useful base for introducing improved nutrition and health practices, producing desired products including fat more efficiently than commercial races. Technical recommendations resulting from the work included raising pigs on floored pens after treatment with anthelmintics and feeding a diet containing pigeon pea at about one percent of liveweight with boiled sweet potato or rice bran and banana stalks. Recommendations are also made about the research methodology, which from a situation of little knowledge allowed reliable information and technical recommendations to be made in a short period of time through the use of an initial survey to refine researchable problems with practical outcomes.* Falvey, J.L. (1981). *Research on Native Pigs in Thailand.* *World Animal Review* 38:16-22.

producing either lean meat or fat with minimal mortality rates. Contrary to most pig nutrition literature, fat was a primary product of pigs as the major source of oil for cooking and light in the remote highlands of the era.

In this remote, steep and road-less region, the provision of ample research funds and access to intellectual interaction through such University of Queensland supervisors as Professors Barry Norton and Ross Humphries, was a privilege – and a boon that allowed rapid definition of technical constraints to agricultural development. Indirectly, it also stimulated consideration of the influence of social factors on agriculture and the complete integration of agriculture with the lives and beliefs of tribal peoples of the highlands.

This growing appreciation of the interrelated nature of agriculture with all aspects of the simple lifestyles of the hilltribes led to socially oriented research projects concerning religious sacrifices of large livestock (Publication 21).²¹ Another paper in the same vein examine the economic significance of covert livestock movements within the micro-economy of the highlands of north Thailand, Burma and Lao-PDR (Publication

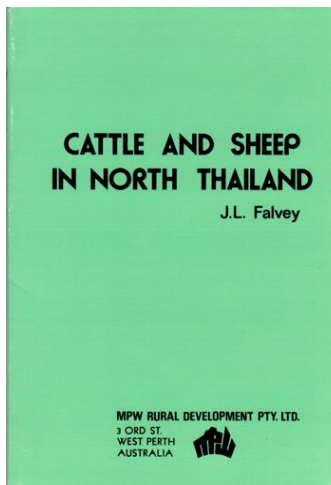
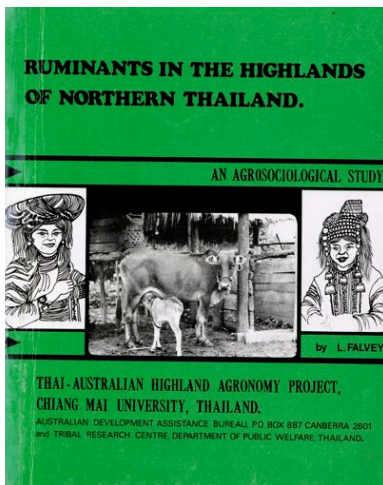
²¹ Outline of the paper: *Development agencies attempting to build up large herds of large livestock in the northern Thailand highlands have met with limited success because they have not taken into account the practice of large livestock sacrifice, which tends to inhibit the commercial success of large livestock breeding. No review of the practice has yet been prepared, perhaps because researchers of the region have been more concerned with ethnic groups than particular practices. This study brought together information available about large animal sacrifice and its implications for development in the region, including its positive elements in terms of human nutrition and health at stressful times and community cohesion as a basis for tribal survival in a harsh environment.* Falvey, J.L. (1979) Sacrifices involving large livestock in the northern Thailand highlands. *The Journal of Developing Areas* 13:275-282.

22).²² The work, conducted with colleagues in Thailand – Choke Mikled, Theera Visitpanich, Egachia Thanyalipitak, Prakob Hengmichai, Peter Hoare, Trevor Gibson, Alan Andrews and Rod Chamberlain, among others in the Thai-Australia Highland Agriculture Project – was published widely, and duplicatively. A book published about 1978 from the earlier work about cattle²³ was revised to a more technical book²⁴ in 1980; neither of these books formed part of the earlier collation. It was such findings of the importance of non-technical factors in agricultural research and development that stimulated more broadly-based research into Thai agriculture, as presented in Chapter 4.

²² Outline of the paper: *The paper provides an overall description of the highland livestock industries based on broadly-based cross-disciplinary research that commenced with a detailed and personally administered survey that garnered information on income production from livestock, sales and purchase behaviour, agistment contracts, leasing-out of working animals, pack animal contributions, and comparisons between bovines, notably buffalo and cattle. The information is then linked to other work published elsewhere about technical innovations that could benefit livestock owners in the highlands and highlights the imperative to include social considerations in development recommendations and research activities.* Falvey, L. (1982). Some economic aspects of the livestock industry in the highlands of north Thailand. *The Journal of Tropical Geography* 49:11-18.

²³ Falvey, L. (1977) *Ruminants in the Highlands of Northern Thailand: An Agrosociological Study*. Tiphaneer Press, Chiang Mai, Thailand. c100pp.

²⁴ Falvey, L. (1980) *Cattle and Sheep in Northern Thailand*; MPW Australia, Melbourne. 124pp.



A More Personal Comment Looking Back

These papers were selected to represent a theme of technical research highlighting the need for integrated knowledge of the development situation to which research results might be applied. It was an invaluable lesson to learn early in a career. That lesson set the conditions for decision-making in subsequent work and allows a thread to be discerned through what might otherwise seem a disparate collection of work. It was and remains a useful reflection, but there is more that can be said even at this early juncture of discussing this initial selection of publications.

The first is that some research is conducted apparently alone while other research relies on colleagues. Direct collaborators are mentioned in specific experiments but the environment that allowed the research to be conducted relied on supportive superiors, namely John Sturtz and John Austin in the Northern Territory and Peter Hoare and Ajan Sangwien Posri in Thailand. At the same time, a penchant for engaging in formal

education brought great benefits from comments of the La Trobe University staff Drs Charles Lamp and John Wilke for the NT pasture experiments. Similarly for the work in Thailand, the structure of the aid project ensured guidance from the supervision of Professor Mike Norman at the University of Sydney in the initial years and subsequently that of the University of Queensland through project and doctoral supervisors Professor Ross Humphreys, and especially Professor Barry Norton.

The second thing that can be said is that there are many other similar papers that might have been included, but would have added little. On reflecting on the work from this distant point, much of it seems trite and opportunistic. This is not being overly self-critical – in fact it may be considered a strength to design publishable experiments in environments not usually considered conducive to good research. It is not all good research nor is any of it world shattering, but it was published and was often of some use. The documentation of research outcomes was more a hobby than a desire to be a member of the narrow university or specialized research clubs. Yet the hobby paid off in diverse ways; it contributed initially to further study and to later being sought for a senior academic post. It also created energy to do more and to be organized. More importantly, it set a direction that explained life and nature, and with time for reflection, facilitated integration of scientific, natural and esoteric knowledge.

A third comment may be made from these papers. It is more a comment arising from this re-living of the exciting times of which these papers are but a mere talisman. It was a free and easy professional life during these years; in the NT this meant available budget for whatever experiments could be dreamt up and freedom over one's time to be in the field as often as needed. Thailand offered similar freedom and budget plus the additional stimulation of periodic intellectual input from other

disciplines and visiting supervisors and peers. Only by looking back and realizing the constraints under which other colleagues laboured can one see the benefits of such freedom. It was complemented by the reflective habit continuing from long university days, which combined to encourage an intellectual approach that progressively built on experience.

It is the reflective aspects of the times over which this research was conducted that seem to be the crux of the most enduring outcomes of the period. It is that which produced the ever-widening realization that technical research was essentially easy to do and intellectually narrow unless it had a context. And the context made all the difference to the design and the application of the research. It led to cross-disciplinary thought and work, and in turn led away from the insular approaches of some mainstream scientists. Thus an intellectually richer life resulted than would have been the case for one moulded into the usual research career, and also unconsciously fuelled spiritual life. It is more than curious that today, mixing with elite colleagues in the Academy and universities in Australia and internationally, many of those who stuck with the narrow world of technology are now, in retirement, also discovering interrelationships between things they had never allowed themselves to dream of.

Chapter 4

Thai Agriculture

Overview

Influenced by these earlier experiences, the overall context in which agriculture is practiced became a means of interpreting subsequent investigation. So when the opportunity arrived to delve into the subject for a longer period, a detailed investigation and review of knowledge concerning agriculture in Thailand was conducted. It began with the historical origins that shaped Thai (the modern nation and culture) agriculture from the Tai (the ethnic group that migrated into the region of Thailand and elsewhere) and the technological transfers that allowed its development. The work considered interactions between historical, political, economic, social, technical, and socio-cultural aspects of agriculture. The form of agriculture that emerged from this research differed from that assumed by the agricultural research and development approaches of the Western-influenced cultures that had defined and continued to define the research agenda of less-developed countries.

Numbered list of papers included in Chapter 4

23. Falvey, L. (2000) Thai Livestock Industries: Assuring Quality. Proceedings of the Scientific Program of the Second Northern Agricultural Fair in Honour of His Majesty the King's Sixth Cycle, held December 1999 at Chiang Mai University, Chiang Mai Thailand.
24. Falvey, L. (2000) The Role of Smallholders in Thai Agricultural Development. *Kasetsart Journal of Social Science* 21: 199-213.
25. Falvey, L. (2000) Early Origins of Agriculture in Thailand. *Asian Agri-History Journal* 5: 23-28.
26. Falvey, L. (2001) The Tai and Thai Agriculture. *Asian Agri-History Journal* 5: 109-122.
27. Falvey, L. (2001) Beginnings of Thai Agricultural Expansion. *Asian Agri-History Journal* 5: 185-196.

28. Falvey, L. (2001) Thai Agriculture from Ayutthaya to the Early Twentieth Century. *Asian Agri-History Journal* 5: 283-296.
29. Falvey, L. (2001) Sustainable Technologies in Thai Agriculture. *Academy of Technological Sciences and Engineering, Focus* 115: 2-5.
30. Falvey, L. (2003) The Success of the Chinese in Thailand: The Case of Agribusiness. *Tai Culture* 7(2): 51-61.
31. Falvey, L. (2000) *Thai Agriculture: Golden Cradle of Millennia*. Kasetsart University Press (international distributor, White Lotus), Bangkok. 490pp

Discussion

Specific conclusions derived from discussions in each paper are not repeated here beyond summaries in the footnotes. The following discussion continues to draw out linkages across research in a manner that supports continuity across the overall document.

From the technical research about Thai agriculture and in particular livestock, Dr Choke Mikled extended the honour to present an overview of the Thai livestock industry at a meeting commemorating His Majesty The King of Thailand (Publication 23).²⁵ This included consideration of the special nature of less-developed countries, and the unique case of Thailand as one of

²⁵ Abstract from the Original Paper: *Thailand has a traditional association with livestock that has evolved into an efficient modern sector for some livestock industries while languishing in others. From a detailed summary of the development of the livestock industries of Thailand and an assessment of global trends in livestock production, the paper postulates the need for adoption of improved quality assurance and management procedures as a prerequisite to the expansion of the industries and maintaining export market access. The opportunities for expansion appear large and are worthy of the investment required in education, legislation, research and ethical production and trading approaches.* Falvey, L. (2000) *Thai Livestock Industries: Assuring Quality*. Proceedings of the Scientific Program of the Second Northern Agricultural Fair in Honour of His Majesty the King's Sixth Cycle, held December 1999 at Chiang Mai University, Chiang Mai Thailand.

the world's few major agricultural exporters. The common outcome of this re-analysis of current research was the invalidity of the assumption that smallholder agriculture would quickly be replaced by extensive systems in less-developed countries (Publication 24).²⁶

Further examination of the special nature of Thai agriculture led to detailed literature research in both the Thai and English languages to document the early origins of agriculture in Thailand. This (Publication 25)²⁷ was to be the first of a series of

²⁶ Abstract from the Original Paper: *The role of smallholders in underpinning the Thai economy through exported and domestic product and supporting their 70 percent of the population without government welfare is emphasised in a review of the needs for smallholder development. Economic development models are discussed in a context of agriculture fuelling economic growth with a revision of assumptions that family farms can be viewed as a phase toward large-scale commercial agriculture. Intensive smallholder agriculture permits production of high quality produce, efficient use of by- and waste products in integrated systems, and maintenance of cultural values. The review concludes that specific attention to smallholders is a primary responsibility of government and requires policies based on alternative agriculture, self-sufficiency and social welfare as distinct from the commercial policies of agribusiness.* Falvey, L. (2000) The Role of Smallholders in Thai Agricultural Development. *Kasetsart Journal of Social Science* 21: 199-213.

²⁷ Abstract from the Original Paper: *This, the first of four papers dealing with the history of Thai agriculture, introduces its origins up to the time of major immigration and influence of the Tai ethnic group. As part of wider Asian agriculture, known through its own archaeological sites, the slow domination of hunters and gatherers by migrating agriculturists shows their means of encouraging reliable production from wet rice suited to the tropics after climate changes. Rice became the staple and technologies that exploited national recession of floodwaters evolved into ... a reliable food base for the development of agro-cities. While empires managed agriculture well, security over rice production allowed inland cities to dominate coastal trading centres, except in the South. Differing agricultural technologies of the eastern Khmer, western Pagan, and immigrant Tai, among others, provided the base for future agricultural expansion.* Falvey, L. (2000) Early Origins of Agriculture in Thailand. *Asian Agri-History Journal* 5: 23-28.

publications in the Asian Agri-History Journal, an initiative out of India led by Dr Nene that was to support my approach. This paper revealed an ancient agricultural people who had evolved techniques compatible with the natural environment, and who had protected these human-environment interactions by cultural lore. Having developed unique technologies, the Tai ethnic group in migrating south to the area now known as Thailand retained an openness to alternative agricultural technologies that maintained a close to natural balance after rice fields has been established (Publication 26).²⁸ The unique developments of the traditional glutinous rice varieties and the *muang fai* irrigation system jointly proved sustainable for more than a millennia. With this picture of T(h)ai innovation and inseparable links with the surrounding environment, the expansion of agriculture in Thailand was then examined.

Study of the expansion of T(h)ai agriculture again used source documents in Thai and English languages as well as translations of the diaries of a noted Chinese traveler of the period - Thai history is largely documented by others

²⁸ Abstract from the Original Paper: *Beginning as lowland wet rice growers in China more than a millennium ago, the Tai brought in their southward migration, glutinous rice associated with their muang fai irrigation technology, which with refinement proved sustainable into the twentieth century. Integrating with the existing Mon-Khmer system, the Tai widened their agricultural capabilities and administrative system to respectively breech larger northern Thai rivers. They evolved a complex blend of animism and Buddhism, which incorporated traditional ceremonies relating to rice and agriculture from their own, and the cultures blending to form the Thai. Despite modern searches for Tai historical environmental values, modification of the natural environment seems to have been more important than its preservation, although retention of holy wood lots and spirit worship may indicate a level of interest in forests above that of other agricultural communities. This is the second of four papers dealing with the history of Thai agriculture.* Falvey, L. (2001) The Tai and Thai Agriculture. Asian Agri-History Journal 5: 109-122.

(Publication 27).²⁹ Next the development path towards more modern agriculture during the period from Ayutthaya until the early twentieth century was plotted (Publication 28)³⁰ from archival material in Thailand, Stanford University, Cornell University, and the World Bank. This emergence of a foreign-influenced agriculture separate from the continuing smallholder form of past centuries was thus shown to have displaced the latter from overall research policy. The transition

²⁹ Abstract from the Original Paper: *Two preceding papers have introduced the origins of Thai agriculture up to the thirteenth century. Rice agriculture continued to progressively improve and expand, thereby allowing political development to build on community formations, the civil leadership of water managers, and embryonic administrative structures. Assisted by an embracing and pragmatic nature, discriminate absorption of technologies and cultural elements in an ongoing cultural evolution produced a resilient dualism in both the production of domestic and export/urban rice varieties, and in religious beliefs supporting agriculture. This, and environmental modification enabled agriculture to continually produce significant surpluses from minimal human inputs in an expanding society which favoured a simple cuisine.* Falvey, L. (2001) Beginnings of Thai Agricultural Expansion from 1200AD. *Asian Agri-History Journal* 5: 185-196.

³⁰ Abstract from the Original Paper: *Thai agricultural history has been traced from early origins and through its subsequent phases in three previous papers. This paper completes the scene over the period of some 500 years ago until early in the twentieth century. Expansion into the delta region introduced flood and drought hazards and highlighted the association between rice agriculture and State security. Nevertheless, development of a Thai State isolated small-holders from the Crown's primary focus on war, labour, and later, trade, and gradually relegated rice to an exportable and taxable commodity to fuel State expansion. Through the period, small-holder agriculture expanded under market forces and relaxed labour laws, and produced a shift from returns to labour towards returns to land area. Chinese and European domination of the narrow export base of raw agricultural commodities led to agribusiness development being left to foreigners with minimal State interest in technology transfer, and to an expansion ethic which encouraged small-holder opening of new agricultural lands for rice and widespread harvesting of timber.* Falvey, L. (2001) Thai Agriculture from Ayutthaya to the Early Twentieth Century. *Asian Agri-History Journal* 5: 283-296.

from traditional to modern agriculture also highlighted that earlier systems had included elements of sustainability that did not form part of the quest of research serving the modern introduced agriculture (Publication 29).³¹ In the spirit of relating agriculture to people, the research also included consideration of the critical role of the Chinese in Thailand (Publication 30),³² as an adjunct to traditions of the Tai ethnic group and as a further component supporting the modernizing of Thai agriculture – a sociological phenomenon that remains critically relevant to the country, yet underappreciated, today.

³¹ Opening Paragraph of the Original Paper: *For a meaningful assessment of the place and potential sustainability of agricultural technologies, the history, current position and possible futures of agriculture must be examined from technical, social, economic, political and cultural perspectives. This paper discusses agricultural technologies that have been practiced in Thailand, some of which have endured for a millennium into last century, and implications from these of relevance to some modern technologies. The technologies begin with the migration of the Tai ethnic group to what is now Thailand and an agricultural revolution, coincident with the decline of Mon-Khmer domination of the region from its Angkor Wat headquarters. The modern appellation, Thai, is a cultural and nationalistic definition which encompasses many aspects of the Tai who settled Siam, or as it is now known, Thailand.* Falvey, L. (2001) Sustainable Technologies in Thai Agriculture. Academy of Technological Sciences and Engineering, Focus 115: 2-5.

³² Abstract from the Original Paper: *The Chinese of Thailand have been critical to the emergence and growth of Thailand's agribusiness. From assumption of embryonic colonial European enterprises in seventeenth century Thailand, Chinese traders proved adaptable to remote areas and as Crown agents. Despite periodic restrictions of Chinese and their businesses, social integration and economic power ensured a continuing place until major expansion in the 1960s. This required the combined resources of the Chinese-Thai community through inputs supply, trading and banking and soon transcended Thailand's borders. A significant success in immigration and social policy terms, the concentration of government policy on supporting commercial developments has incidentally alienated the small-holder and self-sufficient sector of agriculture.* Falvey, L. (2003) The Success of the Chinese in Thailand: The Case of Agribusiness. *Tai Culture* 7(2): 51-61.

