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Improving land productivity and sustainability by developing lucerne and livestock production in Huanxian county , Gansu province , China

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Introduction Huanxian county is one of the counties in China severely affected by poverty . About 93% of the 0.33 million population lives in the rural areas . The county lies in the western part of the Loess Plateau which has a reputation for having the worst soil and water erosion on the earth . It covers the area of 106°21'-107°45'E~36°01'-37°09'N . The altitude is 1130-2089 m above sea level and the mean annual rainfall is 359.3 mm , of which about 60% falls during the period of July to September , with drought in spring being a frequent occurrence (Hou *et al.* , 2002) . The main crops grown in the region are : wheat (*Triticum aestivum*) , potato (*Solanum tuberosum*) and buckwheat (*Fagopyrum Mill*) . The main livestock include sheep , goats and donkeys . The major farming system is cereal monoculture with livestock grazing rangeland and being fed cereal straw and little forage during the winter and spring periods . There is no close link between cropping and rangeland livestock production , although rangeland covers 67.7% of the total land area in the county . The annual degradation of rangeland occurs at about the rate of 53km² . With the technical support from ACIAR projects and other projects the county has set up an objective of establishing and developing integrated crop-pasture-livestock production systems to achieve the sustainable development of agriculture . One of the ambitious targets is increasing the area under lucerne (*Medicago sativa*) by 2 million mu (130,000 ha) , which will feed about 2 million sheep by 2010 .

Technical services About 833 agricultural extension officers and public servants were working fulltime on the lucerne-sheep project . A method of train the trainer was employed . The 833 technical staff were trained on lucerne , and sheep and goat production in the county . The staff that were trained then went to townships and villages to train the farmers . More than 6000 copies of technical booklets on lucerne , sheep and goat production were distributed to the farmers , and more than 20,000 farmers were trained . A County Standard of Lucerne Establishment and Management was produced as guidelines for the practices . About 15 cultivars of lucerne were selected for the local production based on the evaluation trials . A special program on lucerne was also launched on the county television station . With the efforts of the extension officers , demonstration fields were established at the township and village levels . Normally there were two to three demonstration fields with 1000 mu (about 67 ha) each for every township . One demonstration field with the area of 100 mu was developed for each village . Lucerne was grown on various landscapes to complement the local farming systems . For instance a six meter wide area of lucerne intercropped with a five meter wide area of wheat on the tableland . Lucerne was rotated with cereal on the terraces while all slope croplands were converted to lucerne where the slope was more than 30 degrees .

Ecological and economical benefits There have been 0.749 million mu of lucerne newly planted since 2005 . The total number of sheep and goats has reached 0.4775 million , of which 0.262 million were slaughtered for commodity . Farmers' income increased significantly (Table 1) . Soil quality has also improved . Soil organic carbon of 9-year-old lucerne was 6.27 kg/m² , which was 19.5% , 26.6% and 40.7% higher than that of buckwheat , potato and winter wheat , respectively . Total nitrogen of 0-100 cm soil profile of 9-year-old lucerne was 0.564 kg/m² which was 15.8% , 22.7% and 25.0% higher than that of buckwheat , potato and winter wheat , respectively .

Table 1 Incomes from lucerne and livestock production at Guo Yuan village , Huanxian county , China , in 2007 .

Farmer	Lucerne areas (Mu)	Livestock (numbers)	Income (RMB)
Y . F . Tang	30	Goat 15	10 000
W . C . Guo	60	Goat 20	7 800
Y . K . Du	120	Cattle 5	8000
J . Du	500	Goat 320	120 000
Village in total	2800	Goat 955	360 000

Reference

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