



VICTORIA UNIVERSITY OF WELLINGTON
Department of Geography



UNIVERSITY OF HONG KONG
Department of Geography & Geology

TOUR AND IDENTIFICATION REPORT

on

Uplands Utilization Project

in

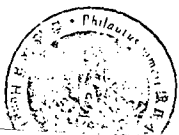
Guizhou Province,

People's Republic of China

Revised May 1991

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CONFIDENTIAL

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VICTORIA UNIVERSITY OF WELLINGTON

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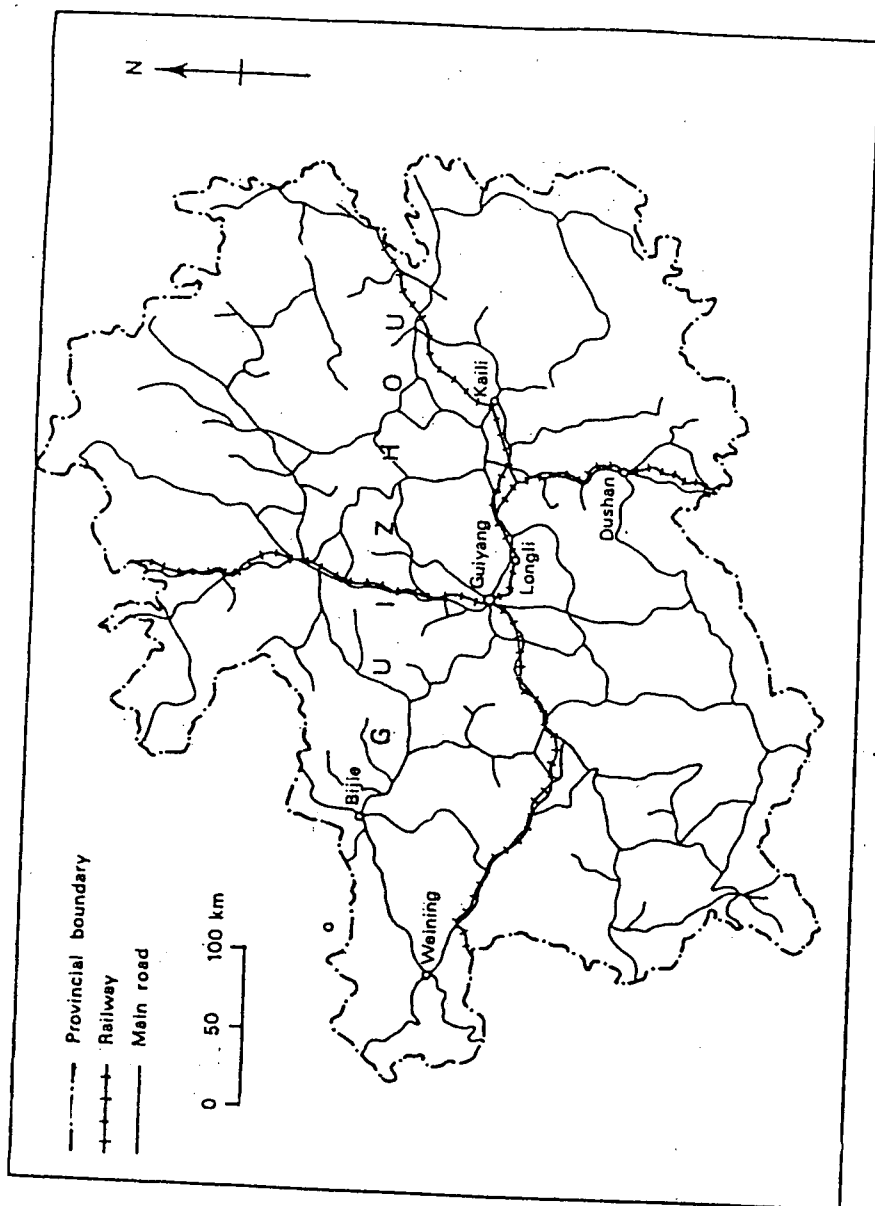
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Sketch map of Guizhou Province

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Summary

Generalities (paras 1.2.1 - 1.2.8)

- Guizhou is one of China's poorer provinces with very adverse man/land ratio (17 persons per ha cropland)
- thirty-one counties out of 82 are below the official poverty line
- 40 percent of agricultural production from livestock
- 40 percent of the land area reckoned to be eroded
- forests comprise only 13 percent of the area

Specific Possible Projects

- assessment of current uses of upland phytomass in central and western Guizhou province and the improvement of 'cut-and-carry' livestock production and other forms of farm production by agro-forestry
- assessment of current uses of open range land in Weining County and the improvement of production from such lands
- assessment and control of soil erosion in both of these areas
- the expansion of new pastures based on Dushan Seed Farm and Long Li into surrounding small farms
- setting up agro-forest and intercrop-tree crop systems in valleys of the Kaili area, focusing especially on Chinese fir and Masson pine, and experiments in community forestry
- study and improvement of rural-urban linkages at Guiyang, Weining, Dushan, Kaili and Long Li

Objectives

- training
- communication and extension
- directly development-oriented research
- monitoring new appropriate land-use systems

Conclusions and Recommendations

1. Ultimately it might be argued the sustainability of the three major systems of upland land use - cut-and-carry fodder, maize with beans or potatoes, directly-grazed pasture - will be resolved through industrial development, further intensification of lowland agriculture and the withdrawal of population from marginal lands followed eventually by their natural stabilization and regeneration. However, at present rates of economic growth and population increase (up to 3.5% annually in some minority areas) it is inconceivable that significant population withdrawal and natural regeneration the uplands will take place in less than two or three generations. Therefore, it is necessary and urgent to carry out field studies of different upland management regimes. These would include study of sediment yield transportation and deposition. The results would form the basis for estimating denudation rates and judging the relationships between particular upland utilization systems and soil erosion. Hydrological research into sediment transportation by streams and rivers is also required (3.7.5-7).
2. If improved pasture-based systems are to become attractive to small farmers grazing their own land or public-access it is fundamental that a truly low-input system be devised since the high cost of artificial fertilizer is likely to be beyond their financial reach. Large farms, such as the five state farms in Weining, may be able to bear the expected cost of investing in high-quality pastures but even so, doubts remain as to both technical, and especially economic, feasibility (3.6.1-7).
3. In addition to the main thrust of investigation into grass pastures an additional approach to the no-fertilizer or low-fertilizer approach could be into shrub or tree browse (3.6.7).
4. In some areas above 1800 m cold weather rice such as those used in northern Japan or in Nepal may perhaps succeed; further investigation appears to be warranted (3.7.2).
5. Erosion control is of paramount importance. Where it is impossible to take steep land out of production, contour planting becomes essential, the digging of silt-traps along the contours where the soil cover permits, and terrace-edge plantings of useful trees which can be managed with pollarding for feedstuff and firewood (3.7.3).
6. The system of cut-and-carry fodder is of enormous importance. It is essential that detailed study be undertaken on the pressure exerted by this form of utilization in the uplands on lands with public access. A number of important practical and scientific questions on the ecology and economics of this form of production (identified in 5.1.3) require careful field investigation and measurement.
7. Trials are urgently needed on the role of tree planting in minimising soil loss from slopes. The suitability of a range of tree species, vetiver grass, willow, poplar and others as forage plants need to be tested (6.1.1-5.6).

8. There is a danger that the provision of cheap Government loans could become counter-productive both on privately-held land and public-access land if they encourage the build-up of family herds or flocks to a level that exceeds the fodder supply available (3.9.3, 6.5.9, 7.1).
9. The Bijie District has been identified by the Chinese Government for a national experiment in ecology involving the interaction between rural poverty, environmental management and population pressure (8.1.3 and 8.1.5). The district has only 0.8 *mu* of land per capita of population yet 7.5 million *mu* of undeveloped natural grasslands.
10. The Government recognizes that the first task to deal with rural poverty, population growth and carrying capacity is to improve grasslands quality, by replacing poor natural pastures and scrubland (on terrain that is not too steep) with improved pastures.
11. Government also recognizes the importance of fencing, under-tree sowing, planting trees in grasslands and agro-forestry, though this policy began only in 1979 (8.1.12). Training in these new forms of land use is of high priority.
12. Although Guizhou has been one of the poorest and most traditional provinces in China, two trees of great importance - Masson pine and Chinese fir - grow very well in some areas of the province.
13. *Camellia* and probably *Azalea* varieties would appear to have great potential as possible export products if a market can be established with Western garden suppliers, and varieties can be selected and bred for their floristic qualities (9.1.7). At present this possible potential is being ignored.
14. Good relationships have existed for a number of years between Guizhou foresters and the Forest Research Institute of Rotorua, New Zealand, which has provided technical assistance and training. This friendly relationship and excellent record of good working cooperation should be expanded in the future, including the Kaili area (9.1.8).
15. The Institute of Forestry of Guizhou has achieved good results in forestry research and investigation, especially on a number important species. While its prime role in research and investigation should not be weakened or diverted, there is a need to supplement its work with close attention to market factors and return to farmers and especially the role of forestry extension (9.1.9-9.1.10).
16. It is very difficult (and probably almost impossible) for Guizhou to become self-sufficient in grains (10.1.3-10.1.4). However it has a distinct comparative advantage in pastoralism and forestry and could become a significant exporter in these products to other areas of China and perhaps overseas. Moreover, while Chinese food policy tends to emphasize the economic autonomy of each province as a separate entity, other major issues (such as the occasional catastrophic flooding and erosion of major river systems such as the Yangtze) emphasize the

importance of inter-dependencies between provinces and coordinated planning of neighbouring provinces and whole watershed systems in the interests of all.

17. In the countryside, production costs have risen faster than farmer incomes in 1987-90. In 1982 the official price of rice was 53 fen per jin (0.5 kg), falling to 40 fen in 1983, but in 1990, in spite of inflation, the Government price was only 54 fen compared to the open market price of 74 fen. The gap between the official and market price of about 13 fen in 1989 had increased to 20 fen in 1990. It is likely that changes in official and open market prices have a considerable effect on output. Some poor farmers could no longer afford to buy chemical fertilizers or pesticides or could only afford small amounts.
18. About 60% of rice lands were planted in new varieties, developed from Changsha hybrids developed earlier from Los Banos HYVs.
19. Six forests in Dushan County are not doing well. Insect pests are bad in some Masson pine forests (11.2.4). The introduction of mixed forestry, involving broadleaf trees, has been judged to be necessary to bring bird life to the forests to facilitate insect control.
20. The great achievement of Dushan Seed Farms is to pioneer the methods of establishing successfully high quality improved pastures on very poor acid soils where before only scrub and weeds grew. Dushan has been a striking success, possibly the most impressive farm it is said in South China, and since it was handed over by New Zealand scientists its high standards have been maintained. Dushan is also significant in training. The farm is, however, seriously under-stocked, which deprives the farm of a considerably higher income, and also it does not reach its full potential in an extension role.
21. The number and frequency of trespassing raids by small farmers for cut-and-carry fodder shows they appreciate Dushan's high fodder value. The demonstration role of the farm farmers to learn new techniques is clearly manifest. Dushan should be used more as a springboard to extend the new pastures into the surrounding hill country by bringing the technology to small farmers (11.3).
22. Large extensions of several thousand *mu* of natural pasture exist in Long Li County. If developed, it could become a source of supply of meat, wool and animals for Guiyang and other large cities in South China (12.1-12.2). It was asserted that there are over 100 other areas of natural pastures of over 10,000 *mu* requiring development. Remote sensing and aerial photography data need careful evaluation on this issue.
23. Long Li also a successful and impressive pasture development. Development however is unbalanced, the pastures are under-stocked and it is difficult to acquire sheep and cattle when needed to fully stock the farm. Recognition of needs over the medium and long term is needed to bring greater consistency of policy and hence minimise bottlenecks.

4. As stock numbers increase, the problem of meat and wool processing, cool storage and marketing will have to be addressed.

5. Kaili, in eastern Guizhou, is the most important forest timber base in the province. Since Chinese fir grows faster in Kaili than anywhere else in China, the Chinese Government has given priority to Guizhou Province for research and development of this important tree (13.4). At Huang Ping there is the largest Masson pine seed orchard in China.

6. In northern Kaili many rivers flow north-east to form part of the Yangtze River system which poses one of the major ecological problems in the country. Erosion-protection is a major objective in these steep riverine valleys, if the danger of flooding hundreds of kilometers downstream is to be minimised.

Dense population pressure on steep valley slopes and the less frequent occurrence of coal in the Kaili area mean that many villagers cut valuable timber (including occasionally Masson pine) for fuel. The planting of species suitable for firewood, such as *Acacia* or *Robinia pseudoacacia* is thus recommended. The latter is roughly twice the weight of Masson pine, grows better, regenerates rapidly, and is leguminous (13.6.1-3). A caveat needs to be entered concerning the expanding use of Masson pine. It is known to be susceptible to insect attack and control is both difficult and expensive. In Hong Kong, for example, its use for protection forest is being phased out for this reason.

An interesting experiment in forestry extension in Kaili involves the leasing of peasant land by the Forest Bureau for 25 years, its planting in Masson pine (or Chinese fir), its protection and tending for that period by the Bureau until it is felled for timber. The scheme looks ahead for 25 years, provides reasonable cash returns, and serves as an inducement to forego short-term land uses. It ensures steady extension of Masson pine planting, makes provision for future incomes, timber supplies and protection forestry. The scheme needs careful evaluation in terms of its possible significance, investigating ways in which Miao families and others who possess little land might participate in some way (14.2).

The protection forestry extension after perform a valuable function guarding against illegal forest felling and forest fires, but it would seem to be desirable to extend the functions of this division to include forestry extension to small farmers, once a clear set of policies have been determined in the various land-use zones, with their differing attributes and potentials (14.3).

Research is needed into the potential of tea forestry, both as a source of peasant incomes and the ecological suitability of tea on steep valley terrain. While a company appears to have been successful in promoting Lei Shan tea, a number of aspects of the enterprise need careful evaluation, including the question of whether in fact there is already over-production of tea in Guizhou, whether further research is needed into tea varieties, the process of technology transfer to small farmers, the issue of continuity in management and the problem of insect control. A

method of contracting a scientific institution to investigate how insect control can be economically achieved appears to be needed (15.2.2-4).

31. In some areas of Guizhou Province, the rate of deforestation is alarming and huge areas, formerly productive, are going out of cropping, with only traces of former terraces remaining. Thus in Nayong and Zhijin Counties, Bijie District, population pressure and the need for new agricultural land reduced the forested area from 158,700 ha in 1950 to only 19,000 ha in 1989. In such areas the average peasant holding is about 2 ha of which 1 ha is cultivated. This includes about 0.25 ha which should not be cropped as the land is marginal and the slope over 25°.

32. The long term Guizhou Government plan is to reduce cultivated land from 43.7% of the total area to 35%, increase the forested area to 40%, and progressively to develop pastures where the land is suitable. To be successful, however, this requires higher grain production from a reduced area and hence success of a parallel agricultural intensification programme.

33. Project 3356 of erosion control in Nayong and Zhijin Counties appears to be proceeding satisfactorily. This project needs careful evaluation with respect to its potential for replicating its approaches to other steep, poor hill lands that are rapidly being eroded and degraded at present (17.1-17.1.11).

1.1

Introduction

Professor Ray Watters, responding to an invitation from Professor Chen Yong Xiao of the Geography Department, Guizhou Normal University, visited China from 12 June to 23 July 1990 in Guizhou Province. Dr Ron Hill, also invited by Professor Chen, visited for a shorter period in June.

The purpose for the visit was to discuss with the geographers and scientists the possibility of undertaking joint research between Guizhou and New Zealand to be submitted for international funding.

Funding for the visit was provided by a Ministry of External Relations and Trade (NZ) exchange grant for Watters and University of Hong Kong support for Hill. Local support was supplied by the Guizhou Normal University and the Guizhou Provincial Government.

1.2

Guizhou Province

Guizhou is one of the two or three poorest provinces in China, although it is developing rapidly and has significant mineral and hydroelectric power resources as yet comparatively little developed.

Yunnan-Guizhou form part of the second step of the three-step 'staircase' stretching from the Qinghai-Tibet plateau of 4000 m eastwards to the coastal hills and lowlands of Guangdong and Fujian.

Area = 176,000 sq kms

1.2.1

Elevation

Guizhou comprises mountains, plateaux and basins of altitudes rising from about 800 m in east to about 1400 m in centre and to over 2200 m in the west.

1.2.2

Topography

72% of the area is in limestone with many areas being deeply dissected with slope angles over 45°. Karst plateaux and steep karst valleys dominate the topography along with some cone karst mountains.

1.2.3

Climate

- relatively mild, sub-tropical at lowest altitudes to sub-tropical montane climate at higher altitudes; relatively wet
- mean annual rainfall (15 stations) 1309-1500 mm in SW and SE but only 900-1300 in centre and West
- annual variability, no good data, but thought to be 20-35%
- precipitation seasonal, 70% fall May-September
- mean monthly precipitation in dry season mostly below 10 mm
- annual evaporation thought to be 700-900 mm but data unreliable
- January mean temperature 2° to 4°C in lowlands, 2° to -4°C in uplands
- July mean temperatures 26° to 28°C in lowlands, 16°-20°C in uplands

1.2.4

Soils

- Along with part of SE Europe, Guizhou is one of the famous classic karst areas of the world. Thus over 70% of the soils are developed on limestone, of generally poor fertility. Nutrient status varies from very poor to medium fertility. Many soils are acid.
- Five main soil types according to local classification dominate:
 - yellow soils (including better rice/rape/wheat lands)
 - calcareous soils
 - high mountain soils) Weining
 - yellow-brown soils in warmer, wetter areas) area
 - red soils (extreme east and south-west)

Soils are described as often "... extremely acid, they are often extremely low in phosphate and some sites have been depleted of potassium to a level much lower than we have ever seen before in trial results. We need to recognise also that there are a range of trace element deficiencies that may be limiting growth and certainly animal production. Of these molybdenum is important for legume establishment, copper and selenium were both certainly at a level that would be limiting to animal growth and possibly copper limiting pasture growth in some situations" (Dr. P. Rolston, personal communication).