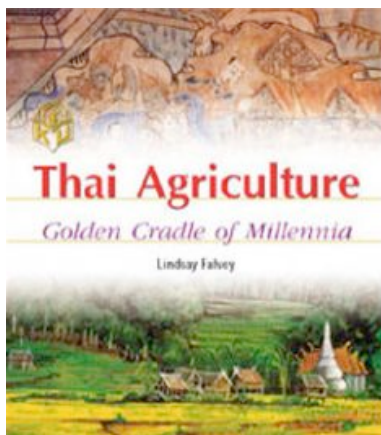
This work was collated and published with other detailed and extensive work in the book *Thai Agriculture: Golden Cradle of Millennia* (Publication 31 – the Foreword of which is presented following this paragraph; the footnote presents the summary poem from the book).³³ Working on the book linked me with colleagues around the world and in particular again with Professor Charan Chantalakhana. In Thailand Professor Thira Sutabutr, President of Kasetsart University kindly provided an office in the Australian Studies Centre, Dr Douglas Forno provided an office and library access at the World Bank as did Professors Wally Falcon and Alan Bell at Stanford and Cornell Universities respectively. The book has been well received and was also published as a Thai language book as the culmination

³³ Summary Poem from the Book:

*The story of Thai agriculture is largely one of wet rice culture,
which built cities with God-Emperors, long after first food gatherers.
With glutinous rice, migrating Tai sustained yields based on the muang fai,
founding a sound governance device for a civil State with surplus rice.
Ayuthaya rose, secure and wealthy, while its rice was cared for and healthy;
then foreign business emerged and grew, as Thai numbers and new lands ensued.
Declining in a pure fiscal term, agriculture's real role remained firm
for work, income, and social support, and from global force, an old resort.
Imported plans allowed excesses, unredeemed by research successes,
as roles changed to knowledge extension, in a package of credit expansion.
Agribusiness then as State right arm, sought to convert the small to a large farm,
losing the complete production system and social values of local wisdom.
Uniquely Thai, farming comprises, ancient irrigation contrivances,
and governance based on water control, which support a primary export role.
With agribusiness now multinational, foreign deals which mix need with the rational,
and scope for increases from techniques known, Thailand's set to reap as it has sown.
As a leader in chicken meat and prawn, feeding more than four times its own born,
from less intense farming than neighbours', markets portend more reward for labours.
Yet poverty, research, welfare, and schools, now shown as lacking along with law's rule,
define culture and nature's demise, in a land yet to industrialise.
Is it income or less poverty, or tradition informing policy,
commercial or self-sufficiency? In fact it is all, with real equity.
Sunthorn Phu's lament of bull powered mills, might today cause tears for buffalo killed,
which is but part of lost social traditions that form the challenge for rural transitions.*

Falvey, L. (2000) *Thai Agriculture: Golden Cradle of Millennia*. Kasetsart University Press (international distributor, White Lotus), Bangkok. 490pp.

of a follow-on project. The University of Melbourne kindly underwrote part of the publication cost of the first edition, and the Arkelton Trust through the Bernard Coyers Award for translation and publication of the Thai language version. More particularly, the work of Professor Charan Chantalakhana and his daughter Khun Manmad Chantalakhana was invaluable for the Thai research and translation of the Thai version of the book – การเกษตรไทย: อุ้งข้าวอุ้งน้ำข้ามสหัสวรรษ.³⁴



The Foreword is presented here as a summary of the book’s thesis:

“The story of Thai agriculture is too voluminous to contain in one book such as this. It includes all elements of the Thai culture, economy and environment, and has been the subject of specialist research in the various branches of these fields over centuries. Because Thai traditions of writing have not emphasised the same technical and economic approaches common to Western documentation until recent times, much of

³⁴ สินธุ์ชัย พาลวีย์ (2548) การเกษตรไทย: อุ้งข้าวอุ้งน้ำข้ามสหัสวรรษ. จรัญ จันทลักขณา (บรรณาธิการ), แม้นมาศ จันทลักขณา และคณะ (ผู้แปล) สำนักพิมพ์มหาวิทยาลัยเกษตรศาสตร์, กรุงเทพฯ. 476 หน้า.

the origins of Thai agriculture is derived from professional extrapolations. Nevertheless, there are voluminous writings surrounding the subject, beginning in the thirteenth century, from Thai, Chinese, Japanese, and various European authors. It is their experience and knowledge which comprise the bulk of this book much more than the eclectic experiences on which I reminisce with increasing frequency in this twenty-fifth year of working in Thailand. Having a year to collate information has been most beneficial. As Zimmerman noted in his 1930s treatment of the subject, one year to write on Thai agriculture is grossly inadequate, twenty years' research being a minimum.

The book seeks to highlight unique aspects of Thai agriculture. As Thailand has many faces, so there are differing types of agriculture. It is misleading to assume that this is an ecologically and ethnically uniform rice-producing Buddhist country; agriculture of the South differs from that of the Central Plain, which differs from that of the Northeast, which differs from that of the North's river valleys, which in turn is distinct from highland agriculture. So this book, in taking an historical as well as technical, economic and cultural perspective, seeks to use examples from Thailand's different regions to highlight the diversity which in itself adds to the resilience of Thai agriculture.

The book traces the origins of Thai agriculture from pre-history through historical times to the present day, concluding with speculation about the future. As it strives to cover a wide range of disciplines and views, and to stimulate deeper local interest in study of the subject, the work contains more references than may be customary. It is thus synoptic in an attempt to present a flow of thought which is something of a middle path through sometimes contentious opinions. To facilitate the flow of chronology, technical evolution, and cultural thought, each chapter concludes with a three paragraph summary, which in turn is referred to as part of the

concluding chapter where the elements which may influence the future of Thai agriculture are discussed.

There have been many exceptional works which relate to Thai agriculture in both Thai and other languages. Most are included in the hundreds of references used to compile this work. Many have taken a technical and development approach; others have taken economic historical approaches, while yet others have taken cultural perspectives, although, in numbers of words, the post-1960 development literature dominates. Works in the Thai language have also followed similar trends, often deviating in their conclusions and emphases from foreign works on apparently similar subjects. However, such differences appear to have steadily declined with the rise of English language publications in Thailand, such that today many Thai and English language works are the same, and where different, the English work may be the more carefully presented. For these reasons, works in the Thai language are included together with those in English in one list of references, rather than follow another tradition of assuming separate groups of readers. Notwithstanding the implications of these views, this work is also expected to appear in the Thai language as a means of extending it beyond the usual educated elite. With some 900 references, some sentences have more than one reference; this has the dual aims of providing direct guidance to further reading on the summarised detail, and to highlight the source of the thought behind statements which might otherwise be assumed to be in error.

The story of Thai agriculture is one of importance to all. It contains lessons about the importance of culture and history in development. It highlights the shortcoming of the economic development models. It illustrates the durability of an export industry which also employs most of the population, leads the world in some business fields, and rescues the non-agricultural classes from catastrophe in times of crisis. Yet it also contains

lessons about the civilising of development, and is bold enough to relate spiritual aspirations to those of industry. Very briefly, the story flows is as follows.

From hunters and gatherers through agro-cities, State-religious Empires infiltrated by migrating Tai persons with a wet glutinous rice technology, evolved to produce a sustainable agriculture. Rice culture determined administrative structures in a pragmatic society which regularly produced a saleable surplus. Ayutthaya's ascendancy, continuing today, consolidated the importance of rice agriculture to national security and economic well-being, as Chinese and European influence benefited agribusiness and initiated the demand which would expand agriculture through population increase until accessible land was expended. The resulting central interest in the spoils of agriculture more than its producers pervaded decision-making until recently, and was supported by narrow economic development advocates.

As agriculture declined in relative financial importance, it continued to provide the benefits of employment, crisis resilience, self-sufficiency, rural social support, and cultural custody. Technical and economic globalisation forces which assumed a cultural uniformity were eventually revealed to require modification, but had meanwhile allowed unregulated exploitation of community resources and excesses in economic activity, all with at least the tacit approval of development financiers. Agricultural institutions evolved from a taxation and dispute resolution base to provide research, education, and technology transfer at levels below potential as they supported commercial agriculture funded by credit. Agribusiness, both private and government, expanded from the 1960s and smallholders were partly viewed as a past relic which agribusiness could modernise. However, small-holders' intensive integrated production systems continued to offer efficiencies uncounted in narrow financial analyses, including

social benefits which have now caused agriculture to be treated as both a social and financial sector in planning, with increased cognisance of environmental and cultural values.

Unique elements of Thai agriculture include: irrigation technologies which spanned a millennium; administrative structures which originated with agricultural water control; its global leadership in production and export of a number of agricultural commodities; its agribusiness sector which includes one of the world's huge multinational conglomerates; the negotiating approaches of the culture over several centuries; potential for further large increases in productivity from known technologies, and an open culture which has allowed new ideas and peoples to be absorbed at various times, and which can still relate a national cultural ethic to traditional agriculture with its religious and environmental management associations.

Now one of the world's few major agricultural exporters, leading the world in rice, rubber, canned pineapple, and black tiger prawn production and export, the region in chicken meat export and several other commodities, and feeding more than four times its own population from less intensive agriculture than its neighbours, Thailand is poised to benefit from predicted expansion in livestock products demand. Poverty reduction, and improved education, research, and legal and social systems, which may be addressed in the wake of the recent Asian financial crisis, stand to benefit from popular concern for environmentally and socially sensitive alternatives for smallholder farmers to co-exist with commercial agriculture. Unlikely to rapidly industrialise, Thailand will remain one of the world's major agricultural countries in social, environmental and economic terms for the foreseeable future.

Apart the overriding dichotomies of Thai agriculture in terms of; self-sufficient and commercial agriculture, national income and rural poverty alleviation, and traditional and imported value systems, which will necessarily inform future policy formation, other issues remain. Sunthorn Phu's love lament evoked through agricultural metaphor...

*at a sugar mill, they feed in sugarcane,
buffaloes are noisily urged to pull the vice;
juice gushes forth onto a row of jars.
Oh, I see tears dropping from my eyes:
the sugar cane is crushed like my heart;
the juice pours out like my tears. ...*

If he wrote today, the flood of sugar juice in large mechanised mills might symbolise tears for lost 80 percent of the buffalo herd, itself a metaphor for lost traditions and values in the society. If one lives by the financial efficiency sword, one dies by it; thus social costs of unbalanced development may yet force genuine reconsideration of agriculture and rural dwellers.

It has been a fulfilling experience to collate the works of others, to challenge my own conclusions, and to assimilate diverse information into, what I hope is, a cohesive text. My hope is that the diversity which is still common in Thai agriculture remains, and that a central component of future development can be the small-holder farmer."

-----กวีนิพนธ์ไทย-----

This work confirmed the results of site-specific research that had grown out of technically oriented research activities. It also challenged both their priority and the mainstream approaches to research, which assumed that smallholder farmers would gradually disappear as they had in agricultural nations of the New World. The applicability of this conclusion was then tested more widely, albeit in an uncoordinated fashion, as

considered in the wider international agricultural context in the next Chapter.

A More Personal Comment Looking Back

The habit of reflection described earlier led into much of what is included in this Chapter. Some papers were the result of specific invitations from old friends and colleagues, such as that about livestock in Thailand. As such that paper is representative of many others not listed here that were indirectly a product of the University of Melbourne decanal post. Yet during the 15 years of consulting for development agencies and managing the MPW Australia and Coffey-MPW companies, similar invitations to speak at conferences were also frequent and generally accepted. Some opportunities were even initiated by clever politics, such as speaking to a paper prepared with John Leake at a plenary session of the World Congress in Canada on the exotic subject of livestock in Mongolia where we had been the first Western specialists engaged in the country's emergence from Russian domination. The point may be minor, but it indicates a critical link of consolidated thought through the series of publications. Without overstating it, this may be seen as extending from the early days as an apprentice researcher to latter days as a senior university figure. This does not mean to imply any conscious career planning or coach-induced management; it means that the continuity is explicable by seeing the conditions that earlier experience established for subsequent 'opportunistic choices'.

The book on Thai agriculture is an example of as such 'opportunism'. It was a self-imposed discipline for a year-long sabbatical after stepping-down as Dean at the University. Nevertheless, it relied on prior conditioning in Thailand and Thai culture, contacts with fellow international scientists and development specialists, and negotiations with the University.

The process of gathering information for the book, the travel involved and the solitary nature of research and writing proved cathartic after the intensity of the Deanship, and provided space for other matters to be arise. This is a lesson of the reflective habit – it is not a social activity, nor is it conducive to maintaining delusions. But these other matters are not of interest to this collation; more is written elsewhere.

Reflection on the essence of Thai agriculture had another major benefit in personal development and understanding of nature in general. Reading more of what Thais had written about their own agriculture in early years, a feeling of familiarity arose – not just in agriculture and science, but also in religion. This resulted in a Chapter of the Thai Agriculture book being dedicated to religion and traditions associated with agriculture in Thailand. And researching this aspect proved exciting as it spun off in multiple tangents – from environmental, animistic, religious and superstitious beliefs. In reading for these aspects of the book – particularly in the quiet eclectic library of the Siam Society in Bangkok – a more holistic view of agriculture was confirmed. Not the agriculture of the greenies or the fundamental organic groups, but agriculture as man’s greatest environmental interaction. And as it was the central focus of life when the great religious texts were written around the world, it provided the language and metaphor for otherwise inexplicable experiences of the human mind. This was the re-uniting of science and religion. It proved to be the beginning of further thinking and writing which at times was profound, at the personal level in any case, as is partially introduced later in Chapter 8 in the discussion about the book *Religion and Agriculture*, and in other books that touched on Buddhism as mentioned in the Appendix. Before that, however, this thread of work introduced other insights into international agriculture.

Chapter 5

International Agriculture

Overview

With the emerging understanding that culturally-insular and technically-narrow approaches to applied science were constraining agricultural science, the next group of publications may be seen as testing means of improving the situation. Some major issues within international agriculture were examined for consistency with the emerging conclusion that current approaches, while technically sound, contained elements of their own ineffectiveness. These analyses included dozens of applied reports for international agencies (World Bank, IFAD, UN and Australian, Dutch and German aid) that are not included here beyond the summary footnote list,³⁵

³⁵ Reports range from bureaucratic to researched. 2010: Review Central Asian Republics Training ADB. 2009: Food Security ADB; GATS and ASEAN Indonesia; 2008: Food security Middle East group; Sustainable universities Saudi Arabia; Assessment Capacity Development Greater Mekong Subregion ADB; Feasibility and Preliminary Plan Indonesia Boston Consulting Group. 2006-7: Global Research Review CGIAR. 2004: Iraq HRD AusAid. 1996: Agricultural Research Training CGIAR. 1995: Agricultural Education World Bank; Dairy Education DRDC; Australian Tertiary Education DRDC; Kenya National Research World Bank; Russia Research Education and Extension World Bank. 1993: Review University of Melbourne; Agricultural Knowledge Systems World Bank. 1992: Provincial Agriculture Philippines AIDAB; Far East Russia/Siberia Coffey-MPW; Mongolian Livestock ADB; Thailand Land Titling World Bank/AIDAB. 1991: Guyana Project Investigation World Bank; Greenhouse Gas DASETT. 1990: Philippines Environment AIDAB; Caribbean, St Kitts and Nevis Rehabilitation World Bank.; 1989: Lao-PDR UNDP Redesign UNDP. 1988: Vietnam Mekong Secretariat. 1987: Livestock Policy Review AIDAB; Solomon Islands Livestock ADB. 1986: Thailand University Review AIDAB. 1982-86: Thai-Australian Village Water Supply AIDAB. 1985: Courses for Africa Cereals, Thailand Marketing, South Asia Cereals, Philippines Marketing, Asian Investment, AIDAB; 1984: Lao-PDR Rehabilitation World Bank. 1983: Burma Dairy AIDAB; Thailand Rural Development World Bank; Lao-PDR Agricultural Support World Bank; Thailand Support Services World Bank/AIDAB; Masters Program AIDAB. 1982: Lao-PDR Round Table UNDP; Thailand Rural Development World Bank; Thailand Agricultural Support World Bank; Australia Masters AIDAB; Lao-PDR Rehabilitation World Bank; 1982 Lao-PDR Integrated Development UNDP; Thailand Rural Development World Bank; Lao-PDR Economic World Bank; Thailand Livestock World Bank; Lao-PDR Feed Mill AIDAB. 1981: Evaluation GTZ & BMZ; Lao-PDR Rehabilitation World Bank/IFAD; Philippines AIDAB; Lao-PDR Cassava Utilisation AIDAB. 1980: Thailand Integration DTH; Thailand Livestock Products UNDP/World Bank; Thailand Crop Replacement UNPDAC; Lao-PDR Rehabilitation World Bank. 1979: Thailand Research World Bank. 1976-80 Thailand Highland Agricultural Project, University of Queensland/AIDAB. 1977: Thailand Integration Netherlands; Thailand University Feasibility Australian Embassy; Bangladesh Chittagong AIDAB.

which represents a kind of field-testing site for knowledge development in the context of this book. While the reports are not included directly, experience and knowledge gained in those projects found its way into this evolving thesis. This occurred because the assignments and the reports were themselves formative in the sense of establishing conditions that then influenced subsequent actions and personal understanding. In some cases, papers derived from such assignments were presented and published internationally, including country-specific analyses where no previous data existed. In another case, the experiences of such work with major funding agencies led to a jointly edited book that publicly challenged technical and policy fallacies concerning dairying in the tropics. On a broader front, a re-presentation of similarities across Asian countries served to highlight critical aspects of culture and thought processes omitted in the ‘Westernization’ approach. Thus the work in this Chapter contributed to knowledge for current practices while also isolating flaws in policies developed for international agricultural research and development based on imported assumptions from more-developed cultures.

