DAIRY PRODUCTION FROM PASTURE IN SOUTHERN CHINA

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ABSTRACT

This paper covers the development of dairy production systems as part of the UNDP funded Agro-grasslands Systems Development Project in Guizhou Province, China. The basic philosophy for the project was for local adaptation of New Zealand technology for developing dairy production systems based on pastures. The dairy production systems were established and the outputs of the project successfully achieved. Net incomes of smallholder farmers increased from a baseline of RMB $140 to RMB $1740 per annum over a three year period. Based on the experienced gained in setting up these systems local researchers, administrators, extension personnel and smallholders were able to identify a number of problems and opportunities for the further development of milk production from pastures in Guizhou Province. The main feature was, in general, a lack of planning of suitable stock policies to make effective use of the improved pastures, which lead to either underfeeding of animals and/or the use of high cost concentrates. The reasons for this underfeeding and possible solutions are identified and discussed in the paper. Dairy development at one site (Dushan) offered a successful model for production as at this site a lower cost system based on 24 hour grazing of pasture with less total supplement fed/ha and the use of fodder crops and silage rather than concentrates without any reduction in per cow production was established.

KEYWORDS

Dairy production, Pastures, China, Smallholders, Technology transfer

INTRODUCTION

The demand for milk and milk products in China is rapidly increasing. This demand is being met by a dairy industry based on a small number of large scale units, with confined animals fed on concentrates and silage. Milk processing and marketing is carried out by individual farms. High overhead and feed costs in association with Government control of milk prices have placed considerable economic pressure on these units. The high and increasing demand for grain for human consumption within China suggests that livestock systems should not compete for either the production or use of this grain. Future milk production systems are therefore likely to be based on crop residues, industrial by-products, and pasture and forage crops grown on soils unsuitable for crop production. A dairy industry based on low cost, low input, milk production systems from pasture was established as part of the Agro-grassland System Project in Guizhou Province, China (Chu et al 1997, Jiang et al 1995a and 1995b). A two day workshop involving Chinese scientists, local technical staff, farm managers, and smallholders was held to review progress over the previous three years and to identify and offer realistic solutions to the current issues (problems and opportunities) facing the developing pasture based dairy industry (Matthews 1994). This paper reports the findings of this workshop and offers recommendations for the continuing development of the dairy production from pastures in Southern China.

DEVELOPMENT OUTCOMES

The basic philosophy for the project was for the local adaptation of New Zealand technology for developing dairy production systems based on pastures (Chu et al 1997). As part of the project, pastoral livestock systems were established at three locations, Weining (Yunnan - Guizhou high country 2,500 m), Qinzhen (Central Guizhou hill country 1,300 m), and Dushan (sub-tropical hills 1,000 m). These three ecologically different centres also represent a cross section of areas in Southern China potentially suitable for pasture development. Dairying was the main emphasis at Qinzhen due to the neighbouring large population centres. At all site the climate is suitable for the establishment of temperate grass and legume species (Jiang et al 1995a). At this site a small 12 ha research/ demonstration unit and 13 small holder dairy units were established. Production was based on pasture with land cultivated and sown to ryegrass and white clover and stocked with Friesian type cattle from within China. Although development in the other centres was based on beef cattle (Dushan) and sheep (Weining), personal initiatives by local technical staff also saw a smallholder demonstration unit established in Weining and a larger scale dairy unit at Dushan. In Qinzhen, pasture development started in 1990 and milk production in 1991 while dairying was established in Dushan in 1991 and Weining in 1993. A dairy farming system based on pasture was established and the outputs for the project successfully achieved with smallholder farmers net incomes increased from a baseline of RMB $185 to RMB $1740 per annum over a three year period (Chu et al 1997). Physical data for the two larger scale units (Qinzhen and Dushan) and the average for three Qinzhen small holders is presented in Table 1(a) and the gross margin for the existing Qinzhen Centre Farm in Table 1(b) (Jiang et al 1995b).