1.2.5

Population

- 32 million by 1990; average annual growth rate 1.5% but up to 3.5% amongst some minorities
- crude density 182 persons km²
- agricultural density (crop and pasture land) approx 490 person km² (urban population included)
- 46 minority groups, 1982 43% illiterate in Chinese. Main ones are Miao, Buye, Dong, Yi, Shui, Hui, Yao.

1.2.6

Poverty

- On major criteria Guizhou is amongst the two or three poorest provinces in China. As many as 31 counties out of a total of 82 in the province are below the poverty line of 200 yuan annual income (4.2 per US\$). The counties of Nayong and Zhijin in Bijie District had per capita incomes of less than 80 yuan on average in 1986, compared with a national average of about 460 yuan, and the illiteracy rate was over 50%, being particularly high among women and minorities.
- Guizhou is poor because of its difficult hilly topography, poor, sometimes acidic limestone soils, and its remote, isolated position in the periphery far from major growth centres of the Chinese economy. Communications both within the province and to other major cities are generally poor.

- Food production is low by Chinese standards and grain consumption per capita of peasants on average is about 4th lowest among 29 provinces/regions (Kueh 1988: 666).

However the road network grew from 1,950 to 27,367 kms between 1949 and 1979 and by that year 80% of the provinces' communes were accessible by road (Lardy 1983: 206).

1.2.7

Agriculture

- cultivated area - 1,909,000 ha; 41.9% of this in cropland - i.e. 17 persons per ha
- about 41% (800,000 ha) are irrigated paddy fields, and the balance rainfed, often created at the expense of forest
- total grain production (about 6 million tons per year or double figure for 1949) is insufficient to meet the needs of population; between 500,000 and 1,000,000 tons of grain imported each year
- in 1985 774,000 ha of paddy rice produced 3.23 million tons; 592,000 ha of maize produced 1.57 million tons
- main "cereals" (Chinese definition): paddy rice, maize, wheat, red tai, potatoes, soya beans.
- main cash crops: rape (3 types on 317,000 ha produce 279,000 tons or 10.2 times product of 1949), tobacco (fourth largest producer of tobacco in China), tea (17 varieties on 28,400 ha to produce 10,600 tons), sugar cane, peanuts, sesame and fruit (7,600 ha of orchards produce 101,000 tons fruit). Most famous are Weining apples, Xingcha "red robe" oranges etc. It is significant however that livestock comprise 25% of total agricultural production.

Livestock

- 4.2 million
- pigs 13 million
- goats 1 million
- sheep 0.4 million
- poultry 35 million
- water buffalo 2 million
- horses 0.6 million
- average consumption of milk and eggs below national average

Grain output

Per person about 220 kg, is well below national average, and is almost entirely for human consumption in this karst environment. Crop residues are an important feedstuff for stall-fed animals.

Thus animal husbandry is very important here and the aim is to use less grain for fodder and to use more grass.

Total pasture is 4.3 million ha of which 70,000 ha (1.6%) is sown (7 persons per ha).

The development of new pastures thus has high potential in agricultural policy in the province.

- two crop annual rotation of rice/rape seed or rice/wheat only below 1800 m
- higher areas maize and beans or above about 2000 m maize and *Solanum* potatoes

Gross value of Agricultural Output (GVAO) per capita

- in most agricultural studies, Guizhou has about the lowest figure of China's 29 administrative units apart from Tibet

1.2.8

Soil erosion

- 40% of provincial area mapped (from remote-sensed data) as eroded
- erosion more serious in west (over 60% area seriously affected), north and northeast, less so in south
- relatively high rates of soil loss even under good cover expected because of steep slopes, thin soils, high rainfall intensity, especially on weak rocks such as weathered basalt and Permian shales
- substantial carbonate naturally in solutes
- apparently little is known of run-off, erosion and sedimentation rates on slopes

1.2.9

Forests and rangelands

- 14.5% provincial area forested (cf 12% for China as a whole)
- Mainly sub-tropical evergreen broadleaf. Some tropical plants in extreme south and some deciduous in western, higher parts.
- It is estimated that there are 2,300,300 ha of forest of which 1,450,000 ha are brush forest and 828,600 ha sparse woods. Barren hills suitable for afforestation over 4,133,000 ha or 23% of the total land area.
- Guizhou has a rich and diverse flora, stretching as it does from the sub-tropical to temperate sub-tropical montane zones. There are 301 families, 2,980 genera and 24,537 seed plant species and more than 1,000 tree species (about 25% conifers and 75% broadleaved).
- Substantial areas in successional communities comprising spontaneous pastures and scrubland.
- Some oversowing of pastures e.g. with *Medicago*.
- The dominant tree species constituting the natural deciduous forests are

Pinus yunnanensis, *P. yunnanensis* var. *reniufolia*, *P. massoniana*, *Cupressus funebris* and *P. armandia*. The dominant tree species in the average broadleaf forest are *Castanopsis*, *Cyclobalanopsis*, *Lithocarpus*, etc. of which *Gordonia*, *Schima*, *Manglietia*, *Michelia*, *Machilus*, *Phoebe* etc. are the common species. Guizhou Province is also one of the bamboo bases in China.

- Guizhou is the natural distribution centre of *Aleurites*, *Rhus verniciflua*, *Eucomia ulmoides*, *Rhus chinensis*, and other species. In the economic forest *Aleurites fordii* and *Camellia oleifera* occupy the largest area. The forests of *Rhus chinensis*, *Sapinum schiferum*, *Rhus verniciflua*, *Juglans*, the host trees for lac insects have very high economic value and enjoy great fame in the domestic and foreign markets.
- Small plantings of trees, especially *Cupressus* spp., *Pinus massoniana*, *P. yunnanensis* (at higher elevation), *Betula* spp; *Cunninghamia lanceolata*, *Acacia* and *Eucalyptus* spp.
- The main types of economic trees are tung oil, tea oil, Chinese tallow tree, lacquer and walnut.
- Some preservation of tree-lands near villages for geomantic reasons. On steep slopes such conservation may be beneficial, limiting erosion.

2.1

Qinzheng County, West of Guiyang

30-40 kms. This area is an intermediate plateau of about 1,200 m, with steeply weathered residual soils. Water table in parts is too low for rice paddy, so maize-beans mixture dominate on the yellow soils with rape seed planted from October till March. Elsewhere rice (grows only to about 1,300 m) and maize-beans, some tea on hillsides, most of which are covered with horsetail pine. Some tobacco and apple orchards. Occasional industry - cement factories, nylon factory. Coal is abundant - coal gas plant, joint venture with Japan.

90 kms west of Guiyang, basic cone karst topography, with horizontally-bedded limestone.

Villages located at the foot of wooded hills.

- vegetation kept for geomantic reasons (and regulations against felling), hills are intensively used for cut-and-carry fodder.

Villages distinguished by stone houses with slate roofs.

250 kms. Lianpa area - regarded as one of the poorest areas in the whole province - many scrub covered hills, not too steep, 3rd class hill country, could support pastures or trees?

270 kms. About 1,800 m. Maize, buckwheat, oats. Water logged maize in valley bottoms. Sedimentation drowning plants. Wheat and maize. Steeply incised valleys - incredibly intricate Miao terracing for maize.

2.2

Shuicheng, 1,300 m

Largest coal mine in South China. Coal mining, iron and steel.
Upper Permian limestone.

30,000 employees in steel plant, operating since about 1970. A lot of water has been pumped out of the water table, which has caused massive subsidence in the area. Biggest problem is the shortage of water for the steel plant during the winter.

.1

Weining County

The karst plateau, generally at an elevation of 2200-2500 m (relative relief > 700 m) gives rise in this cooler, drier climate to predominantly yellow-brown or calcareous soils.

.2

Weining county is the poorest country in Guizhou Province, which is probably the poorest province in China. There are several reasons for the poverty of Weining.

- (a) Historical reasons - it lies on the periphery of the province and suffers from government neglect. It has very poor roads and railway services and lacks other infrastructure.
- (b) Difficult and poor physical resources (except for coal and steel in Shuicheng). Its poor acid soils are rather infertile and its steep karst gorges are difficult to cultivate. It has a harsh winter and can experience intense spring droughts.
- (c) Weining is the home of many minority peoples - 3 main ones, and small members of 14 other groups.

Grazing for sheep is common. Maize interplanted with *Solanum* potatoes is most common on land in the lower altitudes (hilled up during wet season), with buckwheat, oats and potatoes higher up. Sheep, pigs and cattle often run together.

Weining Lake provides another example of a major ecological disaster. During the Great Leap Forward 13 km canal was dug to drain the lack to bring water to provide irrigation for rice. The abandoned long canal and the huge barren area, formerly under the lake, are stark reminders of a local environmental catastrophe. Nothing grows on the former lake bed, the lake is much smaller than before, much of the rare wildfowl from this area has disappeared, and the attempts to extend rice paddy failed.

The population of Weining County is about 900,000. Intense population pressure on the land would appear to be an underlying reason for widespread

erosion (especially gullying) and land degradation. The key question that needs to be posed on the three major systems of upland agricultural use - cut-and-carry; maize with beans or potatoes; directly-grazed pasture - is their long term sustainability.

3.6

Dashan Research Station

Located at 2504 m on 500 m weathered residual, rather acid limestone and on top of several metres of more fractured material. The Dashan experiment station, now partly funded by New Zealand, has been active since 1980. About 10% of the total area of 466 ha are new pastures.

3.6.1

Initially the focus was on ryegrass and clover, a combination known to require substantial fertilizer input, particularly at this site where the soil, paradoxically since the parent material is limestone, is rather acid, possibly a result of having been derived partly from blanket peat which may be presumed to have existed when the region was covered in subtropical montane forest.

The highest-yielding combination (in order of productivity) are:

red & white clover & rye grass + rye grass & fescue)
red & white clover + cocksfoot & fescue) all for in situ red &
white clover + perennial ryegrass) grazing
red clover + cocksfoot - for cutting

Fertilizer applications are quite heavy, in the first year before ploughing 60 kg phosphate/ha. followed after emergence, by 75 kg N (as urea) 60 kg P and 75 kg K per year. Such levels are almost certainly quite beyond the reach of ordinary farmers.

3.6.2

Experimental pasture trials

Many experimental plots were established in 1985; currently 1,060 plots are operative. Dr Alex Chu has guided experimental work since 1985; he will establish new plots in 1991.

Twenty-six cultivars have been tried since 1985. Fifteen ryegrass varieties have been tried, being cut at 30 cms 4 or 5 times a year, but 1 from Japan and 2 from Holland are best. A prairie grass from Japan is very productive in the winter. Cocksfoot (*Dactylis*) from Dushan Farm (originally from New Zealand) is the best. Alfalfa from Jiangsu province and white clover is being tried.

3.6.3

Pasture quality

Insects were bad, so pastures resown in 1987. Bracken fern and common Chinese fern invade unless management is right. The acid soils obviously vary greatly in fertility over short distances. Tops of hills and exposed parts of new pasture going back in parts, thin pastures and more weeds. In sheltered dips colluvium accumulates and pastures are best. The yellow flowering cudweed

(*Gnaphalium*) and *Artemisia* are problems. A mixture of N15 P50 and K15 gives very good results.

Fencing costs 4.2 yuan (1 US\$) per metre.

3.6.4

Direct grazing

Tests of white clover and cocksfoot or white clover/perennial ryegrass/*Vicia* combinations without added fertilizer are reasonably satisfactory but it is doubted that they can persist for long after two years. Of course such pasture at Dashan has been established on land ploughed before sowing.

A similar trial without fertilizer on ploughed land using red clover and perennial ryegrass but with cutting rather than grazing showed fair production in the first year but then a steep decline; it lasted only four years.

3.6.5

For improved pasture-based systems to be attractive to small farmers grazing their own land it is fundamental that a truly low-input system be devised since the high cost of artificial fertilizer is likely to be beyond their financial reach. Larger farms such as the five state farms in the county may be able to bear the capital cost of investing in high-quality pastures but even so doubts remain as to both technical and, especially, economic feasibility. At Dashan ryegrass and white clover were sown (on plough) in 1985 yet had to be resown in 1987. Soils are obviously highly variable over very short distances of a few metres. Patches have been invaded by weeds and poorer pasture species including introduced Yorkshire fog and *Lotus major* as well as herbs like *Artemisia* some species of which (at Dashan?) are known to be poisonous to livestock.

3.6.6

No data were forthcoming on annual pasture production curves either for improved or unimproved pastures. Given the substantial variation in monthly rainfall and below zero winter temperatures it may be expected that there are problems in maintaining production during the winter. Except at the highest levels on the plateau (around 2500 m above sea level) there appears to be virtually no ploughable land available for such temperate fodders as turnips or *chou moulrier*. Presumably animals are carried through the winter using stored crop residues and whatever else is available. This must be a matter of concern since December lambing is usual. While later lambing might seem preferable to take advantage of lush pasture growth in the summer, later-born lambs do not do well, as much summer growth is of very poor quality.

3.6.7

While the main thrust of research and development has been towards grass pasture an area for further investigation, in addition to the no-fertilizer or low-fertilizer approach, is into shrub or tree browse. This approach, of course, is one that temperate pastoralism has, for the most part, not taken. (It should be remembered that the climate of Weining and similar areas is not truly temperate but subtropical montane). In the Andes, for example, lupin (*Lupinus* spp.) is of

some value locally. Sage-brush, though generally considered to be a plant of semi-arid regions, does tolerate cold and may be worth a trial for growth without fertilizer. Shrub-tree browse has, in principle, several advantages over most grasses. Species tend to be relatively deep-rooting. Thus they not only survive drought better but also draw upon soil nutrients from deeper, less-leached horizons. Once mature, free-grazing animals cannot extirpate them entirely unless the herdsman cuts them excessively. Trees will also provide timber and firewood. Some consideration should be given to making long-term trials employing this approach.

3.7

Erosion Control

3.7.1

It is probably not necessary anywhere in the province that the implementation of control measures waits for studies of erosion rates to be completed. On public-access hill lands it is reasonable to suppose that control measures are not, in most areas, spontaneously adopted by the rural populace for several reasons:

- No farmer would be willing to pay for controls, either directly by way of a levy or indirectly by way of income foregone, which would benefit the community as a whole unless the whole community participates. Some farmers are too poor to be willing to forego any short-term income or food in the interest of maintaining or increasing long-term production.

3.7.2

On uplands between Anshun and Weining, for example, where maize, beans and a little millet are grown on slopes up to 60° in some instances, crops cover virtually every accessible corner. It may be supposed that no land could be withdrawn from cultivation without the risk of starvation.

In such terrain, erosion control by the construction of flat terraces would be a Herculean undertaking and one unlikely to be attempted unless for wet rice which alone might give an adequate return. However, most of these lands are too high and cool for rice, the current upper limit for which is at about 1800 m. There is little doubt, however, that rice is the preferred food. At levels above this limit, where the terrain permits, as it does in a few areas, cold-weather rices such as those used in northern Japan or in Nepal may succeed.

3.7.3

Erosion control must therefore take other forms. As was mentioned earlier, since maize and potatoes or maize and beans are often grown in ridges, the simple reorientation of these parallel to the slope would assist the retention of water and sediment. On the steepest slopes, however, this approach could not work since the terraces are minuscule, often only a row or two wide. An alternative, at least where the soil cover is reasonably continuous and sufficiently deep, is the digging of silt-traps along the contour. (This approach is increasingly used in the temperate vegetable area of north-central Luzon, Philippines, on

erosive deep-weathered granitic soils). In cone-karst areas, where soil is very patchy and variable in depth, the digging of contour silt-traps is not feasible except at the foot of the slope. A possible alternative, and one already adopted in some areas, is terrace-edge plantings. At present these are mainly trees such as *Cunninghamia*, *Cupressus*, even *Pinus*. Tree species planted along terrace edges should meet stringent requirements. They should not have wide spreading roots, which would compete with the crops for water and nutrients, they should have a narrow crown to avoid shading the crop, though a broad, spreading crown is acceptable and may be beneficial (by reducing evaporation) if it is feathery. In equatorial highlands a number of trees, *Albizia* is one, meet these specifications but trials may be necessary for Guizhou's higher areas. Crown shape can, of course, be managed by pollarding which can be, in addition, a minor source of feedstuff for stock and firewood.

7.4

A key question for all three major systems of upland agricultural use - cut-and-carry fodder - maize with beans or potatoes - directly-grazed pasture - is their long-term sustainability. Of course, it could be argued that 'ultimately' the issues will resolve themselves as industrial development together with further intensification of lowland agriculture will result in the withdrawal of population from marginal lands followed eventually by their natural stabilization and regeneration. At present rates of economic growth and population growth (up to 3.5% p.a. in some minority areas) it seems inconceivable that significant population withdrawal and natural regeneration of the uplands will take place in less than two or three generations.