Numbered list of papers included in Chapter 5

32. Falvey, J.L. (1992) Livestock Development Assistance: Australia’s Experience. Paper presented to the Sixth Congress of the Asian-Australasian Association of Animal Production, held in Bangkok, November 1992 (this is a summary of a small book published by the Australian Government Printing Office for AusAid).
 33. Falvey, L, Phonvixay, S. and Pravongviengkham, P. (1994) Future Cattle Production in Lao-PDR. *Thai Journal of Agricultural Science* 27:371-379.
 34. Falvey, J.L. and Leake, J.E. (1993) Sustainable Management for Livestock: Mongolia. Invited Speaker, First Plenary Session of the 7th World Conference on Animal Production, Edmonton, Alberta Canada, June 28-July 2, 1993. Volume 1 (Invited Papers): 17-32.
 35. Falvey, L. and Chantalakhana, C. (2001) Supporting Smallholder Dairying in Asia. *Asia-Pacific Development Journal* 8(2): 89-99
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36. Falvey, L and Chantalakhana, C. (1999) *Smallholder Dairying in the Tropics*, International Livestock Research Institute CGIAR, Nairobi (chapter author and editor) Falvey, L. (1999) *The Future for Smallholder Dairying*, Chapter 24 in *Smallholder Dairying in the Tropics*, International Livestock Research Institute CGIAR, Nairobi.
37. Falvey, L. (1998) Food Production and Natural Resource Management. *Australian Journal of Environmental Management* 5:9-15.
38. Falvey, L. (2001) Global Development Forces on Agriculture and the Environment. Keynote Presentation at the Regional Science-Policy Conference 'Global Change and Sustainable Development in Southeast Asia', Chiang Mai, Thailand, 17-19 February 2001.
39. Falvey, L. (2001) Re-conceiving Food Security and Environmental Protection. Keynote Lecture, Asian Agriculture Congress Organised by the Combined Ninth Congress of the Society for the Advancement of Breeding Researchers in Asia and Oceania, the Fourth Conference of the Asian Crop Science Association, and the Sixteenth Conference of the Federation of Crop Science Societies of the Philippines, held at the Westin Philippine Plaza, Manila, 24-27 April, 2001. Re-presented at the SEARCA Conference 'Food Security and Environmental Protection for the 21st Century', University of the Philippines, Los Banos, April 26, 2001.
40. Falvey, L. (2002) The Common Agricultural Heritage of India and Southeast Asia: A Different Environmental Reality. *Asian Agri-History Journal* 6(4): 295-313.
54. Falvey, L. (1988) *Introduction to Working Animals*; MPW Australia, Melbourne. Pp208.
55. Falvey, L. (1989) *Sú Dung Đông Vật Làm Việc*. Translation of above text into Vietnamese by Châu Bá Lộc of Cần Thơ University. Pp122.

Discussion

The detailed research of Thai agriculture presented in the preceding Chapter was complemented by research to inform international agricultural development policy. It is introduced by an international conference paper that summarized research on livestock development assistance using Australian aid program projects as case studies; Australia was a significant player in international livestock development (Publication

32).³⁶ That research was conducted with assistance from a colleague assigned by the client AIDAB from the NSW Department of Agriculture, Dr Neil Fogarty supported by AIDAB staff Dr Satish Chandra and Bill Costello.³⁷ It included a survey approach to examine achievements against expected outputs. Overall results and discussion were variously published in more learned forms, and this indirectly informed documentation of the cattle industry in Lao-PDR as a prelude to further research and development planning. This was a new approach for a publication in a refereed journal albeit one somewhat related to the author and sympathetic to his worldview. The Lao Director General and Deputy Director of Livestock – Drs Sitaheng Phonvixay and Parisak Pravongviengkham were co-authors. With the experience of Lao-PDR through the period when Western agencies were largely repelled, the publication sought to pave the opening in a manner comprehensible to such an audience (Publication

³⁶ Indication of the Paper's Contents: *A total of 62 livestock projects funded by Australian aid were reviewed and published in a separate booklet; the conclusions of that booklet modified those that arose from the analysis and this paper aims to use wider information to better inform the original conclusions. In seeking to elicit common conclusions and areas of difference, it was found that smallholder livestock, while difficult to understand and requiring greater skills than administrators acknowledged, was the most beneficial line of assistance. It was also emphasized, among many other factors, that assistance in the Pacific had been particularly poorly managed. The benefits of long-term commitment and competent advice were concluded to provide higher rates of economic return and intangible social benefits to rural communities.* Falvey, J.L. (1992). Livestock Development Assistance: Australia's Experience. Paper presented to the Sixth Congress of the Asian-Australasian Association of Animal Production, held in Bangkok, November 1992 (this is a summary of a small book published by the Australian Government Printing Office for AusAid – see next entry).

³⁷ A booklet published by the Aid agency is referenced as 'Chandra, S., W. Costello, L. Falvey and N. Fogarty (1989). Livestock Sector Review. Australian International Development Assistance Bureau, Canberra.'

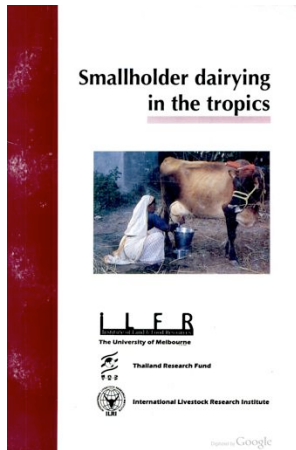
33).³⁸ The process of describing possibly sustainable management systems before conceiving technical research and development activities was then demonstrated for the livestock industry in Mongolia at a critical juncture between Russian dominance and modern Western-influenced agencies introducing aid and loan programs. The paper was written jointly with John Leake and presented at the Opening Address to the First Plenary Session of the Seventh World Conference on Animal Production in Edmonton, Canada (Publication 34).³⁹

³⁸ Introduction from the Original Paper: *As a stable economic framework now exists in which to speculate about the future, we see cattle production systems of Lao-PDR being increasingly aligned to market forces to the potential benefit of both new investors and smallholders. While it seems common for papers about Lao-PDR to open with defining the country's drawbacks in geographical, income and capacity terms, we see each of these as offering advantages for introducing innovation in the cattle industry; Lao government policy on investment now reflects a similar perspective. This paper discusses a likely scenario for the industry taking account of relevant technical, economic, social and institutional factors within the context of experience of the past fifteen years.* Falvey, L, Phonvixay, S. and Pravongviengkham, P. (1994) Future Cattle Production in Lao-PDR. Thai Journal of Agricultural Science 27:371-379.

³⁹ Abstract from the Original Paper: *Mongolia, a unique country in terms of livestock, provides instructive information for sustainable management of livestock grazing rangeland under continental conditions. A sustainable traditional system, supplanted by a State farm approach under communism with the aim of producing greater surpluses, provides lessons for managing the fragile rangeland under low precipitation regimes. It appears technically feasible to produce acceptable surpluses from the system in the future but this depends on knowledge of the sustainable carrying capacity of the plant species concerned, the ability to monitor this regularly and to provide incentives for herder associations to manage this capacity. This will involve reconstituting herder associations, reducing stock numbers in some areas, opening new areas, reducing mortality rates and increasing reproduction rates. An innovative national project is proposed to meet rangeland ecology and national livestock production objectives.* Falvey, J.L. and Leake, J.E. (1993) Sustainable Management for Livestock: Mongolia. Invited Paper, First Plenary, 7th World Conference on Animal Production, Edmonton, Alberta Canada, June 28-July 2, 1993. Volume 1 (Invited Papers): 17-32.

The findings of the work were also applied to an apparently irrational policy stance among most funding agencies about smallholder dairying in the less-developed tropics. This led to a review of global research and development on the topic to demonstrate the bias introduced by invalid economic and technical assumptions that had been adopted unquestioningly from more-developed countries' worldviews (Publication 35).⁴⁰

To demonstrate this situation, a book was conceived with Professor Charan Chantalakhana to combine with experts around the globe in writing a book on the subject for publication by the preferred international publisher, the CGIAR's International Livestock Research Institute of which Charan was Deputy Board Chair. This was a significant publication for international animal and agricultural development and was successful in



⁴⁰ Abstract from the Original Paper: *Tropical Asia is the largest milk-producing region of the world. Its efficiency as an integrated smallholder production system provides financial, health and social benefits to millions of rural dwellers. Variations between cultures and economic circumstance define local options for further development of smallholder dairying. Notwithstanding the success of this industry, it has been misunderstood in some international development agencies and national policies, and as a consequence has not attracted the same analysis and investment as other sub-sectors of agriculture and rural development. Technological and environmental efficiencies suggest that smallholder dairy industries may demonstrate a higher likelihood of sustainability than the mono-cultural industries of developed countries. The contributions, success, and social and economic spin-offs support a revised consideration of smallholder dairying in national development policies of tropical Asia.* Falvey, L. and Chantalakhana, C. (2001) Supporting Smallholder Dairying in Asia. *Asia-Pacific Development Journal* 8(2): 89-99.

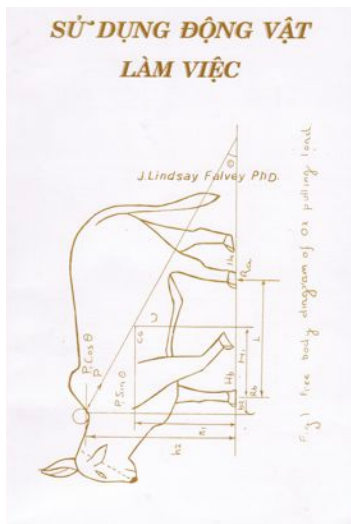
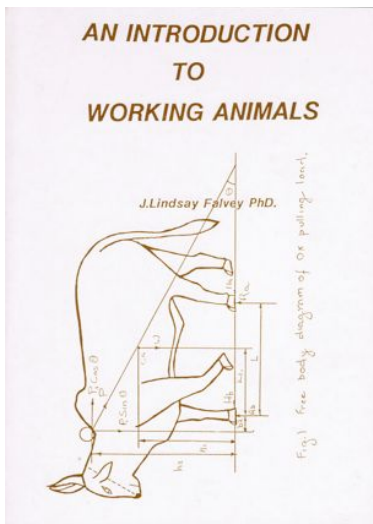
producing a re-consideration of development policy and research approaches to accommodate the reality of successes in Indian dairying, for example. (Publication 36).⁴¹

⁴¹ Extract from the (1) Acknowledgements section, and (2) Introduction from Chapter 24: (1) Acknowledgements – *This book should have been written long before today. We see it as a comprehensive text that builds on the pioneering 1958 and 1966 CAB works of Mahadevan, concerning Dairy Cattle Breeding in the Tropics and Breeding for Milk Production in Tropical Cattle. We also see it as a subject that will continue to rise in importance in the developing tropics. Smallholder milk production continues to involve increasing numbers of people providing a regular income to support families. In some cases, continued participation in the industry has been possible without ownership or tenure over land. The importance of milk as a dietary component in rural communities provides benefits above cash flow and income production and these nutritional benefits also flow into urban communities. For these reasons, we first wish to acknowledge the millions of smallholder milk producers throughout the tropics. These are the people whom we hope will be the ultimate beneficiaries of the work presented in this book.* (2) Chapter 24 Introduction – *Assessments of international development agencies such as the World Bank and ADB Bank [assume] that smallholder dairy producers in developing countries in some way mimic smallholders in the past, of more developed countries. In some cases, they assume that smallholders will evolve into larger producers in free market environments. Conclusions for the future of smallholder dairy producers are then based on a gross comparison of natural resource endowments. The current competitive advantages of temperate climates are commonly extolled as the primary, and in some cases, the sole reason for suggesting that smallholder dairying in the tropics cannot be a viable industry in the long term. Our conclusion is contrary to these assertions; we believe that it has a sound future.* (1) Falvey, L and Chantalakhana, C. (1999) Smallholder Dairying in the Tropics, International Livestock Research Institute CGIAR, Nairobi 445pp. (2) Falvey, L. (1999) The Future for Smallholder Dairying, Chapter 24 in *Smallholder Dairying in the Tropics*, International Livestock Research Institute CGIAR, Nairobi 445pp, page 417-432. (Other Chapter authors included: Professors/Drs. Hank, Fitzhugh; Harm Schelhaas; Peter de Leeuw; John De Boer; John Vercoe; V.K. Taneja; V.D. Mudgal; S.K. Ranjhan; E. Zerbini; I. Made Nitis; Ross Humphreys; Ron Leng; Suneerat Aiumlamai; B.M.A. Oswin Perera; Canagasaby Devendra; Dougal Gilmour; Thirapong Thirapatsakun; B.K. Ganguly; P. Bandopadhyay; S. Kumar; Bill Malcolm; N.V. Belavadi; Suntraporn Na Phuket, and Adrian R. Egan).

An earlier publication had similarly demonstrated that more-developed country perspectives may be inappropriate for analysis of less-developed countries. That book, *An Introduction to Working Animals* (not included in the original collation and hence numbered out of sequence as Publication 54;⁴² it was translated into Vietnamese – see Publication 55⁴³) also successfully assisted reallocation of research effort that could not have arisen from simple duplication of the research portfolios of more-developed countries.

⁴² Outline of the Book: *The book was perhaps the first collation of information about working animals with the expressed aim of raising interest in this overlooked subject in international agricultural development. With a preface by Prof. Emer. Derek Tribe and a Foreword by Prof. Robert McDowell, both international leaders of the time, the book was validated in its role. Including chapters by international experts in their subject areas, such as Prof. Ramaswamy, Drs Wells, Lawrence, Bansal and Thierstein, the book provided a credible foundation for its thesis that international neglect of the field of working animals on the premise that they were doomed to disappear was not only incorrect but led to erroneous development research and conclusions. The book considers such aspects of working animals as third world reliance on animal power, the origin of working animal-human relationships, economic and social considerations, working animal health, working animal nutrition and engineering principles for working animals. It also introduces a range of animal species critical to human existence including cattle, buffalo, horses, asses and mules, camels and cameloids, elephants, yaks and others, as well as commenting on the future for working animals.* Falvey, L. (1988) *Introduction to Working Animals*. MPW Australia, Melbourne, 208Pp. (Other Introductory or Chapter authors of the book included: Profs/Drs. Derek Tribe; Robert E. McDowell; M.S. Ramaswamy; Eric Wells; Peter Lawrence; R.K. Bansal and G.E. Thierstein).

⁴³ Falvey, L. (1989) *Sú Dung Đông Vật Làm Việc*. Translation of above text into Vietnamese by Châu Bá Lộc of Cần Thơ University. Pp122. Published with the assistance of Prof. Vo Than Xuan in a modified form.



Expanding the principles from livestock to other aspects of agriculture led to analysis of the ongoing debate about food production and natural resource management (Publication 37),⁴⁴ and then to the particular aspect of global development forces on agriculture and the environment in less-developed

⁴⁴ Abstract from the Original Paper: *Education in the fields of agriculture and the environment at tertiary level should be closely related. This review considers the continuing need to increase global food production and intensive agriculture and the associated research and education infrastructure as biased toward specified outputs without sufficient emphasis on environmental values. The argument includes both more and less developed countries and in particular the environmental impact of poverty. The compromises that occur between food production and environmental preservation and care require improved understanding which can be developed if agricultural education is conceived as a component of natural resource management. This will allow the inclusion of moral and social elements into agricultural courses ...* Falvey, L. (1998) Food Production and Natural Resource Management. Australian Journal of Environmental Management 5:9-15.

countries (Publication 38).⁴⁵ This means of conceiving the needs of international agriculture from a wider perspective led to

⁴⁵ Abstract from the Original Paper: *Sustainable development must accommodate the realities of rising population and food production, and the global force of dominant cultures. These appear to conflict with notions of preservation of natural environments and traditional practices of independent cultures. ... Using agriculture as the major human interference with the natural environment as the example, its impact and association with global economic development models are considered within the context of traditional values and practices. Modern interpretations of traditional practices are then compared to current global forces and practical development outcomes in Southeast Asian agriculture. The experience of international development practice, recognition of local aspirations, economic circumstances and communication technologies is distilled to suggestions for policies related to science and sustainable development. Southeast Asian agriculture has markedly modified the natural environment. Under pressure from higher population densities, further modification is likely. Modern impacts of unsustainable agricultural development include; soil degradation, chemical contamination, forest destruction, and reductions in biodiversity, which have resulted from a Southeast Asian agriculture that expanded by opening new lands. Now, only marginal and fragile soils remain, and demand for food production continues to rise. Sustainable agriculture is thus as elusive than ever. Their recent embrace [by agencies] of the rhetoric of sustainability follows successive modifications of the economic planning inspired by the Marshall Plan. Seemingly separate from this, past traditions have recently been ascribed environmental wisdom that is commonly linked to the numerically dominant smallholders of Southeast Asian agriculture. Moral and religious advocacy has raised the issue to wider local attention. ... Development experience and re-consideration of social values can now inform policy for the two agricultures in Southeast Asia, self-sufficient and commercial. The worth of agriculture as a social system contrasts with conventional 'increasing the cake' economics, which nevertheless seems to once again, be an irresistible global force on Southeast Asian policies. Sustainable development in agriculture, drawing on traditional knowledge and local aspirations as well as international experience, requires overt separation of policies for commercial agriculture, rural poverty alleviation, and increased environmental research.* Falvey, L. (2001) Global Development Forces on Agriculture and the Environment. Keynote, 'Global Change and Sustainable Development in Southeast Asia', Chiang Mai.

analysis of the critical indicator of congruence of conceptions in international agricultural development policies related to food availability in all countries. The analysis challenged current approaches by including ancient value systems deeply held in the poorer populous agricultural nations and this in turn led to a proposed re-conception of global, national and local food security and environmental protection (Publication 39).⁴⁶ The

⁴⁶ Abstract from the Original Paper: *Population growth in less developed countries (LDC) and human behavior define food security and environmental protection. This paper considers conventional analyses of food demand and compares these with wider philosophical perspectives that may modify approaches to agricultural science. The conventional approach is indicated in IFPRI research which models scenarios to 2020 and predicts an increased demand for cereal of 40 percent met by increased production mainly in LDCs with more developed country (MDC) exports possibly falling with prices. While production seems adequate for the higher population, continued distributional and nutritional inequities are foreseen. Food production is likely to maintain priority over environmental protection in LDCs although environmental remediation should benefit from technology, particularly in MDCs. The agricultural environment represents humans' widest spread terrestrial environmental manipulation, and its monitoring is more economic than ecological in orientation. Rising understanding of mutually causality of impoverishment of people and the environment may well focus more on non-technological factors through this century than the last. Outside agricultural circles, philosophical thought has advanced beyond the anthropocentric approaches of sustainable agriculture to consider the rights of nature including humans. Increased societal awareness of such matters may influence the overall development paradigm within which rests most of our agricultural research. A reduction in total food requirements is implied in this paradigm as agricultural self-sufficiency is accepted as socially beneficial and as food security is conceived as a universal right of access to nutritious food. Such security implies increased protection of environments in LDCs.* Falvey, L. (2001) Re-conceiving Food Security and Environmental Protection. Keynote, Combined 9th Congress of the Soc. Advancement Breeding Researchers in Asia and Oceania, the 4th Conference of the Asian Crop Science Assoc., and the 16th Conference of the Federation of Crop Science Soc. Philippines, Westin Philippine Plaza, Manila, April, 2001. Re-presented at SEARCA 'Food Security and Environmental Protection for the 21st Century', University of the Philippines, Los Banos, April 26.

work formed the Invited Keynote paper for a combined meeting of the Ninth Congress of the Society for the Advancement of Breeding Researchers in Asia and Oceania, the Fourth Conference of the Asian Crop Science Association, and the Sixteenth Conference of the Federation of Crop Science Societies. Importantly, this work informed the more recent book referred to in this book's Chapter 9.