PROBLEMS AND OPPORTUNITIES

All participants in the dairy workshop agreed that since 1991 much had been learnt and achieved by all those involved in the development of dairy production systems from pasture and that although development targets had been achieved it was recognised that a number of problems still existed. A feature of the evolving system (Table 1), however, was the low per cow production (< 3000 litres milk/cow/year) despite in most instances high inputs of concentrates (50% gross farm income (GFI) at the Qinzhen Centre Farm). The initial on-farm emphasis was on pasture development often at the expense of production and economic returns. There was, in general, a lack of planning of suitable stock policies to make effective use of the improved pastures which lead to either underfeeding of animals and/or the use of high cost concentrates. Underfeeding resulted in low per cow production but also had a longer term effects through low cow liveweights, conception rates and in-calf rates for most herds (Table 1). The high proportion of GFI spent on concentrates reduced expenditure on longer term investment in improved stock, fertiliser, and pasture improvement. The dairy development at Dushan adopted a lower cost system with less total supplement fed/ha (Table 1) and the use of fodder crops and silage rather than concentrates without any reduction in per cow production. Over stocking resulted in low average pasture covers on farms (1000 to 1500 kg DM/ha) which in itself is likely to limit pasture production as well as cow intakes and animal production. These relationships do not seem to be well understood and therefore have not been well demonstrated by the Centres. The underlying cause of the problem is that farms are overstocked relative to the current levels of pasture production (2500 to 7000 kg DM/ha). Pastures have deteriorated due to reduced soil fertility and lack of persistence of local ryegrass (Lolium perenne) in association with the overgrazing. Although capital fertiliser to overcome soil deficiencies was applied there seems to be a lack of appreciation of the role of maintenance levels of fertiliser in sustaining the improved level of soil fertility. Measurements at Qinzhen showed a 79% increase in production from a four year old pasture receiving adequate maintenance fertiliser compared to one that had no fertiliser since establishment (Jiang 1994). The annual cost of maintenance fertiliser to produce the extra 2700 kg DM/ha is RMB $120/ha/year; the cost of 50 kg concentrate. Further oversowing and pasture improvement will be ineffective unless the soil fertility question is addressed. The local perennial ryegrass showed many annual characteristics and therefore pastures sown in perennial ryegrass lacked persistence. Where soil fertility was not maintained at a high level, cocksfoot (Dactylis glomerata) appeared to be both more productive and persistent than the local perennial ryegrass cultivars.

With the project objective for technology to be identified and implemented at the local level (Chu et al 1997), two key limitations were identified. Firstly technical personnel were unable to adapt New Zealand technology to the local situation. To understand New Zealand technology, they were introduced to the concepts as implemented by leading farmers (computer use and feed budgeting in association with intensive monitoring to aid feed planning and decision making) and although they were able to understand the technology they were unable