7.5

If this assessment is accepted, it is urgent and important to initiate field studies of sediment yield and transportation under different upland management regimes. So far as is known little or nothing has yet been done or at least published internationally. Here the approach need be quite simple. Limestone solution is so widespread that it can largely be taken as a universal in favour of concentration upon the study of sediment yield and transportation. The selection of a good number of slopes - steep cone-karst, steep covered slopes, gentle plateau slopes with varying types of vegetative and crop cover - can be followed by simple estimation of sediment yield using simple traps. (A 5 litre cooking oil tin, with an entry slit on its upper surface, set flush to the soil surface, works admirably and requires simple drying and weighing of the captured sediment). The basic objective, given a general lack of information, is to carry out crude, order-of-magnitude investigations over as wide an area as possible. The results from these investigations would form the basis for the estimation of denudation rates and for judging the relationships between particular upland utilization systems and soil erosion.

3.7.6

The question of sediment transportation by streams and rivers is less simple to investigate. Quantity is relatively easy - a measured stream-bed cross-section or a hydraulic notch if funds permit, a depth marker, a wide-mouthed bottle and a reasonably accurate pair of scales are all that are needed following modest training of personnel. Distance travelled by sediment is more problematic but is important since if it were to be shown that most sediment travels only a short distance from its point of origin, control strategies would be quite different from the case of distant travel. Only a professional hydrologist would satisfactorily investigate this issue.

3.7.7

It is envisaged that in an upland project, control measures, likely to be effective both technically and economically, should proceed in parallel with the investigation of sediment yield and transportation.

3.8.1

Sopu Experimental Pasture Farm

Mean temperature 9°C and 2400 m elevation, 1100 mm annual rainfall. On yellow-brown soils. This experimental farm was established in 1986 by the grant by Government of 663,000 yuan. Its area is 473 ha. While Dashan is purely an experimental farm, Sopu is both an experimental and extension station, supplying seed and animals to surrounding farms.

3.8.2

Until 1986 the area was covered with wild bush and grasses. Flat areas were ploughed with a 1 ton plough and 1 ton harrow but aerial sowing did not lead to a good strike; resowing with grasses and legumes had to be done. Steep areas were burnt at the end of the dry season and sheep used to crush regrowth before sowing. Eroded bare-slopes were ploughed on the contour and fertilized before sowing. Since the farm is enclosed grazing can be controlled, unlike the surrounding areas of range lands.

3.8.3

In 1990 there were 3200 sheep on the station; about 850 lambs were produced each year. Cattle and goats are also run. Topping is done in winter (December-January). Lambing rates in total are about 80%. Both Corriedale and Romney are run. Corriedale were introduced into the province in the 1950s but in 1986-87 large numbers of Corriedale were imported and Romney from elsewhere in China and New Zealand. Corriedale crossbred has a lambing rate of 106% compared to pure Corriedale of 90%; Romney is not doing very well.

3.8.4

Disease problems (worms mostly) are troublesome. About 4-5% of stock die yearly; two drenches a year are necessary.

3.8.5

The main purpose of Sopu is to provide an all-purpose animal of meat and wool to the family farms of the region. About 300 sheep each year are product. Farms receive between 1 to 3 sheep each, with a ewe costing 150-200 yuan. Rams cost 200-300 yuan. Nine specialist farmers (averaging over 200 sheep) are

nearby and Romney and Corriedale rams provide about 100 matings a year.

Many farmers seek to purchase stock from the station, but lack the capital. The station would like international funding to assist this but point out that farmers cannot cope with high interest rates.

Grass diseases are another problem. Invasive wild grasses are worse here than at Dashan.

3.8.6

Experimental plots

red clover + fescue + *Bromus* + white clover

very successful with fertilizer 1000 kg animal fert per mu

15 kg P

5 kg N

5 kg K

This is extremely heavy fertilizer use.

Phalaris is very useful in winter. Cocksfoot and a local grass are best for cutting. Fourteen local grasses are being tested. White clover from New Zealand, Japan and Holland are the most successful.

3.9

High Plateau Open Range Improvement

3.9.1

The Weining area, a limestone plateau region, is one in which livestock are grazed in enclosed fields or open range. Farmers are used to handling stock. Private small farmers graze mixed flocks of 10-20 sheep, cattle and sometimes pigs on spontaneous pastures which have long replaced the subtropical montane forest of the region. However, the basic food supply comes from *Solanum* potatoes as a sole crop or an intercrop with maize, grown in ridges both on flat and sloping land. The slopes are roughly terraced but because the slopes are remarkably uneven the terraces are small, sometimes only a row or two of crops in width. Moreover the orientation of the cultivation ridges with respect to the slope seems quite haphazard and is not infrequently normal to the slope instead of parallel to it as good practice requires. The terraces may slope considerably, up to about 5°-7°, and consequently do not control surface wash fully.

3.9.2

The two basic agricultural activities clearly induce two forms of soil erosion. Much of the pasture was closely-grazed (and this close to the presumed peak production associated with the June/July rainfall peak). Significant bare areas occur. Characteristically these bare patches appear to cover areas from about 50 m² up to several hectares. They appear to have been initiated by accelerated sheet wash following baring of the soil cover. On the upslope side of such patches there is usually a scarplet 30-40 cms high and this presumably migrates upslope. Some of the larger bare patches show signs of rill formation and a few more extensive ones have begun to gully. The practice of grazing pigs may assist the initial opening up of the sward by rooting. Though conditions in June are favourable to plant growth, virtually no plant colonization on bare

patches was observed. (It may be that native grasses are autumn-seeding and that by the time seeds are naturally-distributed the surface of the bare patches is too dry to obtain a strike.)

3.9.3

The control of erosion on public-access lands is unlikely to be easy not least stock numbers appear to be rising. This is in response to relatively easy access to loan moneys. The Committee for the Eradication of Poverty in Weining County has, since 1986, given small, low-interest loans (averaging about 300 yuan at 0.06% yuan) to 90,000 families, many of whom have subsequently purchased livestock. The World Bank has also allocated 1.5 million yuan for sheep projects in the county.

3.9.4

So far as was observed no erosion control measures are being taken on public-access grazing lands. However the Soil Conservation Bureau, part of the provincial Department of Agriculture, has recently begun work in a projected area of about 2000 km² in the Upper Yangtze catchment. Since in Weining this organization has only eight professional staff future progress is likely to be slow. While no information on the policy for the selection of areas for erosion-control treatment was forthcoming in the field, it will be important that areas selected will have a good prospect of recovery in the short and medium term. Badly-damaged areas in which recovery is likely to be slow and expensive may have to be left aside at this point.

3.9.5

On public-access grazing land an obvious approach is pasture improvement though any such improvement would necessarily be by way of a direct subsidy in that, apparently, no mechanism currently exists for the recovery from users of any of the costs of such improvement. Limited local experiments show that the burning of 'natural' pasture and scrubland, followed by crushing using animals followed by the sowing of cocksfoot and white clover results in the establishment of a satisfactory pasture. This combination, without added fertilizer, has been tried only on a limited scale and there must be some doubt as to its long-term persistence especially if grazing is uncontrolled. (The trial was made on a state farm.) The same consideration applies with even greater force to the ryegrass/white clover/*Vicia* combination which has also been tried with somewhat less success than cocksfoot and white clover.

4.1

Soil Erosion

4.1.1

Farmers deal with erosion in a number of ways:

- terracing some steep land
- leaving protective forestry on some steep slopes and anchoring erosion-prone terrace edges with some appropriate trees (though this now appears to be becoming uncommon)

- leaving a cap of trees on mountain tops
- leaving a belt of trees around a mountain with grasses dominating near the bottom
- on acidic-yellow soils, liming to improve soil quality
- utilization of legumes. Main ones used at Qianxi were *Medicago* and also *Vicia*, with free seed supplied by government. There was here a clear need for wide use of legumes, and the identification and supply of the most appropriate for this region
- *Pyracanthus* spp. are sometimes planted

While there are some excellent examples of sound local ecological practices, such as capping steep hills with Yunnan pine or other protective trees, there are many instances of accelerated erosion - e.g. the exposure of the bare karst rock by stripping of overlying soil layers at Jian Nan Xian near Bijie appears to be expanding steadily.

Near Qianxi some tobacco and maize are planted up and down steep slopes, not following the contour.

1.2 There is a Government policy to stop cropping on slopes above 35° and to turn these slopes into grassland. However there is still extensive erosion on cropping sites of 15-35°.

1 Cut-and-Carry Fodder

1.1 Cattle and buffalo-rearing based on cut-and-carry fodder are quite widespread in the province though there appear to be no published studies on it. Characteristically farmers own 1-3 cattle or buffaloes which are kept in stalls and fed on phytomass cut daily from public hill lands and carried back to the farm in pannier baskets or, where accessible by road or path, by pony-cart. Animals are kept for milk and buffaloes, especially for ploughing on flat lands or ploughable slopes.

1.2 Unlike neighbouring Guangdong, where significant areas of public hill lands are cut intensively for wood and grass fuel, in Guizhou the availability of coal for domestic as well as industrial use tends somewhat to reduce the intensity of cutting on the hill-slopes. There is, nevertheless, some cutting for fuel in the province.

3 A number of important practical and scientific questions concerning the ecology and economics of this form of production have been identified.

Since the upland, being public land, receives no fertilizer, not even from animals (since they generally do not graze it directly) what sustainable level of nutrient transfer can be expected? Continuous burning and cutting

coupled with high rainfall seem to have leached many nutrients out of the system.

- What is the frequency of dry-season burning and what are the reasons for this (e.g. maintenance of legume/grass cover, improvement in nutrient-content of irrigation water)?
 - How do rates of sediment yield relate to cutting frequency and intensity?
 - What are the prospects for improving the productivity of such public access hill lands, e.g. by oversowing?
 - Cut-and-carry agro-forestry mixtures have tremendous potential we believe. Local people are well adapted to cut-and-carry, they are simpler to manage than grazing systems; and some introduced species are likely to do well under cut-and-carry on low fertility acid soil (Dr Phil Rolston, personal communication).
 - What are the prospects for the introduction of better management of such lands given that they are of public access?
 - Frequently there is a tendency (e.g. the grazing of common land in the Andes) for over-grazing to occur due to the unregulated growth in the numbers of livestock. When community debate ensues over how livestock numbers might be reduced, richer larger families with a considerable number of livestock generally prevail, and reduce the numbers of stock less than poorer families are required to do.
 - Assessment of the need for social and political acceptability of 'privatization', subdivision and enclosure of hill lands or the development of user groups which might more effectively managed the use of such lands (cf Wade's 1988 study of this issue in South India).
 - What are the prospects for improving the transportation of biomass e.g. by bicycle, bearing in mind that improved access, especially when coupled with loans for stock now available, might increase pressure on hill biomass?
 - What are the non-fodder uses of upland biomass, e.g. fuel, biogas digestion?
 - Would road-side and terrace-edge plantings of fodder shrubs/trees be feasible, bearing in mind that many species would compete with adjacent crops for nutrients, light or both thus depressing crop yields?
 - What are actual and potentially-feasible annual fodder biomass production curves and are they sustainable in the medium and long terms?
- 5.1.4 The investigation of these and related questions will require the cooperation of individual scientists, their employers, university students and, especially, farmers. Though its use in China is not at all widespread, the use of key farmers as low-level, paid researchers, has been successfully used elsewhere, of course with appropriate supervision. At the same time, such key farmers, if successful in identifying (with scientific workers) appropriate, sustainable, upland utilization strategies, would be expected to help to monitor trial plots and act as

informal extension agents. (This assumes, of course that farmers share information - something which requires proof).

6.1 Role of Tree Planting

6.1.1 There are as yet no data on rates of soil loss from hill-slopes, but prompt consideration will need to be given to the role of tree planting in the project area, both for erosion control, for farm timber (and fuel where needed) as well as for ultimate sale. The slopes that are particularly steep and too distant from homesteads to be attractive to farmers as regular sources of cut-and-carried phytomass are obvious candidates and they will need to be identified at an early stage.

6.1.2 There seems little doubt that trees can be grown successfully both on slopes with a continuous soil mantle and on those where it is patchy though care must be taken to protect them from cutting and livestock (if there are such, grazing freely) during the establishment phase. It will be an early task to establish how such protection may best be provided.

6.1.3 It cannot be too strongly emphasised that in order to obtain a good strike rate, especially on limestone 'pocket' soils where soil-covered surfaces may range from 40 to 70% and may be very thin, simple hand-seeding is unlikely to be successful. Seedlings in bags with pelletized fertilizer are likely to have much greater success and it is more likely that farmers will care for such if they plant themselves rather than for direct-seeded seedlings grown *in situ*.

6.1.4 A particular problem will be to avoid losses in the first dry season. In many areas hand-watering is not a feasible option given that domestic water may have to be hauled from distant wells. The steep and broken slopes of cone karst especially, the difficulty of simply walking over the surface, let alone carrying water, is considerable. Mobile pumps and hoses may be technically feasible but the cost is likely to be beyond contemplation.

6.1.5 While it is generally assumed that trees are suitable for erosion control, so far as is known, there has been no systematic investigation of the relative efficiency of various species in this respect. Obviously, in a given environment and location there is likely to be an optimal combination of species, balancing net benefit as timber, fuel and fodder against efficiency for erosion control purposes.

6.1.6 For higher, more temperate areas pampas grass may offer possibilities and for lower more tropical areas *Veiver* may be suitable for erosion control. Neither is good-quality fodder. This is important since good-quality fodders are likely to be environmentally-sensitive, or require significant inputs (which no

farmer can afford and would not use anyway on public-access lands). More importantly, vigorous low-quality fodder is likely to suffer less cutting or grazing pressure and thus continue to be effective in erosion control, especially if planted, as recommended, in a double-row hedge along the contour.

6.1.7 While large areas have obviously been deforested and may be suffering from soil erosion, there is little doubt that trees will grow satisfactorily but they will be grown only where they will not unduly compete economically with essential food crops or rough fodder.

6.1.8 Species of trees possibly worth further trials and extension include:

Albizia spp. especially *A. lebbek* which casts light shade, fronds may add nitrogen & organic matter to soil. Shallow-rooting, good timber. Lower elevations only.

Leucaena spp. despite problems with pests, good fodder, firewood. Lower elevations only.

Cupressus spp. already planted in some areas and appears to do well but may depress crop yields on adjoining fields.

Willow and poplar would be good forage plants as they are quick growing, reasonably tolerant to grazing, and also tagosaste or tree lucerne.

Pinus massoniana, already planted in some areas and does quite well at lower elevations but likely to depress crop yields if grown closer to them.

Pinus yunnanensis already common in Weining.

Cunninghamia lanceolata, as for *P. massoniana*.

Melaleuca leucodendron, grows well at lower elevation but is known to produce very acid litter. Much the same is true of most *Acacia* and *Eucalyptus* spp. These cast quite dense shade, eventually forming single species stands with an open floor if planted into scrub. Consequently of limited use for erosion control except insofar as they reduce raindrop impact. *Acacias* generally are of limited or no value as fodder and some *Eucalypts* may be positively toxic in the event that stock can be persuaded to eat their leaves.

6.1.9 A particular problem is that the numbers of large livestock appear to be building up in response to the relative ease with which loans may be obtained for their purchase and to a substantial government subsidy (at least at Huaxi) on purchased feedstuffs. (On a scheme at Huaxi farmers paid 38 fen/kg for bagged feed against an open market price of 78 fen/kg. Loans averaged 8000 yuan each, enough to buy three animals). But neither purchased feed (even if subsidized), nor farmers' own improved pasture; vegetable wastes (mainly rice and wheat straw and maize stalks), nor road-side grazing or cutting necessarily suffice to support the animals. On a 0.6 ha family farm at Huaxi with 7 milk cows the minimal daily cut was reported to be 50 kg of hillslope phytomass rising to 140 kg or more at times in winter. Such pressures, if representative, are considerable and an early task would be to establish on-farm phytomass budgets.

6.1.10 Considerable scope exists utilising vegetable wastes and straws using technology developed in India providing the appropriate enzymes in silage-based systems (P. Rolston, personal communication).

6.1.11 The improvement of the yield of fodder from public-access hill lands by means of grass is likely to be a matter of considerable importance. Casual observation and experience in a number of tropical areas with erect non-spreading grass species such as vetiver (*Vetiveria zizanioides*) suggests that these, where planted on the contour as double-row hedges, may trap surface wash more effectively than trees. As mentioned earlier (para. 6.1.6) it is ironical yet important that such species provide relatively low-quality fodder, since if their quality were high they may well be cut or grazed close to extinction. Suggestions for further trials and/or extension include: *Paspalum* - for cooler areas and *Vetiver* - for warmer areas. *Medicago* has already been used for over-sowing but with what success we do not know.

7.1 Loans to Farmers

7.1.1 As the example from Huaxi illustrates there is a danger that cheap Government loans could become counter-productive if they encourage the build up of family herds or flocks to a level that exceeds the fodder supply available.

7.1.2 A World Bank loan of about 1.5 million yuan has been provided for improvement in sheep and goat farming while the Chinese Government supplements development funds by a 5% grant to be devoted to farmer training.