Through such research, combined with the outcomes of the specific case of Thailand (Chapter 4), it became evident that the paradigm used for agricultural development and discovery in Asia had neglected an inherently Asian commonality. Research into the shared elements of agriculture across Asia produced a re-conception of a common agricultural heritage between India and Southeast Asia, which revealed a different environmental reality (Publication 40)⁴⁷. Analysis of such research and development paradigms had demonstrated the need for a wider conception than was provided in mainstream disciplinary approaches. During the same period of developing and analysing existing knowledge about agricultural development, it became clear that false conceptions derived at

⁴⁷ Abstract from the Original Paper: *To seek a common heritage between agriculture in India and Southeast Asia requires a broad focus. Common technologies, agricultural species, and problems may be cited as evidence of historical interrelationships across the region, but the common heritage in fact is deeper than such physical factors, for heritage itself relates to human relationships. The development of agriculture indicates common regional legacies, but it is the historical interactions between India and Southeast Asia that provide the most critical of commonalities in attitudes to nature, which incidentally contrast with attitudes of the modern West. Therefore, the following discussion firstly considers agriculture and history as preludes to comparisons with Western environmental approaches and some implications of the unique common agricultural heritage of India and Southeast Asia.* Falvey, L. (2002) The Common Agricultural Heritage of India and Southeast Asia: A Different Environmental Reality. *Asian Agri-History Journal* 6(4): 295-313.

least partially from the education base, and this formed the basis of work presented in Chapter 6.

A More Personal Comment Looking Back

Reflecting on the papers and books mentioned in this Chapter, their eclectic nature may be unified as developing the theme of the deficiencies of derivative research being blindly applied across cultures and environments. This was an emerging and strong insight – it was not unique, but it was unusual among the conventional research organisations. And there were really few other groups conducting research in these areas in any case. [Reflection also stimulated the thought that the nineteenth century era of the gentleman scientist would have been more suited to such enquiry.] Today it is rare to be so fortunate as to be able to pursue interests in such matters concurrently and through international consulting.

These matters are described from the perspective of employed domestic researchers as is necessary to communicate with peers who live at home and only visit other cultures as an adjunct to their mainstream work. But the perspective limits the view. This has been reinforced over the years that what seems like ‘lucky breaks’ for one are simply normal choices for another, with each leading to different experiences that ultimately prove difficult to communicate to the uninitiated. Asia teaches one to be silent in such situations; nevertheless it is clear that many more professionals, especially in these agricultural fields could have worked internationally, engaged in self-funded enquiry and publication, written papers and books on subjects that interested them and cobbled thinking and writing into respectable graduate qualifications. This memory coincides with an increasingly polemic tone in these publications, or at least a rising willingness to question the

status quo in a way that life in the ‘employee scientist model’ has excised from much curiosity-driven research.

Questioning the status quo is a responsibility of science and should pervade all fields of research-informed development including policy. Without pre-empting the work that forms Chapter 9, it can be noted here that the insights afforded by the freedom of approach are almost miraculous. That approach has sometimes been referred to as risk-taking behaviour but again that is from stationary domestic perspective. A better comparison would be with the scientist-explorers of an earlier generation. Nevertheless, such criticism assists to understand the ever-widening scope of this enquiry, which with a confidence of contextual understanding allows comment on specific aspects of research and development, as in the penultimate Chapter 9. For now, the discussion must return to the reasoning and emotions behind the publications in this chapter. First, the paper on Australian livestock aid arose from a detailed review conducted for the aid program. Its modification to suit current politics was a useful lesson.

Awakening to the processes of aid also heightens sensitivity to the progressive shift in the functions and competences of aid and development institutions. Through consulting roles it became clear that field ‘research’ often served to justify preconceived project designs rather than eliciting needs from the development site. Nevertheless, MPW Australia’s success allowed some choice of objective, interesting and potentially useful assignments. In that world, using the publication medium to encourage an open dialogue maintained an approach to intellectual life that has worked until today. Travel still affords surprise meetings with persons who have read something included in these pages. The Mongolian and Lao-PDR papers fall into that category of widening the discussion, though that style of publication has a shorter life.

This explains why with Charan we went to such effort to produce the book about smallholder dairying in the tropics including the harnessing of experts from around the relevant world to inform the case. We were successful and international funding and views changed, though few would even know of this cause of the change. The earlier book about working animals, which was much more basic and should not be on the same shelf as some of these other publications, had a similar effect of pricking mentally lethargic research and development agencies into rethinking their culturally-narrow assumptions.

Of course, one and all suffer from the same lazy malaise from time to time. In such circumstances, being aware and snapping out of it has proven to most effective when mixing with objective and non-traditional thinkers. That is why advice to young mentally agile and intelligent persons with a desire to do something more than just pay a mortgage or make a name should include cultivation of worthy peers. Among those peers should be included persons who have not entered universities, for academic disciplines and regimented learning can make intellectual slaves with narrow lazy minds. Reflecting on the papers about global forces and food security, the emotions of combining experience with science and development thought to arrive at new visions re-arose. Such a return is not just an interest but knowledge that it is folly for food security experts to allow millions to starve – again. One cannot be sure how one would react to such a critique if one's actions in an organisation were meant to avert unnecessary deaths – but a previous generation might have raised hell in the agency and then left to do something more useful in their life.

In any case, these publications indicate a path guided by early training, which is why words like morals, ethics and spirituality begin to appear in these papers. It is fitting that the final paper in the Chapter is not only on this subject and Asian values, but that it is also from the Asian Agri-History Journal,

which unlike virtually all other refereed science journals, is able to accommodate human spirituality in its consideration of agricultural knowledge. The contribution of Asia to this wider understanding of human life that began, for this work, with Thailand had by now spread more widely across cultures and it now appears that the rate of expansion was related mainly to the degree of openness.

Chapter 6

Agricultural Education

Overview

The international agencies that have funded and thus influenced the research agendas in less-developed countries have necessarily been based on Western experience. The scientists in less-developed countries that they sponsored to further their research education were necessarily trained in those more-developed countries. This observation fed into a widening of this enquiry into agricultural education. Seen as being of declining efficiency in meeting even the needs of the more-developed countries, agricultural education was examined in some depth from its origins to current trends and weaknesses in order to elicit means of modifying agricultural education in both more- and less-developed countries.

The resultant surveys, historical research and global data collection culminated in many papers, some of which are included here. In particular a comprehensive book concerning natural resource management and agricultural education demonstrated that agricultural education and research could no longer be considered separate from environmental concepts. This work was conducted before some of that reported in Chapters 4 and 5, and consequently did not develop the theme of wider human values beyond an important consideration of 'environmental empathy'. In confirming the benefits of integrative agricultural education and research, the work also challenged previous conclusions about its effectiveness in situations where the majority of the population is engaged in agriculture and where it also performs a welfare function.

As noted in the previous Chapter, research related to international agriculture was informed by consulting reports not included in this book. Those reports were heavily critiqued, and some related to agricultural education and its linkage to research.

Numbered list of papers included in Chapter 6

41. Falvey, L. and Forno, D. (1997) Institutional arrangements in agricultural education, extension and research: Lessons for international development. *Journal of International Agricultural and Extension Education* 4:7-14.
42. Falvey, L. and Maguire, C. (1997) The Emerging Role for Agricultural Education in Producing Future Researchers. *Journal of International Agricultural and Extension Education* 4:15-22.
43. Falvey, L. (1997) Formal Agricultural Education: Origins of Agricultural Knowledge Systems. *Asian Agri-History* 1(3): 191-206.
44. Falvey, L. (1997) Food and Environmental Science. *Australian Science Teachers Journal* 43(3):7-14.
45. Falvey, L. and Matthews, B. (1999) Stakeholder Views on Agricultural Education in Australia. *Journal of International Agricultural and Extension Education* 6 (1): 23-35.
46. Matthews, B. and Falvey, L. (1999) Year 10 Student Perceptions of Agricultural Careers: Victoria (Australia). *Journal of International Agricultural and Extension Education* 6 (1): 55-67.
47. Falvey, L. (1998) Are Faculties of Agriculture Still Necessary? *Australian Academy of Technological Sciences and Engineering, Focus* 103:2-8.
48. Falvey, L. and Bardsley, B. (1997) Land and Food: Agricultural and Related Education in the Victorian Colleges and the University of Melbourne (co-authored with Barrie Bardsley), Institute of Land and Food Resources, University of Melbourne, 266pp (chapters author and editor) Introductory pages and Chapter 1, 12, 13.
49. Falvey, L. (1996) Food Environmental Education: Agricultural Education in Natural Resource Management, The Crawford Fund and the Institute for International Development, Melbourne and Adelaide. 260pp.

Discussion

A summary collation was conducted with Dr Douglas Forno from the World Bank of international development projects funded by a range of agencies concerned with institutional arrangements in agricultural education, extension and

research, from which lessons for international development were posited (Publication 41).⁴⁸ This was followed by a further paper with Dr Charles Maguire of the World Bank that focused specifically on agricultural education, and in particular the emerging bifocal role for agricultural education in producing both future technicians and researchers (Publication 42).⁴⁹

⁴⁸ Abstract from the Original Paper: *Agricultural research, education and extension are often organized in separate institutions in less developed countries. Many developed countries also have institutionally separated systems, but have evolved mechanisms to effect coordination among these integrally related fields. Development projects in less developed countries have, in many cases, assumed that it is possible to base projects on an institutionally integrated model such as the US land grant college system wherein teaching, research and extension functions are integrated. Experience indicates that this approach is costly and unlikely to succeed in the long term. Each country has its own organizational needs which should be considered in the design of assistance projects related to agricultural knowledge systems.* Falvey, L. and Forno, D. (1997) Institutional arrangements in agricultural education, extension and research: Lessons for international development. *Journal of International Agricultural and Extension Education* 4:7-14.

⁴⁹ Abstract from the Original Paper: *Agricultural education is changing and will continue to do so in response to changes in the definition of the agricultural sector, communication technology and funding imperatives. Bachelor's graduates will probably focus on career opportunities in natural resource management and vocationally oriented agricultural production, processing, and marketing fields. The small proportion of agricultural graduates with the aptitude and motivation to work effectively in research forms an important part of the post-graduate agricultural education pool and requires specific orientation to the changes occurring in agricultural research systems. Mechanisms used in some developed countries may be of benefit and provide a basis for strengthening overall human resource development and management in agricultural research systems, both in terms of the management of existing researchers, and the continuous training of new researchers. The approaches described in the paper have relevance to both more and less developed countries, particularly in agricultural knowledge systems that separate extension and applied research from education.* Falvey, L. and Maguire, C. (1997) The Emerging Role for Agricultural Education in Producing Future Researchers. *Journal of International Agricultural and Extension Education* 4:15-22.

These papers defined a position for agricultural education that differed from that extant in less-developing countries, which had largely been introduced uncritically from historical models of more-developed countries.

In challenging the agricultural education approaches of less-developed countries, it became evident that deficiencies may be related to either the lack of suitability of that model from more-developed countries, or indeed deficiencies in the model itself. The post of Dean of a large agricultural faculty enabled further analysis of the subject with the intent of improving the limitations inherited from, and inherent in, the old entities. A research project, funded by Australian state and federal sources was initiated from that impetus.

This work began with historical research to define the origins of formal agricultural knowledge systems (Publication 43),⁵⁰ and progressed to analysis of the production focus of past agricultural education compared to the apparent need for understanding interactions between food and environmental sciences – lip-service paid in renaming courses was discounted

⁵⁰ Abstract from the Original Paper: *The components of the agricultural knowledge systems, research, extension, training and education share common origins. Early European schools were necessarily practical in orientation and may be seen as an amalgam of today's vocational colleges and extension programs in both more and less developed countries. The evolution of some of these schools into universities or their equivalent complemented the continuing vocational schools to an extent, although separation of extension from education and training, and education from training in many countries ignores these common origins, possibly to our detriment. Transferring the model of more developed countries to less developed countries has further severed linkages between these three components of agricultural knowledge transfer.* Falvey, L. (1997) Formal Agricultural Education: Origins of Agricultural Knowledge Systems. *Asian Agri-History* 1(3): 191-206

as amateur marketing (Publication 44).⁵¹ It also led to reconsideration of the human dynamic in agricultural education, to include more than the teachers; this was conducted through a statistically-based survey tool that elicited stakeholder views on agricultural education in Australia (Publication 45).⁵² In terms of demand for agricultural

⁵¹ Abstract from the Original Paper: *The negative impact of food production on the environment is of increasing public concern and more sensitive production systems such as organic farming are often proposed. Such views miss the point that this global issue must be considered in terms of essential tradeoffs which require more and better science in the fields of food and environment, such as in agricultural science courses. Global population will continue to grow and demographic shifts and poverty will require massive increases in food production which can only be provided from intensive agriculture. Declining food prices and extreme poverty in some countries will continue to orient food producers to short term gains. All of these factors suggest that intensive agriculture restricted to suitable lands will be required for the foreseeable future. Balancing environmental care with food production is a challenge which continues to demand the best minds for research and education. We cannot isolate ourselves from the world in which we live.* Falvey, L. (1997) Food and Environmental Science. Australian Science Teachers Journal 43(3):7-14.

⁵² Abstract from the Original Paper: *Australian research funders, research providers, educators and agricultural producers were surveyed to elicit their views on future directions and needs of agricultural education. Information was gathered concerning the ... challenges facing universities and agencies associated with agriculture over the next decade. An overriding focus on environmental management and sustainability was evident in answers with a need for closer interaction between providers of education and research and users of knowledge, particularly agricultural producers. Attracting high-performing students to fields servicing agriculture, and integrating agricultural and environmental knowledge, were highlighted as particular needs. It was concluded that existing provision of educational services is failing to meet expectations of producers in terms of information delivery, creation of attractive learning environments, and involvement of stakeholders in decision-making. An education and research provider partnership with industry was seen as a logical outcome of current debates.* Falvey, L. and Matthews, B. (1999) Stakeholder Views on Agricultural Education in Australia. Journal of International Agricultural and Extension Education 6 (1): 23-35

education, the extant anecdotal research approach was informed by a further detailed and statistically validated survey to determine the drivers of choice among year 10 students (Publication 46);⁵³ both papers were work conducted with Bernadette Matthews and formed part of her masters research and a longer publication as a booklet and on the web at the sponsor's (Rural Industries Research and Development Corporation) site.

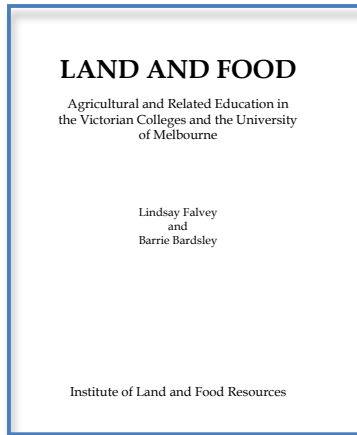
Relating the international to the local aspects of agricultural education was conducted through the paper presented as Publication 47;⁵⁴ an inaugural presentation after election as a

⁵³ Abstract from the Original Paper: *This study was conducted to assess the knowledge and perceptions of metropolitan and non-metropolitan Year 10 students in the Australian state of Victoria, concerning careers in agricultural and environmental fields. A survey of 550 Year 10 students was undertaken to determine factors involved in decision making: about careers by high school students, the knowledge of such students about careers available in agricultural science; and whether the perceptions of students about agriculture affect decisions to undertake university study in agriculture and related fields. The study showed that a greater number of non-metropolitan students had considered a career in agriculture than metropolitan students. It was also found that the most important influence on student knowledge about agricultural careers came from parents, school, and the media; that overall student knowledge of the various careers available to graduates of agricultural science was limited, and, where such knowledge existed, it was biased by misconceptions of the role and activities of agricultural scientists. Furthermore, students were interested in high paying careers, yet did not consider that agriculture offered these.* Matthews, B. and Falvey, L. (1999) Year 10 Student Perceptions of Agricultural Careers: Victoria (Australia). *Journal of International Agricultural and Extension Education* 6 (1): 55-67.

⁵⁴ Abstract from the Original Paper: *Higher agricultural education is in a period of transition which may not be widely recognised among its participants. Throughout Australia, declining enrolments have been masked by the offering of higher agricultural education by colleges and the renaming of CAEs as universities. A cyclical low in the popularity of science may also contribute to the present situation, but is probably no longer the over-riding factor. A declining understanding of agriculture itself in the*

Fellow of the Academy of Technological Sciences and Engineering. That paper considered whether faculties of agriculture were still necessary. The answer suggested was 'yes', but that the educational focus needed to be better aligned with domestic and international social responsibilities, and demand and industry requirements for the short-term future, particularly from the perspective of environmental studies.

general population sets a context for the demise of agricultural education predicted by some. Against this apparently damning scenario, the need for further increases in global food production from a declining land area, and the need for vast improvements in environmental care, seem to be in conflict. While recognizing the sometimes fickle decisions which affect the relative popularity of university courses, the imperatives to change agricultural education to acknowledge environmental management, agribusiness, food processing and safety, and lifestyle among other social aspects of agriculture, are evident. Changes in the shape of Australian agricultural education may lead to a small number of comprehensive and adaptable faculties concerned primarily with agriculture linked to international knowledge systems, which support a number of centres where specific examples relevant to a local area can be demonstrated. Overall, one might expect to see less students and staff in traditional Australian agricultural faculties, increased emphasis on agribusiness, environmental management and food safety, and improved links between the sector and all university faculties. Falvey, L. (1998) Are Faculties of Agriculture Still Necessary? Australian Academy of Technological Sciences and Engineering, Focus 103:2-8.



