

REGENERATIVE ARCHITECTURE

An Application of Regionalist Sustainability in
New Zealand Dairy Farming Practice

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ABSTRACT

Over the past decade the New Zealand dairy industry has undergone unparalleled expansion in the agricultural sector. The influence of globalised market competition, beginning in 1985, has resulted in significant changes to the operation and scale of production of New Zealand farm conditions. With this, there have been a series of changes to the physical form of farming in New Zealand - most notably in a shift towards larger and more intensive practice. The term 'factory farming' has taken a unique and contextual evolution within these conditions, leading to questions of sustainability. Sustainability in this setting is often defined by production growth and trade conditions before more humanistic issues of social and ecological welfare.

Similar to the competing perspectives of New Zealand dairy farm sustainability, the discipline of architecture faces a wide and complex field of approaches to sustainable practice. The views of researcher, Steven Moore, are focused on in this study with regard to the contested definitions of architectural sustainability. He advocates a regionalist approach in the belief that sustainability is better defined by local circumstance than a universal best approach. Moore's theory of non-modern regionalism and regenerative architecture are utilised in this thesis as a means of questioning the issues faced in New Zealand dairy farm sustainability. This study applies Moore's concept of a regenerative architecture in New Zealand dairy farming to cultivate improved social and ecological conditions.

The architectural consequence of this discussion is in the form of a future mixed-use prototype for Canterbury dairy farming practice. This design explores the relationship between architecture, place and regionalist concepts of sustainability to improve the social and ecological attributes of this cultural setting. By taking a multidisciplinary approach to toward environmentally and socially sustainable dairy farming practices the design

produces an integrated system that identifies with Moore's regenerative strategy. The study concludes that further architectural investigations into this setting could potentially influence and improve the future health and sustainability of the industry.

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INTRODUCTION

This thesis investigates a regionalist approach to architectural sustainability presented by theorist, Steven Moore, in the context of New Zealand dairy farming. The research explores how Moore's view of a regenerative architecture can be applied to dairy farm practice to enhance social and ecological conditions. These design intentions are explored in a mixed-use rural prototype that reacts to current issues faced by this setting.

The New Zealand dairy industry has been subject to significant expansion over the past decade. This expansion has resulted in a strong shift towards large scale, intensive dairy practice in the Canterbury Plains - a province previously known for sheep and arable farming. The change in operation has brought about many contentions surrounding issues of sustainability and the direction of future industry growth. The large scale reconstruction taking place on this farmland presents an opportunity to rethink how the architecture and infrastructure of dairying could influence a more socially and ecologically sustainable future.

Architectural sustainability is discussed within this research to provide a platform for the investigation. Sustainability in architecture holds an often unstable definition in today's practice due to the wide range of solutions, approaches and classifications available. Some architects believe that energy rating models and assessment tools are all that is needed to produce social and environmental change, while others argue that the concept of sustainable architecture is full of paradoxes that are often misunderstood. Researchers, Simon Guy and Graham Farmer, suggest that this diversity can be broken into six general categories that compose our understanding of the field. The point highlighted in Guy and Farmer's study is that sustainability is a fundamentally contested concept that varies between local settings and parties involved.

The views of architectural theorist, Steven Moore, are in support of this belief. He proposes that the definitions of sustainability should be understood in a regional sense rather than a universal context. His proposed theory of a non modern regionalism builds upon principles of critical regionalism, arguing that the concepts of place and technology are key determinants of a sustainable architecture. This view is prescribed in Moore's eight points for a regenerative architecture which are applied to the setting of Canterbury dairy farming under examination. The interpretation of this strategy and its architectural application investigate a more sustainable living condition for dairy farm staff in a integrated scheme focused towards improving and utilising the qualities of place.

The research approach of the investigation is structured into five chapters.

Chapter one, 'Sustainable Architecture', begins the research by positioning architectural sustainability within contemporary debate. The definition of this broad field is understood as diverse and uncertain. A review of Guy and Farmer's 'Six Logics of Sustainable Architecture' positions the various themes and arguments into recognisable categories for discussion.

Chapter two, 'Non-Modern Regionalism', discusses Steven Moore's regionalist approach. This includes the development of Kenneth Frampton's critical regionalism and the central concepts of place and technology. The theory of non-modern regionalism and Moore's condensed manifesto for a regenerative architecture provide strategies for the dairy farm design investigation.

Chapter three, 'New Zealand Dairy Farming', reviews the conflicting attitudes of sustainability in New Zealand dairy farming practice. The review contends that the industry definitions of sustainability are often unspecific to local practice and prioritise production output before social and ecological objectives. The study argues that the industry would benefit from Moore's regionalist approach that focuses on improving local social and ecological wellbeing.

Chapter four, 'Design Investigation', applies the regenerative design strategies proposed by Moore to a mixed-use rural prototype for the Canterbury Plains. Engaging in the local conditions of place, the design aspires to reorient dairy worker lifestyles and the environmental impacts of intensive practice.

The final chapter, 'Conclusion', summarises the results of the research and the application of Moore's regionalist concept of sustainability. The thesis culminates by outlining possible future investigations into architecture and the cultural setting of rural New Zealand, as well as encouraging regionalist theory in regards to sustainability.

Chapter 1:

SUSTAINABLE ARCHITECTURE

Introduction

Three decades of debate has brought various solutions and definitions on what sustainable architecture is and how it may be measured. Some environmentalists believe that the wide range of solutions can be bewildering and are concerned that the possibility of a universal best approach to sustainability may not exist. The American architect, James Wines, notes that architectural practice tends to “confuse, rather than reinforce a progressive image of earth friendly architecture” (Wines & Jodidio, 2000, p. 11). On the other hand, some architects disagree with this position and believe that sustainability has become a prominent theme of thought among designers.

The views of Steven Moore mediate these opposed positions. His position, along with researcher, Simon Guy, argues that it would be more practical and progressive to celebrate the variety of debates, instead of attempting to define a universal picture of sustainable practice. In this view they would rather be inclusive than exclusive and argue that rather than critiquing sustainability through a set of emphasised standards, it would make more sense to critique what architects actually produce (Guy & Moore, 2005). This stance is fundamental to a pragmatic approach to sustainable architecture that French sociologist, Bruno Latour, calls science in practice (Latour, 1987).

Given the diversity of culture and nature, Moore suggests that the analysis of sustainable buildings should be inseparable from the people who shape their environment. This is a key component to Moore’s theory of non-modern regionalism that will be discussed in the following chapter.

Defining Sustainability

The United Nations Brundtland Commission of sustainable development defines sustainability by the concept of “carrying capacity” (Hinrichsen, 1987). This concept can be understood as the capacity of a population to be supported by an ecosystem without destroying that ecosystem. This popular understanding of sustainable development focuses on energy efficiency and conservation to produce healthy, economical and beneficial spaces for local needs. Author of “A Rough Guide to Sustainability,” Brian Edwards (2010), among others such as American architect, Harry Gordon, support this view. They believe that scientific approaches such as energy rating models and assessment tools are all that is needed to produce social and environmental change. In this optimistic view, there is no barrier in the ability of scientific method to measure and implement sustainable strategies successfully.



Figure 1, *Taipei 101*
This exemplary green building holds a LEED platinum certificate of sustainability.

There are others who are less confident however. Researcher, Eric Schatzberg (2002), considers these optimistic methods to be a flawed example of technological utopianism - the belief that advances in science and technology will eventually fulfil a utopian ideal. This can be witnessed in a study performed by Cook and Golton (1994) of materials considered efficient and environmentally friendly. One example in this study references the London Ecology Centre’s promotion of a specific insulated window to increase the energy efficiency of buildings and thereby reduce resource consumption. While this is an acknowledged ecological goal, Cook and Golton point out that the window advocated by this authority requires highly processed materials that are not manufactured locally and require

transportation from a distanced location. The material considered sustainable in this example therefore fails to consider sustainable objectives outside of the priority to increase building performance.

Steven Moore believes that guides following this outlook often focus almost exclusively on resource efficiency with little mention of political, social and cultural issues that can be just as important. To Moore the idea of assessment tools such as BREAM (Building Research Establishment Environmental Assessment Method) reduce sustainability to a checklist of points, ignoring the multi-faceted nature of local contexts. While these tools are still important to sustainable practice, Moore notes that the self-confidence of some architects using these recommended standards might be distancing themselves from actually producing sustainable environments (Guy & Moore, 2005).

Social and Ecological Values

An important component to the sustainability debate that Moore believes is often overlooked is the role of social and ecological values. This aspect puts emphasis on the parties involved in controlling, managing and understanding natural environments. In this view, disciplines such as the humanities and social sciences provide a progressive means of further understanding sustainable development.

This position on sustainability requires a different way of viewing the environment. Rather than treating the environment as an external entity to be protected or dominated, some anthropologists, such as Clifford Geertz, believe that the relationship an individual holds to nature has a significant influence on how they feel, how they think and their local knowledge (Geertz, 1993). Moore and Guy (2005) believe that this social attitude can result in a more considerate approach to risks involved when manipulating environments and also the level responsibility an individual will hold towards such settings.

Theorist, Marteen Hajer (1995) believes that sustainable development is invariably much more a struggle between affected parties than a question of resource efficiency. Parties,

including the likes of scientists, politicians, or architects, each have a specific way of addressing environmental issues. Hajer argues that sustainability is often defined differently by these parties and therefore the analysis of sustainable buildings can be primarily considered “social representations of alternative ecological values” (Hajer, 1995, pp. 12-13). Simon Guy reinforces this view noting that the widely differing motivations of various parties often brings contrasting technical innovations, development contexts and social processes that affect any given definition of sustainable architecture (Guy, 2002).



Figure 2, *The Solar Towers, PS10 and PS20*
In contrast to the Figure 1, the solar towers in Andalusia, Spain represent a different set of social and ecological motivations in regard to sustainability.