7.1.3 By far the most significant institution providing rural credit however is the Fushan Ban, or Committee on Poverty Eradication. It provides loans of about 6 to 7 million yuan at an interest rate of only 0.6%. About 40% of the population of Weining County receive loans, which average 300 yuan. As the mean per capita income in 1990 was 148 yuan, this means that after the loan, a head of household's income on average is 448 yuan. Since the programme began in 1986, 90,000 families have received loans. About 19,000 families have repaid all the loan, but most families repay step-by-step over the 5 year period. Only about 203 have defaulted.

7.1.4 Farmers near Government research stations receive agricultural loans. Thus 18 were given by the Soku station; mostly these go to the bigger and best farms, including specialist farmers.

7.1.5 Care International provides loans only to the poor. About 60% of their loans go to farmers of under 200 yuan per capita, and 40% to those in the 200-400 yuan range.

7.1.6 The World Bank Programme also provides loans to farmers in areas where it has projects.

8.1 An Overview of Development in Bijie District

An interview with the Deputy Director of Agriculture of the District and other district and county officers reviewed the situation in Bijie, which comprises 12 counties in the north-west of the Province, involving several of the poorest.

Underground resources, especially coal, are very important for Bijie, holding considerable potential for the future.

Main agricultural resource:

1. Tobacco
2. Pastures are regarded as second in priority in agriculture. Government officers believe an excellent job has been done in establishing Soku Research and Extension Station. Pasture improvement and the development of meat production as a source of protein is stressed.

8.1.2 Main problems of Bijie

1. Communications very poor.
 - no railway exists in the district
 - roads are poor, and some become treacherous or almost impassable in the wet season. This limits the development of coal mining.
2. Development of the coal mines and other minerals.
 - 50% of the Province's coal production is in this District. When the extensive problem of pollution in mining areas was raised, officers admitted it was a problem and that both state and private (small) operators were exploring ways of minimising environmental deterioration.

They believe the problem of pollution can be managed and because of this issue stressed the balance between mining and agriculture.

8.1.3 Greatest concerns for future

1. The widespread levels of poverty - how can incomes be raised?
2. Ecological issues and environmental control.
3. The very heavy population: Bijie has a large representation of tribal minorities whose population is often growing at over 3% annually.

The Bijie District has been identified by the Chinese Government for a national experiment in ecological policy, with the purpose being to examine the interaction between the above three factors.

8.1.4 The officers stated they had done a lot of work and achieved some success in certain areas (exemplified by the promise and achievements of Soku and Dashan stations) but stated they lacked good ideas in the ecological field.

believed it was important to embark on tree-planting projects and to animal husbandry, partly to provide more income and meat as a source of protein but also to control erosion. (While sheep grazing is clearly more ecologically appropriate at high elevations on sloping land, the danger of over-grazing was not mentioned).

8.1.5

Population pressure

Officers stressed:

- 1 - Education approach
 - population control is now regarded as very important and is in the curricula of secondary schools
 - to tackle belief systems of farmers, to extend family planning campaigns to them and make them more aware of the advantages of birth control. Officers aware of the logic of the peasant economy, the need for a household labour force, of children to care for parents in their old age and ideas of social insurance. Part of the problem is involved in inheritance to the usufruct of land for the family farm.
- 2 The main problem of the national Government is to control the increase in population, how to reduce poverty and to use the environment in sound, sustainable ways.
- 3 Birth control. Three aspects were described: the effectiveness of contraceptive techniques, the need for more technicians for birth control campaigns and the impact of their family planning programmes amongst farmers.

8.1.6

Population pressure, land tenure and inheritance

Officers agreed that increasing agricultural yields in the countryside was often a long, slow process. Attachment to plots of land and issues of security of use are likely to be important. After communes were abolished in 1979 the process of decollectivisation occurred with households receiving usufruct rights of equal portions of formerly commune land around 1981. Land ownership however belongs to the state, though farmers were assured of undisturbed usufruct usage of their portion for 15 years. Currently they have farmed these plots for about 9 or 10 years and as it is not known what the new policy on land tenure will be after 1996 some insecurity is seen to be emerging as to long term land use rights.

8.1.7

Normally when a farmer dies, his children inherit equal portions of the land that he farmed. In this current 15 year period however, if the head of the household dies, it has become common to still farm the family farm as one unit and to choose a new "manager" for the family farm from the most experienced members. Some families still try to divide the land among all members, but this is now not permitted by government policy.

8.1.8

The district has an average of only 0.8 *mu* of land per capita and hence there is great concern by the authorities that there should not be any more subdivision.

8.1.9

Officers stated that the land belongs to the community, people only have use rights. Farmers, it was asserted: "think the policy is good." Preference was stated for a neo-freehold approach to tenure for most land to accommodate the interests of individual farmer households, but it was recognized that joint or public use of steep mountains was likely to continue (since they "belong to the community") and it would be inappropriate to privatise such land. Children do however, have inheritance rights to trees planted on state land (e.g. a mountain side).

8.1.10

Ray Watters raised the common problem experienced in many areas of the world (e.g. the Andes) of the clash between the principle of private ownership of small flocks of sheep and common ownership of a mountain side. There is frequently a tendency for flock size to increase over time, leading to increase over time, leading to increasingly great competition for fodder and hence social conflict. When it was agreed stock numbers would have to be reduced rich or powerful families would often win out at the expense of poorer, or weaker families.

8.1.11

The officers responded that it was urgent to find new ways of solving the three interrelated problems (poverty, environmental management and population growth) and this had the highest priority. They saw it primarily as a technological problem. Ray Watters agreed that this was partly true, but that it was also a human or social problem as well as a technological problem.

Officers believed that the contradiction between increasing sheep numbers and carrying capacity of the land is not very sharp in this area; the farmers are very poor. If the carrying capacity is exceeded it was felt that the grass yield could be increased to keep up with stock numbers. The first task for programmes is to improve the yield by artificial sowings, and especially by over-sowing, to increase carrying capacity.

A rule also exists that if a farmer grows 2 *mu* of pasture he can have 1 sheep to graze it. This Provincial Government regulation of 1989 was known by most farmers.

8.1.12

The Provincial Government had just begun to improve land management, using funds for sheep grazing management over a huge area. Xie Ji Shi stated:

- Government was improving grassland quickly.
- Cattle/sheep numbers were to be controlled - 1 sheep for 2 *mu* grazing.
- Other techniques of management were being employed, such as fencing,

under-tree sowing and planting trees in grasslands. These began only in 1989 but a step-by-step approach would be followed.

Remote sensing was undertaken in 1986 and classification began for future utilization. Soil on coal beds tends to be very acid but with the cloudy, moist climate (rainfall 800-1100 mm) good conditions existed for pasture establishment. Leafy vegetation would be planted over mined land. About 7.5 million *mu* of natural grassland in district, devoted above all to sheep grazing.

1.13 Bijie City

This city, the capital of the district, appears to have over 100,000 population. It has amongst its main enterprises a cement factory, timber mills, fertilizer (nitrate plant) and tobacco manufacturing factory (middle-grade quality). A thermal power plant is to be built soon to utilise local coal.

1.14

A wool manufacturing enterprise is the only one in the province apart from one at Duyan. It was established by the state in 1985 with an investment of 21,500,000 yuan and employs 735 full-time and 160 part-time staff (60% female). The average wage is 110 yuan a month (about average urban wage).

The manager reported total costs of production per year of about 8,900,000 yuan with a gross income of about 11,000,000. The factory is enlarged each year as output is growing. Half of the wool used is imported from New Zealand (about 3 million yuan a year) and the other half is local Weining wool. Demand however is now weak, leading to a little over-production. The demand for clothing (Corriedale wool) dropped, but that for bed quilts (at 40 yuan each) has picked up (pure Romney wool).

All machinery is Chinese made. Workers are trained for 2-3 years at lower than average wages. With the drop in clothing sales, work has shifted to bed quilts with no lay-offs. Every province has woollen factories, making different types of woollen products; it was believed that this was one of the best for its particular products and sells to many parts of China. If animal husbandry was developed in Bijie as planned, the factory would do well. If the factory prospered it would stimulate local animal husbandry. Margins were tight, as illustrated by a finished rug. Production costs totalled 167 yuan with it retailing for only 190 yuan, i.e. only 23 yuan for distribution and transport costs, tax, plus profit for shopkeeper.

Management was checked by Government inspectors twice a year.

1

Institute of Forestry of the Guizhou Forest Bureau

1.1

Founded in 1959, located in Guiyang on yellow soils (limestone). Mean average rainfall 1200 mm. Mean temperature 14°C (lowest extreme -7°C, highest 37.5°C). Evaporation about 600 mm, 287 frost-free days, sunshine 1375 hours.

Staff 322, of which 122 scientists. Director: Xu Chungui. All professional staff had 4 years University training. About 50 sub-stations in whole province (most in Kaili, the forested area in the east of province). 86 experiments underway on 11,000 *mu*, and 60 projects, some national, others provincial projects.

Forest plantings cover 83% of the Institute's land of 20,000 *mu* (1,330 ha).

9.1.2 Main objectives

- Water and soil conservation
- Development of timber species
- Development of other economic species

The two main species are Masson pine and Chinese fir. Also important work on tung oil, tea, camellia, walnut, Chinese gallnut, olive, wood oil, Chinese plantain.

1600 *mu* devoted to economic tree species.

9.1.3

Protection forestry

This is very important in the province. Masson pine and Chinese fir are not only excellent timber species but are highly desirable for planting in steep, non-cropping areas. If steep slopes are terrace they grow well on the terraces, but can also do well on steep sloping land, growing taller than other trees and can be cut at 25 years.

Masson pine - At 25 years average tree about 10 cu. m. Average market price 400 yuan for 1 cu. m., average tree bringing in about 4000 yuan.

Chinese fir - At 25 years about 16 m. high av. - about 50 cu. m.

Value 1000 yuan per 1 cu. m. tree worth 50,000 yuan.

On watersheds these two superior trees are the preferred plantings on a 50/50 basis. The Institute raises 40% of its seedlings from its nursery of 100 *mu* with 60% purchased from farmers at 2 fen per seedling. The Forest Bureau has the responsibility of providing through the Plantation Commission seedlings for farmers for erosion-control.

9.1.4

Tung oil

This tree is important with about 80% of production exported. S.E. China is the main producing area; other provinces have higher yields than Guizhou. Tung oil output is decreasing nationally. Disease problems are not great; market price is the main disincentive, with farmers making only about 5 yuan per tree per year. While the tree does best on rich soils it does well mixed with other trees or pastures. On average a farmer might have 4 to 5 trees.

Main emphasis has been selection to develop the best bearing variety. Work has been going on for 20 years; 2 more years needed to complete work. Scientists confident that production can be increased by about 100% to produce about 10 yuan per tree and that the quality will be amongst the best in China.

9.1.5 Walnut

Scientists of the Institute claim that the quality of the best local walnuts was better than elsewhere, especially in oil content. The main problem is the considerable variation in quality. Grafting and use of clones are practised and the use of a greenhouse gave better results than open field. Key trees are selected and two year seedlings used to establish nurseries. After 10 years a tree might bear 100-150 kg of nuts, (av. 125 kg) at a value of about 3 yuan per kg. Densities with spacings of 3m x 3m, 4m x 4m and 8m x 8m (the best) have been tried. Experiments have run for 3 years and 2 years more are needed to complete. Some disease problems occur but in natural conditions this is not a problem. From improved grafting good nuts (some huge) are produced and it is estimated yields will increase 20%-30% in volume. Walnuts do best on soils with 6.5 to 7.5 pH. The main problem appears to be the low price - only 3-4 yuan per kg.

9.1.6 Paulownia

Next to Chinese fir and Masson pine the most valuable tree is probably *Paulownia*. This light timber grows very fast, reaching about 13 m in 6 years when it is worth about 1000 yuan.

9.1.7 Variety of trees

A wide variety of trees are grown at the Institute, including 26 varieties of pine, elm (*Davidia involucrata* - 365 sub-spp), *Cupressus chinensis*, (both used for firewood), *Taiwania*, rare olive varieties, *Sassafras tzumu*. A plant bank exists of *Eucommia ulmoides* (Chinese medicine) used for bark and leaves.

Masson pine, 2000 mu with 800 mu of new plantings; graftings after 3 years. A big seed orchard also established in Huang Ping County. After 10 years will be able to supply seed. 49 different sources of seed, from 14 provinces. Seed from Guangdong and Guanxi do best here. Oldest planting 30 years ago. Some diseases attack *Masson Pine*; also insects provide a big problem. *Eucalyptus* (50 mu) and *Acacia* (mu) experiments mainly for firewood and eucalyptus oil. Frost and ice are a problem however; in 1963 some *Eucalyptus* 6-7 years old killed by frost.

Poplars - 50 different varieties and mainly from Italy - 7 years old, very fast growing. Used for paper production. *Camellia* - about 25 species. Used for food - fruit sold for cooking oil. Almost 100 fruit per plant per year but price very low. S.E. Guizhou best area. No development for floral purposes. As the home of this greatly desired plant (along with Azaleas - Rhododendrons), a great potential export is still undeveloped.

9.1.8

Technical assistance

Several forestry scientists have visited New Zealand and/or been trained at the Forest Research Institute, Rotorua. Dr Mike Wilcox, Tony Firth (assistance with Masson pine seed orchard), Ryde James and others have been involved in various areas of technical cooperation. Friendly relationships and good working co-operation have existed for a number of years and should be expanded.

9.1.9

Extension

The Institute has an extension programme. In theory scientists are meant to make new, higher yielding varieties of timber or economic trees available to farms, including small, poor farms. Yet it is clear that the Institute, which is in many ways a significant and promising centre of scientific research and investigation and the locale for building up large stocks of valuable, much-needed seedlings, is far too separate and removed from ordinary farmers' needs, whether for timber species, economic trees of a variety of kinds, legumes, firewood species and for protective afforestation needed for water and soil conservation. A full discussion was held on the issue and while it is important that the Institute's main role in significant research and scientific testing and investigation should not be weakened, a greater awareness and involvement with farmers' organisations could profitably be built into the Institute's functions. While each project has an extension phase to it and about 100 farmers are trained each year (cost only about 4000 yuan per farmer) it is clear that widespread, substantial or on-going involvements with farmers or farm organisations scarcely exist. In the rapid process of decollectivisation some valuable functions of sharing scarce resources (such as technical knowledge, new varieties) do not appear to have received close attention in Guizhou. At some periods (if not others) and in some places in China after 1949 cadres played major roles in diffusing new innovations or teaching new skills, but with the dissolution of communes many cadres became contentious figures in the changed social situation and many sought to become entrepreneurial farmers, traders or self-seeking power wielders on their own account, neglecting their earlier extension or innovatory roles in rural society. It is clear that this essential extension role needs to be carefully reformulated in the current Guizhou situation of a more individualized, more commercialised neo-capitalistic peasantry, but in which the State remains the prime actor through ownership of land, control of the price system, and the operation of many Provincial Government departments and institutions.

9.1.10

Economic factors

The argument presented in 9.1.9 above on extension was reinforced by much evidence at the Institute that economic factors of price and returns to farms are not given great importance. Data on gross and nett yields and productivity in yuan values were not carefully and systematically measured. It is abundantly clear however that ordinary Chinese farmers will not be interested in adopting

new plant species unless they either fill an important conservation role or bring in a worthwhile monetary return. Adding this dimension to the work of the Institute would greatly increase its overall relevance to the farming population at large and also encourage greater interest in its purely scientific research role.

10.1 Rice and Grain Policy

Mr Pen, in charge of rice policy for the Province and other Government officers explained national and provincial government policy.

10.1.1 Priorities

The National Government formerly asked the Guizhou Government to produce 1,000,400,000 jin of grain per year (1 jin = 0.5 kg). It was reduced to 1,000,000,000 jin in 1985 and is still at this level.

In view of the great population in China, and the occasional fear of famine, it has been top priority for many years to produce grain to supply basic food to the population.

The main priorities in agriculture in Guizhou are:

- Grain production (defined as rice, maize, potatoes) as top priority. Now more is sold in the open market and less procured by the State.

- Animal husbandry (including pasture development)

- Forestry

- By-products (e.g. use of bamboo etc.)

Officers expected no big changes would occur from 1991-2000.

10.1.2 Crop data

Actual sowing area - 3,473 mill ha

Total all grains - 1,858 mill ha

Rice - 767,000 ha

Maize - 667,000 ha

Rape seed - 400,000 ha

Tobacco - 200,000 ha

Potatoes - 533,000 ha

Wheat - 333,000 ha

10.1.3 Self-sufficiency versus comparative economic advantage

10.1.3.1 Officers confirmed when questioned that it was still the national policy that each province should become self-sufficient in grain by the year 2000. In Guizhou this meant the province should produce all rice needed for local consumption.

10.1.3.1

Ray Walters observed that some provinces were major rice or grain producers and could export to other poorer regions. However Guizhou was hilly with often very poor soils, and experienced temperate climate with harsh winters; in such conditions it would be very difficult indeed to produce all the rice needed. However it had comparative economic advantage under such natural conditions to become a major producer of forest products and also to develop livestock production, exporting both to other areas of China. Moreover from the point of view of sustainable land use, such emphasis would be ecologically more appropriate. After all, such an economically advanced country as Japan did not grow all its rice and food needed, but imported from abroad.

10.1.3.3

At present it costs Guizhou Province 750 million yuan to import grain from other parts of China. Officers explained that population had a tendency to increase at a rate that was greater than the increase in food production, so it was very important to maintain this top priority.

It was stated:

- Current annual population growth rate of Province	1.7%
- 1984 total provincial grain output	7,600,000 tons
- 1985-89 grain harvests had, however, been lower	
- 1989 total grain output	7,000,000 tons approx.

