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Red Meat from Pasture: Sustainable Livelihoods for Small Mixed Farmers in China's Yunnan Province

A thesis submitted in partial fulfilment of the requirements for the degree of

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in

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Alan Kent McDermott

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Abstract

China's pattern of food consumption is changing. The demand for high quality red meat is rapidly increasing, especially in the more affluent coastal regions. The pastoral livestock farmers in Southwest China have low and declining incomes, and operate in a highly uncertain environment. This environmental uncertainty is derived from the seasonal climate, land tenure policies, and a dealer-dominated supply chain in which information is scarce, ambiguous, and untimely. The researcher spent two years in China's Yunnan Province working on a pastoral development project. During this assignment, the researcher undertook a case study of the small, mixed livestock and cropping farmers involved in the project, together with an evaluation of alternative strategies for pastoral development and enhancing livestock production. The case study also involved an overview of agricultural extension and the red meat supply chain in the study area. The current farm production systems are environmentally, financially and socially unsustainable. Farm output is low and achieved inefficiently at considerable cost to future productive potential. Farmers are not investing in farm improvements because they lack confidence in their ability to generate a return from such investments. Confidence is low because farmers do not trust other supply chain participants, and they perceive a low level of control over the operating environment. This is resulting in a vicious cycle of unsustainability. There are numerous market opportunities emerging due to changes food consumption. Farmers have three broad strategic options for taking advantage of these opportunities: invest in technologies to raise output and quality, further process to add value and increase consumer acceptance of red meat and co-operate within the supply chain. The technologies extended as part of the development project were demonstrated to yield significant benefits in terms of production and profit. However, adoption has been low because many of the technologies did not consider local constraints, extension has not widely occurred and uncertainty in the operating environment did not encourage investment. For farmers to be able to successfully implement these strategies farmers need to be empowered and a more enabling environment created. This empowerment involves changing farmers' perception of locus of control, sharing control and supply chain participants learning about each other. Co-operation between farmers and the rest of the supply chain should provide

benefits along the whole chain. A model for co-operative and sustainable development is proposed and limitations of this model are discussed.

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Abbreviations

ADB	Asian Development Bank
AHB	Animal Husbandry Bureau of Yunnan Province
CIDA	Canadian International Development Agency
FAO	Food and Agriculture Organisation of the United Nations
GGERI	Gansu Grassland Ecological Research Institute
NBS	National Bureau of Statistics, Peoples' Republic of China
OECD	Organisation for Economic Co-operation and Development
UNDP	United Nations Development Programme

Units

Billion	1×10^9
DM	dry matter
Million	1×10^6
Mu, 1 mu (亩)	1/15 ha
s.u.	stock unit, one stock unit = one 55 kg ewe raising 1.1 lambs to weaning, equivalent to 550 kg DM/year.

Place names and work units mentioned in text with Chinese translation

Animal Husbandry Bureau of Yunnan Province 云南省畜牧局

Bei Da Ying Village 云南省寻甸回族彝族自治区河口乡北大营村

Gansu Grassland Ecological Research Institute 甘肃省草原生态研究所

Lang Mu Mountain 云南省曲靖市麒麟区沿江乡郎目山

Qujing City 云南省曲靖市

Qujing Prefecture 云南省曲靖地区

Xun Dian County 云南省寻甸回族彝族自治区

Yun-Gui Plateau Sustainable Pasture Technology Research and Development Project 国家“九五”科技攻关“云贵高原草地持续发展技术研究专题”

Yunnan Province Sheep Breeding Farm 云南省种羊场

Exchange Rates and Currencies

USD	United States dollar
NZD	New Zealand dollar
RMB	Chinese yuan, Renminbi
USD : RMB	1 : 8.27
NZD : RMB	approximately 1 : 4.5 during the study period

1 Introduction

1.1 Poverty in China

Poverty in China is predominantly found in rural regions although it is becoming increasingly significant in urban areas as urban unemployment rises (ADB, 2000). There is significant poverty in China, although estimates with respect to this level of poverty are conflicting (Table 1.1).

Table 1.1: Official and International estimates of poverty in China. Numbers in brackets indicate percentage of population.

Year	State Bureau of Statistics[1]	International Estimates		
		$1US/day	$1US/day[2] (1985 purchasing parity)	$2US/day[2] (1985 purchasing parity)
1997	50 m (5.4%)	124 m (13.5%)	-	-
2000	27 m (3.1%)	-	230 m (18.5%)	670 m (53.7%)

[1] The official poverty line is based on annual income of 635 RMB per capita, and is only measured in rural areas. [2] World Bank estimates based on consumption norms at 1985 purchasing parity. Sources: UNDP (1999b); ADB (2000). The official exchange rate since 1996 is $1 US = 8.29 RMB.