With this in mind Guy and fellow researcher, Graham Farmer, propose a pragmatic approach to analysing the variety of inherent values seen in sustainable architecture. This is formulated in six divergent logics by which sustainable architecture can be categorised. Logic in this discussion is considered as a collection of concepts used by specific practices to give meaning to their social and physical realities (Hajer, 1995). Each of these logics presents a way in which the debate is shaped differently upon the social interpretation of environmental problems. The important acknowledgment that Guy and Farmer make about their logics is that they aren't definitive or stable and that each logic described may overlap, interact and even be absent in practice (Guy & Farmer, 2002).

Six Logics

The following sections describe each of Guy and Farmer's six logics of sustainable architecture to provide a better understanding of the various approaches.

Eco-Technic Logic

This approach is based on the belief that science and technology can solve environmental problems. The eco-technic logic believes that environmental issues are global in scale and because of this centralised national and worldwide incentives are required to implement sustainable strategies successfully. The role of energy efficiency is often the most important determinant in these incentives and, as the title suggests, technologies are emphasised solutions.



Figure 3, *Frank Gehry's Dancing House*
This expressive architecture is representative of the alternate views of eco-aesthetic sustainability.

Eco-Centric Logic

The eco-centric logic combines the science of ecology with ethical concerns. The environment in this approach is viewed as a fragile entity that requires protection. Ecologist, Aldo Leopold, exemplifies this belief in his land ethic writings that state, "We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect." (Leopold, 1970, p. ix). Buildings therefore should not interfere with nature in this view and it is more often a question of whether to build at all.

Eco-Aesthetic Logic

In this view sustainable architecture is metaphorical and inspirational. Architectural form should be considered as important as physical performance because as observed by theorist, Charles Jencks, a "good ecological building may mean bad expressive architecture" (1995, p. 94). In response, the eco-aesthetic logic seeks to further the formal interpretation of built environments. Jencks notes that this discourse can be seen in the 'organitech' architecture of Frank Gehry or Santiago Calatrava.

Eco-Cultural Logic

The eco-cultural logic emphasizes a re-orientation of values to combine environmental issues with cultural concerns. The important aim of the logic is to preserve the diversity of cultures and in doing so, consider locality and place when building. It promotes a decentralization of sustainable design and is concerned with

the regional or bio-regional characteristics of a setting. In this view, architecture should uphold the diverse cultural characteristics that are implicit to particular places and move away from universal, technological based principles of building if it is to be sustainable.



Figure 4, *Decayed Chinese Vernacular*
An example of traditional Chinese building methods that are characterize of eco-cultural concerns with sustainability.

Eco-Medical Logic

This approach focuses on a social and humanist approach to sustaining individual health. The eco-medical logic views buildings as potentially hazardous environments that put individuals at a level of risk. Sustainable design is defined by the control of these risks through technology to provide safe and health conscious conditions. These measures of control often result in a building that is isolated from the natural environment, commonly seen in the architecture of healing environments.

Eco-Social Logic

The eco-social discourse goes beyond individual concern and believes that ecological problems stem from wider social factors. It focuses on political challenges of democracy in architecture and pursues a community model to assist in common needs while also maintaining personal freedoms. The approach suggests that society should be decentralised into small, self-sufficient, communal units. Buildings in this view should participate with the entire social and ecological community and in effect, highlight a democratic control over technology and expertise.

What can be deduced from this dissection of sustainable architecture is that it is defined by a multitude of social and ecological values. Sustainability should therefore be understood as a fundamentally contested concept, one that explores reappearing themes but does not hold a single universal definition.

Conclusion

In this chapter I have discussed contemporary debate on sustainable architecture. In doing so the review has outlined the theoretical conflict that occurs when attempting to define sustainability. While some researchers propose that there are stable, scientific methods in producing successful sustainable development, others disagree, believing that scientific method often ignores the multi-faceted challenges faced by local contexts.

Ultimately sustainability is considered an issue of social and ecological values in this study. The struggle between these diverse values often results in contrasting technical innovations and social processes that affect any stable definition of sustainable architecture. Guy and Farmer's six logics broadly categorise these opposing values and provide an insight to how sustainable architecture is conceived. It is concluded however that sustainability is a fundamentally contested concept and that sustainable architecture varies based on the parties involved and environment under development.

In the following chapter the study discusses Steven Moore's theory of non-modern regionalism that builds on this stance. Sustainability in this view is shaped by the people and places involved in development, categorised by Moore's principal concepts of technology and place.

Chapter 2:

NON MODERN REGIONALISM

Introduction

Building on the concepts formed in the theory of critical regionalism, Steven Moore offers a view of sustainability that emphasises the importance of local place and technologies in architecture. In this chapter I will discuss the development of Moore's non-modern regionalism along with the key concepts that define the theory. Moore argues that "technology and place should be understood as the suppressed core concepts that are contained within regionalist architectural production" (Moore, 2001, p. 130) and proposes a non-modern, regenerative approach that is positive to both elements.

Moore's attitude towards the concept of place adopts the geographer, John Agnew's approach that breaks the term into three sections – location, locale and sense of place (1987). These components compose a scaled means of analysis that mitigates the opposition between the objective structure of location and subjective experience in sense of place. In Moore's approach to technology he implements a similar scaled approach by sociologists, Donald Mackenzie and Judith Wajcman. Their definition divides technology into human knowledge, patterns of human activities and sets of physical objects (1999). These approaches to place and technology provide the basis for Moore's theory of non-modern regionalism that emphasises that places shape technologies and technologies shape places. This proposition is further developed in Moore's 'Eight Points for a Regenerative Architecture' that acts to define the non-modern attitude in an applicable format for sustainable architectural practice.

Critical Regionalism

The basis for Moore's approach to sustainable development is grounded in the principles of critical regionalism. Critical regionalism was a theory first introduced by theorists, Alexander Tzonis and Liane Lefaivre in response to the placelessness of modern architecture during the 20th century (Canizaro, 2007). Kenneth Frampton however popularised this theory in a series of publications that would later serve as his manifesto, 'Towards a Critical Regionalism: Six Points for an Architecture of Resistance' (1983). The theme of resistance is at the centre of critical regionalism which acts in opposition to both modernist and post-modernist views of architecture. Frampton's view sees the theory as a tool to settle the conflict between universal civilization and local culture. He discusses the importance of local and direct experiences that were often overlooked in modernist architecture and is also critical of the sentimentality that is often attached to post-modern views of place. To better summarise Frampton's views I will reference Steven Moore's abbreviated form of the seven attitudes, or points, which are indicative of an architecture of critical regionalism.

- *"Critical Regionalism has to be understood as a marginal practice, one which, while it is critical of modernization, nonetheless still refuses to abandon the emancipatory and progressive aspects of the modern architectural legacy.*
- *... Critical regionalism manifests itself as a consciously bounded architecture, one which rather than emphasising the building as a freestanding object places the stress on the territory to be established by the structure...*
- *Critical Regionalism favours the realization of architecture as a tectonic fact rather than the reduction of the environment to a series of ill-assorted scenographic episodes.*



Figure 5, *Saynatsalo Town Hall by Alvar Aalto*
The works of Alvar Aalto align with Frampton's critical regionalism because of their emphasis on the tactile qualities of place in architecture.

- *It may be claimed that Critical Regionalism is regional to the degree that it invariably stresses certain site-specific factors, ranging from the topography... to the varying play of local light across the structure...*
- *Critical Regionalism emphasizes the tactile as much as the visual... It is opposed to the tendency in an age dominated by media to the replacement of experience by information.*
- *While opposed to the sentimental simulation of local vernacular, Critical regionalism will, on occasion, insert reinterpreted vernacular elements as disjunctive episodes within the whole...*
- *Critical Regionalism tends to flourish in those cultural interstices which in one way or another we are able to escape the optimizing thrust of universal civilisation..."* (Moore, 2001, p. 16)

There are two leading critiques of this theory. One is that critical regionalism is preoccupied with the definitions of its oppositions, which does not bring a resolution but rather conflict. The other is that the theory is limited by aesthetic and formal representations rather than understanding the larger context of architectural development. Researcher, Timothy Cassidy, discusses this debate in the article 'Becoming Regional over Time: Toward a Reflexive Regionalism' (2007). He argues that Frampton's objection to nostalgic forms and resistance towards commodification creates a concept of region that is "a collection of self-referential objects instead of a complex contextual cultural web" (p. 410). The works of architecture are thereby reduced to a set of formal relationships that can be modified without any regard to the regional context. Instead of this he proposes a reflexive regionalism in which buildings become regional through their interaction with the region and not their formal characteristics. Author, Barbara Allen also argues against the formal characteristics of Frampton's theory in the article 'On Performative Regionalism' (2007). In her belief, although the theory has mentioned cultural practices, it does not go beyond a passing mention. She reinforces that a sustainable architecture of regionalism should be more engaged in cultural practices and the performances that give cultural identity meaning and life.

Steven Moore believes that while there are conflicting positions on critical regionalism, it provides a progressive platform for theoretical development. He believes that the

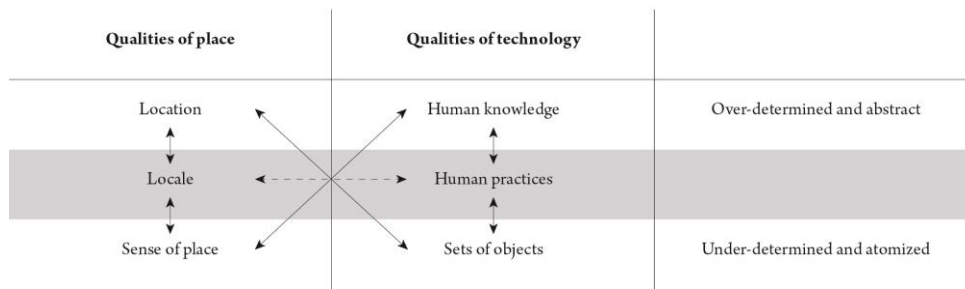


Figure 6, *The Dialogic Qualities of Place and Technology*

This table illustrates the network of theoretical relationships established in Moore's non-modern theory.

regionalist concepts of place and technology established in Frampton's manifesto are the key determinants of a sustainable architecture (2001).