to appreciate that most farmers in New Zealand do not use these methods and that the principles once understood can be applied in a much more simple form. This resulted in attempts to use inappropriate and complex computer monitoring and planning systems. Secondly the systems established were influenced by traditional Chinese attitudes that concentrates are required for milk production along with popular myths within China about the relationship between diet and milk production. This made it difficult for farmers to recognise that pasture is a high quality feed for milk production and that concentrates are not required. Pastures are still treated as "native" pastures rather than as high quality feed for milk production. The need for improved feed planning and management was recognised as all the main animal problems identified are directly the result of underfeeding. Emphasis must be placed on effecting a more realistic stock policy to balance animal intakes and pasture production. This will mean reducing stocking rates, improving the ratio of productive to non-productive animals and the control of mating and calving dates. With market demand for milk high in winter and low in summer there is a need to produce milk over the winter months when pasture production is low. Production cannot therefore be seasonally based and there will be need for supplement feeding programmes over the winter months. At Dushan the target is to have 60% of the herd calving in spring and 40% in the autumn to achieve an adequate balance between the seasonality of both pasture production and milk consumption. Although production is based on pasture it must be recognised that the seasonal pattern of pasture production and the variability in pasture growth means that pasture must be integrated with supplementary feeding programmes. Economically farmers must look at lower cost options for overcoming feed deficits with high quality pasture integrated with silage, hay, crop residues and food bi-products. There is also a need to co-ordinate local expertise as development has been hindered by the lack of interaction between contributing groups and individuals reducing the effectiveness of extension programmes. When Chinese scientists, local technical staff, farm managers, and smallholders met for the two day workshop at Qinzhen, reported in this paper, they were able to identify all the current issues facing the developing dairy industry and offer realistic solutions. Provided this interaction can be maintained dairy production from pasture will continue to develop and expand. Although dairy development within the project focused on the Qinzhen region it is the successful establishment of dairy production from pastures at the Dushan Seed Farm that has evolved a model that offers the potential long term sustainable production of milk from pastures by small holders. This development was not encouraged by local technical staff but is likely to continue due to profit motivation by the management of the Dushan Seed Farm and the local small holders. Unless changes are made to the milk production systems as they have developed at Qinzhen the long term outlook at this site is less certain. It has been calculated by Jiang et al 1995b that if appropriate changes are made to the stocking rate, maintenance fertiliser use, and reducing the amount of supplement fed as well moving to lower cost supplements that the gross margin per hectare per year for the Qinzhen Centre could be increased from RMB $1466 to RMBA $4931 (Table 1b).

Table 1

Dairy Systems **(a)** 1994 Production data

	Dushan Seed Farm Farm	Qinzhen Centre Smallholders	Qinzhen
Dairyfarm size (ha)	30	12.2	5.0
Cows milked	48	18	8
Milking cows/ha	1.6	1.5	1.6
Milk Production (litres/cow/year)	3034	2759	2653
Total supplements fed (kg DM/ha/year)	953	3872	2467
Concentrates fed (kg DM/ha/year)	171	2478	1282
Cow liveweight (kg)	-	445	448

CONCLUSIONS

Smallholder systems producing milk from pasture were successfully established. Where low cost New Zealand technology has been adapted, in a relatively simple form, dairy production is profitable.

If the industry is to be successful on a long-term basis changes need to be made to farming policy with emphasis on the use of maintenance fertiliser to support pasture production and developing more appropriate supplementary feeding programmes. These changes will substantially increase gross margin per hectare.

It is suggested that the pasture based model (Dushan Seed Farm) rather than a concentrate feeding model (Qinzhen Centre Farm) should be used as a basis for further development.

There is a need for effective demonstration of the whole system with emphasis on the maintenance of soil fertility and pasture production to underpin production based on adequate feed planning and implementation.

REFERENCES

Chu A.C.P., Matthews P.N.P. and Hodgson J. 1997. An interactive approach to technology transfer in a development project - a case study. Proc XVIII Int Grasslands Congress (In press).

Jiang W.L., Song F.Y., Xung S.L. and Butler B.M. 1995a. Research on the optimisation of dairy systems on sown pastures (1) Current system monitoring and analysis. Acta Agrestia Sinica **3**: Sect 31 (1-16)

Jiang W.L., Song F.Y., Xung S.L. and Butler B.M. 1995b. Research on the optimisation of dairy systems on sown pastures (1) Evaluation of alternate systems. Acta Agrestia Sinica **3**: Sect 32 (1-8)

Matthews P.N.P. 1994. Internal Report UNDP Agro-grassland Systems Project.

Table 2

Dairy Systems **(b)** Gross margin analysis for Qinzhen Centre farm (from Jiang et al 1995b)

	Current System	Improved System
Income		
	42797	75688
Milk	7488	5288
Stock		
Total Income	50285	80976
Variable Costs		
	488	1200
Mating	748	900
Animal Health	21600	5372
Concentrates Purchased	1300	
Hay Purchased	670	
Green Forage Purchased		500
Silage Conservation		500
Hay Conservation	334	500
Green Forage	585	600
Regrassing	384	1736
Fertiliser	6281	8500
Wages		1000
Others		
Total Expenses	32390	20808
Gross Margin	17895	60168
Gross Margin/ha	1466	4931