Increasing Fodder Production in Central Tibet

Nicholas Paltridge[1], Tom Giles[1], Jin Tao[2], Wei Zexiu[2], Liu Guoyi[2], Ci Yang[2], Nyima Tashi[2] and David Coventry[1]

[1] School of Agriculture, Food and Wine, The University of Adelaide, PMB 1 Glen Osmond SA 5064 Email nicholas.paltridge@adelaide.edu.au
[2] Tibet Agricultural Research Institute, c/o Tibet Academy of Agricultural and Animal Sciences (TAAAS), No. 130 Jin Zhu Xi Lu, Lhasa, China 850002

Abstract

The raising of livestock is of great importance in the Tibet Autonomous Region of China, since animal products are a primary source of cash income in many rural households. However, animal nutrition is very poor, with animal feeds based on straw from the predominant wheat and barley crops. The present paper describes initial investigations into the potential of winter wheat (WW)/ vetch relay intercrops for grain and fodder production in Tibet. Three different intercrop densities were tested, representing 33%, 50% and 66% of normal WW densities. Satisfactory grain yields (3-4 t/ha and roughly equivalent to typical farmer yields) were observed at the lower wheat densities. Intercropped vetch produced approx. 3-4.5 tonnes DM/ha, with yields inversely proportional to wheat density. The intercropping approach yielded Land Equivalence Ratios between 1.23 and 1.43, suggesting that winter wheat / vetch intercrops have excellent potential to boost fodder production in Tibet without unacceptable impacts on cereal yields.

Keywords

Tibet, relay intercrop, winter wheat, vetch

Introduction

Agriculture in the central areas of the Tibet Autonomous Region of China (TAR) is mostly confined to the valley floors and lower hill slopes associated with the Yarlongzangpo (Brahmaputra), Lhasa and Nyachu Rivers. The area is well suited to crop production, with mostly fertile soils and rainfall averages of about 400mm, with 90% of the rain falling from July to October. The altitude of this crop-dominant production zone is in the range 3500-3800m. Spring barley has been the major crop grown by Tibetans for most of their history, but is increasingly being replaced by higher yielding winter wheat (WW) and winter barley (WB) varieties (Nyima Tashi *et al*., 2002). In Tibet, these crops are sown in early October and mature the following July. Cropping is usually continuous and based on rotations of spring and/or winter wheat and barley, or these crops and oilseed rape.

The raising of livestock is also of importance in Tibet. Most farms rely on animal products as a major source of cash income, and typically carry 2-5 cows, yak or *dzo* (a yak-cow hybrid) (Goldstein *et al*., 2002, N. Paltridge, unpublished data). However, animal nutrition is currently very poor, with animal feeds based on by-products (mostly straw) from cereal crops, low quality fodder and forage from the mountains, and stubbles grazed directly by animals in the 2-3 months between cereal harvest and seeding. Production of more fodder and forage in Tibet is a major focus of government.

As part of a broader effort to explore fodder production options for Tibet, and to build research capacity at the Tibet Agricultural Research Institute (TARI), the present project focuses on intercropping WW and vetch. What are the optimal row spacings for WW/vetch relay intercrops in Tibet and how do the yields compare with those obtained when the two crops are grown independently?

Method

During 2005, WW/vetch intercrop experiments were established at TARI, Lhasa in central Tibet. WW was sown in early October either using local farmer methods (210 kg seed/ha and 15cm row spacings) or in

three different skip-row configurations, achieved by planting all, 2/3, 1/2, 1/3 or none of the regular cereal rows (hereafter referred to as 100%, 66%, 50%, 33% and 0%, respectively). During May 2005, vetch was sown in rows in inter-row spaces at the 66%, 50%, 33% densities, and in rows right across the 0% cereal plots. Vetch was sown at 150 kg soaked seed per ha in 0% cereal plots, and at the same rate per row in the skip rows of other plots. Yield data were collected for both cereal and vetch crops over the course of the Tibetan summer and autumn of 2005.

Results

The establishment of vetch in all vetch-sown plots was good (shown in Fig. 1), although heavy weed populations developed in the skip rows of some plots, necessitating hand weeding (a technique still widely practiced on many Tibetan farms). WW grain yields of 3-4 t/ha (roughly equivalent to typical farmer yields) were attained at lower sowing densities and in the presence of vetch, compared to 4.7 t/ha in the 100% wheat plots (Fig. 2). In percentage terms, the 66%, 50% and 33% densities produced 79%, 83% and 72%, respectively, of sole WW crop yield. Vetch yields declined with increasing wheat density, and were 2.7, 3.4 and 4.4 t/ha across the 66%, 50% and 33% WW densities, respectively, compared to 6.2 t/ha in the sole vetch plot (Fig. 2). Land Equivalence Ratios (LERs) of 1.43, 1.38 and 1.23 were obtained for 66%, 50% and 33% WW densities.

Figure 1. Project staff in a 33% WW/vetch intercrop plot at TARI

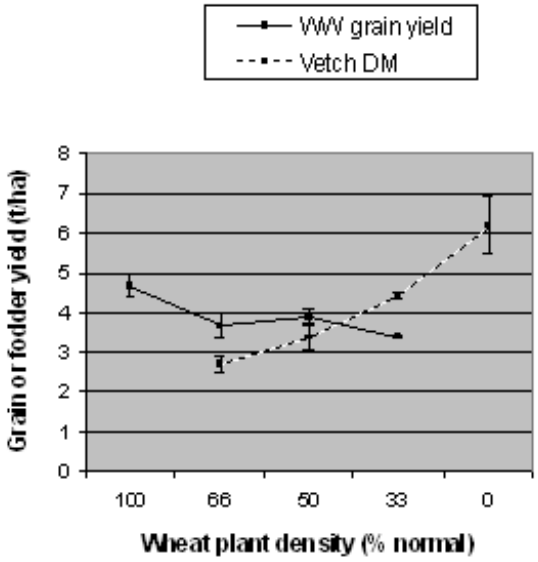

Figure 2. Grain and fodder yields from WW/vetch intercrops of different densities

Conclusions and future work

In this first year of a longer-term experiment, vetch crops appeared well suited to Tibetan conditions, yielding approx. 6 t/ha as a sole crop grown between May and October. WW/vetch relay intercrops yielded approx. 70-80% of the wheat grain of sole wheat crops, and 3-5 t/ha of vetch DM, depending on the row arrangement used. The LERs obtained suggest that the intercrop system utilised available water, light and nutrients more effectively than the sole cropping system. Further data from different sites, together with analyses of the economic benefits of grain versus fodder production, will be required to identify optimal densities and assess the suitability of the approach for broad application. Work is also underway to assess the performance of vetch / winter cereal intercrops established by broadcasting vetch seed into cereal stands sown using current farmer methods. In addition, winter cereal / lucerne intercrops

are being studied and a farmer survey has been initiated to better describe current farming systems and attitudes to fodder production and system change.

References

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