Place and Technology

Building on regionalist concepts of place, geographer John Agnew offers a renewed definition of how the term may be understood and analysed (1987). He does so firstly through a critique of modernist approaches to place to explain why and how the concept needs to be revised. Agnew believes that modernism fails to understand the multifaceted dynamic of place and as result, the subject is often confused. He argues that liberal pursuits in modernist thought often confuse the concept of place with the concept of community, which is seen as coercive and limiting in early modern attitudes. In effect, the concept of place is undermined in an attempt to produce a progressive and liberal society. Agnew believes that the development of this attitude to place is not a progressive stance or in fact accurate.

In producing a more stable and accurate definition of place Agnew offers the three elements; location, sense of place and locale (1987). Location is understood as the geographic area which comprises the objective structures of politics and economy. Sense of place defines a structure of feeling made up of the subjective realities that give a particular place character and quality of life. And locale is the actual shape of a space that provides a connection between the objective characteristics of a location and the subjective

characteristics of sense of place. This revised view of place concentrates on the physical scale in which it is understood rather than the political motivations of modern theory.

The other key concept that is revised based the assumptions of critical regionalism is technology. Moore argues that modern and postmodern views of this subject see technology as a separate process or object from society (2001). Moore prefers the views of STS theory (science and technology studies) that consider technology to be a system that is an inextricable part of society. Sociologists, Donald Mackenzie and Judith Wajcman, are also of this participatory view in their publication 'The Social Shaping of Technology' (1999). They argue that the three qualities of human knowledge, patterns of human activities and sets of physical objects contribute to the definition of technology. The physical objects in this theory do not have significance without the knowledge and expertise of humans who practice them so therefore the three qualities are considered interdependent in a similar sense to Agnew's theory of place.

In Moore's belief these structured approaches are a progressive means of conceiving sustainable development rather than the oppositional theory of critical regionalism and the conflicting positions of modern and postmodern thought.

Non Modern Regionalism

As previously stated, the development of concepts, place and technology, provide the foundations for Moore's non-modern regionalism. In order to avoid the abstract and over-determined characteristics of modern theory and the under-determined attitudes of sense of place, Moore proposes a progressive dialogic between place and technology. In this relationship Agnew's theory of place and Mackenzie and Wajcman's theory of technology are aligned as spatial concepts that inform each other. This theoretical position presents the notion that places shape technologies and technologies also shape places. Under this dialogic understanding Moore believes that place and technology are considered "inseparable but contingent concepts that lead inhabitants of a place to a dialogic

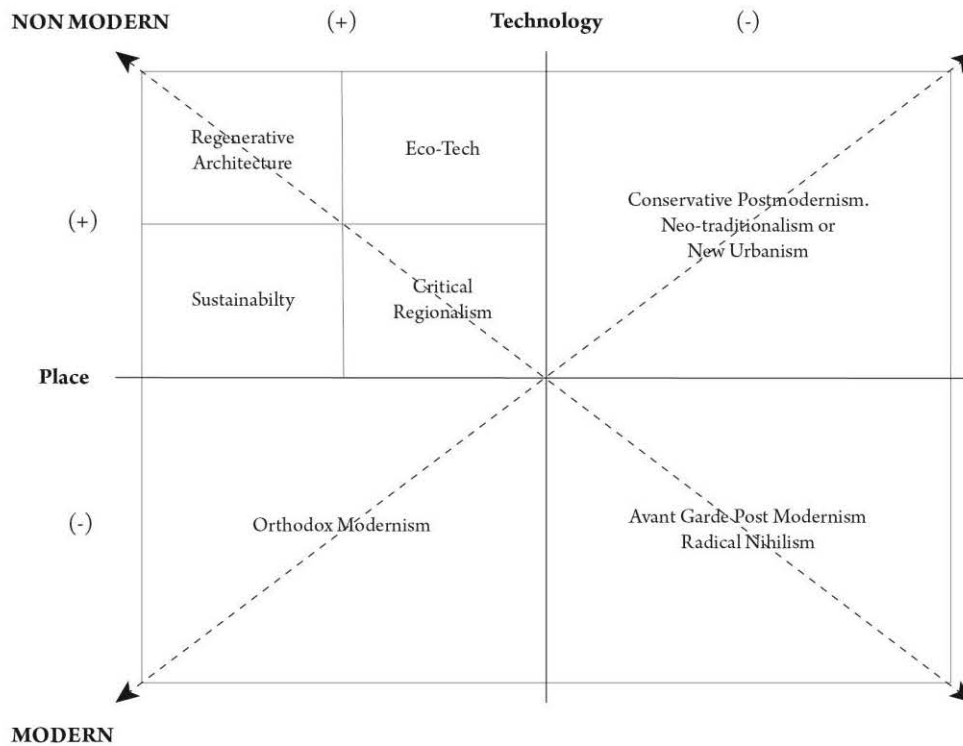


Figure 7, Non Modern Regionalism Diagram

This table illustrates the position of non modern regionalism within the spectrum of relevant architectural theory.

narrowing of cultural horizons” (2001, p. 134). To put this simply, the dialogic proposes that there is an implicit regional emphasis in the creation of architecture. This hypothesis is at the core of Moore’s theory of non-modern regionalism that re-orientes the interpretation built environments as a social construction dependant on his place and technology symbiotic.

To understand the position of non-modern regionalism within the field of sustainability Moore suggests adopting the conceptual term ‘regenerative’, formulated by landscape architect John Tillman Lyle. Lyle defines his understanding of regenerative as a system that “provides for the continuous replacement, through its own functional processes, of the energy and materials used in its operation” (Lyle, 1994, p. 10). Moore believes that this is a positive and progressive stance towards sustainable development but argues that Lyle fails to recognize the role of technological networks that form the ecosystems of place. In turn, he adapts Lyle’s concept of a regenerative system to his non-modern regionalism

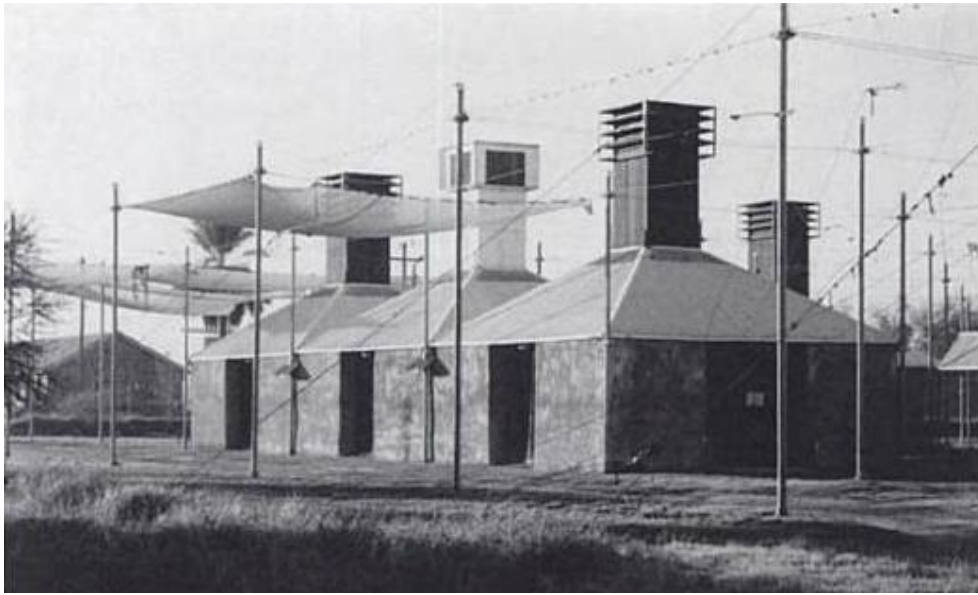


Figure 8, *The Blueprint Farm by the Texas Department of Agriculture*

The Blueprint Farm was studied by Steven Moore in the development of his theory for a regenerative architecture. The flexible modular building system was designed to respond the changing needs of the farmer within changing climate and market demands. Moore prefers that this does not act as a example for how one should build however to avoid limiting the application of his research.

argument. This is put forward in the strategy, ‘Eight Points for Regenerative Architecture: A Non Modern Manifesto,’ that summarises the positions of a sustainable, regionalist architecture (Moore, 2001). By utilising a similar format to Frampton’s manifesto of critical regionalism, Moore intends to produce a distilled set of points that are applicable to the practice of architectural design and construction. Because of the significance of these points to the following investigation of New Zealand dairy farming, they referenced in their original form below:

- *“A regenerative architecture will construct social settings that can be lived differently.*
- *So as to participate in local constellations of ideas, a regenerative architecture will participate in the tectonic history of a place.*
- *Rather than construct objects, the producers of regenerative architecture will participate in the construction of integrated cultural and ecological processes.*
- *A regenerative architecture will resist the centres of calculation by magnifying local labour and ecological variables.*

- *Rather than participate in the aestheticized politics implicit in technological displays, regenerative architecture will construct the technologies of everyday life through democratic means.*
- *The technological interventions of regenerative architecture will contribute to the normalization of critical practices.*
- *The practice of regenerative architecture will enable places by fostering convergent human agreements.*
- *A regenerative architecture will prefer the development of life-enhancing practices to the creation of critical and historically instructive places.”* (Moore, 2001, pp. 198-201)

These points produce a guide to Moore’s regenerative architecture that aspires to bring together a regionalist definition of sustainable development. The manifesto reacts to contemporary debate regarding sustainable architecture by refusing to settle on a fixed scientific method. Rather, it prescribes a range of attitudes which are intended to influence the considerations of architects in the development of regional settings. There is further depth to these strategies which will be interpreted and discussed in the design investigation to better understand how a regenerative architecture may be formed.