The knowledge generated from this research and debate led to the production of a history of the combined large faculty that was to become the Institute of Land and Food Resources in 1997 at the University of Melbourne, and today in a rationalized form, the Melbourne School of Land and Environment. The history was a co-authored publication with the Head of the Victorian Colleges, Professor Barrie Bardsley (Publication 48).⁵⁵ It used histories of individual colleges

⁵⁵ From the Editors' Foreword: *The creation of the new Institute of Land and Food on 1 July 1997 represents a landmark in the history of agriculture, food, forestry, horticulture and natural resource management education in Australia. It indicates a commitment from the Victorian College of Agriculture and Horticulture and the University of Melbourne to merge the agriculture, food, forestry and horticultural activities into a single faculty to become Australia's largest ever such entity ... This story of the evolution of agricultural and related education in South Eastern Australia leading to the formation of the ILFR is a small attempt to provide a perspective on current developments ... In reviewing the various histories of the entities forming Land and Food, we have been impressed by the resilience of persons with a commitment to agriculture as a sector. At the same time we note the ambivalence of government. It is salutary for those involved in agriculture and related education to consider that the general public's ambivalence toward agriculture and related fields may not be a new phenomenon. That these strong and productive institutions have been created, developed and*

survived, to merge into this strong and diverse organisation in such an environment, should provide hope of continuing development of the faculty ... In collating this history we are conscious that the University of Melbourne has become the main custodian for agricultural, food, forestry, horticultural and related environmental education in South Eastern Australia. In transferring this responsibility to the university, all associated with industry should be proud while at the same time maintain an active monitoring role. At this point in Australia's history, universities appear an appropriate mechanism for delivering quality products in sectors demanding education, training, research and related services. It is logical that education moves out of government departments and those small institutions unable to make the large capital investments necessary for international leadership in such education, join into larger groupings. However, lest we make the mistake of believing that we have finally, after 131 years, created the optimal structure for agricultural education in Australia, let us recall words from 1874 from A. R. Wallis, Victoria's Secretary for Agriculture: 'In my opinion a well organised system of agricultural education by means of academies, situated in country districts and having farms attached, will be best adapted to the requirements of Victoria. ... It is by no means essential that an agricultural college should stand alone and have no other course of instruction connected with it; on the contrary there are many branches of useful technical learning which might be taught under the same roof'. ... Wallis can be regarded as the father not only of Dookie College, but also of the new Victorian College of Agriculture and Horticulture (VCAH). [However,] a niggardly Minister for agriculture established only one of the Colleges [that] Wallis envisaged and an equally mean-minded Minister fired him as the Dookie Farm School became little more than a reformatory. There is a nice symmetry in the fact that as Wallis' dream became reality in 1983, control of that reality was removed from the Department which treated him so badly so long ago.' ... In combining the six colleges of the Victorian College of Agriculture and Horticulture and the two departments of the Faculty of Agriculture and Forestry, the new faculty brings together two major cultures. The various styles of operation and approaches to education are reflected in the different origins of the colleges and the university. In the period leading to the creation of the Institute of Land and Food Resources, it has become clear that each entity has much to learn from the other. We trust that some of these cultural interactions shine through the story presented in these pages. Falvey, L. and Bardsley, B. (1997) Land and Food: Agricultural and Related Education in the Victorian Colleges and the University of Melbourne, Institute of Land and Food Resources, University of Melbourne, 266pp (hardback).

written earlier, which it brought up to date. It then illustrated the machinations that were in train to form one single entity with potential to stave off would-be predators and to launch a more up-to-date faculty. The flavour of that book is represented in the following extract:

“The personalities in the early stages of agricultural education, including the persuaders, rogues, visionaries, politicians, academics and farmers, are, we believe, mentioned in context. Such an origin for a great institution is not unique in Australian history. The association of boom and bust gave rise to visionaries and opportunists, both of which contributed to the introduction of a system that has led us to today's united institution. The boom and bust economic cycles of Australia particularly at the end of the 19th Century were compounded in the case of agricultural education by cycles of droughts and export markets. Such ups and downs have led to innovative political manoeuvring to sustain an essential service in agricultural, food, forestry and horticultural education over the past 130 years. Contending with these cycles has produced a resilience of spirit, clarity of vision and strength of conviction. These traits continue in Land and Food, particularly through its partnerships with industry and other stakeholders. When tracing the origins of agricultural and related education in South Eastern Australia some interesting historical parallels can be drawn. For example, the Council for Agricultural Education was conceived as the initial governance mechanism for agricultural education which led to the formation of Dookie and subsequently Longerenong Colleges. Experience taught that the power of the Council should be separated from government to minimise opportunistic political intervention in long term decisions. This evolved into the colleges being part of the State Department of Agriculture. Later, when separating from that state umbrella through the creation of the Victorian College of Agriculture and Horticulture, a council was again formed. In the most recent change of the merging of the

colleges with the university's activities in the sector to create Land and Food, a new board or council has been created. ... For those who feel that we have returned to the logic of last century, it would be wise to read such documents as the statements of Wallace, the Director of Agriculture (not to be confused with Wallis, the first Secretary for Agriculture) who noted in the September 1904 Journal of Agriculture that 'A chair of agriculture at the university would be useful in educating men who would afterwards become lecturers and officers of the Department of Agriculture, that farmers' sons would never attend in any great number and I am afraid that those who did would not return to the plough.' So much has changed - we are charged with educating all persons not just men; we do not simply train persons for lecturing or working in government but increasingly for the agribusiness sector. The children of farmers do attend in great numbers and may not aspire to return to the plough, rather they return as progressive managers who have a perspective of continuing learning to access new technological developments. With such changes as these, changes in mechanisms of governance and indeed ownership of agricultural and related education are warranted. The corporate model aims to set long and medium term policies through the governing body and allow management to implement policy. Such an approach contrasts with the involvement of the Council of Agricultural Education, as highlighted in the 1899 Fink Commission's interviews mentioned in Chapter 2. Today's management of agricultural and related education requires a vision to implement and a clear definition of responsibilities and authorities. This is the point at which we have now arrived."

"The importance of the sector is at least as great as it has ever been in Australia. Economically, agricultural and related industries continue to be the dominant interest of Australia. This may not commonly be recognised when statistics separate manufacturing from primary industries (and neglect the social

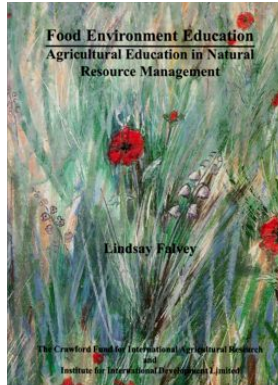
benefits of rural communities); yet a large proportion of the manufacturing industries relates to agriculture and products derived from it. As a consequence agri- industry and related industries represent a major employer throughout the country. Students who pass through faculties related to agriculture, food, forestry and horticulture, move into positions of responsibility for managing more than 90 per cent of the land within Australia. This is not only through natural resource management education but also through agricultural, forestry and national parks, and urban park management education. As a critically important sector, it behoves all who are associated with it, through delivery of education, to ensure a continuing high quality support service to these sectors.”

The most significant research concerning agricultural education in the global sense was published as the book *Food Environmental Education: Agricultural Education in Natural Resource Management* (Publication 49),⁵⁶ which questioned

⁵⁶ From ‘To the Reader’ Introduction of the Book: *Dear Reader, as I recall the many additional thoughts which I originally wished to include in this book, and the many which probably should not have found their way in, I realize that if only a small number of persons think and act in the manners propounded, I will be satisfied. Such a subject can never be covered in one publication. This book can be appreciated in a number of ways apart from reading from cover to cover. For those readers who wish to trace the main arguments, the text may be followed without reference to the Boxes. Others may choose to refer primarily to the Boxes which are mainly the work of others. Some may elect to simply scan the words and dally over the sketches, which pay tribute to the stimulating and productive airs of the Villa Serbelloni in Bellagio on Lake Como - where the publication was given form. Some may even prefer to simply read the poems which attempt to capture the essence of each Chapter. The publication is also accessible on the Internet. ... The book begins with the significant impact of food production on the environment in Chapter 1 and, in Chapter 2 places that impact within the context of the absolute need to further increase food production while reducing poverty. In creating a new knowledge base, the need to increase environmental empathy and understanding in existing*

existing structures and activities. That book was published under the auspices of The Crawford Fund for International Agricultural Research; its writing had been supported by Rockefeller Foundation through a Residency at their Bellagio Lake Como centre in northern Italy, a place that was to, some 14 years later, again contribute to this thinking – see Chapter 9.

education is discussed in Chapter 3. In order to discuss the current and future needs for agricultural and natural resource education in less developed countries, Chapter 4 considers university agricultural education while Chapter 5 introduces vocational agricultural education. The origins of agricultural education, its present delivery and possible future metamorphosis into the wider field of natural resource management education in more developed countries is then introduced in Chapter 6. Chapter 7 discusses the development agencies including the international agricultural research centers as a suitable focus for forming a closer association between research and education and between universities in more and less developed countries. The origin of agricultural extension as part of education is emphasized in Chapter 8 and rapidly developing electronic and other communication technologies in extension and education are considered in the context of change in the university learning environment in Chapter 9. The final chapter amplifies the opportunity and responsibility which agricultural educators and their funders have in shaping a future for education which is more accessible, internationally interconnected, current, and oriented to balancing the issues of food production, environmental care and financial rewards. ... The value of books in general was shown to me several years ago in Vietnam where a collaborating author of the Vietnamese translation advised the setting of our book price [for the Vietnamese version of 'An Introduction to Working Animals'] at the government breakfast allowance rate - the rationale being that any self-respecting intellectual would be prepared to forgo one breakfast for a book. But if this book was for sale, I would prefer the words of Cramer (1993) who, in his preface to his thoughtful discourse on life and science, quotes a colleague as saying ... whoever has two pairs of pants should sell one pair and use the money to buy this book. Falvey, L. (1996) Food Environmental Education: Agricultural Education in Natural Resource Management, The Crawford Fund and the Institute for International Development, Melbourne and Adelaide. 260Pp.



As the book itself notes, it “takes the apparent declining emphasis on agricultural education as an indicator of need for change. It suggests that the increasing separation of urban populations from food production has partly fueled interest in greater environmental care, and that agricultural education should embrace this public viewpoint in order to command respect and funding. The benefits which accrue from education are assumed on the basis of investigations in less developed countries which indicate that GDP growth is higher where education is emphasized even where significant policy distortions work against economic growth. Agricultural education in both more and less developed countries is under pressure from apparent reduced demand and fiscal pressure. In less developed countries this may relate to the profile of students gaining access to universities - mainly from urban areas and privileged backgrounds, and to the policies of the countries which emphasize investment in new industries. In more developed countries this may relate to a continuing reduction in the numbers of persons engaged in modern agriculture with its high levels of automation and hence the partial loss of past political influence, and to public and student perceptions that agriculture is a mature industry that does not offer great potential growth for future career opportunities. Agriculture also suffers from an image of damaging the

environment. Criticisms of the environmental impact of modern food production have merit in many cases. However, there is a need for a wider public understanding of the compromises that necessarily must occur in order to produce sufficient food at current levels of knowledge. Projections of future food demand indicate that present technologies are insufficient to produce global food requirements. The challenges and opportunities for food production research and development contrasts with common perceptions. The dual trends of concern for the environment and the need for increased food production provide a context for future agricultural education. Existing courses mainly take a balanced scientific approach - to this there would appear to be a need to include a greater input from the humanities including an understanding of environmental ethics. The imperative to produce food, as far as we know today, will continue to rely on continued intervention in the natural environment. In accepting the responsibility to manage the environment with care, agricultural education may need to see itself as a field of natural resource management - managing the natural resource base (soil, water, mined fertilizers and so on) to produce food while understanding the interactions with that resource base. The opportunity to introduce change exists as a function of the near global shifts in the popularity of courses and funding. To introduce such changes, the field of agricultural extension - the dissemination of information to producers and others - can be seen as part of education as an extension of the classroom. Electronic technologies already allow this and may be introduced as much by fiscal imperatives as by visionary managers of education. Past trends of agricultural education in more developed countries being followed by less developed countries may be superseded by communication technologies allowing international access to high quality and relevant courses. Investment in this sector in less developed countries may do better to focus on these technologies than infrastructure and traditional approaches to education. The

term natural resource management is used to emphasize that the majority of the world's terrestrial resources are managed by farmers, foresters and those in industries and services which support them. For the foreseeable future, the objectives of this management are to increase food and fiber production efficiency in a manner which is equitable for all producers including the poor, and which minimizes impact on the natural resource base. Agricultural education faces the choice of becoming a variable output from science or skills oriented courses with less understanding of the interactions between science, people and the environment, or of shifting its own orientation to embrace public requirements and emerging technologies. Individual institutions and nations will determine their own response, if they indeed recognize the choice. The great agricultural education centers of the world next century will, more probably, be those which are able to offer their services within areas of specialization on an international basis, and which create a learning environment which encourages motivated students to understand agriculture as the management of risks within the environment - the management of natural resources."

A More Personal Comment Looking Back

The publications in this Chapter continue the theme that routine technological science and aspects of social science can miss the overall picture by seeking to analyze part of it. Now looking back, there are clearly two important points that have been unrefined assumptions for much of the work discussed herein. The first is that reductionist approaches are planned within an appreciation of the operation of the whole system from which is drawn a tiny part to be studied. The second is a corollary of the first and is that persons engaged in research have elite intelligence and are able to understand both the large and small picture - the reductionist studies and their

theoretical place in the overall interactions of systems. Neither assumption has proved valid.

Much of what is called scientific research is conceived and conducted without overall understanding. Only an understanding of the immediate factors affecting the variables being studied seems to have been encouraged. This will not be a surprising realization to many involved in research who have long ceased to pretend to systemic understanding and whose careers as super technologists have rewarded them greatly. But it is an important realization, for it explains how reward systems encourage inventions and their application without consideration of their contingent effects. It also incidentally explains why it is so hard for many people to talk to scientists who have neglected their own continuing education about their work's place in the complex interactions that make up the world.

This scenario is now a generation old and hence a new crop of researchers without broad education in the natural sciences including man – and *ipso facto* humanities – is guiding society's innovations. It is one, not the only, contributing factor to the blindness of influence of research funders as they increasingly morph into influential groups seeking wider control, even in government programs. As a result, the ideal of government balancing private interests in research for the public good has disappeared.

These thoughts serve to introduce simple observations about education as presented in this Chapter. The early thought-pieces elaborated concern for the transplanting of education (in the same way as for research and development) approaches without regard to cultural mores. The quantitative work of Bernadette Matthews presents what was known intuitively – like so much of such social research. But it seemed at that time,

as now, that information was needed for political action, and regardless of its currency, the work remains frequently cited.

The two books presented in this Chapter indicate a concern for context in the form of history. *Land and Food* was largely a collation and summary of others' earlier histories and had the purpose of supporting the merger and political work led as Dean to bring colleges and departments to form a single new institution. It served to show how colleges antedated university agricultural education and how the two complemented each other. Published in great quantity, the book became a gift and PR document for a decade and a half – to 2010 when the last copies were distributed. Thus the book long outlasted the approaches it advocated in the faltering reformation of agricultural education.

However, it was *Food Environment Education* that attracted the largest international interest. It is a curious book that is in effect a categorizing of the miscellaneous new information arising at the time that could support advances in agricultural education. It is the first of these books to include poetry – at the end of and on the themes of each chapter. The presentation was attractive and created interest, though it was the contents that effectively provided a manifesto for change in agricultural education.

Looking back this was a productive period – not just the writing, but also the more-than-full-time role as Dean in the University and other roles in related organizations. Partly it was compensation for other aspects of life, but then again it was a function of accustomed discipline from frequent periods alone over the preceding 25 years. Did that enhance or compromise the work? Who can know? But at least the books have stood the test of time, so far. Of course, one could do better now, but that is with more knowledge and experience. It

should also be noted that such publications⁵⁷ involve others in various ways, an important means in this period being the transcription of the hundreds of thousands of words. These words flowed through the fingers of Mary Vatsaloo – right hand to the Managing Director of MPW Australia and Coffey-MPW, and then to the Dean of Land and Food at the University of Melbourne.

The books and papers contain the continuing message of a wider dimension of life than rational thought, and the need to accommodate this in any discussion and action of man's interactions with other parts of nature. It was through the years spanned in this Chapter, the 1980s-90s that 'sustainability' became the new motherhood statement in agricultural science. Concern about the new un-thinking that would follow such a political message led to incorporation of the Chapter on values and traditions in the 'Thai Agriculture' book, and to addressing sustainability directly through a subsequent book, as is introduced in Chapter 7.

⁵⁷ Apart from the various papers to about 1996, this included large parts of such books as 'Working Animals', 'Smallholder Dairying in the Tropics', 'Land and Food' and 'Food Environment Education'.

Chapter 7

Is 'Sustainability' the Answer?

Overview

The publications presented in this collation so far have been discussed in terms of their unintended contribution to knowledge of interrelationships, as well as their specific technical contributions.

Technical approaches indicated the need for a wider social awareness in research and development. They also indicated the inefficiency of assuming that approaches suited to more-developed countries would be appropriate for less-developed countries. The detailed enquiry into Thai agriculture developed the theme further as a country case study, and highlighted that essential aspects of agricultural sustainability had long been entrusted to religious and other cultural systems as a means of preserving them. However, more recent uncritical adoption of foreign technological approaches has often compromised these systems.

Wider consideration of current international issues in agriculture broadened this conclusion across international policy related to food security, environmental protection and commonalities in Asian food production systems. The source of the assumption that less-developed country agriculture can be improved by adoption of the approaches of more-developed countries was determined to be, at least in part, agricultural education systems, examination of which determined that the context for agricultural education was natural resource management. By reference to the Thai and international policy

work this was extended to mean social considerations, especially in smallholder agriculture.

In order to consolidate these findings a series of investigations were undertaken of the specific relationship of self-sufficient agriculture to religion, sustainability and alternative sources of knowledge, which forms the basis of this Chapter.

Numbered list of papers included in Chapter 7

50. Falvey, L. (2000) Self-Sufficiency or Buddhism? – Applied Agricultural Ethics in Thailand. *Tai Culture* 5: 15-34.
51. Falvey, L. (2002) Sustainability is the Answer! – What was the Question? *Australian Academy of Technological Science & Engineering – Focus* 123:
52. Falvey, L. (2003) Agri-History and Sustainable Agriculture: A Consideration of Technology and Ancient Wisdom. *Asian Agri-History Journal* 7(4): 279-294.
53. Falvey, L. (2004) Sustainability: Elusive or Illusory? *Wise Environmental Intervention*. 245pp. Institute for International Development, Adelaide.

Discussion

In considering wider aspects of human knowledge that are usually omitted in research approaches aimed at technical innovation in a society with a low and declining connection to agriculture, a new conception of international agricultural development becomes evident. But to simply extend the often value-free conception of agriculture to societies where agriculture is integrated with everyday life for the majority of a population, as has increasingly been done in aid for four decades, is to continue to waste resources and to overthrow some useful and sustainable practices.