On average the Province had to purchase about 1,000,000 tons of grain per year.

10.1.4

Reasons for lack of increase in output

Officers suggested:-

Natural disasters are frequent and often widespread. This involved droughts, floods, gales, frosts and hail. Over the last 10 years it was suggested that natural hazards had affected on average about 1,200,000 ha with about 667,000 ha being seriously affected.

A large proportion of the cropped area was unirrigated, and occasionally affected from drought. There was a shortage of water occasionally in irrigated areas.

Production costs have risen faster than farmer incomes, for 1987-1990, in the view of officers. Some poor farmers could not afford to buy chemical fertilizers and other inputs such as pesticides, or could afford only small amounts.

10.1.5 Price policy

One Government officer believed that changes in the official and open market prices had a considerable effect on output. In 1982 the official price of rice was 53 fen per jin (0.50 kg). But in 1983 price fell - to 40 fen. In 1989 Government price 54 fen, market price 74 fen. The margin between the two, about 13 fen in 1989 had increased to 20 fen, making the open market price even more attractive to the Guizhou farmer.

10.2 Innovation of High Yield Variety Rice

10.2.1 Government policy was to encourage the continuous introduction of Los Banos "Green Revolution" high yield varieties (HYV) of rice. New varieties, developed through research at Los Banos, the Philippines for the broad region of S.W. China, are introduced to Changsha, capital of Hunan, for further experimentation, research and hybridization, before being distributed to Guizhou and the other four provinces of south-west China.

Goals were:

- to introduce shorter stemmed rice varieties
- to cross HYVs with appropriate, hardy local varieties at Changsha.

10.2.2 While it was claimed the average yield of rice for the province was approaching 300 kg per *mu* (4.5 tons per ha), most regions in China had a yield that was much higher and also often practised double cropping.

Food grain output per capita seems to have been about 219-238 kg (see Pannell 1985 and Field 1988).

10.2.3 The Government granted some 70 million yuan as subsidies to encourage the adoption of changsha hybrids developed from the Los Banos HYVs. It was thought that about 60% of rice lands in the province were planted to new varieties, which were believed to yield about 100 kg more per *mu* than the traditional varieties.

10.2.4 The Academy of Guizhou was also running more than 10 field trials on further crossing of Los Banos-Changsha hybrids with local varieties to adapt further to local conditions and increase yields.

10.2.5 The rates of adoption of HYVs has varied considerably in the various periods since 1949; however since 1978 the rate of innovation has greatly exceeded that of earlier periods.

10.2.6 The superiority and higher yields of the HYV hybrids are considerable but it must be remembered that they require a great increase in the cost of inputs

required. While the seed of traditional varieties might cost only 30 fen per jin, the new imported hybrids might cost 3 or 4 yuan per jin of seed (10 times the price).

10.2.7 It was stated that whereas the mean income for farmers in the whole of China was 602 yuan per capita in 1989 in Guizhou it was only 431 per farmer and the lowest of all provinces apart from Tibet. The poverty of Guizhou Province and its relatively traditional character were major factors slowing the rate of agricultural modernization.

11.1 South-Eastern Guizhou

Duyun, on the Jian river, is a city of about 250,000 population. Large fertilizer factory (nitrate), woollen mill (spinning and weaving) and cement factory.

11.2 Dushan County

11.2.1 Population of about 280,000, 66% of which consists of tribal minorities, with the Buye being most numerous. The geographic shape of the county is unusual: it is narrow but stretches a good distance from north to south. Dushan is one of the poorest of the 31 counties in this province below the poverty line, and the population relies overwhelmingly on agriculture for its livelihood. The county lies at the gateway to the southern province of Guangxi. Infrastructure and capital equipment rather poor. The county has about 10 bulldozers.

11.2.2 97% of the county is karst. Much of this region consists of very poor quality land, mostly rolling hill country, covered with poor native grasses (50,000 ha). Sub-tropical climate; 1300 mm-rainfall; 300 frost-free days.

11.2.3 Mr Yang Chen Shin (County Governor), Hong Tia (Director of Agricultural Range Plan Office), Mr Gin (Director of Foreign Office), outlined the 7 main priorities for development in Dushan County:

Top priority is to develop animal husbandry (pasture and livestock improvement), fruit trees, and cash crops. 800,000 ha could be developed in pasture (12,000 ha already sown-pastures). Forestry development. In 1989, 33,000 ha of forest tree seedlings sown by air. Planned to develop 2667 ha in mixed pasture and forest or agro-forestry development.

Water. This is an even larger programme, aiming to get access to underground water for irrigation. In this often porous limestone landscape, access to and retention of water has high priority, to restore and extend the plant coverage.

Development of cash crops, fruits, medicinal herbs and economic trees.

- Mineral resources. Believed to be rich but potential needs to be established and development begun.
 - Industry 35% of total value added provided by industry.
 - Cultural areas, involving minorities and Han.
- These are 61 projects in the County Plan.

11.2.4

Bailapo Forest

1000 m a.s.l. Located on very acid soil, rolling hills. Eleven forests in county, of which 5 (including Bailapo Forest) are doing well. In 1967 aerial sowings of 5 forest areas. 40 sq kms of *Pinus massoniana*. 52% of area kept for research purposes.

Tree thinning two or three times since 1967. Firebreaks to guard against forest fires.

Good quality Masson pine, but insect pests bad - pine lappet and cooper blight bad. Need mixed broadleaf trees (now being sown) mixed with the Masson pine to bring birds and hence insect control. Cost of thinning other main problem.

Successful forest, run by County Forest Bureau.

11.2.5

Rural electrification

Telephone communication has been in place since the 1950s but electric power has been brought to minority villages in Dushan County only in the last few years. The programme will be completed late in 1990.

11.3

Dushan Seed Farm (15,000 ha total area)

11.3.1

This model seed farm was developed by Ch NZ Ag Co (Chinese New Zealand Agricultural Consultancy Ltd) from 1983 to 1988 on the abandoned scrub-covered site of a former experimental farm. The New Zealand pasture scientists Dr Ray Brougham, Dr Phil Rolston, G.W. Lill, Mr Gomes of the Department of Scientific and Industrial Research (DSIR), undertook the major tasks, with inputs also from John Harman, Mr Ives and Mark O'Connor of Ch NZ Ag Co. The objective was to develop a seed farm to serve as a model for the county and other sub-tropical areas of the province. Almost 1000 ha of new pastures were developed from 1985, of which 800 ha is growing very well. The northern area is devoted to cattle raising, the higher central area is sheep, and the lower southern area is used for dairying. Original contract required development of farm in 3 years but by 1986, although the farm was well established, two more years were requested to fully demonstrate crop rotations and all skills needed for long-term development. In 1988 the farm was handed over to Dushan authorities.

11.3.2

Dushan is established on yellow soil with a very thin top soil of only about 10 to 26 cms. Soil very poor, often very acid, but great variability. Highest point on farm 1080 m, lowest point 950 m. The area is dissected by the

tributaries of 5 small rivers. Most water is gained from underground sources.

11.3.3

Local red clover from Sanji (grown in China for over 40 years) has proved more adapted to the climate, soils, insects and pests than Humoa red clover from New Zealand, showing better mutability, seed set, flowering longer and higher seed yield, less affected by scorch disease and better resistance to insects and pests.

Red clover, rye grass and white clover have produced impressive results at Dushan. In the southern area where rye grass is thin, a very effective pasture of paspalum and white clover has been developed. Initially the very heavy fertilizer mixture of 1000 kg P 75 kg K and 2900 kg N per ha were applied in the first year of 1985, reducing each year with none used in 1990. This area could carry 15 sheep per ha. If pH is below 5.5, 490 P + 500 K, no N and some Ca is applied. Fertilizer requirements are much less if pH is 6 or above. After several years pasture development topsoil doubles in depth.

11.3.4

An impressive field of cocksfoot had 1500 K 75 K and some P (first year only); this carried 12 sheep per ha.

In early July 1990, 1300 sheep (Corriedale) were grazed, well below the carrying capacity of the farm. A few goats were kept - ideally 200 needed to clean up scrub.

Lambing rate 85%. Sheep dipped about 3 times annually, 4 drenchings.

Lambing from January to March.

100 cows.

11.3.5

Income of Dushan

Wool 1989 - 6000 jin sold at 10 yuan per jin (60,000 yuan)

1990 - 9000 jin sold at 7 yuan per jin 63,000

200 lambs sold and a few others 23,000

43 cattle 30,000

Milk, normally 20 kg per day 4,050

Seed, rye grass and white clover 30,000-40,000 jin 120,000

Total 240,050

11.3.6

Normally about 200 sheep are culled each year and some 40 cows. Wool and surplus stock is the only income from sheep, as there is no sale of meat.

In 1990 there were too few calves and not enough good sires. It was planned to buy good bulls from Wudan State Farm. Average live weight of a

beast at 24 mths about 400 kg, worth about 900 yuan.

Milk production, normally 20 kg per day was only 10 kg in early July.

It was sold at the nearby railway station.

A few years ago the production of the farm financed the development of 2000 mu (133 ha) of new land development nearby; in 1990 it financed 4000 mu (266 ha).

A field of spaced Masson pine has been established and livestock used to trample and eat scrub. No fertilizer has been applied but with trampling and animal droppings a good pasture, mainly of rye grass, is coming away well. It is important that careful measurements be made and this example of agro-forestry is properly monitored.

11.3.7 Breaking in new land

Xie Ji Shi, present manager, reported on the process in which he has been involved in developing new land.

The great achievement of Dushan is to pioneer and identify the methods that have proved successful in established high quality improved pasture where only scrub and weeds grew before on very poor, acid soils. Total costs were 64 yuan pr *mu* or 960 per ha in 1986 and 100 yuan per *mu* or 1500 per ha in 1990. In reviewing Table 1 it is clear that the use of heavy tractors with bulldozer blade and heavy application of fertilizers were used. It would be possible however to reduce total costs considerably by two substitutions - initial clearance of the land by hand labour and burning instead of tractor with bulldozer blade and, secondly,

11.3.8 Machinery

Mostly fairly new.

3 tractors	several harrows
1 heavy tractor	several discs
1 seed harvester	1 truck
1 hay baler	2 jeeps (one old, one new)
hay stacker	car

11.3.9 Staff

84, including 20 technicians or skilled staff, a mechanic, and a graduate in agricultural machinery technology.

11.3.10 Training

Since 1984, over 800 students have been trained at Dushan. An impressive 3-storey training school including lecture rooms was almost complete. Groups of 30-40 agronomy students come here twice a year for training.

11.3.11 Attitude of peasantry: trespassing by local farmers

During the few days of our visit, Dushan Farm was subjected to numerous raids of small neighbouring farmers who targetted the lush pastures for cut-and-carry fodder, returning with heavily-laden pony carts or panniers. These trespassers involved both Han and tribal minority farmers. Many came at any time of the day in broad daylight, but a good many others (perhaps a majority) came at first light or perhaps near dusk when detection would be more difficult.

Table 1
Breaking in New Land at Dushan - Approach and Costs

Task	Input	No. man/days	Cost per ha (yuan)
1. <i>Either:</i> Clearing of scrub & weeds <i>Or:</i> Clearing by hand labour, with hoes	Tractor with bulldozer blade 10 men	10	5-6 wages driver, + + machinery cost? 30
2. First harrowing			150
3. Second harrowing			150
4. Deep discing, about 18 cms deep	Heavy tractor		1200
5. Fertilizer:			
a. Liming:			
if pH v. low (4-4.7)	3 tons		270
if pH low (4.7-5)	2 tons		180
if pH med. (5-5.5)	1 ton		90
b. NPK (including transport costs)	150 kg N 1000 kg P 75 kg K		375 210 134
c. Trace elements:			
Zn	0.5 kg		?
Boron	2 kg		?
Ca Na P	1500 gms		?
6. Chain harrow			60 (+ tractor costs)
Hand tillage			or 450
7. Sowing	White clover and rye grass (or some red clover, paspalum or cocksfoot)		
Total costs 1986			960 y per ha
Total costs 1990			1500 y per ha

It was said that more raids by such trespassers occurred when the manager, who visits only for a few days once or twice each month, was not at the farm, but they also occurred while he was there. He would quickly evict trespassers, threaten them with fines, and also lectured the staff severely for allowing farmers to enter to cut grass.

There was not the slightest doubt that surrounding farmers clearly appreciated the superior quality of the Dushan pastures and keenly desired access to them. (It was said that some had even stolen power poles from the farm.) This was shown by the extent of trespassing and was also stated by various farmers interviewed. The relationship was discussed between the rich, highly productive seed farm and the small, very poor surrounding farmers who totally lacked the means of establishing their own high quality pastures. The demonstration role of the farm was obvious and also the eagerness of the farmers to learn new techniques. In this situation it was important not to alienate the farmers, or to perpetuate in the long term a situation in which islands of prosperity and progress belonged only to the State, locking out in effect or denying access to such resources to the poor farmers.

One possible response was to make available a certain number of fields to farmers for cut-and-carry, and to insist that these be used on a strictly rotational cutting basis. Indeed the manager wondered whether one field should be used in this way. The other alternative is to use Dushan as a springboard as it were for extending the new pastures into the surrounding communities. Xie Ji Shi hoped that a project could be initiated to develop from 20,000 *mu* (1333 ha) to 100,000 *mu* (6660 ha). In the longer term, it is hoped to develop the watersheds of the five local rivers, enlarging the farm to 790,000 *mu* (52,000 ha) of new pastures as well as 1,700,000 *mu* (113,000 ha) of forestry.

11.3.12

Problems

- The trespassing of many neighbouring farmers (if indeed that should be seen as a "problem"). However, it appears that probably only about 200 farmers might trespass, i.e. less than 10% of the 3000 in the neighbourhood. Cut-and-carry lowered the fertility, lessening grazing, which built up fertility.
- Some sheep suffer from footrot (formerly worse). Treated with zinc sulphide. Some sheep not in good condition.
- Pump needed to pump up underground water. Excellent deep troughs have been built with concrete extensions to tap underground springs. Excellent concrete dip and holding yard. Water now available on every 2 or 3 paddocks.
- Weeds, formerly bad, are no longer a problem. Scientific management has largely eliminated weeds and biological control has become important.
- The most obvious deficiency was the serious under-stocking of the farm. Clearly much higher numbers of stock could be carried, bringing in higher income.

- Very great reliance is placed on the highly competent manager who, however, is expected to take on numerous additional responsibilities, so that he cannot visit Dushan as often or for as long as desired. Clearly he needs a full-time, well-training assistant manager on whom he could rely to manage the farm on a day-to-day basis.

11.3.13

Pasture development by small farmers

It has been the intention for some time to assist pasture and livestock development among small farmer families. Some small areas of rough land were developed into improved pasture about 1988 and a scheme of farmer family development began in March 1989. About 20,000 applicants were reported as applying to join the scheme, with only 100 being selected, consisting of 20 Han, 70 Buye and 10 Sui families. It appears that 80 farmer families will be included in Dr Alex Chu's pasture project.

Dushan Farm has developed three ways of assisting small farmers:

- developing rough land into improved pasture;
- selling grass seed to them at low prices;
- supplying low price chemical fertilizers (State-provided fertilizer is cheaper than that available on the open market).

In 1989 the farm provided 80 10-month-old ewes to three farmer families valued at 150 yuan each (the source for purchasing sheep is Weining, 750 kms distant). At age 1 1/2 they are worth 200 yuan. Under a contract, the wool will belong to Dushan Farm. By 1990 the flock will reach 100 sheep and a harvest of 250 kg of wool is expected. The land area for the three families, who originally worked together, was 300 *mu*, but by 1990 they had divided into three 100 *mu* farms, with the land of each divided into improved and unimproved grazing. Over 10 cows are also run by the three families.

The scheme was visited 15 months after its inception, and while it appeared reasonably promising, the new pastures appeared to be deteriorating. Farmers can seek seed and advice from Dushan Farm. The central part was very wet, needing draining, and rams were running with the ewes. The shortage of stock on Dushan Farm meant that it would be impossible to acquire extra ewes locally.

One small farmer interviewed had 3 years' primary education, while another had 3 years of middle school. One man had dug a reservoir for water. In 1988 he had a per capita income of about 200 yuan. It had increased with the growing flock by 100 yuan a year to about 400 yuan expected in 1990.

11.3.14

Conclusion

Many of the most influential leaders of agriculture in China have visited Dushan, including the Vice-Premier, the Vice-Chairman of Agriculture, Ren Jijhou, the NZ Ambassador, and the main leaders of the Province. Wang Sing

Mai, Manager of Animal Husbandry in Beijing, penned this aphorism to commemorate the role of Dushan: "Reform the wasteland and make it rich".

There is no doubt that Dushan has been a striking success and it is said to be possibly the most impressive demonstration farm in all South China. Since it has been managed by the provincial authorities in 1988, its high standards have been maintained and it is significant in training. A substantial increase in stocking rates is called for however, and the expansion of the new pastures systematically into the surrounding hill country, bringing the technology to small farmers, is now urgent.

Small farmers believed it would be difficult for the County to find new areas on which to establish new pastures, or any such areas would be very distant from their homes. Current Chinese practices of supplying development loans of medium to long term at low interest rates were, however, favourable.

11.4 Tang Ba, a Buye Village

A Buye village, a few kms from Dushan Farm, was visited. The village of Tang Ba consisted of about 90% Buye people and 10% Sui. The village comprised only 14 families, and they had lived there for many generations. Before 1979 the village was part of a large commune. A primary school was located in the village.