Conclusion

To conclude, the views of Steven Moore’s non modern regionalism and regenerative architecture present a unique stance towards sustainable development. Based on the development of Kenneth Frampton’s critical regionalism Moore’s approach takes its title from the progressive stance in regard to both modern and postmodern views. The regional emphasis in both social and ecological considerations makes this theory an appealing approach in regard to the previous review of architectural sustainability. Rather than promoting a universal solution that often marginalises alternate objectives, the regenerative strategy put forward by Moore focuses on dealing with regional specific challenges of sustainability. The theory will be used in the design investigation to better understand how architecture can respond to New Zealand Dairy farming in the province of

Canterbury. The following chapter identifies with this setting and the issues faced in both intensive dairy farming and challenges of sustainability.

Chapter 3:

NEW ZEALAND DAIRY FARMING

Introduction

In the two previous chapters I have discussed architectural sustainability and a progressive local approach to this, outlined by Steven Moore. In this chapter I will discuss the New Zealand dairy industry as a place that faces similar challenges in sustainability and could benefit from an architectural intervention, based on Moore's regenerative approach.

Dairy farming in New Zealand has rapidly grown over recent decades into one of the country's largest export earners (DairyNZ, 2011). The pursuit of overseas markets during this period of expansion has had a strong influence on the industry's definition of sustainable practice. The concept of sustainability now often prioritises an economic oriented approach that has resulted in an on-going intensification of farmland, meaning larger farms, more cattle per acre and a larger workforce to support the production demands. The emphasis on dairying as a competitive business is argued to have come at a cost however, as many believe that there has been a level of social and ecological degradation attached to sustaining a return on investment. These costs include the loss of native forest and wetland to extensive land conversion, the popularised effluent discharge issue of dirty dairying and questionable standards of staff working conditions. The region of Canterbury is studied in this debate as a locale that has undergone large shift from sheep and arable farming to dairy. The challenges in sustainable farm practice are given a regional emphasis in this study to provide design incentives for the following architectural investigation.

Dairy Sustainability

One of most important developments in today's understanding of sustainable dairy farming began in 1985. At this time government policy reforms withdrew subsidies and almost all other forms of support from agriculture leaving farmers fully exposed to the competition of a global marketplace. Because of this, the dairy industry, that exports the majority of its produce, was forced to establish farmer co-operatives to provide competitive access to overseas markets (MacLeod & Moller, 2006).

Surviving within these economic conditions has become an emphasised standard of sustainability in New Zealand dairy. Former CEO of leading co-operative Fonterra, Andrew Ferrier, reinforces this noting that for dairy industry leaders, efficient, low cost production is the key to international competitiveness (Ferrier, 2004). In saying this he acknowledges that local farming practice is in many ways dependant on global markets and to remain competitive inevitably means increasing farm productivity.

One of the primary solutions to increased productivity has been the intensification of farmland. This often means creating larger farms with more livestock per acre and a larger staff in the hope that the increased size of production creates economies of scale (PCE, 2004). At a local level the preoccupation with production has led to an ethic where farmers view increased production as an end in itself. In a study by researcher, Mairi Jay (2007), farmers were surveyed on what they believe indicates successful farming operation. Many farmers had a focus on production or return on investment with one farmer stating, "Well, I think high production seems to be the main one really. It's like running a race; it's the fastest that gets the prize" (p. 270). This is indicative in Jay's view of the majority of current industry attitudes towards dairy farming in New Zealand. The issue of sustainability emphasises economic lifespans and continued growth in the marketplace



Figure 9, *Aerial View of a Milking Shed*

The milking shed is representative of the focus given to production in dairy farm. In a physical and metaphorical sense all roads lead to the milking shed.

and also the farm. This however leaves the question of how alternate views of sustainability are treated within New Zealand dairy.

Social and Ecological Impact

The environmental advantages of New Zealand's temperate climate and year-round grass growth contribute to productivity and market competitiveness. The additional benefit of this farming model is that global markets

perceive New Zealand farming to be environmentally sustainable. However beyond this pastoral image, New Zealand dairy farms

have come under increased scrutiny regarding negative environmental impacts. Because cattle are predominantly raised out-doors year-round most of their waste is excreted onto pasture where it seeps into groundwater, streams, lakes and wetlands. In addition to this water pollution New Zealand agriculture and dairying in particular has caused mass deforestation that has resulted in the loss of habitat for native New Zealand fauna. As an example, the Waikato region has had lowland native forest reduced by 18% in the 160 years since European settlement (Jay, 2007). The environmental wellbeing of New Zealand's settled landscape has been compromised by continued agricultural development and, in particular of recent years, dairying.



Figure 10, *A Farm Stream Polluted by Effluent Run-Off*
An example of one of the largely publicised ecological concerns of intensive dairy farming.

As a consequence of these environmental effects, New Zealand Dairy farming has been widely critiqued. The industry of dairy farm management has responded by self-regulating and bringing in guidelines in regard to the ever evolving environmental concerns. However, in Mairi Jay's analysis of mainstream industry discourse it suggests that environmental issues are framed and perceived narrowly in terms of their link to production (2007). Concerns for broader environmental issues such as landscape amenity or conservation of native ecologies have not, to date, been part of the discourse.

The growth in the dairy industry has also had a social impact with the requirement to employ, house and manage an increasing work force. In many cases, employees are not available in the local employment market and migrant workers have become the workforce to operate large dairy farms (Tipples, 2005). The needs of these employees are diverse and are not always fully catered for in this environment. As Rupert Tipples states in his study of the dairy workforce, “We know more about individual dairy cows than about individual farm staff” (Tipples, 2005, p. 4), yet they are the key to the future success of dairy farming in New Zealand.



Figure 11, *Dairy Staff Housing in Mid-Canterbury*
Many recent rural staff housing developments of the region are often isolated objects within pasture and lack an integration with the landscape.

The concept of social sustainability is not mentioned expressly in industry publications but does appear by implication in another imperative: “Be an attractive career prospect for current and potential farmers” (Dairy InSight, 2005, p. 2). These views show a lack of emphasis on the premise of social sustainability in a business of increasingly strained working conditions. As an example of this, only thirty percent of family businesses survive to a second generation in New Zealand agriculture while some studies report succession rates as low as six per cent for dairy farming (Tipples & Verwoerd, 2006). Many people involved in the ‘grassroots’ of dairying are required to work long hours with minimal financial returns and sub-standard working conditions. These conditions can often impact the longevity of their careers in this line of work and more often than not contribute to a high staff turnover for the dairy farm owner.

In the views discussed the dairy industry can be understood to be lacking in environmental and social standards of sustainability in response to operation growth. While there are emphasised standards of sustainable practice in industry publications, they do not prioritise environmental or social objectives outside of maintaining

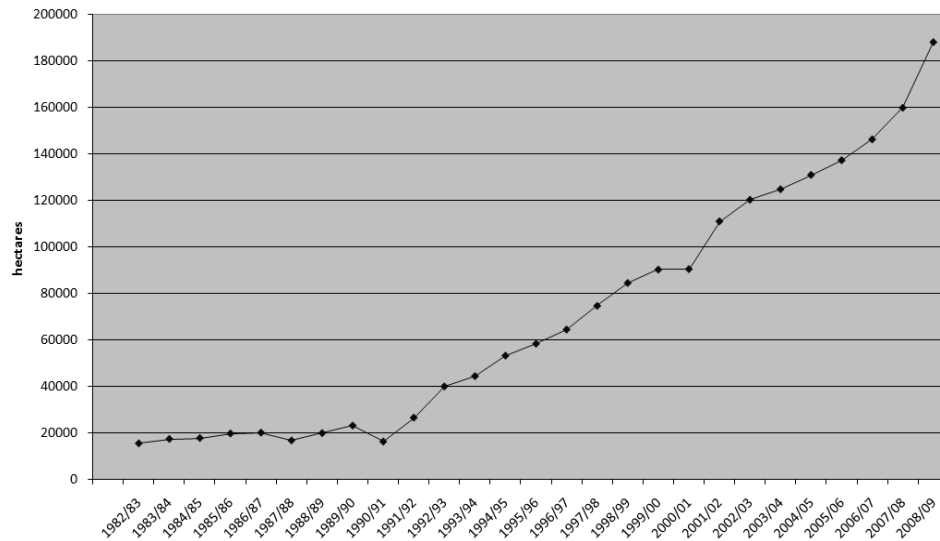


Figure 12, *Canterbury Dairy Farming Area from 1982-83 to 2008-09*
The graph indicates the scale of growth taking place in Canterbury dairy farming.

Canterbury Case Study

Returning to John Agnew's discussion in chapter two, the previous study of New Zealand dairy farming has viewed place under the principal of location. This is understood as an investigation of the objective structures of politics and economy that contribute to the motivations of this cultural setting. In this section I will discuss the locale of Canterbury to better understand how of these motivations have been put into physical practice and architectural consequence. Canterbury has been chosen because of the recent expansion of dairy farming and also the unique attributes of the landscape.