The thesis tested in the Chapters thus far – that conventional Western approaches of agricultural research and development are sufficient for less-developed countries – has already been shown to be invalid. The major deficiency seems to be an ignorance of cultural and religious beliefs, which may be

interpreted by the conventional discipline base as psychological elements. Thus, while demonstrating the benefit of cross-disciplinary research in international agricultural development, this work has also indicated that knowledge of such matters is not far advanced, and that agricultural scientists may well benefit from thinking much more widely than even farming systems research when they work in less-developed countries. The problem of course, though often unstated, is that systems research can be a maze from which unequipped minds never emerge.

The integrative approaches of agricultural science, which extends to the natural environment with its animals including humans, requires a deeper understanding of cultural mores and sustainability before alternative systems are proposed. This points to the need for a wider base in international agricultural research. Thus this work introduces a distinctly different understanding of agricultural research and development policy while incidentally highlighting deficiencies in claims about international agricultural sustainability.

After having challenged conventional assumptions and the framework of much agricultural research and development in a less-developed country, it became important to consider the meaning given to the imprecise area of sustainability as it was approached in agricultural research in general. Later additions such as resilience and vulnerability have assisted temporal understanding of sustainability, yet the words remain subject to malleable definitions. But some things are clear. It reduces social sustainability to replace an agricultural system that had sustained a medium-density population for centuries with one reliant on continuous agricultural research to address each unforeseen problem as it arises. One therefore cannot call that 'sustainable agriculture'.

These conclusions are developed further through what were the final four publications included in the D.Agr.Sc. collation. The first paper in this Chapter considered self-sufficiency and Buddhism within the construct of applied agricultural ethics in Thailand (Publication 50).⁵⁸ This revealed a distinctly different understanding of agricultural development from that which had been considered to date within international development policy, and incidentally highlighted deficiencies in claims about agricultural sustainability that had not been substantiated by research.

Having challenged conventional assumptions and the conventional research framework, consideration was given to the imprecise area of sustainability as it was being approached in agricultural research in general. This led to the paper ‘Sustainability is the Answer! – What was the Question?’ (Publication 51),⁵⁹ which aimed to stimulate debate and research among informed practitioners. The cynical title was

⁵⁸ Overview of the Paper: *Developing ideas in Chapter 14 of ‘Thai Agriculture’, the Thai government’s flirtation with self-sufficiency as a product of Buddhism is considered. It consequently discusses some Buddhist teachings, the rising NGO interest in eco-Buddhism, global relationships of such ideals, the un/naturalness of agriculture in an environment, conflicts between global influences and Thai traditions, and talks of practical measures that may be working in the modern context.* Falvey, L. (2000) Self-Sufficiency or Buddhism? – Applied Agricultural Ethics in Thailand. *Tai Culture* 5: 15-34.

⁵⁹ First Paragraph from the Paper: *The recent CSIRO meeting ... began with a metaphor from the Chief Executive, Chris Garrett – ‘I didn’t know how fast I was going until I tried to stop’. This might be construed to mean that our technological research and development complex, by continuing its accelerating path of discovery and demanding activity, may be missing some elements essential to sustainability. If that was his meaning, it accords with my conclusion that it is probably impossible to conceive sustainability without stepping aside from the fast pace of science and the focussed attention of its supporting structures.* Falvey, L. (2002) Sustainability is the Answer! – What was the Question? Australian Academy of Technological Science and Engineering – Focus 123:

meant to imply that sustainability was both being used to justify whatever action was being taken as well as being used as an end in itself in some cases.

The contextual link is made clearer in Publication 52,⁶⁰ which compares technology and ancient wisdom within an Asian paradigm, concluding that while agriculture originated with and was probably causal to the refinement of two forms of knowledge, the rational deductive form has since been pursued in earnest in modern science while experiential knowledge has been ignored. The subject of this imbalance in knowledge was developed further in a book that collated these and other works about the ‘elusory or illusory’ nature of sustainability; Publication 53.⁶¹

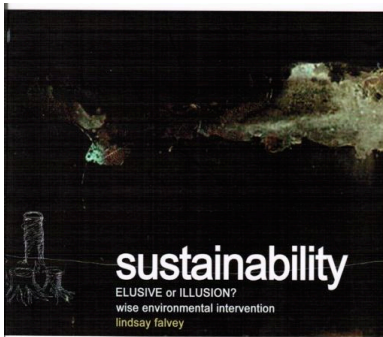
⁶⁰ Abstract from the Original Paper: *Two sources of knowledge inform all discussions, rationality including the technological understandings of science, and the insights of spiritual masters. To consider sustainable agriculture within a modern technical paradigm has led us to a perpetually uncertain attempt to sustain an output by constant technological innovation. This paper compares modern technological approaches with millennia-old insights beginning from the Indian classical period, that appear to indicate that sustainable agriculture like other human desires, produces outcomes according to the wisdom of each act. For modern agriculture, this suggests that we should not seek sustainable agriculture where other, singular or multiple, motivations such as profit are paramount, but rather consider those activities that value a wider range of both tangible and intangible products. The discussion begins by considering the meaning of agricultural sustainability and then considers non-rational insights into the natural world to conclude whether sustainable agriculture can, and is likely to be, attainable.* Falvey, L. (2003) Agri-History and Sustainable Agriculture: A Consideration of Technology and Ancient Wisdom. *Asian Agri-History Journal* 7(4): 279-294.

⁶¹ Summary from Chapter 1: *Stepping Back to Survey the Landscape: Sustainability of the environment contains both wishful thinking and ignorance – ignorance of the reality that natural systems are complex and unfathomable by scientists, and that repetition of their outputs depend on repetition of initial and all subsequent conditions. Scientific insights provide knowledge, but it is partial in most cases, and when applied is often subject*

In 'An Optimistic Afterword', Chapter 10 of that book *Sustainability: Elusive or Illusory? Wise Environmental Intervention*, it notes: "From ancient Asian wisdom through modern global forces and technology related to environmental management to the central environmental issue of food production, we have identified some necessary conditions for sustainability to be possible. Yet, our approaches to protection, care or management of the natural environment seem to be based on such erroneous assumptions as; that there is an essential need to compete for limited resources, that sustaining our current lifestyles and their supporting production systems is necessary and virtuous, and that global forces will inevitably lead to a situation in which Western culture will inform all technological development and application as a precursor to an utopian global form of sustainable environmental management. While each of these assumptions may be easily challenged, and some of those challenges have been considered in the chapters of this book, the possibility that they may contain some truth is sufficient reason to consider the conclusions of the penultimate chapter, Chapter 9, in the light of everyday practices. In that way, we may posit a conclusion about whether sustainability is an elusive goal that our ever more clever science will one day pin down, or whether it is just an illusion."

to conflicting objectives, which in turn produce conditions that affect outcomes - thus our best efforts to predict natural outcomes are usually flawed. We further display our ignorance in seeking social sustainability while we behave inequitably towards groups other than 'us' and invoke spurious reasoning to justify further research. The effect of ignorant self-interest is played out daily in our largest intervention in the natural environment – agriculture, which is why agriculture provides perhaps the best model for consideration of the ideal of sustainability. Falvey, L. (2004) *Sustainability: Elusive or Illusory? Wise Environmental Intervention*. 245pp. Institute for International Development Fund, Adelaide.

That final Chapter ends with the paragraph: “So in answer to our question – is sustainability elusive or illusory? – we may answer ‘both’, and learn from the discussion that ensues. If the individual insights of the wise scientists and others are used to develop products to serve the greed of the developers and consumers and which each group seeks to sustain into the future, we can be sure that sustainability is illusory. Our usually deluded minds may see this as simply muddling along – win-some-lose-some – but the primary intentions are not conducive to sustainability. But the good news is that we are subject to natural law in the same way as those very things we seek to change, and the homeostatic tendencies of cyclical nature suggests that our excesses at one time will stimulate a corrective reaction, sometimes using us as its agent. This may be occurring as we realise more and more that our role remains fixed within nature. Thus we, the destroyer become the protector, or even the creator, as captured in the Hindu Trinity and the myths and doctrines of other great religions. In this way wisdom may arise from the karmic fruit of ignorance and produce the overall outcome that in the long term ‘to sustain all things is not to subdue change’. So, sustainability is not necessarily illusory, but we will only find it when we accept natural changes and live within them – rather like the perennial ‘living in the moment’ advice of the wise.”



Contrary to popular discussion, this contextual section concludes that apparent conflicts between science and traditional value systems can be addressed in the continuing evolution of applied science, and that some current views apparently derived from science in fact neglect reference to underlying assumptions.

Thus the cost of neglecting traditional values that are often part of extant sustainable systems in poorer countries emerges as a distinct conclusion from all this work. Agricultural research and development approaches as introduced to less-developed countries commonly omit these essential human values that are critical to sustainable agriculture. However, the problem does not appear to be that of science *per se* but one of neglecting the scientific method, for while isolation of an external influence is acceptable to study a specific set of other relationships, the scientific method has never suggested that the outcome of the artificial experimental system can be applied across other circumstances – and in agricultural science in less-developed countries, this necessarily includes all aspects of being human.

Without repeating the words of the publications themselves, the overall conclusion from experience with technical, through social, historical, political, economic and cultural aspects of agriculture and its science can be described in terms of ‘wisdom’ as well as knowledge. What is termed ‘wise environmentalism’ in the publications of this Chapter effectively define sustainability, and yet this does not exclude science simply because it is knowledge-based. Science explains much of the natural world in a manner remarkable similar to everyday levels of the Causal Dependence insight of Buddhism which may be the same as wisdom, and science remains open to constant challenging of its own hypotheses. Put another way: spiritual insights and good science coincide in many discoveries for material matters.

The original D.Agr.Sc. collation continued to a conclusion at this point; those couple of pages are now relegated to Chapter 10. Since that collation, two other books have been published that advance this subject. They are based on further research and reflection across the four decades. The bridge between them may be seen in the poem that summarized the book

'Sustainability: Elusive or Illusory? Wise Environmental Intervention'; each chapter of that book was summarized by two lines of verse, which when assembled became the poem *'Elusion'*⁶².

The luxury that a privileged life afforded in terms of choices of employment, career, adventure and development, as well as time to reflect had been coming together over the last five or so years of this third professional decade. So from this point on, there is no longer any need to add a specific section of personal reflections or 'looking back'. Writings from this time have incorporated increasing reflection within them. This is particularly evident in the book presented in the following Chapter 8. With such reflection the focus then returned to two practical matters that seem pivotal to avoiding a coming crisis, as presented in Chapter 9. For what use are insights if they are just for one's own comfort?

⁶² ***Elusion***

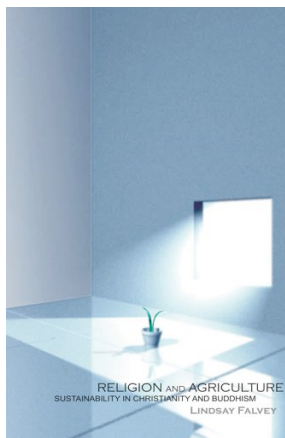
*To reflect how things change yet last / is to measure life anew,
to see man's thoughts as loaned from past – / for no false gods renew!
Now as gods fall, so surfeit soars, / yet we still exploit the poor,
invoking science to yield us more, / while our nature we ignore.
Our superficial civil heart, / belies the beast below,
which of self-delusion makes an art, / tasting but truths shallow.
We crave our touch will all imbue / and in our quest we poison,
spurning spirit, we pain pursue, / though seldom see the reason.
But nature glimpsed by scientists sane, / may ignorant bonds sunder,
for all is ever here sustained / when we with wisdom wonder.*

Chapter 8

Holistic Considerations: Sustainability Science in Context

Religion and Agriculture

Reflections from the work to date on what might be called the human spiritual dimension in science led to a wider consideration of sustainability. Rather than exciting earth-shattering revelations they are more in the style of a progressive unfolding of the nature of reality. Those deliberations can be appreciated from various papers and books that appear in the more recent years in the list of publications included in the Appendix, but may be best appreciated from the final chapter of the book *Religion and Agriculture: Sustainability in Christianity and Buddhism* (Publication 56)⁶³ namely,



⁶³ From the Book's Back Cover: *Religion is a powerful expression of culture that is most obviously expressed in our relationships with nature. As our major meeting point with nature is food, this provides a fertile field for cultivating the wisdom that Professor Falvey concludes is the essence of all sustainability. By bringing sustainability, agriculture, global issues, Buddhism, Christianity and a host of other factors into play, we see that our motivations belie our rhetoric – in environmental actions through to trade and aid. This open-spirited book contains a wealth of analysis and alternative logics that make it essential to serious readers about nature, the environment, spirituality and religion, Asia and ourselves. Beginning with science and spirituality, the discussion moves from immortality to theology to literal misinterpretations and unifies these themes around unacknowledged Western core values. Shifting to philosophy, ethics, and*

Chapter 29 - *Tying the Thread: The Sutra of Sustainability*, as follows:

“Our meandering search for sustainability has eclectically selected philosophical elements from diverse opinions in order to divine a common thread. By tracing that thread of the suture (Sanskrit, *sutra*) that binds the body of wisdom, we connect our search for sustainable agriculture back to some dubious motives. We also understand the intent behind common justifications for environmental activism. Now, as we follow that *sutra* through each of the chapters, we may describe how Yeats’ old men could be happy amidst the tragedies that we bring upon ourselves.

We began by considering sustainability as a proxy for beliefs in immortality or rebirth and revealed a fundamental fear of impermanence. This fear of impermanence explains the resilient misinterpretation of eternity common to all religions and which sanctions the popular belief in sustainability as a virtue for science to investigate. While pure science studies the processes of nature and recognizes cycles of life and decay, the more narrowly conceived technological or applied sciences are oriented to forestalling change – and death, the ultimate

rights, an ecological argument about our selective ‘liberation’ of nature is proffered as an introduction to global issues, including traditional values of poor countries and lost traditions in the West. An engrossing hybrid Oriental-Western dialectic allows chapters to be read alone or as part of an accumulating thesis. Thus Buddhist and Christian teachings are applied to agriculture and sustainability – and they are found to be at one with each other. Whether it is biblical metaphor, karmic logic or enlightened self-interest, the continuous thread of a strong suture stitches a complex set of subjects into a coherent sutra that will vivify the current moribund dialogue between agriculture, science and religion. Falvey, L. (2005) *Religion and Agriculture: Sustainability in Christianity and Buddhism*. 290pp. Institute for International Development, Adelaide.

change. This occurs even within cultures that consider themselves secular.

The so-called secular culture of the West retains its Judeo-Christian origins in the form of an assumed licence to dominate other elements of nature. By misinterpreting the creation myths and thus denying their lessons about the interconnectivity of all things (in God or heaven in this conception), time, space and quantity have been emphasized as the elements of sustainability. At the same time, a fascination with a deterministic model of an inconceivably complex nature has fostered neglect of what has long been termed the divine essence in all of us. Neglect of this essential part of natural wellbeing produces the indeterminate angst prevalent in modern lifestyles. Yet, ironically, it is these modern lifestyles that demand sustainability at the same time as continued growth. Its criticality is then shown by invoking an environmental apocalypse that mimics literalistic eschatology.

Literal readings of the Old Testament easily elicit concepts of apparent relevance to agricultural sustainability in such forms as stewardship, equitable land distribution and simple close-to-the-earth lifestyles. But such interpretations must be tempered by the emerging human self-consciousness expressed in the historical narrative of everyday activities, which include agriculture in metaphors for personal development. From this perspective, references to sustainable agriculture separate from personal self-transformation are not readily apparent in the Christian scriptures.

The spiritual insights of Christianity revel in the changeability of life as an expression of universal divine immanence. This is the Christian version of the theme recurring through this book – sustainable agriculture exists within dynamic change. For those who have exchanged literal definitions of God in favour of an experience of an immanent spirit, sustainable agriculture may

be seen as working within and respecting the spirit. For others, such awareness might also be expressed as God's hand in managing natural law. However, those who adhere to a paternal controlling God inevitably arrive at a belief in human-controlled sustainable agriculture that varies little from rationalist conceptions.

Since the Reformation, the West's trust in rationality has diluted the impact of insights of human unity with an unseen order. It is thought that statements about sustainability are rational and whoever challenges rational thought is regarded as today's heretic. Yet what is called a rational search for sustainability may simply be self-will, which when it ignores the natural order, can produce little of lasting benefit. Such unsustainable outcomes, as argued through this book, are an example of what Christian language calls sin – failing to accord with the natural unity, or if you like, reality.

Insights of human unity with all things have commonly described a divine indwelling that permeates all nature and its flows, which confirm that agriculture can only be sustainable when practised within those flows. But technology seems to disrespect those flows as it seeks to understand only that part of them that technologists or their masters wish to manipulate in response to a societal fear of change. This could explain the myths and symbols that refer to psychological health being dependent on knowledge of the integrity of all things – the first premise of sustainability, and an insight that pervades all great religions.

All religions centre more on our common potential for higher forms of consciousness than everyday experience, although each religion has its own cultural and institutional accretions that mask this essential message. The Old Testament reveals the emergence of awareness of human consciousness and realization of the ideal of balance between physical,

psychological and spiritual development. Within this context, scriptural references to agriculture as a punishment or source of human misery may be understood as rhetorical in the same manner as the pain of childbirth, and as emphasizing the karmic interconnections between all things from thoughts to actions.

In a more advanced form, prophetic insights speak of reality in terms that Western rational interpretations can only appreciate as a dim reflection. So it is possible that the emphasis on sustainable agriculture is a misguided response to mythological and allegorical messages about our oneness with all things. But it may simply be the desire to maintain things the way they are – a kind of agricultural salvation from the vicissitudes of change. Or an emotive reading of immanence may erroneously project spirituality into all things, which would suggest that ecological and agricultural sustainability can be a form of belief-based pantheism, or of God, without the option to further develop one's consciousness.

Pantheism is not some new (or ancient, as the church once taught) form of devil worship. In seeing the divine in all nature, pantheism can encourage an interrelated conception of life that fosters positive environmental attitudes, which can be a step towards sustainable agriculture. Its apparent appeal mirrors literal interpretation of maternal metaphors intended to explain our separation from our natural state when we ignorantly exert our will. However, pantheism's ambivalence toward personal transcendence denies it a role in rational and spiritual development, both of which appear to be critical to sustainability.

Such developmental elements may occur through philosophy and science as much as through religion in the ethical evolution of improved human relationships with each other and nature. Just as the West now conceives of greater rights for slaves and

animals than in the past, so it is beginning to appreciate the wider rights of nature as a secular ethic of sustainability. When there is an overemphasis on mechanistic agricultural approaches to profit from nature, animals are treated unethically and even the basic elements of sustainable agriculture are neglected. The Western societal response expressed in the emergence of rights may also be seen as part of an evolving self-consciousness, although this may be diluted in secular ecological ethics.