The situation of two small farmer families of Tang Ba is illustrated in Profiles 6 and 7 and includes data on their livelihood and future prospects. Poor sloping land under wild grasses and scrub behind the village and steep mountain land covered in scrub seemed to be regarded by poor families as common land, for common grazing or cut-and-carry by community members; however, the influential headman regarded 50 *mu* of this land as "his own" land. Judged by the relatively large area of land he possessed and substantial livestock numbers, it appears his monetary income is substantially understated.

12.1 Long Li County

This rather impressive and large area of new pastures was visited. It lies about 45 km SE of Guiyang and is typical of much of the plateau surface of Guizhou.

The county comprises 1521 sq kms (2,280,000 *mu*) with a total population of 174,000, of which over 90% is agriculturally based. Minorities comprise 37% of the population, Miao mostly in high hills, Buye in some villages, and Han in cities and towns. The range in altitude is from 900 m to 1700 m a.s.l. with most pasture land lying between 1300 m - 1600 m.

Crop land	- 360,000 <i>mu</i>
Forests	- 80,000 <i>mu</i>
Natural pastures	- 880,000 <i>mu</i> in centre-south and centre-west, of which there are several large areas of 1000 to 10,000 <i>mu</i> in separate natural pastures.

National income of county is 139 million yuan or about 751 yuan per head - well above the average for Guizhou counties, but lower than the most advanced.

Consumption - 110 million yuan of 139 million income.
Agricultural income productivity - 88 million yuan.

Animal husbandry - 23 million yuan
Crop land - 46 million yuan
(Forestry (4.4 m), fishing make up balance of 88 million)
Sideline production - 28 million yuan (tobacco, rape, beans, strawberries, timber, bamboo, mushrooms, Chinese medicines).

Rice fields - 46.23% of total crop area sown.
All crop land (including pastures (35%) comprise 60.8% of total area of county.
Forest land - 38.3% total area.
Most income comes from natural resources, and gathering rather than planting - only 20,000 of population in non-agricultural employment.

12.1.1

Yields

Mean yield for rice is 600 jin per *mu* (300 kg).
Climate is generally suitable for cropping, but availability of irrigation water and seed quality are important.
Produce new varieties of rice themselves, based on experimental work near Guiyang, and are not primarily reliant on HYVs from Changsha, Hunan.
Highest yields said to be:
Rice - 800 - 1300 jin
Maize - 500 - 1000 jin
Wheat - 300 - 650 jin

12.1.2

Cash crops

Tobacco - 3500 tons per year
Rape seed - 3500 tons per year
Beans
Barley (in cooler parts) - for beer
Some sweet potato, potato, soya bean

Two harvests:

In summer - rice, maize, sweet potato
In winter - wheat, rape, barley, tobacco, tomato

12.1.3

Livestock

End of 1989 - 65,240 pigs; 40,000 cows
Production of grasses from pastures - 4,800,000 tons

12.1.4

Pastures

The resource of pasture land is rich, with natural pastures occurring in large extensions on ridge tops - pastures could graze 470,000 cattle. Long Li is only 45 kms to the capital, Guiyang, and is well served with railways and highways linking it to the market. It is now the main source for baskets for Guiyang housewives.

12.1.5

Main problems

Main issue is how to make Long Li the main source of supply of meat and animals for Guiyang and other large centres in south China. Resources are still not developed, or are only partially developed - e.g. large patch of under-developed land Long Shan Ding.

12.2

Long Li Pasture Project

12.2.1

1635 to 1713 metres a.s.l. Pastures sown from air in 1983, resown in 1986. 200 ha in farm, 25% formerly belonged to Miao commune and 75% to peasants. Now under management of Mr Jang. Small farmers can graze here in return for 25 fen paid per *mu*, which is handed on from Mr Jang to village.

Information supplied by Mr Lo (Governor of County), Mr Chen (Deputy Governor), and Mr Zhang (Director of Pastures).

Investment in pasture comes from four sources - Chinese Ministry of Agriculture, province, district and county levels.

In the resowing of 1986 some parts were ploughed, others disced then ploughed before sowing.

12.2.2

Management

Ren Jihou, Director of Gansu Grasslands Ecological Research Institute, is in charge of project - comes about twice a year. Also advised by Dr Alex Chu, Massey University, New Zealand. Many leading Chinese pasture specialists and some foreign specialists (including Dr Phil Rolston) have visited Long Li.

Total staff of 36, including 19 professionals.

12.2.3

Seed mixture

1 kg perennial rye grass (Nui) + 0.5 kg white clover + 0.25 kg red clover. Nui from New Zealand, other two from Dushan Seed Farm.

In 1983 there was a sowing of cocksfoot and white clover + rye grass which was very good in the first year but was not subjected to enough grazing and pastures deteriorated.

12.2.4

Fertilizers

The pH of the soil was formerly only 4.6, now about 5.5. Lime is used only in the first year. Fertilizer used was N 5 jin P 50 jin K 100 jin per *mu* (very heavy). After seeding when grass about 10 cms use N 5 kg + 5 kg K per

mu.

Grass growth: cut 4 times a year, getting 1000 kg each cutting.

12.2.5

Stocking rate

In July 1990 only 3-4 sheep (Corriedale cross) per ha - in fact need 10-12 sheep per ha. Plan 125 bull cattle and 300 heifers. At present 1900 sheep (including a few goats) and 129 cows.

Shortly after visit it was planned to visit Weining to buy 1500-2000 more sheep (at about 205 yuan each) for the farm. Applied for capital for this in 1989, approved 1990.

12.2.6

Weed control

Sheep rescue one of worst needs, small willow (?) quite bad. With better pasture management better control of sheep rescue and other weeds would be achieved.

12.2.7

Insect control

A major problem. In 1988 measurement of sample gave 400-1000 insects per sq. m. Control aimed at proper pasture management, cutting of grass, sticks in pasture to attract insects. There has been a decrease in burning of scrub cover.

12.2.8

Pasture development

5% - 10% of area (poor patches) resown. 6000 *mu* for new development each year. Ideally 40,000-50,000 *mu* needs developing; Government seems to have accepted 30,000 *mu* to aim for. Immediate plans are to develop 5 large pieces totalling 160 ha (2400 *mu*).

A map of the farm showed Long Li area divided into 5 zones:

1. Area of 3000 *mu*
2. Area of 1600 *mu*
3. 5000 *mu* near centre
4. 10,000 *mu*, the largest area
5. In east 5000 *mu*

Area which can't be developed with machinery not shown on map. Claimed that hand cleared areas make even better pasture as soil is deeper in valleys; more shelter there and pH is higher.

Costs: 100 *mu* can be cleared in 1 day by bulldozer, at cost of 110 yuan per *mu* (machinery - disc plough, chain harrow - seeds, fencing). Hand labour used earlier, but farm given a complete set of machinery by Agriculture Department.

- 12.2.9 **Drainage**
50 cm ditches filled with large stones - effective.
- 12.2.10 **Machinery**
1 bulldozer 3 small discs
3 large tractors 3 hay balers
2 smaller tractors 3 heavy ploughs
2 hay cutters 3 heavy harrows
1 large disc
Total value 0.4 million yuan.
- 12.2.11 **Tupping**
Three matings have been done over the last 2 years - in spring, summer and autumn. Lambs were born in 1989 in October, in 1990 August. The problem is that there is detailed climatic data for only 3 years. While it would appear to be desirable to have abundant pasture growth when ewes pregnant and at lambing special conditions appear to apply. There is always surplus grass. In 1989, 1800 mm rainfall and mean temperatures 9.5 to 25°C.
- 12.2.12 **Fattening rate**
No data on traditional sheep fattening rates. Plan to sell Corriedale cross at 10 months when 35-45 kg.
Cattle - average weight of 300 kg, with 52.7 kg increase in body weight per year.
- 12.2.13 **Lambing**
Survival rate 94.5%. Twinning 7.5%. 600 lambs from 600 ewes - over 500 left.
- 12.2.14 **Wool**
Two shearings: At 4 months av. clip per lamb 1.5 kg.
Second shearing at 9-10 months - av. clip 5.6 clip 5.6 kg per head, adult sheep.
One adult ewe worth 160 yuan.
Sheep 100 yuan; Wool 60 yuan; Total 160 yuan.
- 12.2.15 **Future**
Only 6000 yuan allocated for new ewes in future. According to plan the farm will be completed in terms of areal development by 1993.
- 12.2.16 **Family farms**
A total of 27 family farms are part of the Long Li project. These specialist farmers average 150 mu and have about 100 ewes per family - i.e. 1 ewe for 1.5 mu. Part of this land is in natural bush - will be developed gradually.

The average size of these families is about 5 persons. Many of these farmers take other employment, some working as casual labour on the farm to pay back their loans. As specialist farmers the intention is to devote all their land to sheep grazing.

- 12.2.17 **Problems**
- Shortages of capital, which underlie divergent estimates of land areas to be developed in the next few years.
 - Unbalanced development. It is difficult to acquire sheep and cattle when needed to fully stock the farm. According to plan, Government investment is 4,600,000 yuan. But bottlenecks occur in funding, and capital comes in separate amounts and too late for the desired rate of development to open new wasteland and to purchase sheep and cattle in the numbers needed to stock it. Two factors are involved: management decisions on appropriate stocking rates for various pastures and, secondly, acquiring early funding to purchase stock.
 - Farm needs pure blood Romney sheep, which should be more suited than Corriedale cross to the wet and humid conditions (some footrot occurs).
 - Erosion. A few eroded hillocks and exposed slopes. In such areas it is wise to leave the land under its protective scrub. Masson pine, though stunted and slow growing in these exposed areas, is also useful as protective vegetation.
 - As stock numbers increase, the problems of meat and wool processing, cool storage, and marketing will have to be addressed.

- 12.2.18 **Significance**
Overall, Long Li is a reasonably impressive and successful development. The aim of achieving a complete farming system on the farm may be achieved in a few years time if the problems can be overcome.
It was asserted that aerial photography and remote sensing had showed that there are over 100 other areas (one estimate stated 220) of over 10,000 mu in size like Long Li in other parts of Guizhou Province. Thus successful experimental findings at Long Li, Dushan, etc. are likely to be of great relevance for upland development in other regions.

13.1 Kaili Autonomous Prefecture, Eastern Guizhou

- 13.1.1 **Kaili**
In 1948 it is said that Kaili city comprised only a Miao village and a Dong village flanked by a temple at each side. Before 1970 no building was more than 3 stories high - now there are many 6-7 storey buildings. Today it is a modern, vigorous city of about 100,000 people, manufacturing paper (from grass, reeds, bamboo, Masson pine and acacia), aeroplane components and electronics for microcomputers. It has a Forestry School and a polytechnic.

Lying a little lower in altitude than Guiyang, Kaili has a warm moist climate (about 1000-1200 mm rainfall) and many of the 16 counties in the Kaili area include the major forestry areas in the whole province, with Masson pine, Chinese fir and other species being prominent. It is also an area of predominantly minority tribal settlement in steep riverine valleys that often trend towards the north-east part of the headwaters of the Yangtze river system.

The rapidity and recency of much development in this steeply forested zone of Guizhou province, involving the steady encroachment of Han immigrants on to traditional hill country minority peoples, the population explosion of the latter groups, and the rapid industrialization and commercialization of the zone emphasize a number of emerging issues. 72% of the population of the whole district (area 3000 sq kms) of 3.6 million people are minorities, with 38% being Miao. Han are important in only 3 of the 15 counties of the district.

13.2 Forest Priorities

- Plantations, especially of Masson pine and Chinese fir.
- Seed orchards. 3000 mu devoted to Chinese fir and 1500 mu for Masson pine. Now getting about 10,000 kg of Chinese fir seedlings and about 200 kg for Masson pine (quite low in latter case). The quality of stock from the seed orchard compared to natural trees is a good deal higher for Chinese fir, though only slightly higher for Masson pine.
- Timber sales. In 1990, about 50% of timber can't be sold because of the recession.
- Selection of species for firewood and economic trees. In the Kaili area economic species are quite poor, for most small farmers don't recognize the money-earning potential of some trees.
- Establishment of a forest timber base. Plan to plant 340,728 ha. From 1986-90, 94,140 ha planted, an average of 18,828 ha a year at a cost of about 56.48 million yuan. About 28.90 million yuan come from Bank of China and other moneys from Kaili District, counties and villages.

13.3 World Bank Project

- 13.3.1 A World Bank office has been established in Kaili to monitor the expenditure of a grant. The Ministry of Forestry, Guizhou, has contributed 670,000 yuan. It is planned to plant 60,000 ha in the whole Province, of which 44,666 ha of new plantings will be in Kaili district (34,666 Chinese fir and 10,000 Masson pine). The cost of this will be 4,162,532 yuan and planting will begin in 1991.

13.3.2 Current proposals (July 1990)

- Lei San mountain forest protection and assistance of small farmers to develop tea forestry. Total area about 3000 mu involving about 1000 families running about 5 years. Total cost about 70,000 yuan, of which

60,000 for tea planting.

- Forest seed orchard. Aim to develop clone forestry and establish a tree archive of 35 ha. Nursery of about 200 ha, nursery to provide seedlings of Chinese fir and Masson pine for all Kaili area. Cost about 75,000 yuan per ha.
- Cool storage plant for seed. Discussed with Forest Research Institute, Rotorua, New Zealand. Hope to secure NZ aid. Cost 2,050,000 yuan.
- Develop agro-forestry, involving rice, pasture and timber species. Guess cost perhaps 2 million yuan.

13.4 Meeting with Foresters, Kaili

Mr Shen Taiho, Director of Forestry Bureau, Autonomous Prefecture of Southeast Guizhou, explained that with such a dense population of 3.6 million people, agriculture is the top priority, but forestry comes second in importance.

13.4.1

The history of forestry in Kaili stretches back for 400 years. Some of the oldest buildings in Beijing have used Kaili Chinese fir, which can last for 400 years or more. Chinese fir grows faster in this area than in any other area of China, so the Chinese Government has given priority to Guizhou Province for research and development of this tree. In the past 40 years about 140 million cubic metres of Chinese fir has been produced in the Kaili Autonomous Prefecture and the timber is sold to 27 provinces.

13.4.2

The average yield of Chinese fir is about 15 cubic metres per ha per year. 2000 stems are planted per ha, thinned later to 1200 stems - i.e. spacing begins at 2 m x 2 m, thinned later to 4 m x 4 m or 4 m x 3 m. The top priority in timber is Chinese fir.

13.4.3

Mr Mo Wen Li, Senior Engineer and Vice-Director of the Forest Bureau, explained that the Forest Bureau had four divisions:

- Silviculture
- Forest Management
- Forestry Research
- Industrial Forestry

The Silviculture Division is in charge of seed orchards, forest health, plantations including afforestation, forest fires, nurseries, disease control, pruning and thinning.

Forest Management is responsible for forest systems, forestry strategies, tree felling rate, forest protection, forest policy and forest planning for future.

Forest Research includes the Forest Research Institute, Forest Technology School, Forestry Industry School.

Forest Industry includes a forest company that handles timber sales and wood production and the management of market production.

13.4.4

With Kaili as the major zone for forestry in the whole province, 8500 people are employed in a three-tiered structure. The Provincial Forest Bureau is at the top, secondly there is the county forestry staff and thirdly the village forest staff at local level.

13.5 Science and Technology Commission Priorities for Kaili District

It was interesting to consider the order of priorities identified by this important Government Commission, as outlined by Mr Yang:

- Food base
- Improving the lowest producing areas
- Tobacco base
- Tea forestry
- Fruit forestry
- Timber
- Economic species
- Wetland development
- Medicinal spp.
- Watermelon base

The county of Dan Zai is considered suitable for new pasture development and also San Hui, Tai Jang and parts of Lie Ping counties.

The cost of clearing scrub and weed-covered land by hand labour in Kaili was reported by Mr Yang to be only 60 yuan per *mu* or 900 yuan per ha.

13.6 Protective Forestry, Miao Land Use and Fuel

13.6.1 The Guizhou Forest Bureau has planted cypress as protective vegetation on steep hills near Kaili city.

In the Huang Ping area, north-west of Kaili, a reserve was declared in 1973 and 10 sq kms were sown by air in cypress. Tung oil and camellia (fruit pressed for oil) were important economic plants.

13.6.2 The Wan Shao valley, an area of Miao settlement, also includes protection forestry as the Miao cut down timber. The Forest Bureau pays Miao villagers in food (2 yuan per head) for not cutting down protective forestry. It was alleged that they even felled tung oil trees.

13.6.3 While some Han farmers used coal for fuel, coal deposits are much less frequent in Kaili, and Miao used firewood for fuel, cutting mainly acacia but also some valuable Masson pine about 5 years old. The most suitable tree for firewood in this area is the locust tree ("Chinese scholar tree") *Robinia pseudoacacia*. It burns better than Masson pine, half the weight of the latter, regenerates very easily, and is moreover leguminous.

13.6.4

Some Miao land use was, however, excellent, with rice paddies in the valleys, maize on sloping ground, and steep hills capped in dense stands of Masson pine. A variety of trees were kept around villages for geomantic reasons.

13.6.5

Miao grow tobacco for cash sales and also cultivate squash and sweet potato. The other main source of income was Masson pine timber. Many villagers could be seen carrying Masson pine planks or trunks along the road to market or using the Chong An river for transport of the timber to market.