In the 1960s and 1970s, dairying in Canterbury was a minor industry. The dairy sector during this period was limited by harsh climate and soil conditions that meant that the landscape wasn't as well equipped as major dairying regions such as Waikato. Apart from limited areas of heavy soils and other small areas in rain shadows close to the foothills, dairying without irrigation has never been economically viable under Canterbury conditions. The seasons are too short and too severe to promote year round grass growth, so therefore sheep and arable farming was preferred (Pangborn & Woodford, 2011). Today

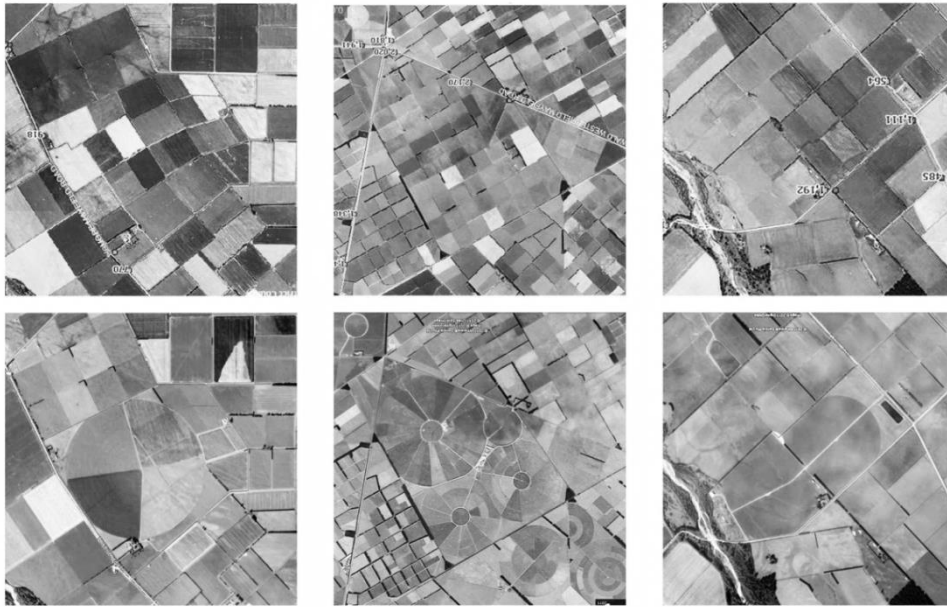


Figure 13, *A Comparative Aerial Analysis of Dairy Farms in Mid Canterbury*
Over the period of eight years (2000-2008) the three farms above display a significant transition in landform and physical shape.

however, there have been significant advances in technology that allows for irrigation on this landscape as well as significant production efficiency increases. As the graph in figure 12 indicates, the area of dairy farming in hectares has risen significantly in the past two decades largely because of these technologies.

Much of the investment in irrigation systems and technologies occurred after 1985, despite the removal of government subsidies for irrigation. In 2007 Canterbury had the largest irrigated area in New Zealand, and the largest annual volume of water consented for irrigation use (Pangborn & Woodford, 2011). New irrigation technologies reduce labour input, apply water more efficiently, and allow more land to be irrigated. The most popular irrigation system in Canterbury currently is the centre pivot sprinkler system, which has an arm up to 800 metres long and waters in a large circle. These are often the favoured system in intensive dairy farming as they require a little maintenance and efficiently cover the large areas of pasture. The impact of this particular technology has had a strong influence on the physical shape and planning of farms, as witnessed in a figure 13. In addition to

changing the division of land they also require the landscape to be cleared to operate meaning that the trees, hedge lines and shrubs are removed impacting ecological diversity.

Canterbury is a region that has only recently become favourable to intensive dairy farming and with this there have been numerous developments that question how this landscape should be treated. In the following design investigation the study will also question this in relation to architecture.

Conclusion

New Zealand dairy farming has experienced significant growth over the recent decade. With this there have been a range of cultural changes and practice based innovations that have reshaped how the modern farm operates. The movement towards intensification today and the consideration of sustaining this movement has increased the efficiency of farms in New Zealand. The challenge attached to this however has been to place goals of producing socially and ecologically sustainable environments. The literature review indicates that there is progress to be made in improving the social and ecological conditions of this cultural setting. With this in mind the following chapter will further investigate the region of Canterbury and the design of an architecture to improve social and ecological sustainability. This will utilise Steve Moore's manifesto for a regenerative architecture to create a building that is responsive to the demands of the productive dairy farm and also the occupant's lifestyle and surrounding environment.

Chapter 4:

DESIGN INVESTIGATION

Introduction

The design investigation explores the theory of regenerative architecture advocated by Steven Moore in the context of Canterbury dairy farming. In the previous chapter, the study identified with the impacts of intensification leading to two contextual objectives in the design. These were to produce a renewed dairy worker lifestyle that would be socially sustainable and to produce ecologically sustainable strategies that cultivate a positive attitude towards environmental challenges. In addition to this, the investigation also discusses the premise of sustainable architecture. It serves to test the regional approach of Moore and understand how his eight point ideology could be applied to a physical context. With this in mind, the investigation uses architecture to promote a more robust living and working environment for dairy practice and explore Moore's regionalist approach to sustainability.

Future Technologies

The design investigation takes into account the importance of future developments in dairy farming practice. This is considered important because of the impact it has on the sustainability of social and ecological networks that uphold the setting. The publication 'Future Food Farming: New Zealand Inc. Meeting Tomorrow's Markets,' by Alan Emerson and Jacqueline Rowarth (2009), provides a local focus on the forthcoming innovations that will significantly impact the dairy farming industry. The more relevant items include the growing implementation of robotic systems and self-supporting herd management techniques.

Emerson and Rowarth discuss the use of robotics in the dairy industry and how they have already drastically revised how practice operates.

Products such as automatic milking machines significantly change the shape of farm practice in not only production of milk, but also in human labour requirements. Automatic milking machines are currently being used in practice on a less intensive scale but it is imagined that when this technology is applied to rotary milking it could produce significant efficiencies. These efficiencies can also be seen in current development of pre-programed irrigation patterns, milking routines and other core components of farm operation. The innovations of herd management technologies are also a key

indicator of shifts in future farm systems. Probably the most dramatic of these innovations is the notion of fenceless farming. In this concept cattle are monitored, controlled and guided by a neck piece device that removes the need for fencing systems. This has been developed in reaction to the growing size of farms and the increasing labour costs. The device attached to each animal enables the farmer to manage wirelessly in an almost GPS calibrated approach and is envisioned to radically shift the way in which New Zealand farms operate. This research could potentially change the physical quality of our landscapes, which rather than being rigidly subdivided by fencing, could become free flowing production parks for the animals.

These technological developments will have a major effect on the labour force in the dairy industry. Labour requirements will decrease on site but there will be a higher demand for skilled staff. The value of technicians will be equal to milking staff or herd managers. In this proposition it is envisioned that small scale farming with struggle to survive. The increased capital investment and productivity of technological large scale farms will mean that smaller, labour intensive models of production find it difficult to remain competitive.

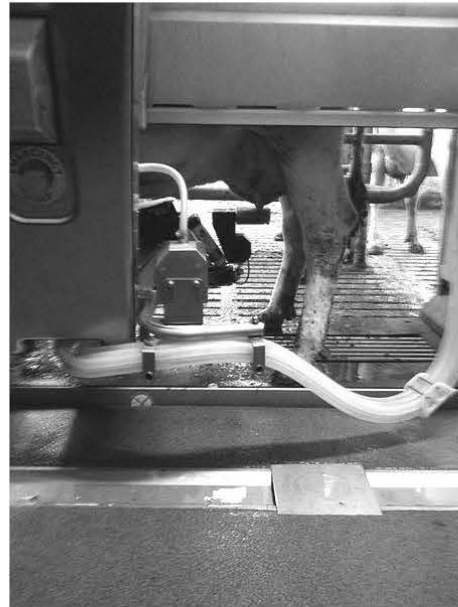


Figure 14, *An Example of Robotic Milking Technology*
The advances in agricultural technologies change the way in the farm operates and the labour demands from staff.

The potential of these systems to relieve the demanding lifestyle of milking routines and cattle management would also suggest that they are key components to be consider in sustainable farm practice

Site Selection and Analysis

Because of the flat and often generic character of the Canterbury Plains landscape I have chosen a site that could represent many other developments of this region. The chosen site is located in Ashwick Flat, near the Fairlie area of the outskirts of Canterbury. It was a property for sale, advertised towards dairy conversion from arable farming. At 243 hectares of relatively flat pasture the site represents the size and ecological makeup of many intensive dairy conversions taking place in Canterbury. Ashwick flat has become an area relevant to dairy farming in recent years due to the Lake Opuia irrigation scheme.

The site holds many of the common characteristics of the greater Canterbury region but also some specific elements that define it within its sub-context. The common characteristics include a relatively flat topography, harsh seasonal climate extremes, irrigation demands for dairy farming, and a medium to large land parcel that is similar to much of the intensive practice taking place in Canterbury. More specific physical features of the site include The site is bordered in the north by a small river that leads to a collection lake off site. Access to the farm is on the south border of the property from a shingle road. There are some larger trees on the

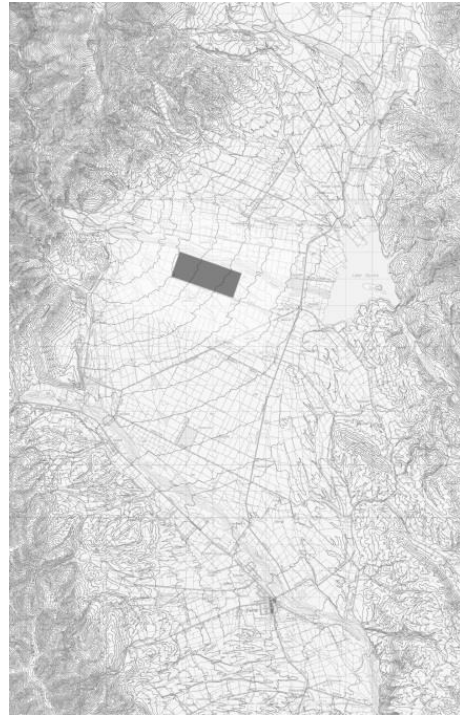


Figure 15, *Ashwick Flat Topography and Farm Aerial*
The scaled out image shows the highlighted location of the site and the flat topography. The scaled in image shows an aerial of the proposed farm.



Figure 16, *Photos of Chosen Design Investigation Site*

The site is very flat and only a small number of defining features so as to promote a design that could be repeated.

boundary of the property to the north. There are also large stone piles remaining from earlier farming practice of clearing the land for cultivation. These can be removed if necessary.

Design Brief

The design investigation uses a brief that challenges both the existing conditions of dairy farming and also the future circumstance discussed previously. The architecture proposed is to firstly house two new dairy staff on the medium to large intensive farm proposed and secondly respond to the criteria of Moore's views on a regenerative architecture. The staff that are being designed for in this investigation, are two families that, based on the technological innovations are all that is required in terms of the day to day running of the farm. There is a share-milker who is more involved with the farm livestock and catering to their needs and a technician who is responsible for the numerous technologies involved in

production. As well as housing these work staff and their families, the architectural investigation needs to consider the production elements that contribute to the unique lifestyle of dairy farming. For the design to respond to social and ecological degradation it must come to grips with the complexity of the practice. In addition to this the design needs to provide a response to Steven Moore's theory of a regenerative architecture. This is a necessary part of the brief as the design serves to also put the concept into a physical setting and test its success.