There are clearly a considerable number of rural and urban people living with limited opportunities. People with such low incomes are often unable to cope with stresses and shocks, maintain or enhance their capabilities and assets, or provide sustainable livelihood opportunities for the next generation (Chambers and Conway, 1992).

Poverty is more prevalent in the western provinces (ADB, 2000). Hence, the focus of the Central Government's Tenth Five Year Plan is on developing these provinces, resulting in large amounts of finance being channelled there.

1.2 Feeding China and the demand for red meat

There are three factors likely to contribute to the expected increase in demand for meat products in China:

(i) Increasing urban affluence will raise demand for high quality meat products that are healthy, convenient, nutritious and produced using animal and environment friendly methods (Rae, 1995; van Gelder et al., 1998; ClearThinking.com, 2000);

(ii) Continued economic growth will see disposable incomes increase further, raising the demand for protein rich food products (Rae, 1995; World Bank, 1997b; van Gelder et al., 1998); and

(iii) Continued population growth will multiply the affects of economic growth (Cai et al., 1998; Heilig, 1999).

Economic development in China is likely to cause the large rural population to migrate to cities in search of work, as farming modernises and they become surplus to the needs of agriculture. Agricultural productivity will need to increase and a food industry will need to be established (Heilig, 1999). Current production techniques are unlikely to supply meat of the required quality or volume in the future. Grain feeding to increase the livestock slaughter rate may be possible, but there are concerns about China's ability to source sufficient grain to meet future demands (e.g., Brown, 1995; World Bank, 1997b). Thus, new and more efficient means of producing meat need to be adopted.

In the Southwest region, the potential for improvement is considerable. Key changes needed to help realise this potential are the introduction of improved cattle breeds and pastures, and the management of these pastures (Zhang et al., 1997; Ren and Jiang, 1999)

1.3 Pastoral livestock systems

New Zealand is widely recognised as having the lowest cost livestock production systems in the world (Chu, 1997; Connor et al., 1998). These systems are designed around New Zealand's comparable advantages of relatively abundant land, temperate climate with adequate rainfall and sunlight, and a considerable knowledge base. The driver of New Zealand's pastoral systems is the legume, white clover (*Trifolium repens*), capable of supplying nitrogen via nutrient cycles to the other pasture species. Phosphorus fertilisers are critical to ensuring productive white clover-based pastures. In New Zealand, animal feed demand is strategically matched to the seasonal growth pattern of pasture. Controlled grazing, both in terms of feed allocation and using complementary livestock classes to optimise pasture utilisation, is central to the sustainability of New Zealand pastoral livestock farms.

There have been frequent suggestions that the climate, terrain and other conditions of Southwest China are very similar to those found in New Zealand. However, there are some significant differences as described by Chu (1997): New Zealand's rainfall is more evenly distributed throughout the year, summer is drier, and winter and spring are wetter than in China. The integration of different land classes is more difficult in China because of the demand for fertile flats to grow crops for human consumption. A further difference is that Chinese farmers often farm to survive while in New Zealand farming is a business. All of these differences influence the strategies employed in pastoral livestock systems. The key similarities between New Zealand and China are the need for both low cost and sustainable farm systems (Chu, 1997).

1.4 Extension and development

A critical component of any development programme is participant learning (Stiglitz, 1998). Learning involves capacity building and the transfer of technology. Capacity refers to the ability to perform certain functions and the ability to exploit opportunities (Chambers and Conway, 1992). There are many models of technology transfer (Reid, 1996b), each of which is appropriate in different situations. Thus, it is important to understand the circumstances of the targeted people and be able to determine the most suitable extension method(s). Technology transfer and participatory technology development are central to capacity building, and provide learning opportunities.

Sustainable development also requires opportunities (e.g., market access, requiring reduced bureaucracy and improved roads) to be available to poor people.

1.5 Supply chain management

The international development community now recognises that merely helping farmers to boost productivity often does not result in a corresponding rise in their income (World Bank, 2000). There is a need to provide opportunities beyond the farm-gate through infrastructural development, credit, and improved markets, in combination with production assistance (Swanson et al., 1984, cited in Campbell and Barker, 1997). A useful framework for analysing 'external opportunities' is supply chain management theory.