In Chong An town brown paper was produced from peasant manufacture from bamboo or rice straw and brick and tile making was also popular.

14.1

Huang Ping Forest Farm

This forest farm was run by the county Forest Bureau with some assistance from the Chinese Ministry of Forestry. It was established in 1958 on 2000 ha with 1000 ha later being added. 80 staff, about 15 professionals. Its objective was timber production, with about 20,000 *mu* devoted to Masson pine planting and 1000 *mu* to Chinese fir. Very few other species were involved apart from *Paulownia* and *Camellia* seed orchards. In 1978 a 100 *mu* Masson pine seed orchard was established, and another, of 1000 *mu*, in 1982, with experiments in ideal tree spacing. After 10 years seedlings could be sold from the orchards. About 100 kg on average of seedlings are sold each year (about 5 million seedlings) at about 15 cms height priced at 1 fen each. These seedlings go to Forest Bureau branches all over the province, where they are kept in nurseries of 100-200 *mu* before being later sold to farmers at the same price.

Normally, farmers are given the seedlings at about 16 cms height with the maximum number acquired from Branch nurseries being 20 to 1000 or more. A large volume of seedlings is due to become available in 1992 when the larger seed orchard is 10 years old.

The 4 m x 5 m spacing has proved to be superior than 3 m x 4 m for Masson pine, and spacings are now changed to 6 m x 4 m. Only a little disease occurs. This is the biggest Masson pine seed orchard in China, with 1 million yuan invested by the Chinese Government in this experiment.

The more valuable, highly prized Chinese fir is priced at 1.5 fen for first class seedlings, 1.0 for second class, and 0.5 for third class seedlings. *Paulownia* is priced at about 10 fen per seedling. The Forest Farm cannot, however, cover its costs through sales of seedlings, needing funding from the Forest Bureau.

About 24 species of American pines are grown experimentally and also *Pinus radiata* from New Zealand (moderate success, though less valuable than Masson pine).

Eucommia Umoides is grown for Chinese medicine (bark) with a tree being valued at about 100 yuan. The garden plant Privet is also valued for the medicinal properties of its fruit. Cypress, developed from a Yunnan variety, grows faster than other species useful for protective forestry. The 3 year tung oil

variety has been introduced, fruiting after only 3 years. There are no insect or disease problems for tung oil.

14.2

An Experiment in Forestry Extension

Two years ago the Forest Bureau began an interesting experiment in forestry extension. Miao frequently visit the Forest Farm and are employed in casual work. The Forest Farm devised a plan of paying 35-40 yuan per *mu* to a Miao farmer to lease some of his land by the farm for 25 years, during which time it will be completely under the farm's control. Using Miao labour under Forest Farm direction, the land is planted in Masson pine at 1.5 m x 1.5 m spacing (i.e. 300 stems per *mu*). Over 300 peasants visit the farm each year, offering land to be included in the planting scheme (too great a demand to be met) but only 500 *mu* can be planted each year. By 1990 1000 *mu* had been sown. Land so planted belongs to the Forest Farm for 25 years, at which point the trees will be tall enough to be felled, and worth on average several hundred yuan each. At felling, 30% of the value of the timber will be assigned the farmer and 70% will be retained by the Forest Farm. Another important said the breakdown was 40%/60%.

The farm hopes to provide enough seedlings (transplanted in February) for 10,000 *mu*, although only 500 *mu* can be planted each year. It is hoped to extend this policy throughout the whole Kaili zone, although it appears to depend on the interest and enthusiasm of forestry extension staff and also the occurrence in roughly contiguous areas of enough land that can still be exempted from subsistence or cash crop production or present protective forestry.

The experiment has a number of points to commend it:

It appeared to be the only forestry extension scheme in the Kaili area embracing both the Government forestry department and poor peasantry.

It was the only scheme designed 25 years ahead, aiming to provide reasonable cash returns, that served as an inducement to forego short-term land uses. The initial payment and wages for labour were additional incentives.

It ensured steady expansion of Masson pine plantings, providing future timber resources and also protective forestry on hill country. The very close spacing suggest that protective forestry is the main aim.

The demand from Miao farmers (as well as the clear interest of informants we interviewed) suggests its popularity. However, at least some undesirable compulsion to join the scheme seems to have occurred (Profile 8).

Clearly a full detailed review of the scheme is highly desirable, including investigating ways in which Miao families who possess little land might participate in some way. Moreover, the scheme could probably also be extended to involve the more valuable Chinese fir and perhaps *Paulonia*.

14.3

Forest Protection

14.3.1

Throughout the Kaili area the protection of forestry reserve land is of high priority and protection extension officers are employed to check illegal invaders felling timber, as well as guarding against forest fires. Invading peasants felling timber on reserves are reported to the police and prosecuted under the forest law.

14.3.2

While these functions of forest extension staff are necessary and important, there appears at present to be no function associated with the planting of timber trees or economic species or protective forestry by small farmers apart from the scheme described above. Since the structure and service exists it would appear that a logical expansion of it to add these functions would not be too difficult to achieve.

Forest officers asserted that small farmers often cut down valuable trees such as Masson pine and Chinese fir for firewood. Some small Miao farmers denied doing this, although some evidence suggested that some at least used Masson pine along with other species for fuel. However, those closely associated with the Forest Farm were less likely to do this on their own land.

15.1

Lei Shan County

15.1.1

A Forest Bureau station in Lei Shan city serves four counties: Lei Shan, Tai Jiang, Yong Jang and Jian Hui. About 45% of the area is covered in forestry, of which 60% is protection forestry owned by the Government. The remaining forested area is occupied by small Miao farmers. The population of the area is only 10,000, but it is impinging steadily on forested areas. The research station, established in 1982, has a staff of 78, of which 58 are professionals.

15.1.2

This area is well known for the Lei Shan mountain nature reserve, the main concern of the station, which comprises about 700,000 *mu* (46,000 ha). The Lei Shan mountain reserve is famous for its wide range of species, many of which are rare. Research into and protection of these plant and animal species are the main functions of the station. Three areas dominated:

- Chinese fir and its sub-species.
- Protection of several animals, snakes and birds, some of which are rare. (A new species of rare snake was discovered recently.)

Chinese medicinal species. Some famous Chinese medicines come from this area. Rare species are propagated, and many species of moss are sought from here.

Chinese gallnut, attracting certain insects from which paint or polish is made, many types of mushrooms, fungus and fly species occur. Foreign scientists from various countries have studied in the reserve.

- 15.1.3 Before the area was protected, small farmers were used to cutting down forest for rice or maize cropping. In this area it was said there is only about one *mu* of land per head of the rural population and the demand for cropping land was acute. Farmers argue with the Forest Station over the policy of protection, but the penalty for cutting down trees is a fine of 60 yuan, equivalent to 50% or sometimes 100% of average per capita income for a year. It is, however, very difficult to catch culprits, who often cut down trees at night for later sale of the timber. The local Government price for Masson pine was about 200 yuan for one cubic metre (after 20 years) or 300 yuan for Chinese fir, with the open market price being double these figures.

15.2 A Forest Bureau Policy for Small Farmers?

- 15.2.1 The issue was raised of what policy was planned to assist the livelihood of small Miao farmers. Two policies are envisaged:

- Selection of most valuable tree species, purchase of them from farmers, propagation in nurseries for later supply to farmers as seed trees.

- Greater emphasis on economic trees (e.g. tea), and the supply of these plus the appropriate technology for their husbandry.

Most of the local population are illiterate and very few of the Miao villagers have been urbanized. It was said their population of c.10,000 was growing at a rate of about an additional 500 per year, a fact which, if even roughly true, contradicts the belief that the Miao had, since 1986, reduced the number of children per family from 2 to 1. Some decades ago there had been fighting between Miao and Han, but currently relations seem to be harmonious with some inter-marriage.

With the area of cultivated land being roughly 1 *mu* per capita on average, sources of income are of great importance. With respect to the second policy noted above, tea production is significant. Some Miao obtain part-time employment on the Forest Reserve and on road maintenance.

15.2.2

Tea in Lei Shan

The yellow soils of the area are said to be very suitable and the clean, unpolluted water is another great asset. The moist equable climate was very suitable for tea production, in spite of the relatively high altitude. Rainfall about 2000 mm, with about 80% relative humidity. Average temperature about 10°C, lowest temperature in January -5°C and highest about 25°C. Droughts never occurred.

The idea of forming a company within the Forest Bureau to develop "tea forestry" occurred 10 years ago, apparently at the time of the dissolution of communes. The Government agreed to their proposal and in 1980 a small tea production company was formed on 3000 *mu* with capital of 1.3 million yuan. This was the only company formed in the area. Tea quality was quite high in the area and Lei Shan, it was said, was famous for the flavour of its tea. About 16 varieties are produced, totalling about 500,000 kg a year. The best known are Silver Globe, Green Tea, Qing Ming.

Prices were quoted at:

Silver Globe	- 70 yuan (Government price), 100 yuan (open market)
Qing Min	- 45 yuan (Government price), 60 yuan (open market)
Green	- 44 yuan (Government price), 50 yuan (open market)

The teas are very attractively packaged and presented and exports go mainly to Japan and Hong Kong.

15.2.3

Production

Average about 25 kg per *mu* which is low for China (average 70 per *mu*) because of its high mountain climate. But its value of 531 yuan per *mu* on average is very high compared to the China average of about 280 yuan per *mu*, indicating its quality.

Since the inception of the company, the main leader/entrepreneur appears to be Mr Pan who has become well known for developing this high-quality tea. Originally he introduced tea species from Fujian which he has developed under Lei Shan conditions, doing much better than in its homeland. No grafting is employed. Mr Pan asserts that no more research is needed locally. This tea is not suitable for transplanting to other areas.

He asserted that nearly all local farmers wanted to try planting this tea; about 30% had some planted. A household income of 2000 yuan per year was possible if a family could plant 4 *mu* in tea. The average family had about 11 *mu* in total for all crops.

15.2.4

Technology transfer to farmers

The company visited each village, charging for its service, and taught the farmers how to retain the high quality and how to pick the leaves. Instruction was given in seed planting per *mu*, the depth and time of planting etc., and insect

pests. The cost of instruction was 4 yuan per *mu*, paid in tea to the company. Although the company had received loans from the Government it had to repay them through its income.

15.3

Problems for the Future?

- A continuing problem that might increase in likelihood, is peasant invasion of reserve forest land in order to obtain the means of subsistence, or timber for charcoal. During the Great Leap Forward much forest was cut down for iron smelting, charcoal making etc.

- Lei Shan is the poorest county in the whole district (about 100 yuan per head) while in the area of the protection forest reserve, the mean per capita income is only about 50 yuan. Food production averages only 200 kg per person for county or 150 kg for protected forest area, and people have no income with which to buy food, hence local markets are sluggish.

- Some sheet erosion occurs on maize plots on steep slopes. The Forest Bureau wants to plant tea partly for protection in such areas.

- A key issue for the tea forestry company, which owes so much to the skills and management of Mr Pan, depends on the quality of management after he retires in about 10 years. He has training about 40 technicians and five small farmers, so hopes competent people will emerge from amongst these.

- Some years ago, tea production was under the Ministry of Agriculture and farmers had access to research facilities for disease control. Despite some excellent work by the company under the Forest Bureau, these facilities were now lacking. There appears to be a need for research on insect pests for tea, funded perhaps at District or Provincial level to scientific institutions who would contract to do the research, to be paid back perhaps by a cess levied on tea production.

- There is a danger in tea forestry schemes where undue pressure is placed on small Miao farmers to participate by entering land into the scheme for planting. Thus in one area unwilling "participants" chopped out newly planted tea to plant their own crops, causing a loss of 200,000 yuan. In the long run such schemes are only likely to succeed if all members are willing to participate and to enter land into the scheme.

16.1 Xijang Town

16.1.1 Xijang, with a population of about 8,000, is the capital for the whole Miao area in Kaili district. It is the centre for administration, secondary schooling, dispensary, etc. and includes a number of shops and restaurants as well as the Government storehouse containing rice for the poor (never empty).

16.1.2 Many features (e.g. old Chinese posters lining house walls) indicate considerable integration into Han society, though the strong sense of Miao identity and distinctiveness is everywhere evident.

16.1.3 The economy, livelihood, income and sources of income, deforestation, ideas and problems for the future, population pressure and land shortage, tea planting, timber and forestry extension are considered in Profiles 10-12 which display a considerable diversity in livelihoods, economic strategies, and perceptions between households.

16.2 Forest Protection Role

16.2.1 Staff explained their tasks of preventing cutting down trees on forest reserve land and forest fires, although fire breaks exist. The cause of fires is usually related to farmers cutting grass and burning to obtain the potash to stimulate fresh growth. Such small fires frequently get out of hand.

Staff are out every day on the lookout for tree felling - each staff member checks about 500 *mu* of land each year. The fine for cutting down several trees is about 150 yuan - more than the average annual per capita income in this area.

There is a tendency for their job to make them unpopular with farmers; this does worry them but they are determined it must not interfere with their work.

17.1 Erosion Control Project, Nayong and Zhijin Counties (Project 3356)

17.1.1 Nayong and Zhijin are two of the poorest counties in Bijie district in north-west Guizhou Province. They lie on tributaries of the Wu river and as forestry is usually cut down soil and water despoliation in these watershed areas is very advanced.

Mr Zhou Ding, Manager of the Project, outlined this Project, funded by FAO and the World Food Program of UN (US\$16.7 million) and Chinese Government (US\$7.535 million) which aimed at erosion control through afforestation and other means.

Before 1987 the Provincial Government sought UN funding. This was gained in Rome, June 1988, and the Project, designed for 5 years, began in December 1988.

17.1.2

The altitude of the area is 1000 m a.s.l. to 1800 m a.s.l., with minimum average rainfall about 1100 mm, minimum average temperature about 15°C (ranging from 4-9°C in winter to 20-28°C in summer). Between 70-80% of the total area consists of precipitous karst gorge slopes that are steeper than 30° (usually considered the extreme limit for any type of cultivation).

17.1.3

The forested area was reduced by population pressure and the need for new agricultural land from 158,700 ha in 1950 to 19,000 ha at present, or about 3.5% of total area. "On large areas of land, only traces of former terraces remain, and the area of uncultivable land is increasing rapidly".

17.1.4

All households practise subsistence agriculture, with a total area per household on average of only 2 ha - cultivated area about 1 ha, including on average 0.25 ha which, strictly speaking, should not be cultivated (marginal land with slopes above 25°).

17.1.5

Average food production in terms of raw grain works out at 179 kg per capita (rural) in Nayong and 192 kg in Zhijin - after deducting requirements for seed, animal feed and agricultural tax, net availability per capita only averages 125 kg, plus 10 kg purchase of resold grain from State or 20-30 kg from free market. This is a very low level of consumption, though compensated by a higher intake than average of meat, oil and vegetables.

17.1.6

Per capita income is thus low - less than 80 yuan on average (average for China in 1986 of 460 yuan and poverty line set at 200 yuan). Rate of illiteracy over 50% and standard of health low. Child malnutrition is general, 40% of children below standard weight.

17.1.7

Government Land Use Plan

- Develop plateaux, hilltops or low rolling hills of slopes 10-20° for pasture or forestry.
- Upper hillsides of shallow soils and slopes above 30° to 35° to be reforested.
- Lower hillslopes of deeper soils - dryland cultivation if properly terraced.
- Valley bottoms - paddy fields.

17.1.8

Long term aims of Government plan are to reduce cultivated land from 43.7% of total area to 35%, increase forested areas to 40%, and progressively develop pastures where suitable (pH at 5.5 - 5.9 is not too low). To be successful however, this requires higher grain production from a reduced area and hence success of a parallel agricultural intensification programme.

17.1.9

Objectives of Project 3356

- Protection of 36,300 ha of land through establishing forest plantations (34,300 ha) and pastures (2000 ha). This should reduce amount and intensity of run-off onto crop areas, roads and buildings.
- Creation of necessary forest nurseries (343 ha).
- Establish a livestock industry through faster improvement of unproductive land.
- Improve access roads (100 kms) to villages, facilitating rural development and mineral development.
- Improvement of social amenities (WFP food assistance of 3 million yuan).
- Intensive technical training of workforce.
- Protection and improvement of 2000 ha of agricultural land by stone faced terracing.

17.1.10

Labour

Most small local farmers, paid in food at rate of 3.25 kg per day.

17.1.11

The Project will be implemented in a total of 413 villages, part of 64 townships, with a total population of 511,000 (104,000 households). However, only 68,000 households will benefit directly from the Project. The total area is 1740 sq kms (174,000 ha) including 76,000 ha at present cultivated.

17.1.12

Implementation

Chinese specialists plus 7 overseas scientists to plan the Project in its agricultural, economic, forestry, pasture and conservation aspects.

17.1.13

Progress

By July 1990 about 222,000 mu of new plantations established, with 400 ha of improved land and 200 ha of pasture land. About 70% of planting is protection against erosion, 20% timber species, and 10% economic spp. Although the Project has only been operating 18 months of a 5 year period it is close to planting half the whole target area. Visiting consultants reported as satisfied with progress. One of the main aims is to maintain and if possible improve the quality of the plantations.

17.1.14 Protection Forestry

Main species - the hardwood *Betula luminifera*, poplar, *Quercus*, *Pinus amandii*.

Timber - Chinese fir, sub-Chinese fir, *Pinus amandii*, *Sassafras*, *Paulownia*.