Design Methodology

The design methodology investigates the application of Moore's eight points for a regenerative architecture. This was done so by taking each point and looking at the ways in which the design investigation could respond in an objective sense. This resulted in the process of attaching a design exercise to most of the points to challenge the strategies assumptions within the context of dairy farming. Therefore the design methodology became a process of establishing a series of architectural gestures that would experiment with Moore's theory of regenerative sustainability. The following sections break the manifesto into recognisable design implications for each theoretical view.

- *"A regenerative architecture will construct social settings that can be lived differently."*
(Moore, 2001, p. 198)

Under a subjective analysis of dairy practice it was understood that the farm operates on the basis of built infrastructures. These infrastructures are the determinants of how dairy farming is currently lived. The house, the pasture and the milking shed are the three most significant determinants of dairy farm lifestyles. The house can be considered a place of rest and refuge from the farm, the pasture is the component that makes the lifestyle unique and the milking shed is the convergent infrastructure between the two. The milking shed is particularly important in this discussion because of its relationship to intensification practice of dairy farming today. It should be considered the technological

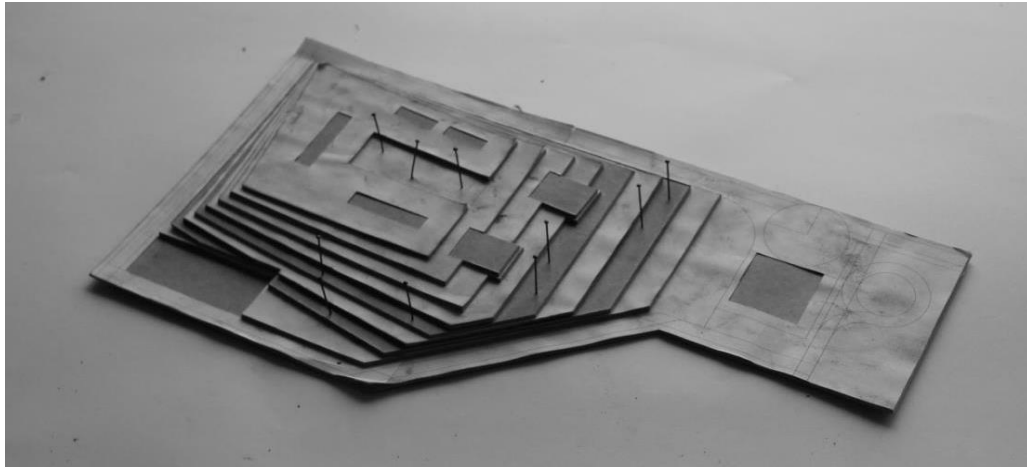


Figure 17, *Model Based Investigation of Topography and Infrastructure*

In this investigation the design explored the relationships between built form and artificial topography. The creation of mounds promoted a new connection between infrastructure and function.

hub where staff and livestock come together in the production of goods that uphold the way of life.

It is the connection between these three components that categorise how the social setting is currently lived and defined. The design investigation therefore looks at how these connections could be conceived of differently. This was explored in an integration of the three infrastructures that would improve the lived conditions of place.

- *“So as to participate in local constellations of ideas, a regenerative architecture will participate in the tectonic history of a place.”* (Moore, 2001, p. 199)

The area of emphasis in this point is the participation of architecture. The design responds to the history this attitude is by acknowledging the demands of intensive dairy farming. Intensification is largely inseparable from today’s dairy farms and, while it is questionable in regards to sustainability, the design cannot reject this important component because of its historic significance. The challenge is to create an architecture that will compete within the current climate of intensification but also emphasise social and ecological forms of sustainability. The design participates with intensification through an emphasis on production. Therefore at the core of the design is the consideration of dairy production and the output of processed goods. This does not outweigh the other strategies implemented

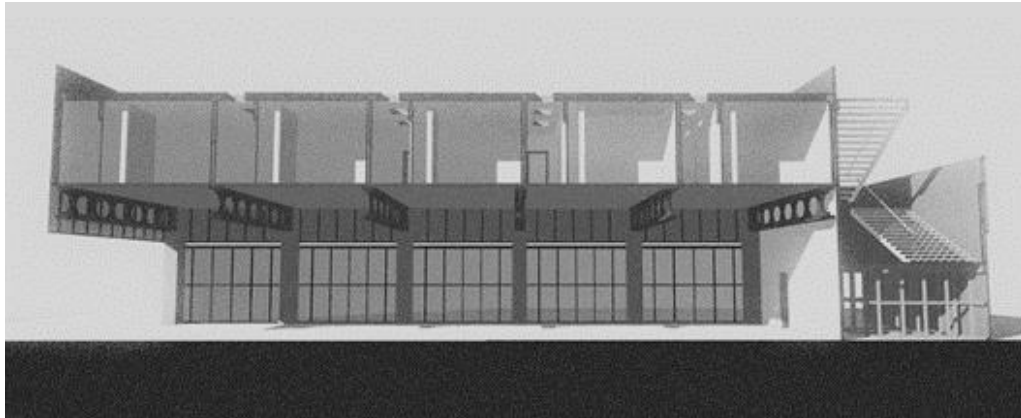


Figure 18, Exploration of Typical Dairy Shed

By rearranging the typical dairy shed to hold living quarters promoted a radical shift in worker lifestyle.

but rather strives to anchor the architecture within the tectonic history of place. This gesture was explored in a range of production flow considerations. The architecture was viewed as the epicentre of these production flows.

- *"Rather than construct objects, the producers of regenerative architecture will participate in the construction of integrated cultural and ecological processes."* (Moore, 2001, p. 199)

This point highlights the integration of social activities with ecological processes. Farming is an activity that is already intrinsically tied to ecological processes. This could be the cultivation of land to produce productive pastures or responding to the seasonal changes in livestock management. This point again looks at how architecture can participate in the construction of these relationships. The design investigation therefore looks at including additional built activities such as a vegetable garden and winter feed storage that bring these connections into the architectural design.

- *"A regenerative architecture will resist the centres of calculation by magnifying local labour and ecological variables."* (Moore, 2001, p. 200)

This position deals with the sustainable technologies and the integration of place in these technologies. The objective of this is to use aspects of the site that will ultimately produce

regenerative elements that contribute to the practice of dairy farming. These technologies are developed in regards to ecological variables including local rain fall, prevailing winds, site topography and natural species of flora. These aspects are integrated into processes such as natural ventilation, rain water collection and site wind breaks and shading that highlight the local conditions of place and the technologies that respond to them. The design exploration categorises this attitude within the gesture of place and integrated technologies. These are systems that utilise the local site factors in collaboration with architecture to influence sustainable farm practice. This was undertaken assessing the aspects such as the flat topography of Canterbury and to find ways in which architecture may utilise this in the design discussion.

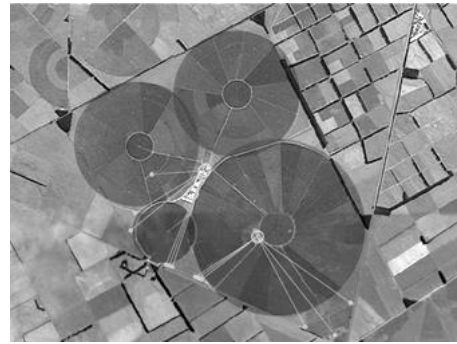


Figure 19, *Analysis of Existing Built Form*
In a series of diagrams the study looked at the existing form and composition of Canterbury

- *"The technological interventions of regenerative architecture will contribute to the normalization of critical practices."* (Moore, 2001, p. 201)

The design exploration of this aspect, deals with a concept driven standardisation of architectural form. Because of the flat topography of Canterbury many farms use similar development layouts and comparable pieces of built infrastructure. This is because the landscape is to a large extent a generic canvas which permits the repetition of effective production infrastructure. The design investigation therefore seeks to participate in this standardisation of built form by creating a design that could potentially be reused in many Canterbury dairy farming scenarios. For this reason the investigation uses a functional core that could be placed in any setting. The core however is then separated by the earthworks that surround it. The use of varied gradients and the multitude of possible access arrangements allows the repeatable core to become site specific without sacrificing a level of standardisation for wide application.

The collection approaches proposed attempts to adapt Moore's theory of a regenerative architecture to dairy farming practice. The points that Moore proposes equate to methods that have been undertaken in the pursuit of a regional emphasise on dairy farm sustainability. Each method uses an architectural gesture that defines its application in the design strategies following.

Design Strategies

The design methodologies formed from Moore's concept of a regenerative architecture are utilised in the design of a mixed use dairy housing scheme. The design presents a new infrastructure model for the Canterbury dairy farm that emphasises improved social and ecological conditions. These objectives are undertaken in a series of design strategies that respond to the methodologies of a regenerative architecture and demonstrate an understanding of how this theory might be applied to architecture in a physical sense. The regional outlook on sustainable architecture in this application values the development of socio-cultural processes and their relationship to aspects of ecology. These applied strategies should be considered to demonstrate Moore's key concepts of place and technology. Each of the following strategies is a technology formed from place that strives to cultivate improved social and ecological conditions of intensive Canterbury dairy farming. Before outlining these strategies however, the overall scheme is presented to better understand how the mixed-use building is composed.



Figure 20, *Exterior Perspective*

The combined dairy instruction and housing scheme sits gently on the landscape with a large ramped landscape. The use of stone gabion and timber cladding reduces visual impact.