Unguided by ethical guidelines or insight, anthropocentric attitudes to sustainable agriculture have produced an utilitarian basis for evaluating sustainability. This secular ecological understanding has produced a well-meaning but largely impractical theory of ecologically sustainable agriculture that ignores the fundamental ecological manipulations that define agriculture. Logic requires that we seek sustainable agriculture within agricultural-ecology rather than outside it in the first instance, yet the separation of food production from consumption allows misinformed urban ecological sensitivities to restrain the contributions of religion, philosophy and science. Such an inherently artificial separation of modern secular and traditional religious ethics is unlikely to persist in such a pragmatic field as agriculture.

The convergence of values from religious, secular and foreign traditions has already produced an eco-theology that recognizes agriculture as an essential activity that should be practised within natural flows. At the same time, the church has reacted against pantheism by renewing emphasis on the ethic of stewardship. But in fact the role of religion has declined to the extent that interpretation of societal feelings is now the preserve of secular philosophy. And as neither have produced modern ethics specific to agriculture, it probably is considered mainly within the philosophical field of the 'liberation' of nature or its elements.

While secular philosophy interprets moral trends in the rights of animals and nature that are compromised by utilitarian valuations, the problem-solving approach of sustainable agriculture research maintains a reactive mentality. For example, animal agriculture continues to assume that animals do not feel pain in the same manner as humans. Likewise, applying a commercial model to all agriculture when the priority of most of the world's farmers is subsistence alienates the West from natural morality and thereby negates attempts at sustainable agriculture. Nevertheless, in exposing the unstated assumption of continued economic development, secular philosophy could in fact relate sustainable agriculture to a wider morality, which one might expect to see reflected in approaches to global economic development.

It is at the juncture of sustainability within dynamic natural flows and sustainability within economic development (sustainable development) that global economic discussions reveal their peculiarly Western orientation. Emphasis on environmental issues in poor countries is a relevant example in that growth once assumed to be limited by the availability of natural resources is now delimited by ever new technologies. By constant innovation the modern developed-country technicians assume that they can sustain whatever they or society desire. Some observers see this as a pragmatic component of consumer capitalism that the West is extending across the globe – a perpetuation of old Western ways in a new world, albeit clothed in new rhetoric in aid and NGO programs. With faith in innovation as a tenet of sustainability, new agricultural technologies are continuously demanded to maintain economic growth, and the West evangelizes less-developed countries with this model. Thus 'sustainability' becomes the servant of economic growth and existing global hierarchies, which adds little to the understanding of real sustainability.

The motivation to sustain Western lifestyles ahead of others, even though the contrary is claimed in international rhetoric, is masked by polarized views around competing definitions of economic and ecological sustainability that must be unified if they are to contribute to agricultural sustainability. Driven by Western secular thought, sustainability in less-developed countries increasingly means policies to stabilize population and reduce poverty through economic growth. This can be warranted, except where economic growth assumes cash cropping and ignores subsistence farming to the detriment of both the local community and the local environment. As the West learns this lesson, it is becoming aware of useful traditions that it has long abandoned.

Traditional agriculture retains attitudes to nature that contrast with those of intensive modern agriculture and suggests that sustainable agriculture is indissolubly joined to attitudes to nature. Traditions of peasant farmers may not always offer obvious productive advantages, but they do recognize agriculture as a modified landscape integrated into the wider natural environment. This may be as close to a sustainable agricultural ecosystem as we have approached so far, which suggests that the West must rediscover its lost spiritual dimension of agricultural sustainability. Recombining the spiritual and intellectual dimensions allows greater acceptance of insights that link overall health to holistic agricultural practices. Such linkages between agriculture and spirituality in the West, where they have survived or where they are mindfully recreated, appear similar to those of peasant agriculture.

When one realizes that the diverse interactions of a smallholder agricultural system in a less-developed country cannot be rigidly defined, it becomes clear that agriculture cannot be defined by technology alone. The intrinsic interrelatedness of

nature described through religious metaphor is foreign to scientific discussions. Yet even though the West has excised spiritual aspects from agricultural science, elements of a unified understanding survive in smaller scale agriculture and gardening where participation in nature is valued above level of output, as is common in Eastern traditions.

As the West (re)discovers Oriental worldviews, it respects the re-linking etymological intent of 'religion' and the continuing evolution of knowledge of ourselves. This stimulates reconsideration of ancient scriptures across various traditions. Buddhism seems compatible with scientific discourse through its insistence on cause and effect in natural flows. Taoism may also fit this description. However, while the apparent compatibility seems to benefit science, it may not benefit the transcendental message of such religions if it limits them to scientific logic. In Buddhist language, science in such a guise may be seen as a 'near enemy' of the teachings as it draws the mind away from its potential to transcend such limited views. At a more practical level though, religious insights provide guidelines for our everyday interactions with nature.

Moral guidelines drawn from insightful observations of natural flows provide, for example, an indication of the origin of the concept of Christian sin as acting out of accord with that flow. When the exotic cultural accretions of Buddhism are stripped away, its expansion in Western societies can be seen to assist in explaining both the West's tradition and its infatuation with sustainability. The essential teachings of Buddhism and Christianity concur that living a sustainable lifestyle leads to contentment, once basic needs are met. It is wisdom to live in accord with the dynamics of nature. Ethical guidelines can then be seen to be self-training actions that lead to wisdom and hence sustainability.

Differing interpretations of one ancient Indian ethic, non-violence, illustrate how anomalous outcomes may occur when awareness of intent is replaced by blind observance of a rule. This may be seen in fundamentalist vegetarianism, and even in approaches to sustainable food production that eschew scientific knowledge. On the other hand, the core of Buddhist insights – Conditionality – shows the self-induced suffering caused by attaching ourselves to such an idea as sustainability. The reverse path is Buddhist practice – acting ethically to condition oneself to instil an automatically ethical behaviour, which when coupled with mental development, produces a mind less congested with fears, frustration and anxieties. Even at a cursory level, it can be seen that Conditionality reveals sustainability to be reliant on wisdom, which itself is the product of mental discipline uninfluenced by unhealthy desire. Thus intentions and actions determine each subsequent event in ways that ignorant understanding cannot conceive.

The naïve pursuit of sustainability leads to a desire to maintain artificial situations which inevitably prove unsustainable, thereby providing a classic example of the operation of karma. This universal law of cause and effect also provides a basis for psychological exploration, which reveals the inverse relationship between acting with understanding of universal interrelatedness and oppression of nature. Before action, intention ultimately determines the skilfulness of an act with respect to sustainability and all other matters. Thus sustainable agriculture can only be expected when the intention is to act in a sustainable manner and it is underpinned by wisdom that accepts the incomprehensible interactions of nature. However, just as a little knowledge is said to be dangerous, so perhaps is a little wisdom, if such a thing exists. The law of cause and effect is often interpreted to mean that nature may be manipulated for some ‘noble’ purpose with the expectation of good results without unfortunate contingencies – and secular worldviews misguidedly call this enlightened self-interest.

Enlightened self-interest appears to be inherently selfish and to derive from an historical bias towards material more than psychological development, which obscures the view of reality and thereby precludes it from being seen as enlightened in any real sense. Thus self-interest leads away from what sustainability may really mean, for sustainability is an ideal in the same manner that full and continuous enlightenment is an ideal. Just as moral guidelines are not prescriptions for enlightenment in themselves but form one part of a process of development, so prescriptions for sustainability may be futile without the concurrent development of the wisdom needed to live in nature.

Practising agriculture in a sustainable manner is probably both a natural and an enlightened action. As a natural action, sustainability is the operating of natural law, which is the realm devoid of the suffering engendered by attachment. Attempts to produce sustainable agriculture from applied science tend to ignore the conflicts of multiple objectives, the reality of impermanence and the fundamental search for that elusive something that is forever unattainable through material means. Thus, the insights of Buddhism and other traditions, clarify the constraints to sustainability. But it would be foolish to accept popular versions of Buddhist agriculture as the solution to this dilemma, just as it would be foolish to accept literal Christian interpretations.

Notwithstanding implied environmental messages in Buddhism, prescriptions for sustainable agriculture *per se* do not exist. Some claim that unsustainable agriculture is shown to be derived from hoarding, coveting and control of natural systems for personal gain. Socially-engaged Buddhism indeed uses such scriptural references for its justifications. But when these develop into proselytized beliefs, the central self-transcendence message is lost, even though at times that

message is expressed in the language of sustainability, environmental integrity and self-sufficiency. As Buddhism expands in the environmentally-conscious West, environmental issues inevitably become a means of communicating deep truths in a manner similar to the use of agricultural examples of two millennia ago – but the medium should not be mistaken for the message.

When enlisted in support of the message of anthropogenic environmental decline and portrayed as offering direct ethics that can inform sustainability, Buddhism is but a political device. In truth, the holistic image of Buddhism does offer a context for the personal development that can inform sustainable agriculture, just as does Christianity. But attachment to the letter of ethical laws or prescriptive agricultural ethics, no matter how apparently righteous, is still attachment – and attachment is the source of suffering according to Buddhism. Acting to sustain productivity or income ignores the inevitability of change as revealed by both science and religious insight, and that very dynamic is what has ever been known to wise persons as the context of sustainable agriculture. Agricultural examples and language pervade scriptures written in agricultural ages and it is from these that we are all taught to ‘cultivate’ the higher consciousness that produces the ‘fruits’ of wisdom, and one of those ‘fruits’ can be sustainable agriculture.

So, from this search for sustainable agriculture from the perspectives of both science and spirituality, we return to that place from whence we set out and *know it for the first time*, as Elliott also found. We can dispense with the motherhood cachet of sustainability and accept it for what it is – our best attempts at maintaining something that suits us. But we can also accept it as an indicator that agriculture is never likely to be sustainable unless we work within the natural order. By definition modern agriculture does not work within the natural order – it seeks to

maintain an isolated unnatural order. Until recently, humans only had the power to modify the natural order minutely and usually in ways that would be pushed aside by nature if they overstepped the mark. Nevertheless, the deserts of sand, erosion and salt to which most cultures have contributed across the millennia testify to either our ignorance of, or our lack of concern for, agricultural sustainability.

We would do well to also recall the coincident expansion of deserts and social ills across history. Rising Western psychological ills seem coincident with a fervent interest in sustainability, which means that we cannot just conclude that this is a simple projection of an inner need for stability and permanence onto science and religion. It is much better to address the cause of these yearnings directly rather than through such proxies as ‘sustainability’ or additional consumption of goods and services, or blind belief in a salvific image.

Our yearnings are older than agriculture, although they come to us via the writings and traditions of our tribal agricultural forebears. We once expressed these as yearnings for a lost Eden, a lost Golden Age, a forgotten jewel, a return to our father’s house from our life eating swine swill, and a hundred other stories from various religions. Today we search for the same things expressed in different words surrounding ‘sustainability’, and we waste much effort and resources on seeking a solution when all the time it has been within us, in the very place from which we set out. Expressed in biological and spiritual terms, sustainability can only be realized by insight into our place in the natural order.”

Such conclusions contain deep significance, yet they are often mistaken as facile by the spiritually illiterate. By now, readers of this collation will realize that the separation of science from intuition including spiritual intuition is seen as a lower form of

knowledge, often better termed technical knowledge. This thought is captured in the final page of the text, which continues the reflective discipline of the preceding book and represents these thoughts in poetic form as ‘The Sustainability Sutra’⁶⁴.

With the confidence of such reasoning and experience, it was inevitable that it would be applied to the concerns of international agricultural development – for this was the conditioning that assisted these insights. Nevertheless, it was a slight surprise to find that two factors out of many came to dominate these reflections. Those two major concerns – survival food security in a real non-political sense and the critical role of small farmers – formed the most recent book, which is the final Chapter 9 in this journey.

⁶⁴ **Sustainability Sutra**

*Is it God’s grace or nature’s law, or logic founded in folk lore
or heretics who’s more is less, or prophets’ cries in wilderness,
that protects from the pain of change, and anguish over rights estranged –
from slaves, to cows, to plants and nature – when we focus on our future?
East exhibits what we once knew, lost spirit limits what we do,
for sin is shunning nature’s flow, whether in heaven or here below;
the only God – the god of karma, told in apocalyptic drama,
which self-interest has exposed, as vain – to all virtue full opposed –
unless it conceives all as related, that selfish urge is ne’er sated.
Yet we life’s lessons still ignore, and promulgate our new-found ‘law’:
‘if you will to my thought revert, that care for self is good for all
if commune would to cash convert, all would balance and live life full.’
Oh! medium mistook for message, renders religion to the savage,
casts wise fruits before blind swine, thus we define land, food, as ‘mine’;
our lust for lost golden ages, long lectured to us by the sages,
whose saga of forgotten jewel, ever within for our renewal,
if we from sleep but ourselves rouse, and so return to our father’s house,
then we re-turn and see the rhyme, know whence we left for the first time.
So as we trace that thread sublime, and let the bells of wisdom chime,
spurn literal texts where truth’s neglected, where no-one knows all is connected,
thus surely see all is sustained, for only then is Eden gained –
but he who’ll but on sense rely, reality doth yet deny.*

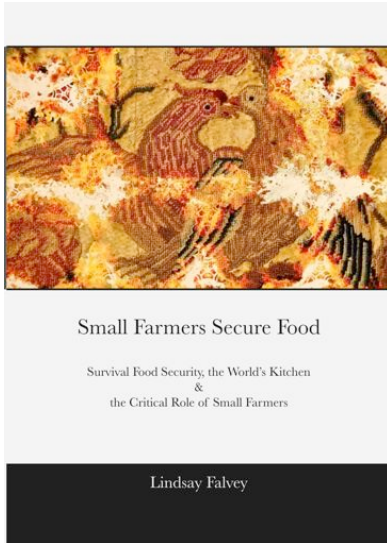
Chapter 9

Insights into Problems in the Making

Small Farmers Secure Food

Having assimilated diverse variables from privileged exposure to agriculture and societies in disparate places from both reflections and early education, decades of conditioning led to rethinking aspects of international development. Various concerns about small farmers being marginalized and their role in providing most of the food for the world's poor had surfaced in the earlier work with Charan. In the same period, a request to review agricultural development for the Asian Development Bank revealed that existing approaches to food insecurity had possibly caused millions of unnecessary deaths in the 2007-8 food crisis. That this crisis was hardly recorded in the West seems to be due to the concurrent collapse of its unfettered money making. Furthermore, the analysis performed for ADB indicated that the food issue had not been addressed and would likely recur, with greater consequences. These two issues – basic food security for survival and the critical role of small farmers – therefore formed the theme of a different style of book, entitled *Small Farmers Secure Food: Survival Food Security, the World's Kitchen & the Crucial Role of Small Farmers* (Publication 57).⁶⁵ The title eponymously combines the two themes of the book and the subtitle aims to amplify this by reference to the aspect of real food security for the marginalized of the world, the fact that most small farms are more like Western gardens and that small farmers are feeding about half the world at present.

⁶⁵ Falvey, L. (2010) *Small Farmers Secure Food: Survival Food Security, the World's Kitchen & the Crucial Role of Small Farmers*. TSU Press, Songkhla. Pp232.



The book was written in part at the Rockefeller Foundation's Bellagio centre where the book *Food Environment Education: Agricultural Education in Natural Resource Management* also had its genesis. This is significant insofar as the idyllic environment offered by such a retreat allows a calmer and less structured thinking to emerge. And thus the book discussed here is of a different style; it has no footnotes or references, all sources being traceable from

the text itself. The back cover of which describes it as in the footnote.⁶⁶ The book also differs from the style of earlier books insofar as it does not build a detailed structured argument across hundreds of pages but rather presents different facts, arguments and information around the two issues of basic food security for survival and the critical role of small farmers. The

⁶⁶ From the back cover of the Book: *Small farmers tilling handkerchief sized farms feed more than half the world. They thus maintain national stability, forestall conflict and reduce emigration. Secure food supply is nothing short of national security. Such facts define the poor world, yet are misunderstood by nations that influence international development. Practitioners know that small farmers' yields can exceed those of large farms. They also know that food security means guaranteeing enough food to survive as a national priority unrelated to free trade. Good governments of poor countries practice this to avoid food shortages and anarchy. Food always comes first – that is the message of this powerful book. History is replete with failed societies that lost sight of the centrality of food and farmers. Today, wealthy country delusions of isolation from instability in the rest of the world open everyone to an unprecedented risk. These matters are, in this book, refocused on the essentials of life, global security and peace. Polemic in parts, it shows the situation as it is.*

principal approach of the book can be seen in the following extracts from Chapters 1 and 8.

“This is a simple book. It argues for a return of two critical values in international development, the securing of food for a minimal level of existence and acknowledgement of the vital role of small farmers in that basic level of food security. The diluted forms of these once central pillars of assistance and government have weakened them to the point that international development efforts are now increasing the risks of starvation in the world. Some of the facts and arguments presented here will be counter-intuitive to conventionally trained functionaries, and so illustrative data and information is provided in support of forgotten yet enduring axioms. The book also introduces the responsible actions of the world’s major food producers, China and India, which were and are still criticized for abandoning the unsuitable agendas of international development agencies.

Small farmers feed the world. The statement is not an exaggeration when compared to the assumptions of narrowly trained development administrators that broadacre farms are more efficient than small farms. In the following pages, the higher yields and higher efficiencies of small farms are discussed as not just worthy of protection, but of encouragement through appropriate policy, research and social infrastructure development. Producing the food needed for more than 10 billion persons living mainly in cities will require support for both the billions of small farms and expanded broadacre farms. Both small and large farms are needed, not one or the other. Large farms – called broadacre farms in this book – are well supported by their commerce. But small farmers are mainly neglected or worse, even by agencies charged with agricultural development in poor countries. This book seeks to redress these major deficiencies in international development by showing that small farmers

and food for survival are the appropriate focus for such agencies.

Food for survival is an obvious first order action of good governance, as illustrated with the Vespasian case for ancient Rome in the preceding section, 'Acknowledging the Past'. Government and leaders who maintain stability by providing basic needs before luxuries and ideology often go unsung. But when food crises occur, those who restore the basics of life are lauded as heroes. In today's poor world, the two billion small farmers who feed themselves and others are truly heroes who while unsung, must not be undone by poor governance. Otherwise, the result will affect not just their fellows in poor countries but all of us. As is increasingly evident in our interconnected and populous world, famines now mean violent riots and mass migration.

As a simple book advancing straightforward arguments to correct two aspects of international development actions, it is presented without references and footnotes. Those who seek to clarify or read more from those cited will find sufficient details of authors and agencies within the text to source publications. The argument flows from a general Chapter 2 outlining the present situation from diverse perspectives, to some detail in Chapter 3 about food production and security issues. Chapter 4 then examines the role and problems of small farmers. The discussion in Chapter 5 considers how we have arrived in this unfortunate position of ignoring or undervaluing critical aspects of development and human rights. Chapter 6 presents food security as a priority of good governance and leads into some practical responses to common mistakes in Chapter 7. The final Chapter 8 then brings the ideas together in conclusions and briefly considers the future of food production."