Economic species - "Chinese painting" tree tea, fruit, orange, apple, peach. Potato, wheat, maize may be interplanted with the new tree seedlings by small farmers on their land for the first 5 years of tree growth. Originally it was planned to use about 20 species but finally a much smaller number have been used. About 90% of seed for tree plantings obtained from Guizhou Province, about 10% from outside.

17.1.15 Problems

- Some difficulty in finding enough scientists to deal with technical problems.
- Supply of black plastic bags for transplanting. Guiyang plastic bags too expensive - have to be purchased from Anhwei and Guangdong.

17.1.16 Conclusion

Overall the Project is ahead of schedule and seems to be progressing satisfactorily. In the long term the Project should preserve soils and develop resources on which the people's livelihood depends. Ultimately therefore household incomes and living standards in one of the poorest areas of China should be improved and safeguarded.

Profiles (Case Studies From the Field)

The limitations of the following profiles, or brief case studies of small farmer households, are obvious. Given the limitations of time, language and background knowledge the results are rather crude and tentative with respect to precise data. In following an approach based on research among peasants in several Latin American and Pacific countries I have tried to avoid the "quick and dirty" of incompetent rural development tourism and the pathological "long and dirty" of some questionnaire surveys. The interview guide employed was a checklist that enabled the farming system to be broadly depicted in its environmental setting indicating problems and opportunities for agricultural or land use improvement. The approach has attempted to maintain flexibility and look at options, with the emphasis on learning from the farmer's experience and eliciting his perspective. On the techniques of "rapid rural appraisal" (RRA) see Chambers 1983.

Profile 1

Specialist Sheep Farmer, Dashan

28.4 ha (426 mu) - 220 sheep (nearly 2 mu per sheep); 2 rams, both acquired from extension station.

Farmer began in 1986, when area covered in wild grass and scrub. Did 80% of work himself, employing some labourers occasionally.

1 ha - buck wheat and potatoes
Pigs - 12
Cattle - 3

Fertilizer - N5 P15 K5 + animal manure at total cost = 2000 yuan.

Wool price received for his wool

- 1986 - 4000 yuan
1987 - 8000 yuan
1988 - 10,000 yuan
1989 - 7000 yuan
1990 - 8400 yuan

Although his stock numbers have increased, the severe effect of drop in wool price can be seen in 1989 after 1988.

<u>Total costs:</u>	Fertilizers	2000
	Shepherd wages (70 yuan per month)	840
	Drenching and infections	450
	Wages for machine hire for cutting grass	400
	Herbicide for weed control	200
	Grain bought for winter feed	600
	<u>Total</u>	4490 yuan

<u>Gross income:</u>	Wool	8400
	Cattle and pig sales	3000
<u>Net income:</u>	6910 yuan - family 4 - per capita 1727 yuan	11400 yuan

Loans: Loan of 4500 yuan from Station. Repaid 2900 yuan so far.

Next steps in improving farm:

- Wants to control invasive weeds and shrubs.
- Wants to increase use of animal rather than chemical fertilizers.

Profile 2

Poor Farmer, Dasha

Has 50 mu (3.3 ha) - no sheep.
Grows crops only in summer

buckwheat - 20 mu
potatoes - 4 mu
pigs - 4

Normally he does not sell any crops (all needed for subsistence). In a very good year, sells a little.

Income - sale of piglets, about 4 @ 100 yuan each
Wages - part-time work on State Farm
Per capita income under 200 yuan

Profile 3

Very Poor Farmer, Dasha

8 mu (0.53 ha), for a family of 7.

Livestock - 9 sheep (uses a ram from Extension Station, or lent by another farmer,
1 goat
3 pigs
2 calves

Crops - potatoes - 4 mu
maize - 4 mu, both just for subsistence

Allowed to graze the rough hillside owned by a friend.

Income 1989: 3 or 4 sheep sold each year @ 40 to 50 yuan each
Wool 180
Sale of 1-2 pigs (50 yuan for piglet, 100 for large one) 200
Total 150
330 yuan

Per capita income: 76 yuan

Profile 4

Hui Herdsman

5 in family. His father owns only 1 mu (1/15 ha). Allowed to graze about 30 mu of mostly bare eroded earth, a little local grass and weeds, mostly yunnan pine dominant.

Access to land through kinship, by reciprocity.

Livestock - 20 ewes (6 rams)
1 cow

Crops - 4 mu maize
5 mu potatoes

His grandfather a generation ago had about 10 sheep here. Now flock has been built up by his father to 30 which he agrees is an absolute maximum (clearly overgrazed).

<u>Gross Income</u> : Wool	300-400
Sale of sheep - about 4 a year @ 50 yuan each	200
Sale of goat (1 a year)	45
<u>Total</u>	<u>595 yuan</u>

Per capita income: 119 yuan

Goats mostly for household eating; eat about 1 head of sheep, 1 goat per year.

Land degeneration is advanced due to over-stocking. Another informant stated that about 25 years ago this area was covered with forest; now none exists. In the periods of "Walking on Two Legs" and "Great Leap Forward" of about 1955-60, the hills were stripped of timber for backyard furnaces.

Profile 5

Yi Shepherdess

2600 m. At this high elevation the grassland belongs to village community: 400 mu pastures, forest of 10,000 mu sown by air in 1985.

Pasture of white clover, cocksfoot, rye grass, but heavily over-grazed.

Livestock - 66 sheep (2 rams)
25 pigs
4 cattle

2 mu needed per sheep.

Sheep Corriedale crossed with local breed, largely disease-free. Corriedale imported to Gansu about 1925; in 1950s brought from Gansu to Guizhou.

Only 3 families use 400 mu grassland - want a bigger flock.
8 people in her family.

Crops - Buckwheat)
Potatoes) 20 mu
Maize)

<u>Gross Income:</u> About 17-20 sheep sold @ 40-50 yuan each	855
Sale of 1/3 potatoes	300
<u>Total</u>	<u>1155</u>

Per capita income: 144 yuan

Technical assistance:

Care International assisting a few families in this village, teaching how to improve the pasture quality and providing injections for sheep disease.

Profile 6

Buye Headman of Tang Ba, Dushan

Headman claimed to be about "average" in income, but he appeared to be one of the richest and most powerful persons in the small community. Income data gained probably considerably underestimates family income.

Household (extended): 7 people

Land: about 10 mu here and another 20 mu on other side of a steep hill some kms distant
about 5 mu rice paddy
3 mu maize (one mu interplanted with other crops)
2 mu vegetables and potatoes

Total land: 80 mu - 10 mu of cropping land here, 20 mu elsewhere, plus 50 mu wasteland (cut-and-carry)

Livestock : 33 sheep
4 cows
3 pigs
"over 10" chickens
1 pony

Grazing and Cut-and-Carry:

Claimed also that 50 mu of wasteland was also "owned" by his family (20 mu of which was forest land). Also owned all bamboo round hamlet.

"No land was left." Obtaining "cut-and-carry" vegetation from the 50 mu wasteland, much of which lay on steep mountain behind village, was a problem. He also visited Dushan Farm with his pony and cart for cut-and-carry fodder.

Denied felling pine trees or poplars on mountain for housing purposes or fuel.

<u>Income:</u> Chili, green vegetables and bamboo	about 500 yuan
Several pigs	"over 1000 yuan"
Rice (about half crop)	?
<u>Total</u>	<u>over 2000 yuan</u>

Problems:

Level of consumption was low but food supply was not considered a problem. Wanted to develop wasteland behind the village and on the mountain with the help of Animal Husbandry cadres and Dushan Farm. Keenly interested in improving the quality and increasing the quantity of cut-and-carry fodder.

Lack of sources of cash income seen as one of major problems - if cash is needed have to sell rice, vegetables or pigs normally needed for subsistence or ceremonial needs.

Attitude to Dushan Seed Farm:

Thinks it has been a great success.

Social Factors:

As headman he is a man of influence with good external contacts. One son is studying at medical school in Dushan city.

Profile 7

Buye Family, Tang Ba

Nuclear family - 5 members (children between 9 and 1 years). Considers he has enough labour in household labour force.

Land: 10 *mu* rice, in winter, paddies partly planted in rape, duck weed in July
6 *mu* maize, interplanted with soya beans (2 *mu*)
0.5 *mu* sorghum
1 *mu* green vegetables

Cropland: 17.5 *mu* plus about 2.5 *mu* rough grazing

Total: 20 *mu*

Livestock: 4 pigs
2 water buffalo
10 chickens
No horse or cart

Grazes land behind village; all people use this as, in effect, communal "common land" for grazing and cut-and-carry.

Income 1989: Crop and livestock sales

3 piglets sold	102
Rice, over 2000 jin sold (some at 55 fen, some at 60 fen per jin)	1210
Rape sold - 300 jin at 74 fen	222
Duckweed sold (fodder for pigs)	50
1 water buffalo sold	600
Wage work	
Casual labouring (breaking stones for roads)	
c.50 days at 7-10 yuan per day	450
<u>Total</u>	2634 yuan

Per capita income: 376 yuan

Farmer saw himself as about "average" in living standard for the community

Prospects for future:

Sees little hope of improving his living standard in his lifetime. With little labour in his household has little time and energy. Sold one water buffalo in 1989 - important capital item (retains one).

He can read and write a little. His son has had to repeat Grade 1 in the village school: "It is necessary to study at school."

Regards the Dushan Seed Farm as a great success.

Query: "What plans do you have to improve your livelihood in the future?"

Question too big for him to answer. "With less than 20 *mu* of land he and his wife have enough to do and to worry about." Would, however, like to breed more pigs and eventually build new house.

Profile 8

Miao Family, Huang Ping, Kailli

Extended family of 15: man and wife, 4 sons, 2 daughters, 2 daughters-in-law, 4 grandsons, 1 granddaughter.

Land: 50 *mu* of forest mountain land
+ 20 *mu* rice land
+ 10 *mu* in maize + tobacco + soya beans + some peanuts
- some vegetable oils
- wheat (alternating with rice)
- sweet potatoes

Total land: probably about 90 *mu* (6 ha)

Production 1989:

Rice - no sale, 630 jin for Government
Tobacco - 1000 jin for Government
@ 3.2 yuan per kg (private sale not permitted by Govt.)
Vegetable oils - about 700 jin for Government
@ 1.41 yuan per kg
Maize - 27 fen per jin open market
Soya beans - 200 jin sold open market at 1.8 yuan per kg
(Government price 50 fen per jin)
Peanuts - 2.6 yuan per kg (same as Government price)
Tree seedlings - has 2 *mu* nursery for masson pine
has 2 *mu* nursery for cypress (from Sichuan)
has 1000 seedlings for sale (in total about 200,000 seedlings)
- 1500 yuan received 1989 from sales

Livestock: 2 cows
8 pigs - 13 piglets sold (2000 yuan total)
50 chickens

Employment: He is regularly employed on Forest Farm on a casual basis - about 10 days a month at 4 yuan per day = 40 yuan per month.

Firewood: Planted some masson pine plus other quick growing species.

Forest Farm Scheme:

- Has 50 mu in scheme with Forest Farm, begun in 1986.

- A 20 year scheme for him; paid 40 yuan at start of scheme (to be deducted from income at completion) when he believes he will receive 40% of value of masson pines, Forest Farm 60%. Thinks he might earn 60,000 yuan at completion. Believes it is a very good scheme.

- Most men in village would like to be in Forest Farm extension scheme but many have not got sufficient land.

He believes that all the rough hill lands should be planted in economic trees.

This man is main community organizer. 300 mu were necessary for scheme to operate (including his 50 mu) - he just took the land of some villagers not keen on joining to make up the 300 mu.

Head of household can read a little. Most children have completed local primary school. Family stated they had no problems.

Profile 9

A Miao Family, Lei Shan, Kaili

11 in extended family. Believed they have lived for over 10 generations in this locality. Long time ago Miao were fighting the Han, so they came up to these hills. Grandfather said only 48 families here in 1940s - now 85 families, over 400 people.

Land: 6 mu - but very low production, only 200-400 jin per mu (have to buy over half their needs - about 700 jin, costing about 500 yuan) - maize + sweet potato and other crops (beans etc.) interplanted 7-10 mu planted in tea

Livestock: 6 pigs
2 cows

4 sheep
10 chickens
No horses or water buffalo

In 1988 had 8 pigs and 2 cows but in 1989 all died of disease.

Income:

All from tea or from sale of piglets and other animals. In Miao custom a girl must be well dressed. All money for this costume comes from tea. Tea only planted in 1988. Interplanted with maize for 1 or 2 years. In 1990 got 700 yuan from tea harvest. Has other economic trees that bring in 500-600 yuan per year.

	700 yuan tea
	500-600 yuan econ. trees
Total	1250 yuan

He would like to expand his tea planting as he has the land, but lacks the labour (only one son plus several daughters) - would have to employ other villagers.

All private trees cut down, due to need for fuel, other land uses. Tree growth slow - 25 to 30 years needed for a Chinese fir to be 20 cms diameter, worth 100 yuan. No trees planted at birth for daughter's future dowry.

Ideas for future:

1. Wants to plant tea or other species. 2. Worried at population increase and shortage of land. 3. Favour tea company which teaches them techniques of tea husbandry and enables them to increase their income.

Problems:

- Insect pests sometimes attack tea crop. They use insecticide but no money for spray and don't know which insecticide to use.
- Erosion quite heavy in this area. Stated that 40% of the deforestation has occurred in the last 30-40 years.
- Only a few farmers had undertaken the planning for Chinese fir planting for the future. One large farmer had several hundred growing - worth 150 yuan each at 25 years.
- A lot of masson pine used for firewood - too valuable to use as fuel.

Profile 10

Miao Headman, Xijang Town, Naili

Old man in 60s. Born here. Says when young, people often hungry, now life is better, always enough to eat. Have TV set.

Land: 8 *mu* rice and carp (about 200 jin a year from carp). No crop after rice harvest, nearly 20 *mu* maize, interplanted with potato and sweet potato

Livestock: 3 cows
10 pigs
20 chickens

Camellia trees, but too tall to produce well.
A few tung oil trees.

Income 1989: 8 small piglets + 2 pigs = 1300 yuan
1 cow = 300 yuan
Rice (about 10% production sold) = 900 yuan
300 jin rice made into rice wine (no sale) rest consumed
Casual work - about 30 days @ 4 yuan per day = 120 yuan
Has about 100 Chinese fir trees (valued at 10,000 yuan) - cuts down one a year at about 20 years growth
No tea, no tobacco, no embroidered costumes made for sale
Masson pine used for firewood only, no cash sale.

Sources of income for future:

Don't like planting tea - see it related to forest regeneration. Can't find enough sources of money or food. But people short can borrow food from others, repaying later - a strong system of reciprocity operates.

Will sell pigs, animals, some rice, some trees in future. Don't worry about population pressure.

Profile 11

Miao Family, Xijang, Naili

Extended household of 15 - Grandmother 83, 4 sons, 1 daughter, 9 grandchildren. When grandmother young, area often hungry, although population low.

Deforestation:

In this steep country, they have always been careful, even during "Great Leap Forward", as they know that bad erosion follows widespread tree felling. 90% of the trees are Chinese fir (very valuable).

Land: 5 *mu* rice - nothing grown after rice
3 *mu* maize - interplanted with taro, sweet potato and potato and chile, water melons and beans
5 *mu* Chinese cabbage, egg plant, dry rice

Total land: 13 *mu*

Some fruit trees. Over 100 Chinese fir trees.

Livestock: 2 pigs
2 cows
10 chickens
No water buffalo (uses hoe instead of plough)

Income 1989: Carp from rice padi 100
Sale of 1 pig 300
No sale of other crops
Total 400 yuan
or about 27 yuan per capita

Forestry Extension Scheme:

States 40 yuan paid per *mu* for inclusion - after 30 years land returned to family - 30% of value of Chinese fir timber to farmer, 70% to Forest Bureau.

This land belongs to whole Miao community - money will go to community as a whole, not to him.

Profile 12

Miao Family, Xijang Town, Naili

7 in family. Head and wife, his mother, 1 daughter and 3 sons.

Land: 6 *mu* rice and carp
1 *mu* maize, potato, soya bean, sweet potato, Chinese taro interplanted
Sometimes plants useful weeds for stock fodder.
No tung oil, no tobacco
60 *mu* tea, first 2 years interplanted with maize and sweet potato (planted tea about 4 years ago)

Total land: 67 mu

Livestock: 3 pigs
1 cow
5 chickens (Because of disease most chickens died 1989)

Income: Carp sales = 100 yuan (40 jin at 2.5 yuan per jin)
Sale of 2 pigs = 500 yuan

Assets: About 20 Chinese fir regeneration.

Ideas for future:

Might cut Chinese fir for buildings after 10 years - no plans for sale of timber. No other sources of income.

Laughed about population growth and shortage of land but agreed it was a problem.

Grandmother recalled time of hunger during 1959-62.

Need to develop hills - forest service work important, stated by man who works part-time for it. Another man stressed importance of protection forestry.

Want to develop tea forest, but can't get enough money, tea and technology - the tea company has never visited here. Believe it lacks resources to visit new villages.

Erosion and population pressure:

Quite heavy. Some on maize plots and rice paddies also affected. Most people recognize danger but when need money cut down timber.

In former period, if a man cut down trees, policemen would come and catch them - need stronger management now.

Question: "Do you need a council to discuss solutions for problems?"

Answer: "Practise the right things for the future is the main need."

Visit of family planning officers (about every 2-3 years). Admit that 4 or 5 children per family would be a big problem - average now about 3 per family.

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