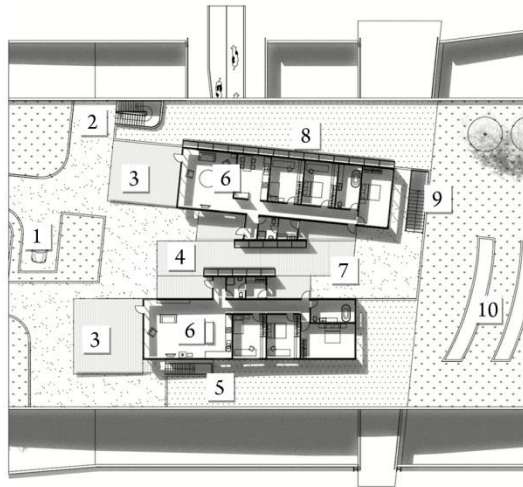


Figure 21, *First Floor Plan*

1. Resident Entrance
2. Secondary Stair
3. Resident Deck
4. House Entrance
5. Secondary Stair
6. Living Area
7. Back Entry
8. Skylight
9. Main Stair
10. Vegetable Garden

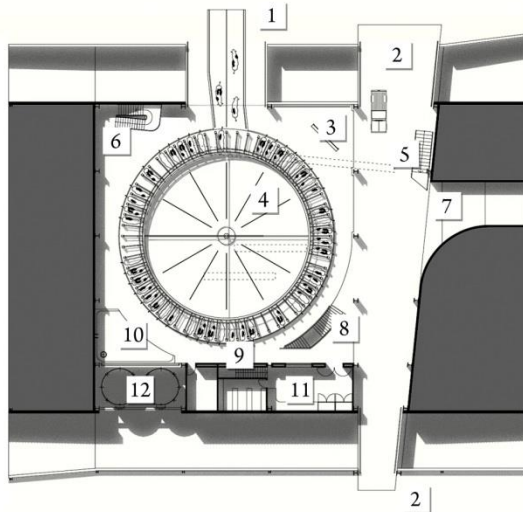


Figure 22, *Ground Floor Plan*

1. Livestock Entrance
2. Vehicle Thoroughfare
3. Operations Monitor
4. Rotary Milking Parlour
5. Main Stair
6. Secondary Stair
7. Secondary Entrance
8. Stair to Basement Level
9. Secondary Stair
10. Wash-down Area
11. Office/ Mechanical Block
12. Milk Tanks

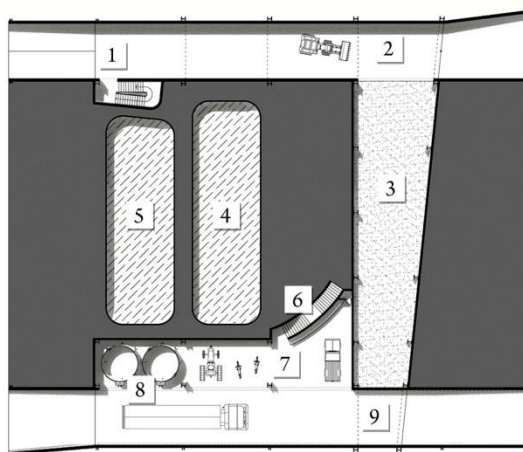


Figure 23, *Basement Floor Plan*

1. Stair to Milking Parlour
2. Heavy Vehicle Thoroughfare
3. Winter Feed Storage
4. Storm Water Collection
5. Effluent Water Collection
6. Stair to Milking Parlour
7. Workshop and Garage
8. Milk Tank and Loading Zone
9. Vehicle Thoroughfare

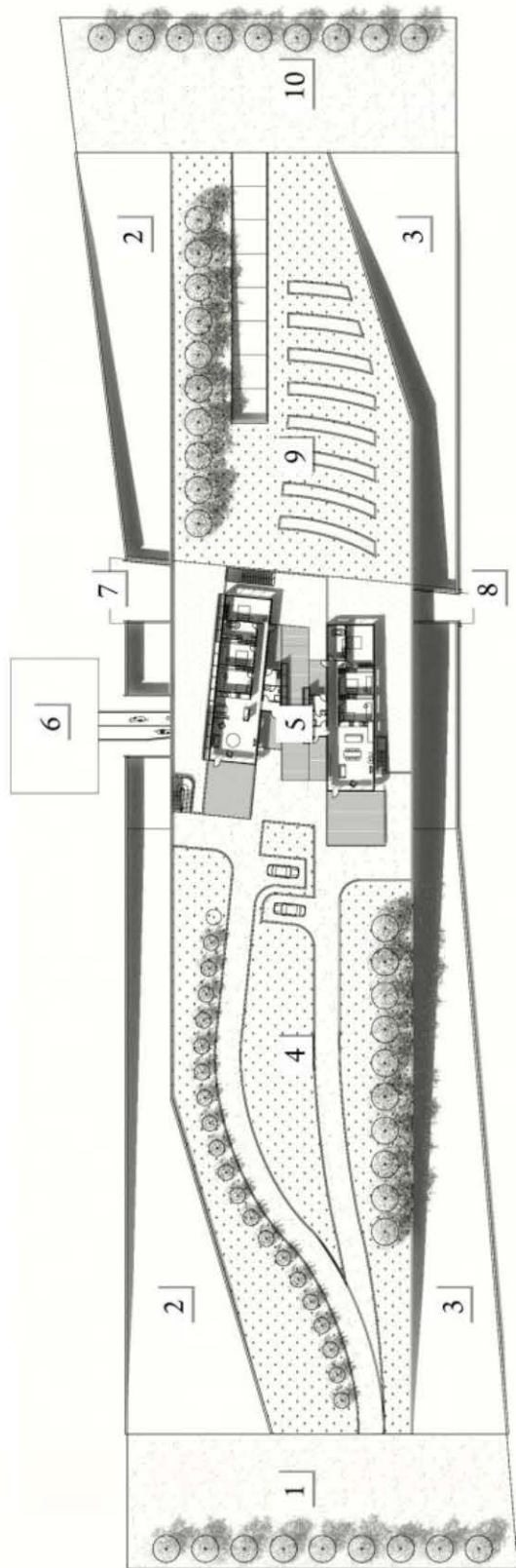


Figure 24, *Location Plan*

1. Resident Entrance Yard
2. Heavy Vehicle Ramp
3. Milk Truck and Farm Vehicle Ramp
4. Resident Entrance Landscaping
5. Resident Housing
6. Livestock Entrance
7. Vehicle Thoroughfare to Pasture
8. Vehicle Thoroughfare to Crop
9. Vegetable Garden / Secondary Entrance
10. Farm Yard

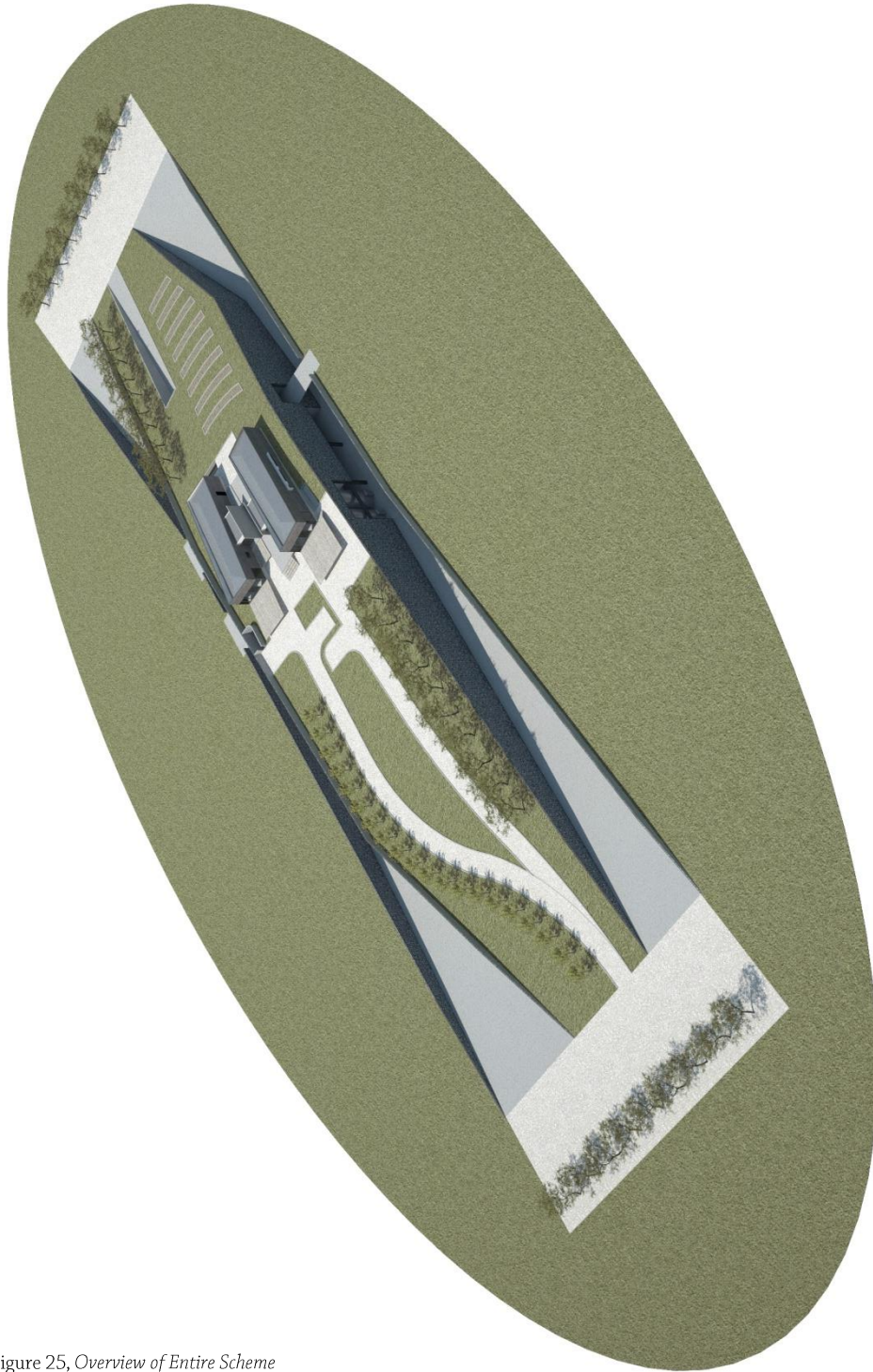


Figure 25, *Overview of Entire Scheme*
The scheme is largely guided by an integration of farm practices to enhance the living conditions of the staff and to minimise impact on the landscape.