Two sections from its final Chapter summarize some of these points, and provide a context for what are rather strident critiques of complacency in international aid, viz:

Farm Size and World Hunger: “some facts:

- food security has been misinterpreted to include too many simultaneous and difficult objectives, such that current definitions are *ipso facto* unattainable;
- historical record and current experience teaches that ensuring a populace has an assured level of basic food for reasonably healthy survival defines good governance from tribal to national levels;
- ensuring basic food for reasonably healthy survival is the common denominator of food security in both practical and moral terms;
- current producers of basic food for reasonably healthy survival are overwhelmingly small farmers, most of whom operate at subsistence level;
- more than half of the world’s seven billion odd people live in cities, food delivery to which accrues wastage and processing losses;
- where food supply to cities has not been ensured, riots and anarchy have resulted through history, and continue to occur today;
- meeting future food demand for a projected nine (or 11) billion population will require all farming operations to be more productive than at present;
- research that stimulates continuous improvement in agricultural yields is overwhelmingly focused on broadacre farming, yet small farms feed about half of the world, and
- policies that marginalize or even seek the demise of small farms abound, based on erroneous understandings of both food production and the role of basic food for reasonably healthy survival as the definition of food security and a major economic good.

The details of these facts may be contested, but their general thrust will be widely accepted – soon I hope.”

“The message of the book is simple: securing food for healthy survival – a minimal level of reasonable existence – should be a central development objective. At present, it exists as a watered down version as food preferences and with multiple conflicting objectives. This makes current approaches unworkable. At the same time, individual countries reject development agency directives and advice when faced with food shortages, and in so doing act out human behavior that has been consistent since before civilizations arose and ever since. A refocusing on food for reasonably healthy survival leads directly to the main food producers, small farmers, who feed two billion of themselves and a proportion of those swelling megacities. In such cities, food shortages can now inflame riots and anarchy even more than they have through history. This confirms that basic food security is a first step towards good governance and socio-economic development. It will shock entrenched views to find that China and India offer lessons not derivable from the West in terms of the primacy of well-directed research and policies concerning small farms and survival food security. Nothing is guaranteed – except insecurity for us all if essential food is not put first in populous poor countries.”

Those who have read the work, who are few as it has only just been released, say that it is ‘an important book’ and suggest who should read it. That is well and good but ‘important books’ are seldom read, especially by those who should read them. Nevertheless placing some store in experience and observations of others who have earned respect indicates that even if books are not widely ‘read’ their ideas can spread as memes that accomplish the same ends. So it was with the book with Charan, *Smallholder Dairying in the Tropics* and before that *An Introduction to Working Animals*. Such is the best of all possible outcomes for any author, unless he seeks fame from

his book or income from its sales. To crave such personal outcomes is inevitably to compromise the message, and so one should be content to see gradual changes in international aid organizations as others realize the same deficiencies noted here. This realization too is part of what has evolved in these 40 years, for no one of us makes a seminal contribution by any idea. We are more often reflecting an emerging intuition among informed peers. For just as all the elements that make up agricultural science and development policy are interrelated and interdependent, so are we.

The book concludes as usual with a poem summarizing the themes.⁶⁷ And with those thoughts as a culmination of the work included here, a final statement about what learning it has afforded is presented in the following final Chapter.

67 **First Food!**

My soul's secure when I must muse / how word's endure from sage's cues
about their insight for man's health, / which all men cite yet trade for wealth.

First commandment in all creeds / remains constant – for basic needs:

*“no civil man forsakes the farm / that bears his bran and breeds the balm
of Ceres' gift of daily bread / that all men lifts from hunger's dread.”*

The second is like unto it: / “societies that don't admit

*the need for grain for all their folk, / do thus profane, and pain invoke;
for never's man calm peace enjoyed / when food is scant and hope destroyed,
not goods nor gods, not gain nor greed / increase the odds to live and breed
if farm and food doth fail, then war / will more preclude 'till all are poor.”*

From dying lips the calls arise / for leadership to realize;

that gran'ries filled all else secures, / that soils tilled gives arts tenure,

that civil life needs feeding first, / that crime's made rife by hunger's thirst.

For 'tis truth yet all need examine / Lest we forget until next famine.

Chapter 10

40 Years On: Closing Remarks

What have I learned in 40 years of professional life? An answer lies in the publications selected for the higher doctorate and the additional Chapters 8 and 9. It is also indicated in the D.Agr.Sc. thesis titular use of the term ‘reductionist research. As introduced in Chapter 1, it is a useful tool to reduce variables in order to work within our mental limitations. However, reducing variables in an experiment or in a policy analysis makes the application of apparent outcomes problematic in the natural uncontrolled circumstances of real agriculture. Yet we have no other institutional means of producing ‘applied’ outcomes for the demands of our times – unless we can somehow harness those rare thinkers who insightfully integrate their colleagues’ work to reveal the wisdom that is otherwise only implied.

Notwithstanding that conclusion, the scientific method itself remains an insightful means of removing human biases while acknowledging the role of intuition in science. Indeed seeking means of cultivating intuition was once a major role of research management and implicit in a scientific vocation. But today, such a suggestion would amuse many senior managers. Today many researchers prefer their reductionist niches. In those cases integrative understanding is pulled apart before it is even understood. For example, as noted herein, agricultural sustainability provides today’s means of understanding the integrity of agricultural science, yet it has been largely sidelined into quantification that reduces it to sterile rigidities. The alternative is to see agricultural science in an integrated fashion within the same natural laws that it studies for human and environmental benefit.

But agricultural science is more than studies and research. It is an applied science in service of the most critical element underpinning civilization, as introduced in Chapter 9. That applied aspect may also be seen as ‘control’ of an environment for food production purposes, which immediately should bring the scientist’s focus to the time-limited nature of ‘control’. Understanding and working within the cyclical and homeostatic tendencies of nature that work against naïve ‘control’ is a dynamic that comes closer to the etymological intent of the words ‘sustainability’ and ‘security’.

Another means of expressing this point is to contrast hierarchical and cooperative models of thought. This popular argument for the interconnectivity of all forms of nature as revealed from science represents knowledge and power as a matrix-based cooperative. By contrast, the pecking-order nature of society and governance automatically imposes hierarchical thinking onto all thought, be it scientific, social or religious. The optimistic conclusion that society may be changing and that this change may flow into educational systems would appear to support the more progressive parts of my Chapter 6, but in fact I now see little of that change in the world post-2007.

Rather than fall back on the unthinking assumptions of our culture based on a notion of progress, the integrated and pragmatic views of agricultural science might better be seen as similar to the difference in Western and Eastern thought processes. In general terms, the Eastern willingness to grant credence to two propositions that appear conflicting to a Westerner may reflect an acceptance of the complexity and incomprehensibility of the natural world. In other words, any human understanding must be limited and thus subject to error. The logic of science in fact accommodates this mental approach – that is why it is said earlier that the scientific

method remains our best tool in advancing and integrating rational thought informed by intuition. A theoretical scientist might express this differently; for example, some phenomena do not lend themselves to the experimental comparisons on which the scientific method relies. The small farmer dilemma discussed herein is an example that cannot be determined by controlled experimentation. In such cases a Bayesian probability approach may be more valid. But intuition and holding competing theories in mind is easier to discuss here.

It is normal, I think, for the scientifically literate to hold competing concepts and ideas in mind as they learn about a subject. But it seems that such literacy is more limited than is useful to civilization among many who interpret and apply the results of experimental science. Thus, taking an example from within this body of work, we may see the millennia-old glutinous rice systems practiced in and around Thailand as sustainable alongside the modern high-input systems that may also be seen as sustainable according to another definition reliant on constant technological research. I admit that I am attracted to the so-called Eastern approach of holding multiple concepts as valid and of embracing mystery for those integral aspects that are beyond intellectual understanding. But it can be more than the emotion of attraction, for the theories that we rely on for science are moving ever closer to concepts of cycles or circles of time in space, which is again common in Eastern conceptions; it is easy in the rush to comprehend a field of science to forget that it is a whole in itself, and that we each accept the responsibility to follow its broad progress as a context for our research and thinking.

Whether it is a matrix-style understanding of complex interrelationships for the scientists who think in those terms or the simultaneous holding of two or more apparently conflicting concepts as valid, the intention may be the same. And where the intention is to see integration as the norm, one

finds brilliant scientists. I do not consider myself to be one of them. I just know that no real understanding occurs except as part of everything else. This is not waffly holism in any New Age sense – it is the common sense of the ages. The wise know this, but they also know that power is empty and often the enemy of integration. Perhaps that is why we have dualistic arguments dominating everything. For example, sustainability is said to be impossible by the purists while pragmatists who take power codify it into practical and definable forms, with some benefits despite it being devoid of its deeper intent. Intent or motivation at both unconscious and conscious levels is the key, as noted in the pivotal Publication 52.

This insight has produced the intention to maintain a broad contextual focus. With that perspective, one can see that just as cell boundaries are permeable so are all boundaries including those of knowledge. Go further and be aware that all boundaries are artificial creations of our minds for ease of communication, dominance and other basic urges. On the one hand, this indicates that the compartmentalisation that characterises components of technological disciplines has been a boon to bring a wider pool of persons into the service of technological development. But at the same time it has trapped potentially brilliant young scientists into becoming high priests of technology-worship by the masses. This may just be another product of modern society. I have found integrated knowledge to be more common in scientific leaders in Asia than the West, and noticed that it is decreasing in Asia with increasing Westernization. This creates wastage of the greatest talent; perhaps it is a part of the waste that Julian Cribb describes,⁶⁸ which I consider ‘the lost wise men of agriculture’. This is one conclusion from the work presented here. It is a more

⁶⁸ “For the past quarter century ... Many of the scientists who fed the world have quit in anger, sorrow, or disappointment, have been fired, or have retired, while recruitment has fallen off.” Julian Cribb (2010) *The Coming Famine*. University of California Press, Davis.

important conclusion than the individual technical outcomes of specific research projects. Put succinctly, I have learned that reductionist research can advance knowledge at the cost of wisdom. But many luminaries do not agree with me.

Richard Dawkins, a luminary of our time, would likely disagree with this conclusion. He explains his approach to evolution science as ‘hierarchical reductionism’ and goes on to say, ‘if you read trendy intellectual magazines, you may have noticed that ‘reductionism’ is one of those things, like sin, that is only mentioned by people who are against it’.⁶⁹ He claims that reductionists actually do not exist and that the extremist criticism focuses on trying to explain ‘complicated things ... as the sum of the parts’. He prefers to see reductionism as ‘just another name for an honest desire to understand how things work’. If he really means that, then we are not in disagreement. Perhaps he misunderstands the criticisms as he does the real meaning of sin (*cf.* page 100 herein), but I am not sure.

The reductionism that concerned me when that word was chosen a decade ago was in applied sciences rather than the theoretical sciences of Dawkins’ universe. To understand how the universe works is an activity that often claims nobility. But to purport to be doing the best science in aid of reduced human suffering from hunger and to be distracted by popular fads is to beggar an even more noble calling.

Yes agricultural science is a noble calling. In common with other noble vocations it suffers from misunderstanding and ignorance. When it comes across the TV screen of those who think they are informed by such media, it is misunderstood as technology that delivers such miracles as the Green Revolution, Genetically Modified Organisms and in-vitro gestation in all

⁶⁹ Richard Dawkins (1986) *The Blind Watchmaker*, Norton, New York.

their guises; and to many in this large and ignorant class of society, each of these can be cast as blights more than miracles. But they are not noble – they are the routine products of technological investigation. That can be noble if they are integrated with insights into life and the world and the development of means of living within that dynamic. I have called this wisdom. It can be an output of the noble part of all sciences. As all sciences combine in agricultural science so they do for many other practical applications. Thus we have noble structures, noble medicine, noble cosmology and noble agriculture. In such an utopia, such disciplines as animal welfare, social equity and environmental husbandry would be not require specific disciplines as they would be automatically subsumed within holistic noble insights. But nobility dwells in reality rather than utopias, which is why I particularly enjoyed my time as inaugural chair of the Centre for Animal Welfare that coordinated government and Melbourne and Monash University research oriented to improved animal care in agriculture and related human-animal interactions.

Such conclusions from my 40 years work can be understood in more common language from four pragmatic observations:

- my early applied technical research produced, in some cases, beneficial practical outcomes of varying durability;
- sustainable agricultural systems that significantly changed the natural environment proved to be short-lived;
- international agricultural research, education and development, while producing extremely high rates of economic return when successful are spasmodic, and
- deep insight into our understanding of the world and ourselves guides real development, which is served by science and non-rational understanding – both of which are compromised in many development situations.

These points have accumulated from my own work, which has proved to be a journey of ever widening perspectives of the conditions that affect agriculture and agricultural science. In each case, a single factor has limited the effectiveness and sustainability of innovations – a failure to appreciate the whole system. Neither ‘holistic’ or ‘green’ in modern parlance, nor Luddite or longing for lost Golden Age in character, my conclusion is that of wise men who saw the same ‘vision splendid’ long before the modern age. It is the insight that all human actions and thoughts exist only as part of incomprehensible interrelationships and that therefore any action on the basis of controlled experimentation must necessarily produce unforeseen outcomes, some of which will be undesirable. It is a welcome surprise to read that this conclusion has been the point at which others who have had the benefit of mixing Eastern and Western approaches also arrived. The wonder is that it does not occur to many more, for far from negating the value of what agricultural science does, it provides a context for its useful application.

In this way, sustainable agriculture today can only possibly exist temporally through constant research. As such research is conducted in both intellectual and spiritual isolation, it relies on guidance from past and current wise counsel. Otherwise it leads to the usual human conflicts, which in the agricultural worldview will be hoarding, famine, disease, migration ... and war.

I have gone as far as is useful in this presentation. More personal aspects of learning about life are represented in other work not included in this book. Spiritual understanding and biographical sketches that round out these aspects may be gleaned from the list of publications in the Appendix.

Appendix – Publications

A more complete list, from which those in the text were selected.

Books

- a) *Small Farmers Secure Food: Survival Food Security, the World's Kitchen & the Crucial Role of Small Farmers*. TSU Press, Songkhla. Pp232. (2010).*
- b) *Dharma as Man: A Myth of Jesus in Buddhist Lands*. pp250. Uni-verity Press, Australia (2009).*
- c) *Reaching the Top: All Paths are True on the Right Mountain*. Pp68. Uni-verity Press. (2007).*
- d) *Religion and Agriculture: Sustainability in Christianity and Buddhism*. c.350pp. Institute for International Development, Adelaide (2005).*
- e) *Sustainability: Elusive or Illusory? Wise Environmental Intervention*. 245pp. Institute for International Development Fund, Adelaide (2004).*
- f) ลินด์ซีย์ ฟาลเวีย (2548) การเกษตรไทย: อยู่ข้างอุ้งน้ำข้ามลหัสวรรษ. จรัญ จันทลักขณา (บรรณาธิการ), แมนมาส จันทลักขณา และคณะ (ผู้แปล) สำนักพิมพ์มหาวิทยาลัยเกษตรศาสตร์, กรุงเทพฯ. 476 หน้า.*
- g) *The Buddha's Gospel: A Buddhist's Interpretation of Jesus' Words*. Pp108. Institute for International Development, (2002).*
- h) *Thai Agriculture: Golden Cradle of Millennia*. Kasetsart University Press, Bangkok. 490pp (2000).*
- i) *Smallholder Dairying in the Tropics* (co-authored with Charan Chantalakhana), International Livestock Research Institute CGIAR, Nairobi 447pp. (1999).*
- j) *Land and Food: Agricultural and Related Education in the Victorian Colleges and the University of Melbourne* (co-authored with Barrie Bardsley), Institute of Land and Food Resources, University of Melbourne, 266pp (1997).*
- k) *Food Environment Education: Agricultural Education in Natural Resource Management, The Crawford Fund and the Institute for International Development*, 280pp. (1996).*
- l) *Introduction to Working Animals*. MPW Australia, Melbourne 208pp (1988).
- m) *Sú Dung Đông Vật Làm Viéc*. Translation of above text into Vietnamese by Châu Bá Lộc of Cần Thơ University. Pp122. (1989).
- n) *Cattle and Sheep in Northern Thailand*; 104p; Tiphaneer Press, Chiang Mai, Thailand. 104pp (1979).

Booklets & Pamphlets

- o) *An open letter to Lindsay at 60: Five Cycles of Lindsay Falvey*. Pp45. (2010).
- p) *Buddhist – Christian Dialogue: Four Papers from The Parliament of the World's Religions, December 2009, Melbourne, Australia, Pp45* (with John May, Vincent Pizzuto & Padmasiri de Silva), Uni-verity Press (2010).
- q) *Pranja Anthology* (The Book of Ecclesiastes rendered into Buddhist concepts in rhyming couplets). Pp38 (2009).*
- r) *Buddhism Briefly Explained* (co-authored with Siladasa) pp40. Melbourne Buddhist Centre, Melbourne (2004).*
- s) *AgriDhamma A Lecture by Buddhadasa Bhikkhu to Agricultural Teachers and Officials on 25 March 1991 at Suan Mokkhapharam, Chaiya, Surat Thani Province, Thailand, translated by L. Falvey from tape transcribed by Lerchat Boonek* (2001).*
[* indicates full text available on the web: see one or more of Google Books, University of Melbourne, Institute for International Development or publisher's sites.]

Papers, Keynote Presentations and Book Chapters

- Falvey, L. (2010) Lessons in Food Security. *Asian Agri-History Journal* 15(1): 59-71
- Falvey, L. (2010) Traditional and New-Age Conservation Agricultural Practices. Keynote Paper prepared for the Asian Agri-History Conference, Rajasthan, September.
- Falvey, L. (2010) Agri-Dharma: The Duty of Professional Agriculturists. *Asian Agri-History Journal* 2: 171-184
- Falvey, L. (2010) History of Rice in Southeast Asia and Australia. Chapter 7 (pages 183-224) in *Rice: Origin, Antiquity and History*, edited by S.D. Sharma. CRC Press and Science Publishers, New York. Pp567.
- Falvey, L. (2009) An Integrated Response to Food: In the Spirit of all things being Inter-related. Presentation and Panel, Parliament of the World's Religions, Melbourne, December 3-9.
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- Falvey, L. (2005) Agriculture and Religion in Thai Society. *Asian Agri-History Journal* 9(1): 17-27
- Falvey, L. (2004) Asian Agricultural Technology Transfer: Lessons from History? Keynote paper to the International Conference of the Asian Agri-History Foundation, Hyderabad, December, 2004.
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