A supply chain is the term used to describe the concept of all participants in the transformation of raw materials into a final good purchased by consumers. Supply chains exist everywhere, but managed supply chains are far less common. Supply chain management is becoming increasingly popular in manufacturing and processing industries (Lewis, 1990; Anderson et al., 1997), and is now beginning to gain greater acceptance in the agriculture and food sectors (Fearne, 1998). The spread of supply chain management can be attributable to firms recognising that in the delivery of goods and services to consumers, they alone do not create value, but rather that each member of the entire supply chain adds value. Through the establishment of vertical linkages with suppliers and customers, firms have been able to improve efficiency and control costs, attain a more appropriate risk-return profile, and better match customer and consumer demands (O'Keefe, 1998b; Spekman et al., 1998). Central to supply chain management is the flow of information on what are final consumer requirements, the product specifications at each stage within the supply chain, and how those specifications can be met (Mohr and Spekman, 1994).

Such an approach is necessary for the successful development of China's beef (Zhang et al., 1997) and other pastoral livestock industries.

1.6 Research project

Poverty in China is a significant problem, especially in rural regions, and farmer incomes are low. However, the demand for red meat is increasing, especially the demand for high quality red meat, as urban consumers become more affluent. This suggests there is an opportunity for farmers, particularly pastoral farmers, to increase red meat output and generate higher incomes. Rural households raising beef cattle have higher incomes compared to similar households not producing beef (Zhang et al., 1997). New Zealand pastoral livestock farming principles may provide guidance on how to increase productivity. However, the need to provide assistance beyond the farm such as credit, institutional support, and functioning markets must not be neglected.

The research question is therefore:

"What are the opportunities for, and constraints to, increasing the level of net farm income of farmers through pasture-based red meat production in Qujing Prefecture, Yunnan Province, China?"

Consistent with the production focus of the research, the following four objectives were established to guide the research:

(i) To describe the current red meat supply chain in Yunnan.

(ii) To investigate and evaluate ways of increasing pasture-based red meat productivity using proven New Zealand pastoral livestock system technology.

(iii) To identify internal and external factors influencing technology uptake at the farm level.

(iv) To identify external factors affecting the increase in net farm income resulting from increased red meat productivity, based on supply chain management, development, and extension theory.

This research was completed during a two-year assignment as a United Nations Volunteer working as a pastoral livestock systems specialist on a National Five Year Plan pastoral development project in China's Yunnan Province. The assignment involved working with pastoral farmers who each operated approximately 100 mu[1] of grassland plus some cropping area (up to 15 mu), with the aim being to raise their farm output. New Zealand pastoral livestock system technologies were seen to be central to achieving this goal by the project designers and management. These farmers, who produce wool, sheep meat and beef, provide the context for the study presented.

The position of employment meant that it was not possible to freely collect information as might have been possible in a research posting. However, information with respect to industry co-ordination and opportunities for increased management of the supply chain may still not have been readily available.

[1] Mu is the Chinese unit of area. 1 mu = 1/15 hectare.

1.7 Thesis outline

The literature review spans four chapters because of the diverse subject areas covered. **Chapter Two** discusses the operating environments in which farms exist; family and subsistence farms; farm systems, their components and the factors influencing farm performance; and strategies for improving farm systems and increasing control over farm performance.

Chapter Three reviews the theory of adoption of innovations, including why farmers do and do not adopt technology, with emphasis on the factors driving adoption decisions. The various extension practices are also described and analysed with respect to their relevance to extending pastoral livestock farming practices in Yunnan Province.

In **Chapter Four**, the theory of the firm and industry co-ordination is reviewed and the more recent developments in co-ordination of supply chains are discussed with particular emphasis on the role of supply chain management in agriculture and the benefits that can accrue from such an approach. The establishment and maintenance of managed supply chains or value chains is also discussed. The content in this chapter is not strictly a component of the programme of study undertaken, but is included here because of its relevance to discussion of the implications of the study.

Chapter Five, on development, brings the previous three chapters together and puts them into context with the problem statement. Past approaches to development are reviewed, the new focus of development programmes is discussed, and the relatively new concept of public-private partnerships in development is raised.

The case study is described in **Chapter Six**. Poverty and food consumption patterns in China are described together with the operating environment small-scale mixed cropping and livestock farmers work in. Pastoral system development work carried out in Southwest China over the past two decades, and some of the technologies extended, are also discussed to set the scene for the research.

The methodologies employed in completing the research are described in **Chapter Seven**. Research results are presented in **Chapter Eight** where the current

situation and available technologies are described. The research findings are discussed and compared to the literature in **Chapter Nine** and research conclusions are presented in **Chapter Ten**.