Figure 26, *Sectional Perspective*

The building is layered into three sections: living, work and infrastructure.

The design strategies that guided the design investigation are as follows:

Infrastructure connections

This strategy can be seen in the overall gesture of the building. The design seeks to provide a setting that could be lived differently by merging the house with the milking shed and bringing the pasture to this configuration. In this integration the building allows the two work staff to easily negotiate the various processes that are undertaken on the farm without having to travel a great distance. It also allows for only a small amount of the farm pasture to be sacrificed by built form and converges many of the sustainable technologies and systems applied in other strategies. Some of these strategies that are specific to the infrastructure connections include passive thermal transfers from the livestock to houses above and the integration of effluent and storm water storage and discharge.

Production flows

These are emphasised in the design to identify with the current intensification focus of dairy farming. The passage of dairy cows, work staff, milk transport and other various flows are designed to become a part of the architecture and inform the shape that the building takes. Important items of production infrastructure such as the rotary milking parlour are at the centre of building while tractor routes and work staff circulation are wrapped around the architecture. These aspects engage with the history of dairy farm practice and the requirements of intensive practice today.

Ecological routines

As to de-emphasise the architecture as an object and highlight its relationship between social activity and ecological conditions the design proposes a series of ecological routines. These routines are areas that combine ecological events into everyday routine. They include encouraged vegetable gardens, plantings on the driveway into the houses, a silage pit within the lower levels of the building and the large earth formed profile of the design. These elements aspire to better engage the occupants with their natural surroundings and reconsider harmful environmental practices.

Regenerative systems

This strategy uses the regional characteristics of Canterbury's ecology to produce a series of systems that could be considered regenerative. One example of these is a rainwater collection system that utilises the heavy rainfalls of the area. The rainwater is collected on either the green platform roof of the buildings infrastructural core or at the base of the ramped up earthworks. The collected water is then used for wash down in the milking shed and for various secondary applications around the development. Another system with many implications was

the building orientation. Some of the implications include producing north facing living spaces for the residents; access and passage through the dairy shed from the east and west to better use the wind for natural ventilation and stone gabion walls for additional ventilation to the milking space.

The integration of these strategies has to successfully produced a building defined by regional needs and conditions. The problem faced when determining whether this design is regenerative is that Moore's proposed theory lacks any sense of definition beyond a series of imperatives. This aspect has been used by Moore to produce a positive stance towards the uncertainty in definitions of sustainability but ultimately makes it difficult to measure the success of the architectural outcome. It does however provide a toolkit for exploring regional challenges in architecture and sustainability. The use of this manifesto should therefore be used to explore a cultural setting rather than define it and in that sense it has succeeded within this study.

CONCLUSION

The main aim of this research has been to explore how architecture could provide a more socially and ecologically sustainable future for New Zealand dairy farming practice. This was done so by reviewing architectural debate on sustainability; utilising the views of Steven Moore's non modern regionalism; reviewing the attitudes towards sustainability in New Zealand dairy farming; and finally, producing an a piece of architecture that assembles and responds this knowledge.

To conclude, the investigation has successfully explored an architectural approach towards analysing the regional setting of New Zealand dairy farming and responding to the demands that became apparent. Steven Moore's theory of non modern regionalism was used primarily in this approach. The positive stance that this view took towards sustainability meant that the research could work within the conflicted definitions of sustainable development to provide a progressive architecture for dairy farming. The use of Moore's manifesto for a regenerative architecture provided a series of guiding strategies to design in regards to regional contexts and produce socially and ecologically sustainable environments.

This approach was then informed by the issues facing intensive New Zealand dairy farming which accounts for a large percentage of the country's settled landscape. The current shift in this setting towards intensification was explored to determine that production goals were prioritised in industry definitions of sustainability. This was important because the focus on output efficiencies had in turn marginalised social and ecological imperatives. These imperatives were understood as secondary goals and therefore became the main aim of the architectural inquiry. The goals of the design investigation were to enhance the lifestyles of dairy farm staff and mitigate the some of the negative environmental impacts of dairy farming. The secondary goal of the design investigation was test Steven Moore's concept of regenerative architecture when applying the approach to a cultural setting. The

result of this design investigation was a mixed use housing and infrastructure facility for Canterbury dairy farming. The scheme was an interpretation of Moore's regenerative strategy that was used in an integrated approach to re-envision how the dairy could operate and be used. This was composed of a three floor stack that could efficiently utilise both housing and infrastructure resources and also improve the staff lifestyles.

The restrictions of the study were the limitations of Moore's manifesto for a regenerative architecture. The strategy lacked a defined measure of what a regenerative architecture may be and stood instead as guide to exploring the regional context of New Zealand dairy with architectural implication. This was intended by the author but ultimately blurred the success of the study's architectural implementation.

In summation, this thesis argues that architecture could further engage in the setting of New Zealand dairy farming. There is a range of opportunities for multidisciplinary studies that could provide a more sustainable future for the industry. In addition to this architectural development can benefit from concepts of regional sustainability and furthering multidisciplinary approaches.

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BIBLIOGRAPHY

- Agnew, J. (1987). *Place and Politics: The Geographical Mediation of State and Society*. Boston: Allen & Unwin.
- Allen, B. (2007). On Performative Regionalism. In V. Canizaro, *Architectural Regionalism: Collected Writings on Place, Identity, Modernity, and Tradition* (pp. 420-427). New York: Princeton Architectural Press.
- Canizaro, V. (2007). *Architectural Regionalism: Collected Writings on Place, Identity, Modernity, and Tradition*. New York: Princeton Architectural Press.
- Cassidy, T. (2007). Becoming Regional Over Time: Toward a Reflexive Regionalism. In V. Canizaro, *Architectural Regionalism: Collected Writings on Place, Identity, Modernity, and Tradition* (pp. 410-419). New York: Princeton Architectural Press.
- Cook, S., & Golton, B. (1994). Sustainable Development Concepts and Practice in the Built Environment - A UK Perspective. *Sustainable Construction*, 677 (85), 6-9.
- Dairy InSight. (2005). *Strategic Framework For New Zealand's Future Dairy Farming and Industry*. Retrieved 02 2012, 23, from Dairy Insight: http://www.dairyinsight.co.nz/downloads/Strategic_Framework_II_2005_2015_vl_13.pdf
- DairyNZ. (2011). *Annual Report 2010/11*. Hamilton: LIC.
- Edwards, B. (2010). *Rough Guide to Sustainability: A Design Primer*. London: RIBA.
- Emerson, A., & Rowarth, J. (2009). *Future Food Farming: New Zealand Inc. Meeting Tomorrow's Markets*. Wellington: NZX Agri.
- Ferrier, A. (2004). Opportunities and Challenges of the Co-operative Model. *University of Auckland Business Review*, 6 (2), 20.
- Frampton, K. (1983). Towards a Critical Regionalism: Six Points for an Architecture of Resistance. In H. Foster, *The Anti-Aesthetic: Essays on Postmodern Culture* (pp. 16-30). Seattle: Bay Press.
- Geertz, C. (1993). *Local Knowledge*. London: Fontana Press.
- Guy, S. (2002). Sustainable Buildings, Meanings, Processes, Users. *Built Environment*, 28(1), 5-11.

- Guy, S., & Farmer, G. (2002). Interpreting Green Design: Beyond Performance and Ideology. *Built Environment*, 28(1), 11-22.
- Guy, S., & Moore, S. (2005). *Sustainable Architectures: Cultures and Natures in Europe and North America*. New York: Taylor & Francis.
- Hajer, M. (1995). *The Politics of Environmental Discourse: Ecological Modernization and the Policy Process*. Oxford: Oxford University Press.
- Hinrichsen, D. (1987). *Our Common Future: A Reader's Guide*. London: Earthscan.
- Jay, M. (2007). The Political Economy of a Productivist Agriculture: New Zealand Dairy Discourses. *Food Policy*, 32 (2), 266-279.
- Jencks, C. (1995). *The Architecture of the Jumping Universe: A Polemic*. London: Academy Eds.
- Latour, B. (1987). *Science in Action*. Cambridge: Harvard University Press.
- Leopold, A. (1970). *A Sand County Almanac*. New York: Ballantine Books.
- Lyle, J. T. (1994). *Regenerative Design for Sustainable Development*. New York: John Wiley.
- MacKenzie, D., & Wajcman, J. (1999). *The Social Shaping of Technology*. Philadelphia: Open University Press.
- MacLeod, C., & Moller, H. (2006). Intensification and Diversification of New Zealand Agriculture since 1960: An Evaluation of Current Indicators of Land Use Change. *Agriculture, Ecosystems and Environment*, 115 (4), 201-218.
- Moore, S. (2001). *Technology and Place: Sustainable Architecture and the Blueprint Farm*. Austin: University of Texas Press.
- Moore, S. (2001). Technology, Place and the Nonmodern Thesis. *Journal of Architectural Education*, 54 (3), 130-139.
- Pangborn, M., & Woodford, K. B. (2011). Canterbury Dairying - A Study in Land Use Change and Increasing Production. *Proceedings of the 18th International Farm Management Congress* (pp. 81-87). Methven: International Farm Management Association.
- PCE. (2004). *Growing for Good, Intensive Farming, Sustainability and New Zealand's Environment*. Wellington: Parliamentary Commissioner for the Environment.
- Schatzberg, E. (2002). Natural Capitalism: Creating the Next Industrial Revolution. *Technology and Culture*, 43 (1), 218-221.

Tipples, R. (2005). Future Dairy Farm Employment in New Zealand: An Application of the Human Capability Framework. *Employment Relations Record* , 5 (1), 27.

Tipples, R., & Verwoerd, N. (2006). Social Impacts of Once-a-day Milking. *Primary Industry Management Journal* , 9 (2), 37-39.

Wines, J., & Jodidio, P. (2000). *Green Architecture*. New York: Taschen.